A REVISION OF THE ADULT AND LARVAL MOSQUITOES OF JAPAN (INCLUDING THE RYUKYU ARCHIPELAGO AND THE OGASAWARA ISLANDS) AND KOREA (DIPTERA: CULICIDAE)[1]

by

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ABSTRACT

This is a taxonomic revision of the adults and 4th stage larvae of the true mosquitoes of Japan including the Ryukyu Archipelago and the Ogasawara islands, and South Korea. The pupa is only briefly considered in the subfamily Anophelinae. The family Culicidae is divided into 2 subfamilies: Anophelinae and Culicinae. The subfamily Culicinae comprises 4 tribes: Culicini, Uranotaeniini, Sabethini and Toxorhynchitini. No changes are made to the generic and subgeneric divisions. *Culex (Barraudus) inatomii* Kamimura and Wada is elevated to species rank from a subspecies of *modestus*. *Toxorhynchites (Toxorhynchites) yamadai* (Ouchi) and *Tx. (Tox.) yaeyamae* Bohart are reduced to subspecies of *manicatus* (Edwards). New taxa are as follows: *Culex (Eumelanomyia) hayashii ryukyuanus* new subspecies, *Cx. (Lutzia) shinonagai* new species, *Heizmannia kana* new species, *Aedes (Ochlerotatus) impiger daisetsuzanus* new subspecies, *Ae. (Och.) hexodontus hokkaidensis* new subspecies, *Ae. (Finlaya) japonicus amamiensis* new subspecies, *Ae. (Fin.) japonicus yaeyamensis* new subspecies, *Ae. (Fin.) nishikawai* new species, *Ae. (Stegomyia) flavopictus miyarai* new subspecies, *Ae. (Stg.) wadai* new species, *Uranotaenia (Pseudoficalbia) novobscura ryukyuana* new subspecies, *Tripteroides (Tripteroides) bambusa yaeyamensis* new subspecies. The male of *Anopheles (Anopheles) saperoi saperoi* Bohart and Ingram and the larva of *Aedes (Geoskusea) baisasi* Knight and Hull are described for the first time.

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The bionomics and relation to diseases, when known, are briefly discussed for each species. The morphology of the larval maxilla is discussed, and the following new terms are proposed: lacinial suture, lateral artis, mesostipes, palpostipes, pseudoartis and stipital sensorium. In addition, a new numbering system for the maxillary ring-based setae is presented.

INTRODUCTION

Background, Methods and Presentation

Scope

The present work deals with the taxonomy of the adults and the 4th stage larvae of the true mosquitoes (dixid and chaoborid midges are not included) from Japan including the Ryukyu Archipelago and the Ogasawara (Bonin) islands, and South Korea. Pupae are also briefly treated in the subfamily Anophelinae since many anopheline species cannot be identified without an understanding of this stage.

Material

As a rule, the taxonomical studies of this work are based on fresh specimens collected during this project from the field. Only when fresh specimens were not available, were specimens obtained from other sources (e.g. various museums, institutions and laboratories). All of the collections were studied at the U. S. Army Medical Laboratory, Pacific. At the conclusion of the study they were transferred to the U. S. National Museum, Washington, D. C. and to other suitable museums or institutions in Japan.

Synonymic References

Only synonyms described from this region are listed. Also, in this section, the first records for each species from Palaearctic Japan, the Ryukyu Archipelago, the Ogasawara islands, and South Korea are listed with the names reported. Those species with a sex or stage described by LaCasse and Yamaguti (1950) are also listed.

Descriptions and Keys

All descriptions and keys including those of supraspecific categories were prepared from specimens collected in this region, unless otherwise stated. Thus, they are not necessarily applicable to the same species and groups of other regions.

For an evaluation of the range of variation of structures, as a rule, 10 specimens (from as many localities as possible*) were studied. However, since there are many exceptions to this rule, and as the reliability of the values of variation ranges depends largely on the sample size, the number of specimens studied is shown in parentheses in each case after the value, unless 10 specimens were studied. When the specimens studied were 10 or more, and, if a case occurred with a frequency of 80% or more, the term "usually" is used.

*Our experience showed this to be a good practical method to cover a tolerably wide range of variation with a minimum number of specimens.

Female. This sex is described first, since it generally is more distinct in scaling and chaetotaxy. Description of the female is an advantage to entomologists who conduct field studies since they normally encounter this sex. Hara (1957a, b, c) published papers treating the female genitalia of most Japanese species and claimed that identification of species was always possible by using these structures. Our evaluation with a number of species revealed that Hara had neglected both individual and local variations; our species could not be identified with the keys he prepared. A thorough revision of the female genitalia utilizing a better technique is needed; however, this is not included here.

Male. Males are described using some secondary sexual characters and other features necessary for comparison with related species. Male genitalic features were found to be the most important taxonomic characters and were therefore fully described. Males are, in general, more slender than females, having larger antennal pedicels, sparser scaling, fewer thoracic bristles, narrower wings, more slender and hairy abdomens, etc.; such common characters are omitted from most descriptions.

Wing. Capital letters show the cells (e.g., R_2) and lower cases show the veins (e.g., r_{2+3}).

Larva. Unless otherwise indicated, all descriptions and illustrations were prepared from exuvia or 4th stage whole larvae. Range of variation in the branching of the body setae together with notes on size, barbing, etc. are shown in the larval chaetotaxy tables; all data in these tables is not included in the descriptions.

Measurements

Approximate Measurements. Obtained on dried pin-mounted specimens by eye-measurements or with an eyepiece micrometer in a stereoscopic microscope. The values obtained and relative values calculated from the measurements are shown in fractions or to one decimal place (more accurate). Also, values transferred to mm from the scales of the micrometer are shown to one decimal place. In these cases, the numbers of specimens measured are not usually given in the description.

Accurate Measurements. Obtained by an eyepiece micrometer in a compound microscope, or occasionally in a stereoscopic microscope, of slide-mounted specimens. These are more accurate, and values transferred to mm from the scale of the micrometer are usually shown to 2 decimal places; comparative values calculated from these measurements are usually also shown to 2 decimal places. In these cases, numbers of specimens measured are shown in parentheses in the descriptions, unless they are 10. The structures measured in this way are as follows: length of antennal flagellum, flagellomeres, palpus, palpal segments, proboscis, wing cells and veins, legs, basistyle, dististyle, its terminal claw, aedeagus, etc., and width of the dististyle, aedeagus, etc., in the adults; length of head, antenna, siphon, saddle, body setae, etc., distance between setae 1-C, and width of head, siphon, etc., in the larvae. The width of the basistyle is often variable according to the degree of sclerotization of individual specimens. In such cases and in other poorly sclerotized structures, comparative values related to them (e.g., length-width ratio of the basistyle) are calculated at most only to one decimal place, even if measured on slide-mounted specimens.

Methods of measurements in some individual structures are as follows:

ADULT. Length of any segment includes the basal portion often inserted into the proximal segment. *Palpus.* Total length of palpus is measured from the base of the proboscis, then the palpus-proboscis length ratio obtained on

slide-mounted specimens is comparable with that obtained from pin-mounted specimens. *Proboscis*. Length includes the labella. *Wing*. Length measured from the base of the costa to the apex of the wing. Length of cell R_2 is the distance between the point of the fork and the apex of vein r_3. Length of cell M_{1+2} is the distance between the point of the fork and the apex of vein m_{1+2}. *Basistyle*. Length from the extreme base located on the lateral surface, which is usually seen as a narrow, more or less triangular process in tergal view.

LARVA. *Head*. Length from the anterior margin of the labrum to the posterior margin of the collar. *Siphon*. Length measured on the dorsomedian line; maximum, basal and apical widths in lateral view. All measurements were obtained from specimens with pieces of glass or glass tubes of suitable thickness between cover slips and slides. The index is the ratio of the length to the basal width. The positions of seta 1-S and the apex of the pecten are determined by their distances from a vertical line drawn from the base (or apex) on the dorsomedian line. *Saddle*. Length measured on the dorsomedian line.

Records of Specimens

The area covered by this work is divided into 14 districts, each district having its own code letter, A-N (Fig. 1). Prefectures, provinces and minor islands are shown in Fig. 2. Each collection made at a single habitat (e.g., a tree hole, a ground pool) is given a serial number. A collection number consists of a code letter and serial number. Collection numbers refer only to collections preserved in this laboratory. Specimens examined in our collection are shown by the collection numbers for each species and precise data is included in the COLLECTION RECORDS Section. Specimens examined from the other sources are shown by detailed data, together with their locations. Numbers of specimens examined are shown in total for each major island, groups of islands or South Korea.

Figure 1. Area covered*

A - Hokkaido District
B - Tohoku District
C - Kanto District
D - Chubu District
E - Kinki District
F - Chugoku District
— Honshu
G - Shikoku District
H - Kyushu District
I - Amami Gunto
J - Okinawa Gunto
K - Miyako and Yaeyama Gunto
L - Korean Peninsula
M - Cheju Do
N - Ogasawara and Volcano islands

*Districts A through K and N are situated in Japan; L and M are in South Korea.

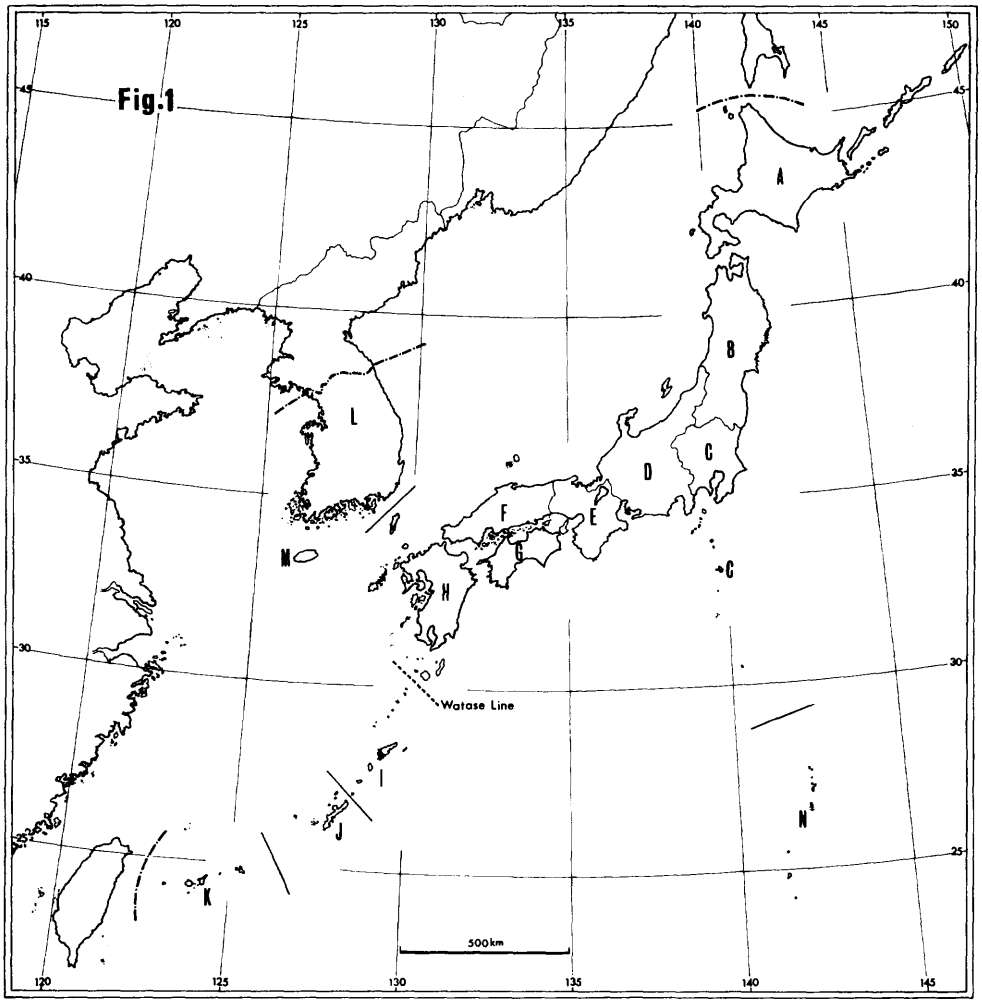
Fig.1
115
120
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40
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25
A
B
C
D
E
F
G
H
I
J
K
L
M
N
Watase Line
500km

Figure 2. Prefectures, provinces and minor islands

A. Japanese Archipelago
B. South Korea
C. Ryukyu Archipelago
D. Ogasawara and Volcano islands

Prefectures of Japan (large bold numerals)

1. Aichi
2. Akita
3. Aomori
4. Chiba
5. Ehime
6. Fukui
7. Fukuoka
8. Fukushima
9. Gifu
10. Gumma
11. Hiroshima
12. Hokkaido
13. Hyogo
14. Ibaraki
15. Ishikawa
16. Iwate
17. Kagawa
18. Kagoshima
19. Kanagawa
20. Kochi
21. Kumamoto
22. Kyoto
23. Mie
24. Miyagi
25. Miyazaki
26. Nagano
27. Nagasaki
28. Nara
29. Niigata
30. Oita
31. Okayama
32. Okinawa
33. Osaka
34. Saga
35. Saitama
36. Shiga
37. Shimane
38. Shizuoka
39. Tochigi
40. Tokushima
41. Tokyo
42. Tottori
43. Toyama
44. Wakayama
45. Yamagata
46. Yamaguchi
47. Yamanashi

Provinces (Do) of South Korea (large bold numerals)

48. Cheju
49. Chollanam
50. Chollapuk
51. Chungchongnam
52. Chungchongpuk
53. Kangwon
54. Kyongki
55. Kyongsangnam
56. Kyongsangpuk

Minor islands (small italic numerals)

1. Amakusa Shimojima
2. Amami Ôshima
3. Anijima
4. Aogashima
5. Chichijima
6. Danjo Guntô (Isls.)
7. Gotô Rettô (Isls.)
8. Hachijô
9. Hachijô Kojima
10. Hahajima
11. Hamahiga
12. Hateruma
13. Hatoma
14. Henza
15. Hirado
16. Honjima
17. Iejima
18. Iheya
19. Ikema
20. Iki
21. Irabu
22. Irimote
23. Ishigaki
24. Iwôjima
25. Izena
26. Izu Ôshima
27. Kerama Rettô (Isls.)
28. Koshiki Rettô (Isls.)
29. Kumejima
30. Kuroshima
31. Mikura
32. Minamidaitô
33. Miyagi (Takabanare)
34. Miyake
35. Miyako
36. Mukojima
37. Niijima
38. Oki Guntô (Isls.)
39. Okinawa
40. Okinoerabu
41. Okushiri
42. Otôtojima
43. Rebun
44. Rishiri
45. Sado
46. Taketomi
47. Tanegashima
48. Tarama
49. Tokunoshima
50. Tsushima
51. Yakushima
52. Yonaguni
53. Yoron

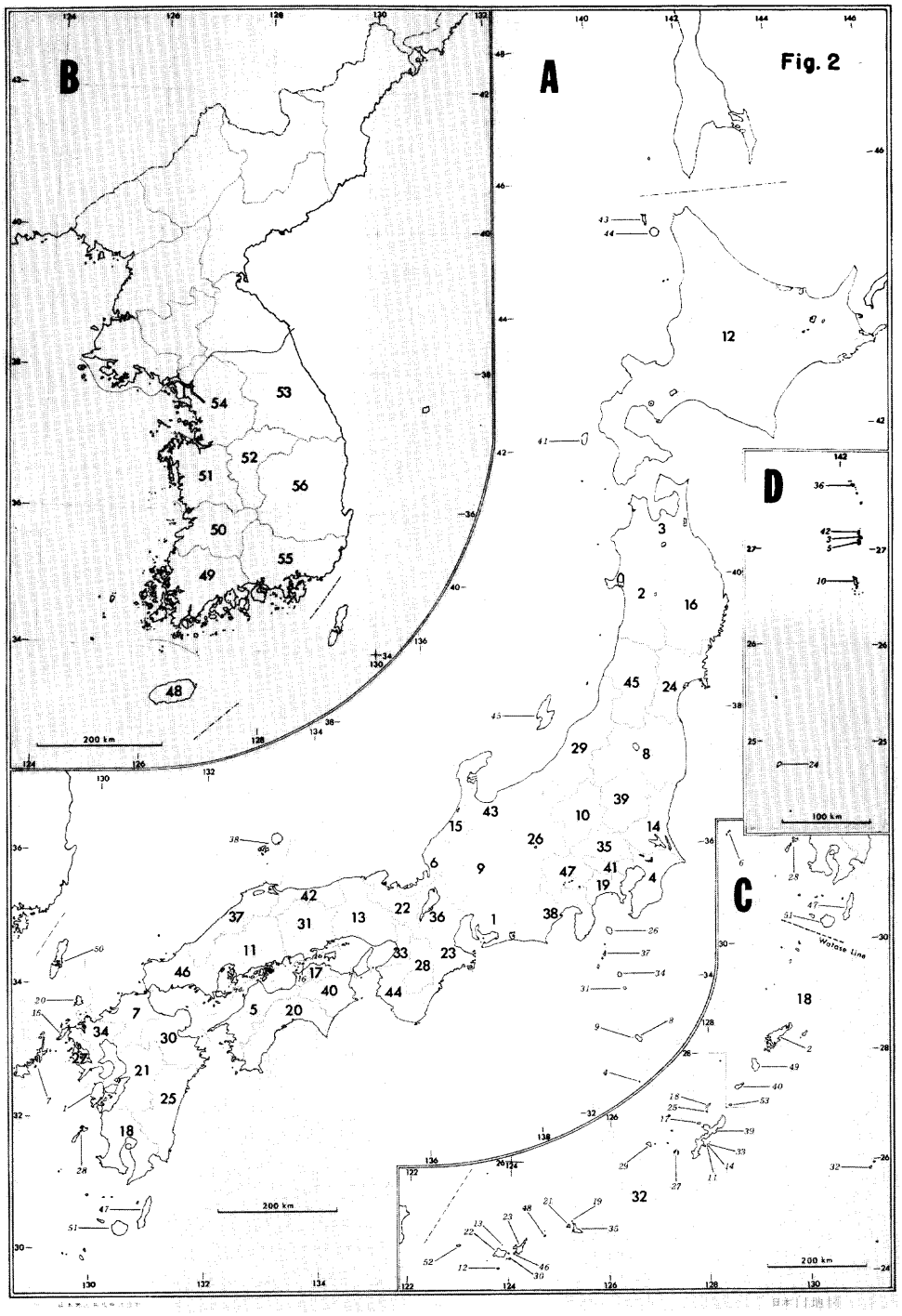


Fig. 2
A
B
C
D
200 km
100 km
Watase Line

Illustrations

Most figures are self-explanatory, thus only a few comments are provided.

Adult. Figures represent females unless otherwise indicated. In the enlarged figures of the male antenna of *Culex (Lophoceraomyia)*, only modified setae are illustrated. Wings represent the dorsal aspect. Legs are drawn from the anterior aspect (anterodorsal aspect of forefemur), and arranged as fore-, mid- and hindleg from the left. Toothed or modified claws are illustrated and simple claws are usually not. When both anterior and posterior claws are equal, usually only the anterior claw is illustrated. When 3 sets of claws are shown, they are of fore-, mid- and hindtarsus from the top or from the left; when 2 sets, they are of fore- and midtarsus.

Male Genitalia. In general, except for *Culex,* the dorsal aspect of the left basistyle, dististyle and most of the proctiger and phallosome are illustrated. For *Culex,* the lateral or mesal aspect of the basistyle (or apical half) and dististyle are shown. Various parts of the terminalia are shown separately as indicated on the figures.

Larva. As to the head, thorax and abdominal segments I-VI, the left half represents the dorsal aspect, and the right half the ventral aspect. Apex of antenna is in dorsal view, unless otherwise stated.

Morphology and Terminology

We adopted widely accepted morphological interpretations and terminology with a few exceptions. Figures 3-10 show most morphological features and terminology used. Those limited to certain species are shown in the illustrations for such species. A discussion of new interpretations and new or uncommon usage of terminology employed here follows.

ADULT (Figs. 3 and 4). Vertex and Tempus. The posterior part of the dorsal surface of the head is usually termed the occiput, and the remainder the vertex. However, there is no border line between the two, and the scaling of these areas is variable and does not indicate any differentiation of the areas. The occiput is reduced on mosquitoes to a small plate (the nape) projecting from the back of the head (Natvig 1948). We follow this interpretation, and call the entire dorsal surface of the head the vertex. The sides of the head behind the eyes are usually scaled differently from the vertex, the bristles along the eye on this part are usually finer than those of the vertex, and projected anteriorly, while the bristles of the vertex are directed anteromesally; thus these 2 groups of bristles are usually easily discriminated. It may be reasonable therefore to consider this area as different from the vertex, and call it the tempus (pl. tempora), again following Natvig (1948). As a result of this interpretation, the bristles on the vertex are termed the *vertical bristles,* and those on the tempus the *temporal bristles.* In some groups, e.g., *Anopheles (Anopheles)*, these bristles are continuously arranged and almost homogeneous, and thus it is difficult to discriminate between temporals and verticals. In these groups a widely used term, the orbital bristle, is employed.

Palpus. Colless (1965) recognized 6 segments in the male palpus of *Culex (Lophoceraomyia).* This condition is common in most species having a long palpus. We, however, consider the first segment as a part of the stipes, probably the palpifer; it usually has neither setae nor scales. On the other hand, many setae and scales are present from the apparent 2nd segment (first segment of the palpus) except for many species of *Culex.* Thus, as accepted generally, the male palpus is 5-segmented. The palpus of the female is often

regarded as 4- or 5-segmented (depending on presence or absence of a minute apical segment). However, it should be 3- or 4-segmented on the same basis as the male. The apparent basal segment is homologous to that of the male. Thus it must be the palpifer or a part of the stipes. It too is always bare. The true palpal segments are always bristled and scaled; the 3rd segment is longest, the 4th is minute or lacking.

Genitalia. Reinert's (1974) terminology is employed for the unusually well developed male and female genitalia of *Aedes (Verrallina)*. This is also applied to the male genitalia of *Topomyia*. The words *sternobasal division* and *tergoapical division,* and Greek letters α, β, γ, δ, ϵ, μ and χ are used for the male genitalia of *Culex*. They are explained in the generic description.

LARVA (Figs. 5-10). *Mandible* (Fig. 6). Special attention has been paid to the mandible and maxilla throughout this project, as they appear to provide good phylogenetic and diagnostic characters. In respect to the morphological interpretation and terminology of the mandible, we chiefly follow Pao and Knight (1970b) and Knight (1971), and partially Gardner et al. (1973), with the following 2 exceptions. The mandibular spurs are numbered as MdS_1 to MdS_5 dorsoventrally, thus, the usually shortest ventralmost spur is to be MdS_5; MdS_2 is usually fine and multiple, located a little anteriad of others; MdS_3 and $_4$ are usually similar, when one of them is absent, the remaining one is regarded as MdS_3. As discussed later, we use a new numbering system for the ring-based setae of the maxilla; consequently, the mandibular setae must be numbered differently. Thus, we use 1-Md instead of 0-Mp of Knight (1971). This seta is found in only *Anopheles* and *Aedes (Stegomyia)* in the mosquitoes of this region.

Maxilla (Figs. 7-10). Recent papers of Pao and Knight (1970a, b and Gardner et al. (1973) provide much assistance toward understanding the morphology of the maxilla of mosquito larvae. However, their studies were based only on a few species of *Aedes*. As a result of our studies which were based upon an analysis of 13 genera, 28 subgenera and nearly one hundred species, [including *Dixa* (Dixidae), *Chaoborus* and *Mochlonyx* (Chaoboridae)] our conclusions are somewhat different from those of previous authors. They are discussed fully in this chapter.

1. Cardo

Salem (1931) identified the usually triangular, well sclerotized small sclerite at the base of the maxilla as the "first segment of the maxillary palp." However, many authors (e.g., Cook 1944; Foote 1952; Shalaby 1957a; Pao and Knight 1970b; Gardner et al. 1973) considered it the "palpifer." Snodgrass (1959) stated, without giving any reason, that it might be referred to as the "cardo." Pucat (1965) regarded it a fused sclerite, the "cardo-basistipes," based on Hinton's (1958) view; the latter author, working on Panorpoidea, hypothesized that the stipes was composed of 2 sclerites, the basistipes and dististipes. Hinton's view was criticized by Badcock (1961) who concluded that Hinton's dististipes was the fused part of the proximal palpal segment or segments and the lacinial lobe (after Matsuda 1965). Maslov (1967) had a different view, thinking it the "stipes." A generally accepted definition of the palpifer is as follows: The palpifer is a differentiated part of the maxillary stipes bearing the palpus distally (Snodgrass 1935; Matsuda 1965). It usually has neither muscles nor sensory organs. Although identical with this definition in lacking muscles, this triangular sclerite of mosquito larvae is never associated with the stipes. It always has a well developed sensory seta (6-MP of Pao and Knight 1970b) and is often fused with the cranium; partially in *Culiseta*, *Culex*, and most of *Aedes* (Fig. 9 a, b), completely in *Armigeres* (Fig. 9 c, d) and

Figure 3. Morphology (I). Adult - 1

a. Female - Lateral aspect

HEAD

1. eye (compound eye)
2. vertex
3. tempus
4. clypeus
5. pedicel } – antenna
6. flagellum }
7. palpifer
8. palpus
9. labium } – proboscis
10. labellum }

THORAX

11. anterior pronotal lobe
12. posterior pronotal lobe
13. scutum
14. scutal suture
15. scutellum
16. postnotum
17. paratergite
18. propleuron
19. spiracular area
20. mesothoracic spiracle
21. postspiracular area
22. subspiracular area
23. prealar knob
24. sternopleuron
25. mesepimeron
26. mesomeron
27. metathoracic spiracle
28. metepisternum ┐
29. metepimeron ├ – metapleuron
30. metameron ┘

WING

31. wing (forewing)
32. halter

LEG

33. hindcoxa
34. hindtrochanter
35. hindfemur
36. hindtibia
37. hindtarsus*
38. claw

ABDOMEN

39. tergum
40. laterotergite
41. sternum

GENITALIA

42. cercus
43. postgenital plate

b. Female head - Dorsal aspect

1. eye (compound eye)
2. vertex
3. interocular space
4. tempus
5. nape
6. vertical bristles
7. temporal bristles
8. clypeus
9. scape } — antenna
10. pedicel }
11. flagellomere 1 }
12. palpifer
13. palpus*
14. proboscis (labium)

c. Thorax - Dorsal aspect

1. anterior promontory
2. scutal angle
3. scutal suture
4. fossal area
5. prescutellar space
6. acrostichal bristles
7. anterior dorsocentral bristles
8. posterior dorsocentral bristles
9. humeral bristles
10. angular bristles
11. posterior fossal bristles
12. supraalar bristles
13. prescutellar bristles
14. scutellum
15. anterior pronotal lobe

d. Maxilla - Male *e*. Maxilla - Female

1. stipes
2. palpifer
3. palpus*
4. galea

f. Foretarsomere 5 - Male

1. ventrobasal swelling
2. midventral process
3. anterior claw
4. posterior claw
5. empodium

g. Foretarsomere 5 - Female

1. claw
2. pulvillus
3. empodium

*Segments of these structures are indicated by Roman numerals in Fig. 3.

Fig. 3

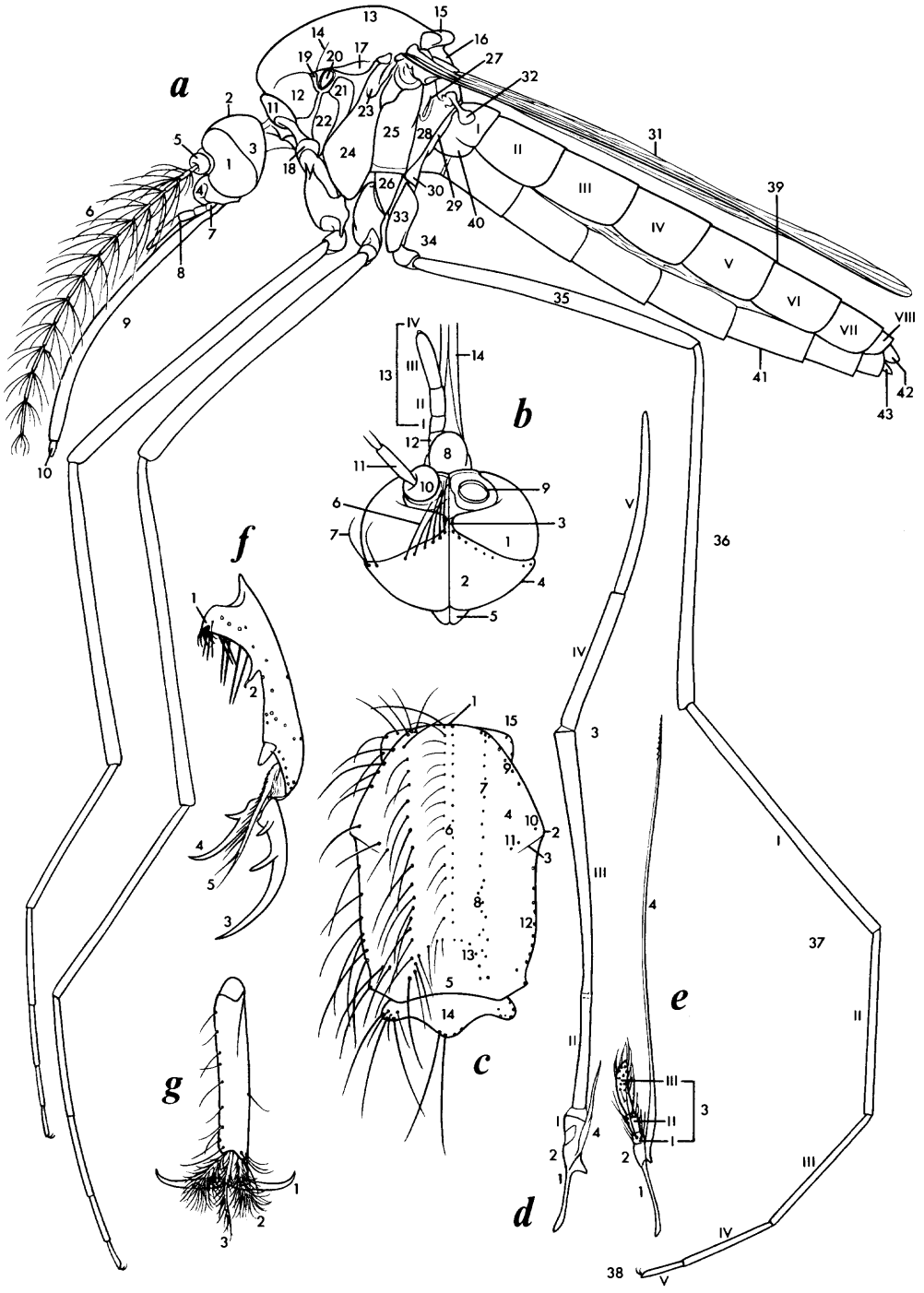


Figure 4. Morphology (II). Adult - 2

a. Wing - general

1. squama
2. alula
3. costa (c)
4. subcosta (sc)
5. remigium
6. radius (r)
7. vein r_1
8. radial sector (rs)
9. vein r_{2+3}
10. vein r_2
11. vein r_3
12. vein r_{4+5}
13. media (m)
14. vein m_{1+2}
15. vein m_{3+4}
16. cubitus (cu)
17. vein cu_1
18. vein cu_2
19. first anal vein (1a)
20. humeral cross vein (h)
21. radiomedial cross vein (r-m)
22. mediocubital cross vein (m-cu)
23. spur
24. plica
25. cell R_2
26. cell M_{1+2}
27. fringe scales

b. Pale marks or spots of the wing of *Anopheles*

1. prehumeral
2. humeral
3. presector
4. sector
5. accessory sector
6. subcostal
7. preapical
8. apical fringe
9. fringe

Male genitalia

c. Tergal aspect - *Aedes (Ochlerotatus)*
d. Sternal aspect - *Aedes (Ochlerotatus)*
e. Lateral aspect, with basistyle removed - *Aedes (Finlaya)*

1. tergum IX
2. sternum IX
3. basistyle
4. basal tergomesal lobe
5. apical tergomesal lobe
6. mesal membrane
7. claspette stem
8. filament of claspette
9. interbasal fold
10. dististyle
11. claw of dististyle
12. tergite X
13. paraproct
14. cercal tergal surface
15. cercal setae

(12–15: proctiger)

16. aedeagus
17. paramere
18. basal plate

Fig. 4

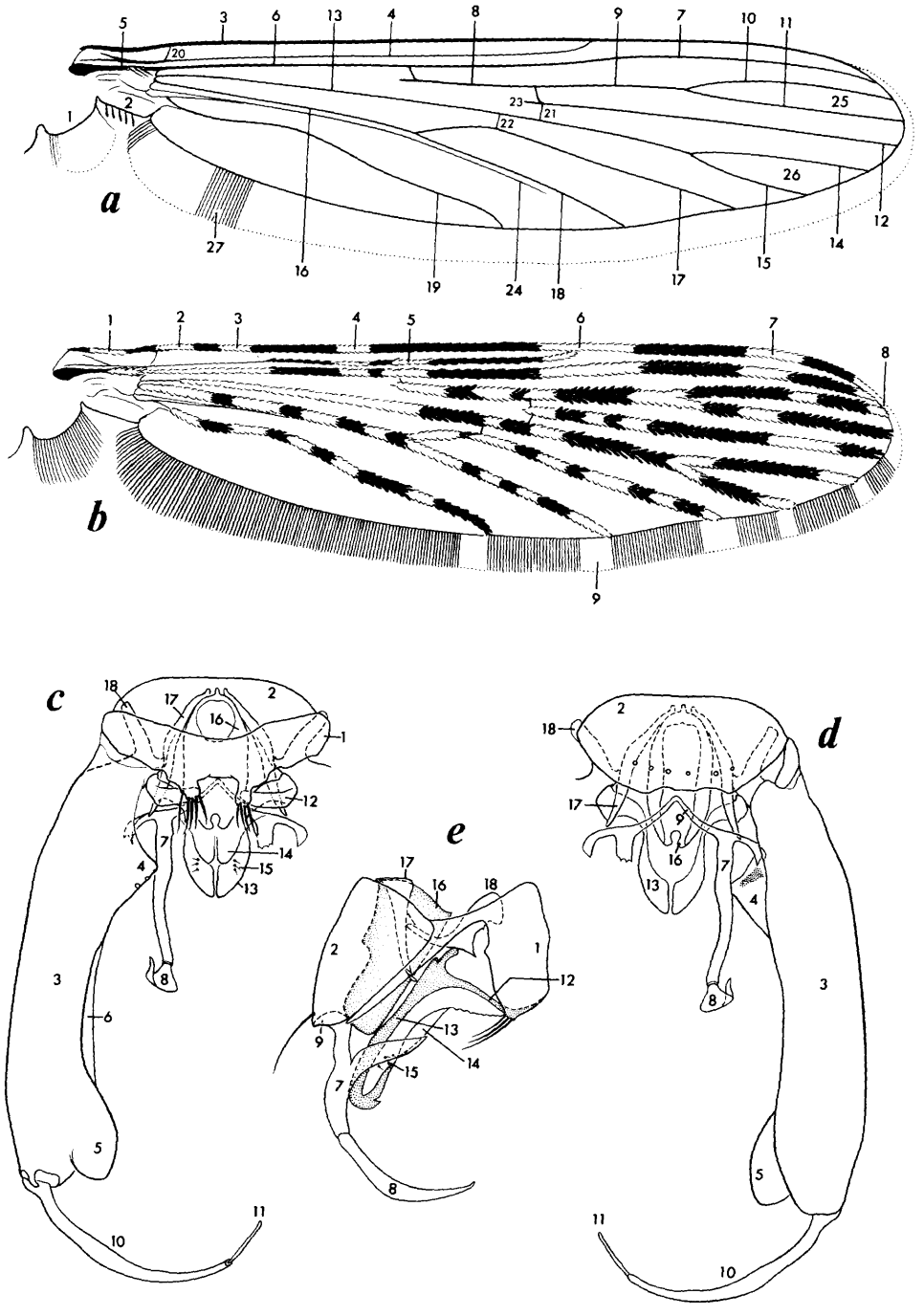


Figure 5. Morphology (III). Larva

a. Lateral aspect - Culicinae

1. abdomen
2. acus of saddle
3. acus of siphon
4. antenna
5. collar
6. comb scales
7. compound eye
8. anal gill
9. grid
10. head
11. mandible
12. maxilla
13. mesothorax
14. metathorax
15. prothorax
16. pecten
17. saddle
18. siphon
19. spiracular valves
20. thorax

b. Segment X - Ventral aspect - *Anopheles*
c. Segment X - Ventral aspect - *Aedes*

1. base of cratal hair (4-X)
2. base of anal gill
3. base of precratal hair (4-X)
4. grid
5. midventral bar
6. saddle

d. Head - Ventral aspect (left maxilla removed) - *Culex*

1. antenna
2. aulaeum
3. cardo of maxilla
4. collar
5. compound eye
6. dorsal artis of mandible
7. hypostomal ridge
8. hypostomal suture
9. labiogula
10. lateral artis of maxilla
11. mandible
12. maxilla
13. maxillary brush
14. mentum plate
15. mouth brush (lateral palatal brush)
16. palpostipes of maxilla
17. paracoila
18. precoila
19. postcoila
20. posterior tentorial pit
21. rod of paracoila
22. stemma
23. ventral artis of mandible
24. ventral stipital seta (4-Mx)
25. seta 1-C

Fig. 5

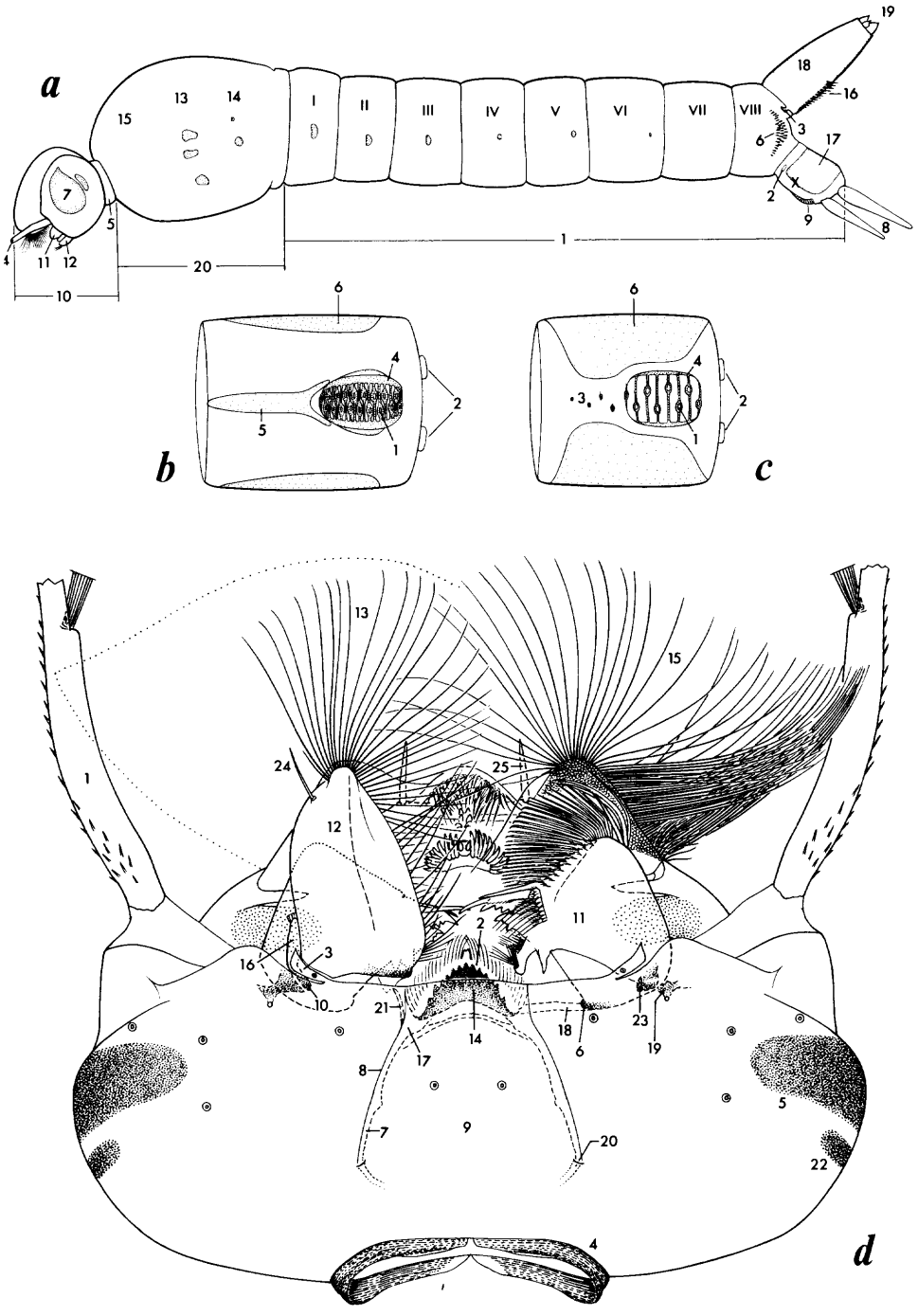


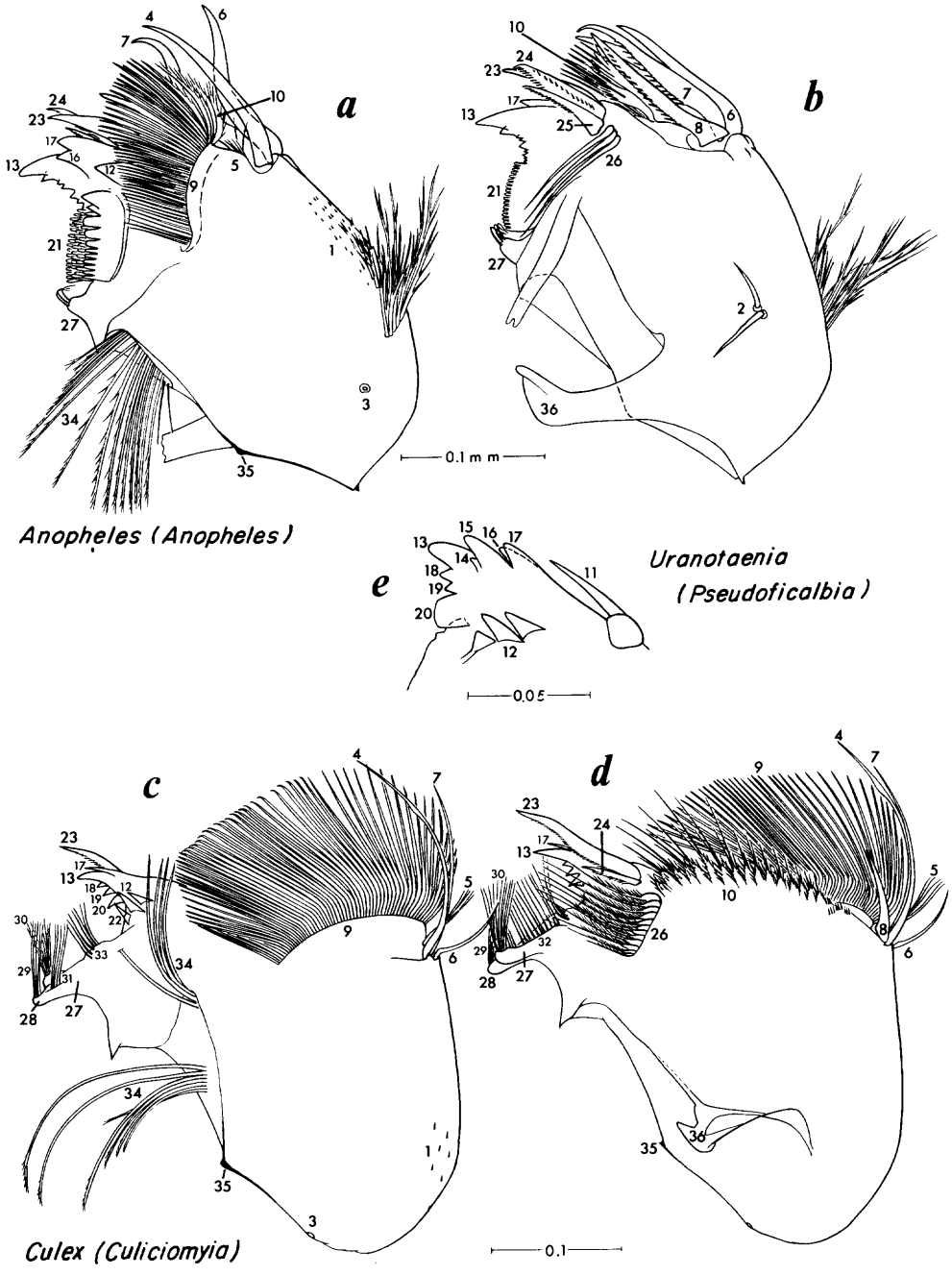
Figure 6. Morphology (IV). Larval mandible

a and *c* - Dorsal aspect
b and *d* - Ventral aspect
e - Dorsal aspect of cutting organ

1. microspines
2. mandibular seta (1-Md)
3. mandibular ring
4. mandibular spur (MdS_1)
5. mandibular spur (MdS_2)
6. mandibular spur (MdS_3)
7. mandibular spur (MdS_4)
8. mandibular spur (MdS_5)
9. mandibular brush
10. mandibular comb
11. dorsal spine (DS)
12. dorsal tooth
13. ventral tooth (VT_0)
14. lateral denticle (VT-1)
15. lateral denticle (VT-2)
16. lateral denticle (VT-3)
17. lateral denticle (VT-4)
18. mesal denticle (VT_1)
19. mesal denticle (VT_2)
20. mesal denticle (VT_3)
21. mesal pecten
22. accessory denticle
23. ventral blade (VB_1)
24. ventral blade (VB_2)
25. ventral blade (VB_3)
26. pectinate brush
27. piliferous process
28. labula of piliferous process
29. piliferous process hair (PPH_1)
30. piliferous process hair (PPH_2)
31. piliferous process hair (PPH_3)
32. piliferous process hair (PPH_4)
33. piliferous process hair (PPH_5)
34. mandibular hairs
35. dorsal artis
36. ventral artis

Figure *a*, *b* *Anopheles (Anopheles) lindesayii japonicus*
c, *d* *Culex (Culiciomyia) kyotoensis*
e *Uranotaenia (Pseudoficalbia) ohamai*

Fig. 6


a
b
0.1 m m
Anopheles (Anopheles)
e
Uranotaenia
(Pseudoficalbia)
0.05
c
d
Culex (Culiciomyia)
0.1

Toxorhynchites. This closer association with the cranium suggests that it will be a more basic sclerite than the palpifer or even the stipes. In *Tripteroides* (Fig. 10 c, d) and *Malaya*, it is fused with the so-called palpus, but is not a part of the stipes. This so-called palpus may not be the true palpus as discussed later. As suggested by Cook (1944), the maxilla of *Dixa* (Fig. 7 a, b), apparently more primitive than that of the Culicidae, seems to resolve all questions about this sclerite. Though quadrangular in shape in *Dixa* this sclerite can be easily identified with that of mosquitoes by its position and the presence of a ring-based seta. The maxilla of *Dixa* has a single segmented, typically cylindric palpus, and this palpus is inserted on another larger sclerite, doubtlessly the stipes. The sclerite in question, bearing a ring-based seta, does not bear the palpus and is situated between the stipes and cranium. Thus, this sclerite is neither palpifer nor stipes but should be the *cardo;* consequently its ring-based seta is here termed the *cardinal seta, 1-Mx* (6-MP of Pao and Knight 1970b). A longitudinal, bar-like, strongly sclerotized structure between the so-called palpus and the mesal main sclerite in *Anopheles* (Fig. 7 c, d) is no doubt a homologue of the triangular basal sclerite, the cardo, in most mosquitoes, though it was interpreted as the "maxillary apodeme" by Shalaby (1956, 1958).

2. Stipes, palpostipes and mesostipes

The lateral cylindric sclerite of the maxilla of mosquito larvae has been unanimously interpreted as the "palpus." The palpus is the telopodite in the maxilla, located on the stipes or the palpifer (Snodgrass 1935; Matsuda 1965). The so-called palpus of mosquito larvae is, however, not located on the stipes or the palpifer, and has a strong articulation with the mandibular ventral artis, and both together are attached to the postcoila, an apodeme of the cranium. Such articulation should be borne by the coxopodite.

As stated above, the mesal main sclerite in *Dixa* is the stipes and it differs from the mesal main sclerite in mosquito larvae in having the palpus-bearing laterobasal part. This laterobasal part appears to be separated from the mesal part by the presence of a deep membranous notch on the ventral surface, and is definitely separated on the dorsal surface. Its dorsobasal angle is produced, strongly sclerotized and articulated with the mandibular ventral artis; it is also characterized by the presence of a ring-based seta. This laterobasal part appears identical with the basal area of the so-called palpus of mosquito larvae. It is especially distinct when the maxilla of *Dixa* is compared with that of *Anopheles;* the latter appears to retain a more primitive condition than other Culicidae studied, and most resembles *Dixa*. The apical half of this sclerite in *Anopheles* is cylindrical. The basal half has a dorsomesal unsclerotized portion and a ring-based seta (8-MP of Knight and Laffoon 1971) remains on this sclerite laterally, though it is specialized into a dendritic form as in many other body setae of this genus. We believe that in mosquito larvae the telopodite (palpus) bearing laterobasal part of the stipes together with its portion articulating with the mandibular ventral artis was separated from the endite-bearing mesal part, and the true palpus was fused with it. This fused sclerite is here termed the *palpostipes**, the remaining mesal part of the stipes the *mesostipes*, and the ring-based seta the *lateral stipital seta, 3-Mx* (8-MP of Knight and Laffoon 1971). Most Culicidae studied have essentially the same structure of the palpostipes as that of *Anopheles*, but have lost

*It may be more exactly referred to as the palpolaterostipes, but this word is too long.

the lateral stipital seta 3-Mx, except for *Mimomyia* (Fig. 8 a, b). *Uranotaenia (Pseudoficalbia)* (Fig. 10 a, b) is different from all the other Culicidae in the structure of this sclerite. It is fairly large, well sclerotized, with a very wide mesal unsclerotized area through its entire length; thus it has no sclerotized apical cylindric portion. At the membranous apex of this sclerite, there are 2 small unequal sclerotized plates. They may be remnants of the true palpus. The maxilla of the subgenus *Uranotaenia* (*annandalei* Barraud and *macfarlanei* Edwards) appears essentially the same as that of the subgenus *Pseudoficalbia* in general structure, but the details of the palpostipes were difficult to observe owing to its poor sclerotization and extremely small size.

In some species, e.g., *Aedes (Ochlerotatus) impiger* (Walker), *Ae. (Och.) punctor* (Kirby), *Ae. (Finlaya) japonicus* (Theobald), *Ae. (Fin.) koreicus* (Edwards), *Ae. (Fin.) hatorii* Yamada, *Ae. (Fin.) watasei* Yamada, *Ae. (Stegomyia)* and *Toxorhynchites*, the palpostipes and mesostipes are ventrally continuous at the base; this is not a primitive condition, but may be a secondary fusion for strengthening the maxilla during the process of evolution from filter-feeders through browsers to predators. A more advanced fusion of sclerites is seen in predatory species of the subgenus *Culex (Lutzia)*. The overall shape of the maxilla superficially resembles that of *Toxorhynchites*. However, there is a great difference between them, that is, the cardo tends to fuse with meso- and palpostipes in *Lutzia*, while it is separated from them, and has become a part of the cranium in *Toxorhynchites*. It is definite that the condition of a cardo separated from the cranium is a more primitive condition. A narrow mesobasal fusion of the cardo with the cranium is seen in *Culiseta*, *Culex* and *Aedes* (except for *Stegomyia*); *Lutzia* apparently retains a similar condition. An intermediate cardo exists in *Culex (Culex) bitaeniorhynchus* Giles and *Armigeres*, in which the cardo is fused along its whole basal margin with a suture in the former species and without it in the latter.

3. Lacinia and galea

Previous interpretations of the mesostipes were the "stipes" (Cook 1944; Farnsworth 1947; Snodgrass 1959), a complex sclerite of the cardo and stipes, usually including galea and lacinia (Shalaby 1956, 1957a, b, c, 1958, 1959; Menees 1958; Pao and Knight 1970b; Gardner et al. 1973), the "dististipes" (Pucat 1965) and the "galeolacinia" (Matsuda 1965). Most authors recognize the lacinia in mosquito larvae. In *Dixa*, the lacinia is a hairy dorsomesal area of the stipes. The presence of the maxillary adductor muscle (the "tergolacinial muscle" of Matsuda 1965) attached to the most mesal, well sclerotized border (Schremmer 1950) substantiates this interpretation. The lacinia is delimited by a weak dorsal line, the *lacinial suture* (a homologue of the "chitinous ridge" of Salem 1931; Shalaby 1957a, b, c, 1959; Pao and Knight 1970b; "maxillary suture" of Gardner et al. 1973), and the mesal margin of the stipes. It has a tapered apex detached from the body of this sclerite, bearing the ring-based *proximal lacinial seta, 5-Mx* (3-MP of Pao and Knight 1970b) on the dorsal surface laterobasally close to the suture, and another, the *distal lacinial seta, 6-Mx* (7-MP of Gardner et al. 1973) on a protuberance approximately at the termination of the lacinial suture. The lacinia of *Anopheles* is similar to that of *Dixa*, but the detached apex is somewhat reduced, 5-Mx is removed to the apical third, 6-Mx loses the basal protuberance, and the lacinial suture is moderately sclerotized. The corresponding sclerite in most of the other Culicidae is more developed in size, usually covering the dorsomesal half of the mesostipes, and is more completely fused with the mesostipes, having lost the detached apex. The distal lacinial seta, 6-Mx, is almost always located at the apex of the lacinial suture. The presence or absence of the galea is debat-

able. In *Dixa*, if the galea exists, it might be the distal triangular area delimited basally by an extremely faint transverse line (likely a remnant of the suture) at the apical third of the ventral surface (there is no such line on the dorsal surface) and the ring-based *galeal seta, 7-Mx* (hitherto undescribed), close to the mesal margin. This part as well as seta 7-Mx remains in *Anopheles*, though shortened and losing the transverse basal delimiting line; all the other Culicidae have lost it together with seta 7-Mx. The maxillary abductor muscle of *Dixa* is attached to approximately the laterobasal corner of the mesal part of the dorsal side of the stipes (Schremmer 1950). It is also found in the mesostipes of mosquito larvae ("cranial flexor of stipes" of Cook 1944; Farnsworth 1947; Menees 1958; "tergo-galeal muscle" of Matsuda 1965) and can be called the tergo-stipital muscle.

4. Articulations of the maxilla with the cranium and mandible

Owing to the reduced nature of the cardo in *Dixa* and mosquito larvae, the articulation between it and the cranium which is generally membranous, does not appear to have a primary significance. The articulation between cardo and stipes is apparently not strong. The direct hinge-like articulation in *Uranotaenia (Pseudoficalbia)*, however, seems to have a more important role in sustaining the mesostipes and palpostipes. The cardo in this subgenus is quadrangular, its mesal margin attached to the cranial process, the lateral margin to the ventromesal margin of the palpostipes in the middle, and the anterior margin to the laterobasal margin of the mesostipes. The palpostipes is also articulated with the mandibular ventral artis and the cranial postcoila, but the mesostipes has no strong articulation with the cranium. The cardo of *Orthopodomyia* (Fig. 8 c, d) appears to have direct articulations with the stipes by a long dorsodistal process and with the palpostipes along the lateral margin at base, but the articulation with the cranium is membranous. Strong modification and sclerotization in the cardo of *Anopheles* suggest that the cardo of this genus retains some significant articulatory function. In *Culiseta, Culex,* most of *Aedes, Armigeres* and *Toxorhynchites,* as already stated, the cardo is partially or totally fused with the cranium, and does not articulate with it.

Two important articulations exist in *Dixa* and most mosquito larvae. One is that between the maxillary parartis ("entoparartis" of Shalaby 1956, 1957a, b, c, 1958, 1959) and the cranial paracoila (Laffoon and Knight 1973). We interpret the parartis to be the more or less sclerotized and produced mesobasal corner of the stipes *(Dixa)* or of the mesostipes (Culicidae), including the point of the articulation but not limited to it. In *Dixa* and *Anopheles*, the parartis articulates with the paracoila through a long narrow sclerotized rod, the *rod of parartis* ("C-shaped sclerite" of Cook 1944; "maxillarer Gelenkstab" of Schremmer 1950; "rod" of Shalaby 1956, 1958; "condyle of cardo" of Menees 1958). A similar structure is seen also in *Orthopodomyia* and *Tripteroides,* but in these genera, the parartis is situated slightly laterad. In *Armigeres,* this articulation is direct and apparently strong. In *Uranotaenia,* there is no parartis-paracoila articulation; the mesostipes seems to be only attached to the apex of the postgenal process, being supported chiefly by the cardo. The articulation is not strong in *Aedes,* but another connection with the cranium is developed. The ventrobasal margin of the mesostipes is produced at the middle and is usually directly attached to the anterior margin of the cranium. These 2 sclerotized parts are connected by a narrow membrane, or sclerotization of this connecting portion is variously developed (varying individually in *Aedes (Ochlerotatus) dorsalis* (Meigen), *Ae. (Och.) excrucians* (Walker) and *Ae. (Och.) punctor*). In *Ae. (Och.) impiger, Ae. (Verrallina) nobukonis* Yamada and species of the subgenus *Stegomyia,* this ventrobasal

process is completely fused with the strip-like narrow, strongly sclerotized anterior margin of the cranium; this strip-like margin is continuous to the cardo laterally and to the hypostomal ridge mesally. This connection or fusion between the ventral mesostipital process and the cranium was considered as the primary articulation of the maxilla with the cranium by Gardner et al. (1973). However, this is not seen in many other genera including the more primitive ones such as *Dixa*, *Anopheles*, *Mimomyia* and *Orthopodomyia*, and is restricted to some of the *Culex* and *Aedes* among the genera studied. Thus, it may be thought as a secondary articulation, and is termed here the *pseudo-artis*.

The 2nd articulation at the base of the palpostipes with the mandibular ventralartis is found in all species studied and is usually strong. This sclerotized articulatory portion, extends at least partially along the postcoila and reaches the mandibular postartis. It has been called the "secondary process" (Cook 1944), "laterales maxillares Gelenk" (Schremmer 1950), "exoparartis" (Shalaby 1956, 1957c, 1958, 1959), "exoparartis + maxillary apodeme" (Shalaby 1957a; Pao and Knight 1970b) and "maxillary apodeme" (Shalaby 1957b; Gardner et al. 1973). The exparartis is the "arm of the parartis articulating on the external surface of the paracoila" (MacGillivray 1923; de la Torre-Bueno 1937). Thus, this term may not be applicable to this articulatory portion of the palpostipes. The "maxillary apodeme" has been confused with both the maxillary structure and the cranial structure. Thus, a new term, the *lateral artis*, is proposed.

5. Sensory setae and sensoria

As in the antenna, the maxilla should have its own numbering of the ring-based sensory setae. Most of them have already been discussed in this paper. They are summarized below in comparison with the numbering of previous authors.

Present work	Previous work
1-Mx cardinal seta	6-MP (Pao and Knight 1970b)
2-Mx dorsal (mesal) stipital seta	4-MP (Pao and Knight 1970b)
3-Mx lateral stipital seta	8-MP (Knight and Laffoon 1971)
4-Mx ventral stipital seta	5-MP (Pao and Knight 1970b)
5-Mx proximal lacinial seta	3-MP (Pao and Knight 1970b)
6-Mx distal lacinial seta	7-MP (Gardner et al. 1973)
7-Mx galeal seta	---

In mosquitoes, the usually twin, thick spiniform appendages found on the dorsal surface of the mesostipes close to the lacinial suture have been called "bristles" (Salem 1931), "membranous appendages" (Shalaby 1957a), "finger-like appendages" (Maslov 1967), "maxillary spurs" (Pao and Knight 1970b) and "dorsal maxillary setae" (Gardner et al. 1973). They are homologues of the palpal sensoria; this is especially clear in *Uranotaenia*. In this genus, the palpal sensoria are well developed, as long as or even longer than the stipital sensoria; the texture apparently the same, often with one or more basal segment-like structures *(basal rings)*. As they may not be receptors of tactile stimuli, they should be called sensoria rather than setae. In species of *Dixa* studied, there are 2, very small and separated stipital sensoria. *Orthopodomyia* has only a single small sensorium. *Anopheles*, *Mimomyia*, *Culiseta*, *Culex*, *Aedes*, *Armigeres*, *Uranotaenia*, *(Uranotaenia)*, *Topomyia* and *Malaya* have twin sensoria, with or without a poorly developed basal ring. *Tripteroides* has 2 unequal sensoria on a common single basal ring. *Toxorhynchites* has

twin sensoria on a common single but partially divided, well developed basal ring. In *Uranotaenia (Pseudoficalbia)*, the stipital sensoria have very well and variously developed basal rings; *jacksoni* Edwards, *ohamai* Tanaka, Mizusawa and Saugstad and *yaeyamana* Tanaka, Mizusawa and Saugstad have a 2 segmented basal ring, the distal one is very large, the apical sensoria are equal in size (one is located apically and another laterally); *novobscura* Barraud has slightly unequal apical sensoria and an almost completely divided basal ring; *nivipleura* Leicester has a single basal ring, an apical sensorium of ordinary size and a very small lateral sensorium. Antennal seta 5-A with a small accessory process on the lateral proximal division resembles the stipital sensoria of *Ur. (Pfc.) nivipleura*. This may be a homologue of the sensoria.

Figures 7-10. Morphology (V-VIII). Larval maxilla - 1-4

a and *c* - Dorsal aspect
b and *d* - Ventral aspect

Am	ampulla	Pst	palpostipes
Ca	cardo	R	rod of parartis
Gl	galea	SS	stipital sensoria
LAt	lateral artis	Stp	stipes
Lc	lacinia	1	cardinal seta (1-Mx)
Mst	mesostipes	2	dorsal (mesal) stipital seta (2-Mx)
MxB	maxillary brush		
Pat	parartis	3	lateral stipital seta (3-Mx)
Pl	palpus	4	ventral stipital seta (4-Mx)
Prc	paracoila	5	proximal lacinial seta (5-Mx)
PS	palpal sensoria (S_1-S_5)	6	distal lacinial seta (6-Mx)
Psc	postcoila	7	galeal seta (7-Mx)

Figure 7 *a, b* *Dixa* sp. (Dixidae)
c, d *Anopheles (Anopheles)* sp. (Engaru race)

Figure 8 *a, b* *Mimomyia (Etorleptiomyia) luzonensis*
c, d *Orthopodomyia anopheloides*

Figure 9 *a, b* *Aedes (Ochlerotatus) hakusanensis*
c, d *Armigeres (Armigeres) subalbatus*

Figure 10 *a, b* *Uranotaenia (Pseudoficalbia) ohamai*
c, d *Tripteroides (Tripteroides) bambusa bambusa*

Fig. 7

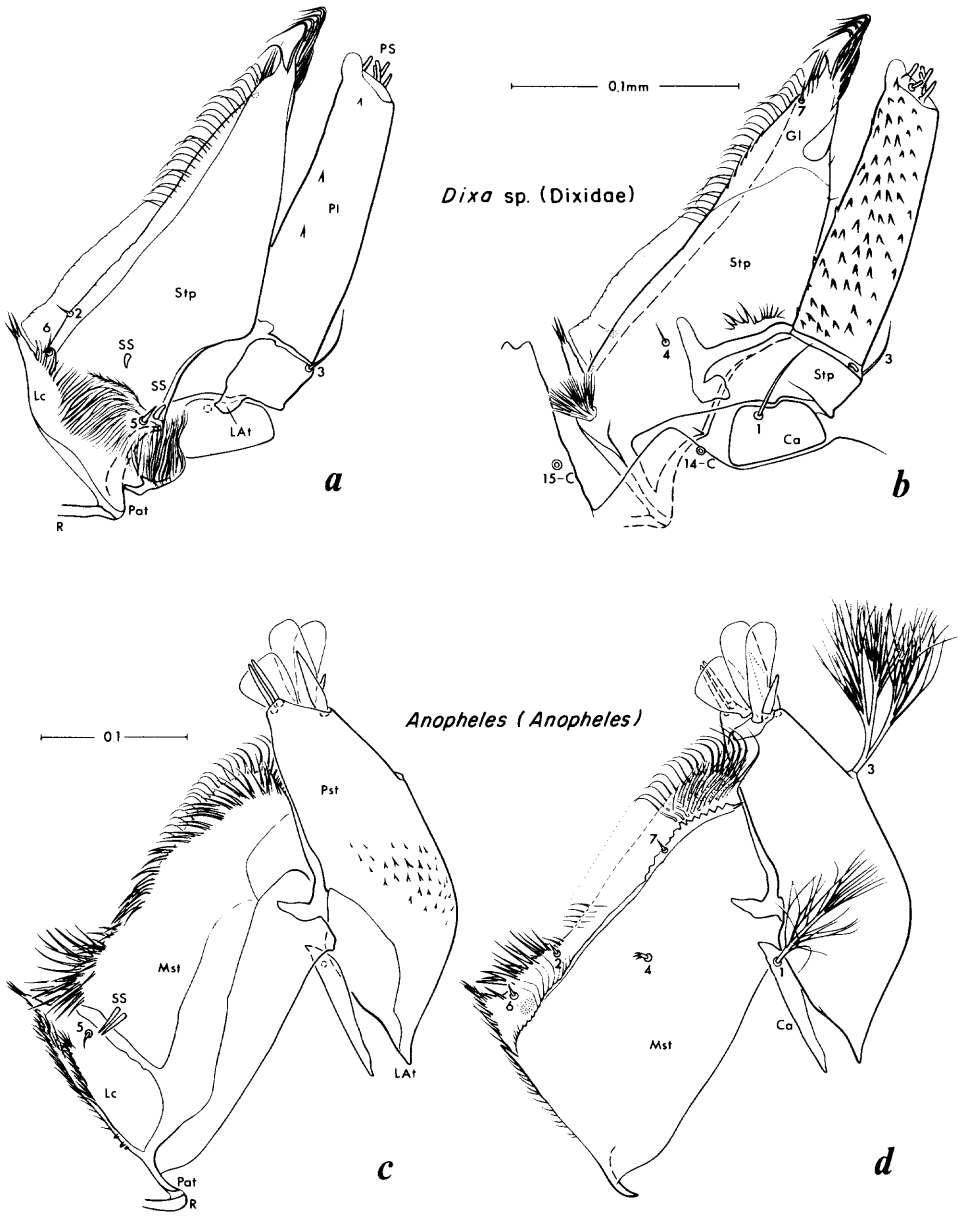

PS
Pl
Stp
6
2
SS
SS
Lc
5
3
LAt
Pat
R
a
0.1mm
Dixa sp. (Dixidae)
7
Gl
Stp
4
3
Stp
1
Ca
15-C
14-C
b
0.1
Anopheles (Anopheles)
Pst
Mst
SS
5
Lc
LAt
Pat
R
c
3
7
4
6
1
Ca
Mst
d

Fig. 8

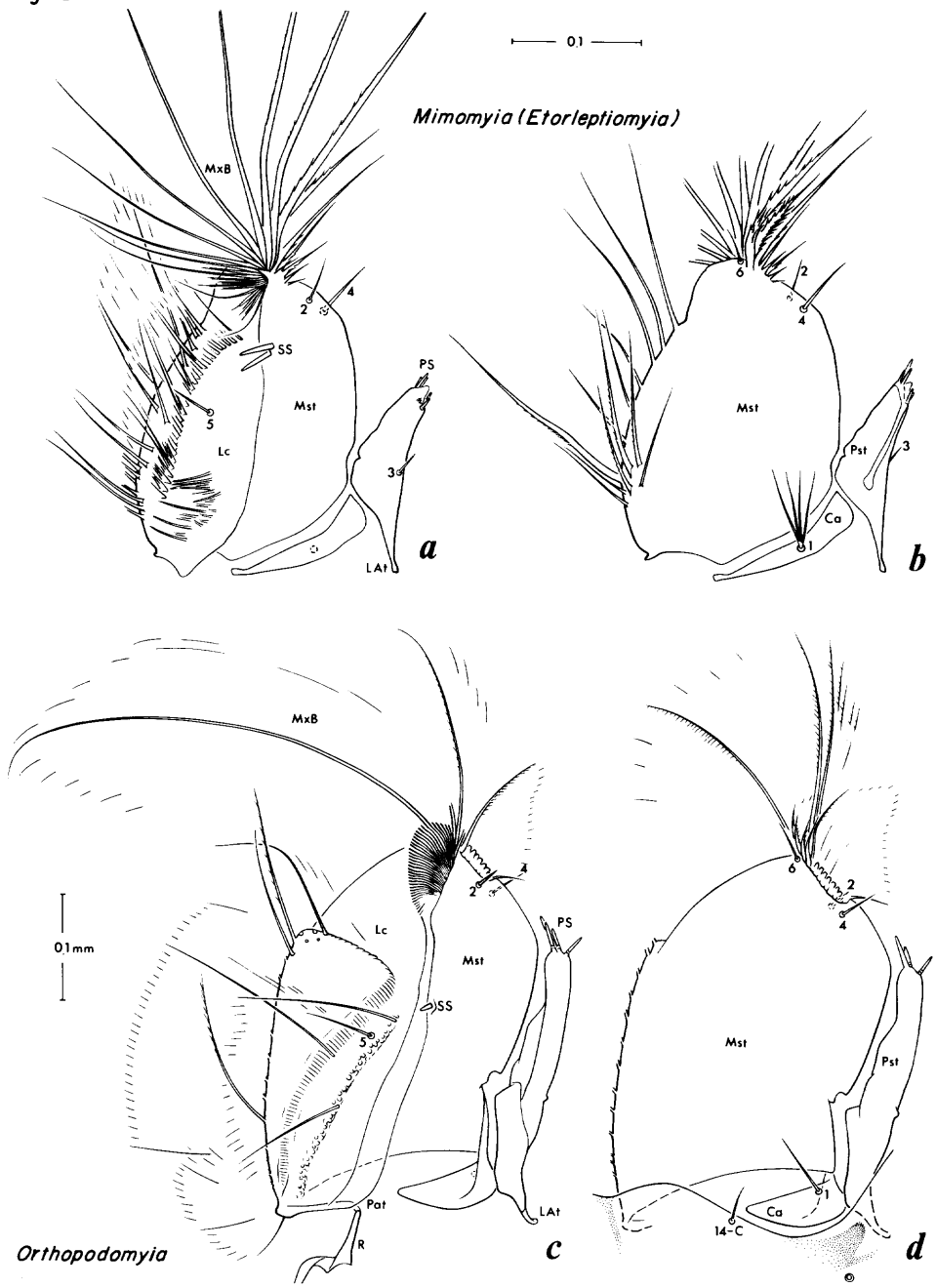

0.1
Mimomyia (Etorleptiomyia)
MxB
SS
PS
Mst
Lc
LAt
Pst
Ca
a
b
0.1mm
Orthopodomyia
Pat
R
14-C
c
d

Fig. 9

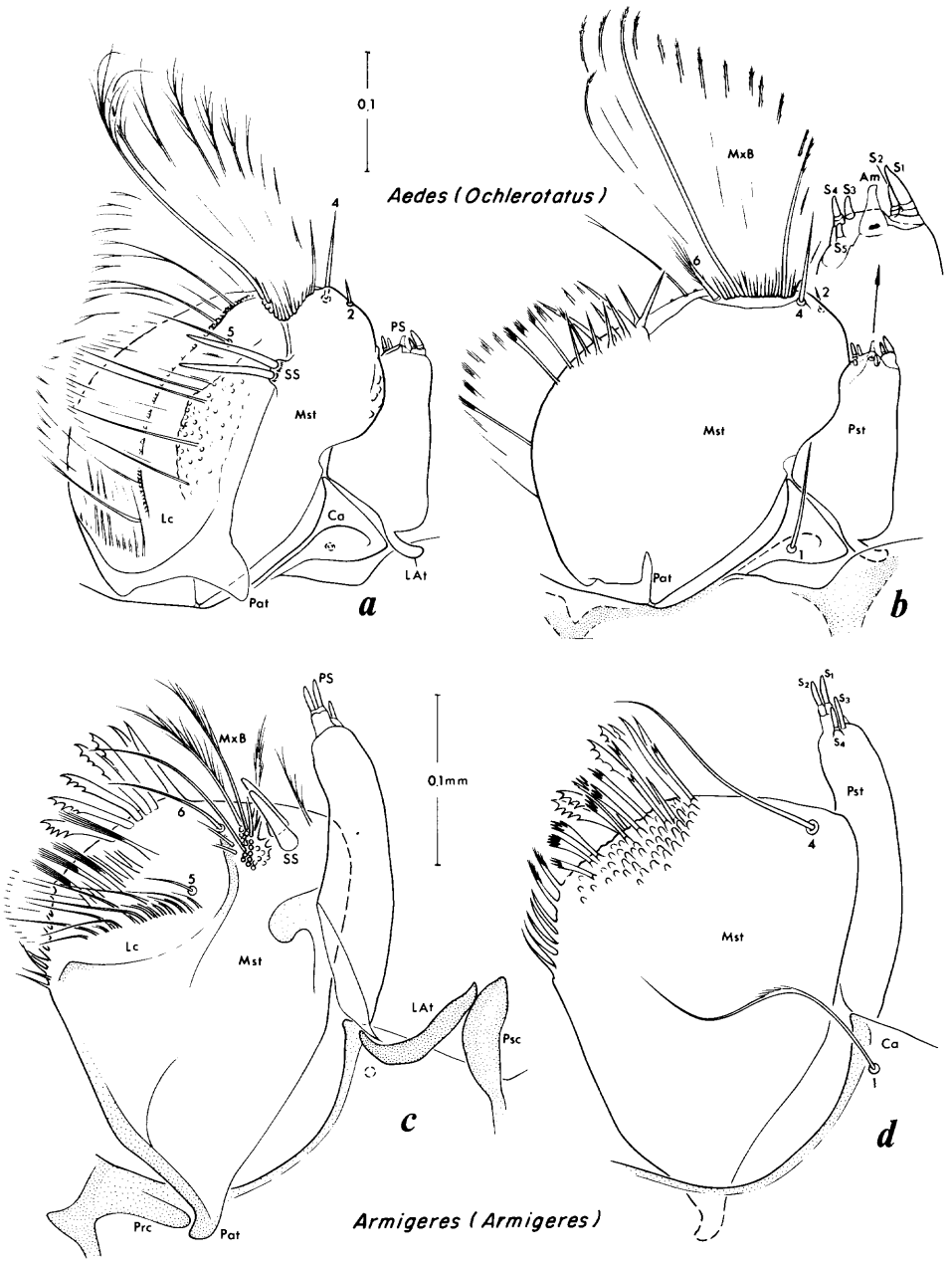
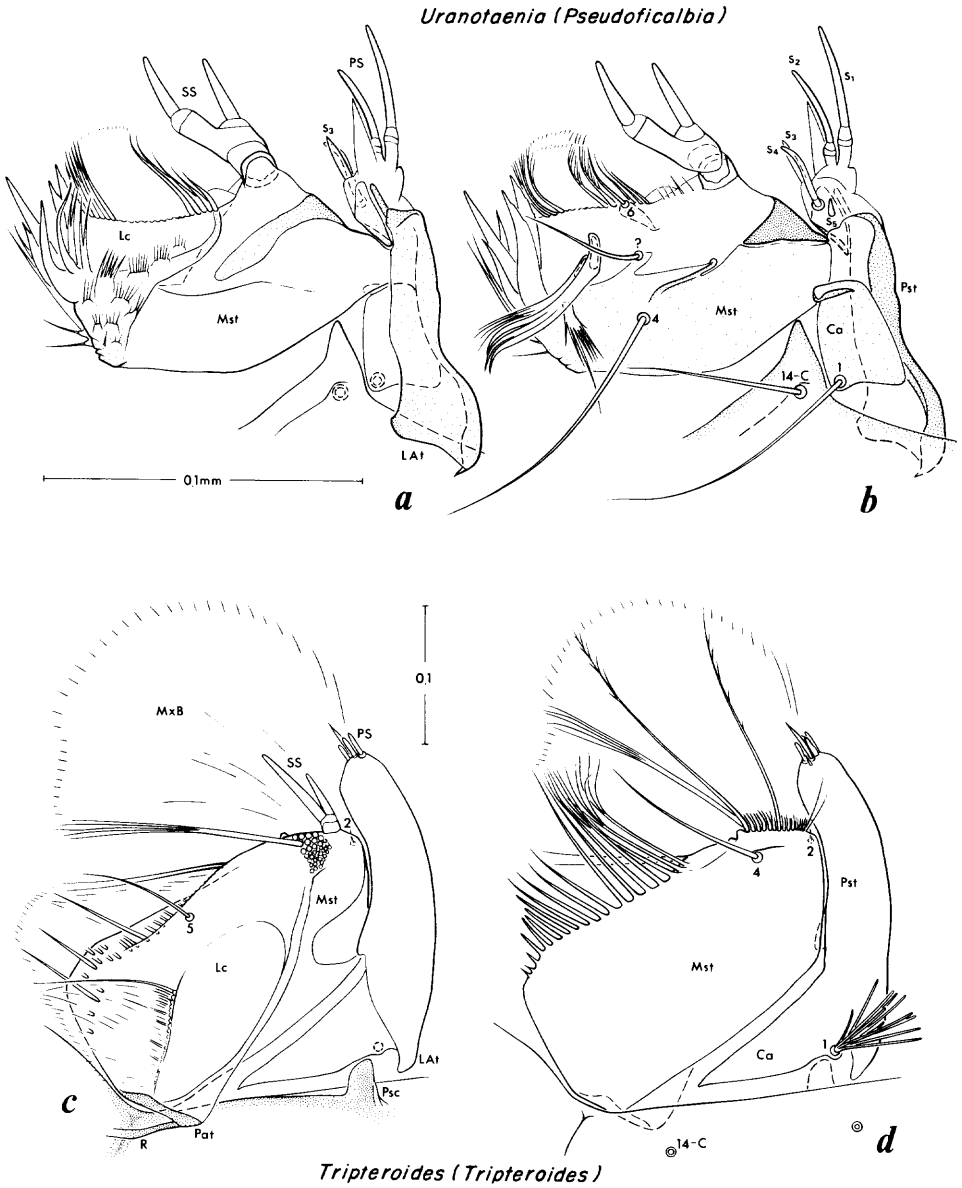

0.1
Aedes (Ochlerotatus)
4
5
2
PS
SS
Mst
Lc
Ca
LAt
Pat
a
MxB
S2
Am
S1
S4
S3
S5
6
2
4
Mst
Pst
1
Pat
b
PS
MxB
0.1mm
6
SS
5
Lc
Mst
LAt
Psc
c
Prc
Pat
S2
S1
S3
S4
Pst
4
Mst
Ca
1
d
Armigeres (Armigeres)

Fig. 10


Uranotaenia (Pseudoficalbia)
SS
PS
S3
Lc
Mst
LAt
0.1mm
a
S2
S1
S4
S5
2
6
4
Pst
Ca
14-C
1
b
MxB
0.1
PS
SS
2
Mst
5
Lc
LAt
Psc
R
Pat
c
4
2
Pst
Mst
Ca
1
14-C
d
Tripteroides (Tripteroides)

Zoogeography

Of the region covered by this work, the Japanese Archipelago (Hokkaido, Honshu, Shikoku, Kyushu) and Korea belong to the Palaearctic region, and the Ryukyu Archipelago to the Oriental region; the faunal position of the Ogasawara islands is debatable, but it appears to be Oriental rather than Australian.

The numbers of species referred to in the following discussion are at the subspecies level. Geographical distribution for each species and subspecies is given in Table 1. Palaeogeographical information was obtained from Minato et al. (1965), Ichikawa et al. (1970) and Minato (1974).

1. The Japanese Archipelago

This and Korea belong to the Manchurian subregion. However, the Japanese Archipelago is here discussed separately from Korea, as it consists of islands separated from the Asiatic continent; this condition possibly effected to some extent the production of endemic species. Sixty-seven indigenous species occur in this area. Nine of these have not been found outside this area; they are: *Anopheles (Anopheles) omorii* Sakakibara, *An. (Ano.)* sp. (Engaru race)*, *Aedes (Ochlerotatus) impiger daisetsuzanus* n. ssp., *Ae. (Och.) hexodontus hokkaidensis* n. ssp., *Ae. (Och.) hakusanensis* Yamaguti and Tamoboko, *Ae. (Och.)* sp., *Ae. (Finlaya) koreicoides* Sasa, Kana and Hayashi, *Ae. (Aedes) sasai* Tanaka, Mizusawa and Saugstad and *Toxorhynchites (Toxorhynchites) towadensis* (Matsumora). Among them, *Ae. (Aed.) sasai* is likely to occur also in Siberia (cf. TAXONOMIC DISCUSSION of *Ae. sasai*). *An. (Ano.)* sp. (Engaru race)*, *Ae. (Och.) hexodontus hokkaidensis* and *Ae. (Och.)* sp. are lowland species, the larval habitat of the former 2 being open ground water, that of the latter also probably the same. It is likely that these also occur outside Japan. The remaining 5 (7.5%) may be truly endemic to the Japanese Archipelago. Such a low endemicity appears to be reasonable, because the Japanese Archipelago had repeated reconnections with the continent through the Pliocene and Pleistocene periods. Three of these endemic species are mountain tree hole breeders and may not have been in contact with their continental congeners through the Pleistocene, because during most of this period. only a narrow and low land bridge connected the Japanese Archipelago with the continent at the present Korean straits in the age of regression. Two other species, *Ae. (Och.) impiger daisetsuzanus* and *Ae. (Och.) hakusanensis* appear to be relics of the Glacial epoch, now restricted to high mountains.

The Manchurian subregion is characterized by a strong invasion of southern elements, appearing to be especially remarkable in the mosquito fauna. Of 67 Japanese species, 26 (38.8%) are distributed in the Palaearctic region, 11 (16.4%) in the Oriental region, and 21 (31.3%) in both regions; however, 4 of the lattermost are apparently essentially Palaearctic, with the remaining 17 being Oriental. Four species found only in Japan, but possibly present on the continent as well, belong also to the Palaearctic stock. Thus, Palaearctic elements total 34 (50.7%), and Oriental elements 28 (41.8%); 5 (7.5%) are endemic. Of these 28 species of Oriental stock, 5 species (*Culex pipiens quinquefasciatus* Say, *Aedes aureostriatus okinawanus* Bohart, *Ae. watasei*, *Ae. riversi* Bohart and Ingram and *Ae. nobukonis*) have been found in limited localities of southernmost Japan. The other 23 species have penetrated deeply to the north, 6 species reaching Hokkaido. Thirteen of these species breed in open ground water and apparently are very common in the tropical region.

* = *An. (Ano.) engarensis* Kanda and Oguma, 1978.

These species are *Anopheles (Anopheles) sinensis* Wiedemann, *Mansonia (Coquillettidia) ochracea* (Theobald), *Ma. (Mansonioides) uniformis* (Theobald), *Culex (Culex) tritaeniorhynchus* Giles, *Cx. (Cux.) pseudovishnui* Colless, *Cx. (Cul.) whitmorei* (Giles), *Cx. (Cux.) mimeticus* Noe, *Cx. (Cux.) bitaeniorhynchus, Cx. (Cux.) sinensis* (Theobald), *Cx. (Lophoceraomyia) infantulus* Edwards, *Cx. (Lop.) rubithoracis* (Leicester), *Cx. (Culiciomyia) pallidothorax* (Theobald) and *Cx. (Lutzia) halifaxii* Theobald. Two container breeding species, *Aedes (Stegomyia) albopictus* (Skuse) and *Armigeres (Armigeres) subalbatus* (Coquillett) are abundant everywhere. These 15 species, apparently, have not been morphologically modified in the temperate region. Thus, they may be postglacial invaders. Further information on morphological modification and/or distribution is needed to discuss the remaining 8 species: *Anopheles (Anopheles) lesteri* Baisas and Hu, *Orthopodomyia anopheloides* (Giles), *Culex (Culiciomyia) kyotoensis* Yamaguti and LaCasse, *Cx. (Cui.) sasai* Kano, Nitahara and Awaya, *Aedes (Finlaya) hatorii, Ae. (Aedimorphus) alboscutellatus* (Theobald), *Ae. (Edwardsaedes) imprimens* (Walker) and *Uranotaenia (Pseudoficalbia) novobscura*. It is noteworthy that 5 of them do not occur in the Ryukyu Archipelago. *Uranotaenia (Pfc.) novobscura* is differentiated in the Ryukyus; *An. (Ano.) lesteri* and *Or. anopheloides* are distributed continuously.

There was a broad connection between the Japanese Archipelago and continental China during the Pliocene; only a narrow land bridge between Korea and Kyushu existed during the Pleistocene, and at the end of this period, the Japanese Archipelago was finally separated from the continent by the completion of the Korean Straits. Thus, in the Holocene of this area, insects must have crossed over the barrier of the sea in order to reach Japan. Belkin (1962) enumerated the factors for overseas dispersal of mosquitoes. Among them, "human agency" may be one of the factors possible in this area, but it is difficult to accept this cause for most of the above mentioned species. Of the natural means, "rafts and drift" and "animals" may also have possibly contributed to the northward dispersal, because of the presence of the Japanese Oceanic Current (Kuroshio) and many kinds of migratory birds. However, these may be minor factors for mosquitoes. Passive dispersal by aerial current appears to be most important in this area. There is a subperiodic emergence of depressions accompanied by warm fronts in central and south China from the spring to autumn; the typical course of these is northeastward, crossing over the East China Sea and passing along the Japanese Archipelago. Numerous insects have been collected on the East China Sea at the time of passage of these depressions; they include considerable numbers of *Sogatella furcifera* (Horvath) and *Nilaparvata lugens* (Stål) (Delphacidae), the most important pests of rice plants, and some undetermined mosquitoes (Kishimoto 1975). In Japan, a large number of these rice-plant pests have also been trapped during the passing of the depressions originating from the southwest. There is another rapid large-scale aerial movement, the typhoon, which emerges in the Pacific Ocean in an area encompassing 110-180° E and 5-20° N. This area includes North Borneo, the entire Philippines and the Micronesian islands. The typhoons are usually directed first northwesterly, then turn to the northeast; very often they turn in the Ryukyu area, and then pass through the Japanese Archipelago. It is known that the eye of a typhoon brings numerous winged insects. The weathership located on the Pacific Ocean at 29° N, 135° E, 780 km from Okinawa Is., 450 km off the southern coast of the Japanese Archipelago has received visits of many insects including *Culex (Culex) pipiens pallens* Coquillett and *Cx. (Cux.) tritaeniorhynchus;* a northeasterly aerial current around the periphery of the Ogasawaran (northern Pacific) anti-

cyclone also brings many winged insects (Asahina and Turuoka 1967, 1968, 1969, 1970; Asahina 1970). Of course, there is no direct evidence that the species in question have come from the southern tropical or subtropical region to temperate Japan by these aerial currents; however, the above facts appear to support this theory.

2. Korea

This also belongs to the Manchurian subregion. Only *Anopheles (Anopheles) pullus* M. Yamada is endemic to Korea; however, there is some doubt as to the specific status of this species (cf. TAXONOMIC DISCUSSION). As in the Japanese Archipelago, a remarkable encroachment of southern elements is seen in Korea. Of the 50 Korean species, 21 (42.0%) are apparently Oriental; among them, 5 (*Culex sitiens* Wiedemann, *Cx. jacksoni* Edwards, *Cx. fuscanus* Wiedemann, *Heizmannia lii* Wu and *Aedes lineatopennis* (Ludlow)) do not reach the Japanese Archipelago.

3. The Ryukyu Archipelago

The border line between the Palaearctic and Oriental regions lies on the Tokara Straits (the Watase zoogeographical line), and this is also the northern border of the Ryukyu Archipelago (Tanaka, Saugstad and Mizusawa 1975). Of 70 recorded species, *Aedes (Stegomyia) aegypti* (Linneaus) is an imported species; *Anopheles (Anopheles) saperoi ohamai* Ohama is doubtful as to its specific or subspecific status. Thus, 68 species are indigenous. It is highly possible that the populations of *Culex (Eumelanomyia) hayashii* Yamada and *Tripteroides (Tripteroides) bambusa* (Yamada) of south China are *ryukyuanus* n. ssp. and *yaeyamensis*, n. ssp., respectively. Excluding these 2 species, 17 (25%) are endemic to this archipelago. (This amounts to 10 (14.7%) at the species level.) One of the more distinguished characteristics of the Ryukyus is the high percentage of subspecific differentiation (Table 2); 4 species have 2 subspecies within the archipelago, they are *Aedes (Finlaya) japonicus, Ae. (Fin.) aureostriatus* (Doleschall), *Ae. (Stegomyia) flavopictus* Yamada and *Toxorhynchites (Toxorhynchites) manicatus* (Edwards). An intriguing fact is that *Ae. (Fin.) japonicus* is absent in Okinawa Guntô, though it occurs in both Amami Guntô (*amamiensis* n. ssp.) and Yaeyama Guntô (*yaeyamensis* n. ssp.), and also Palaearctic Japan and Korea (*japonicus*) to the north, and Taiwan (*shintienensis* Tsai and Lien) and southern China (*eucleptes* Dyar) to the south. This species is common everywhere within its range. *Toxorhynchites (Tox.) manicatus* also occurs in Amami (*yamadai*) (Ouchi) and Yaeyama (*yaeyamae* Bohart), but is lacking in Okinawa, where it is replaced by *Tx. (Tox.)* sp., an undescribed species endemic to Okinawa Is. *Tripteroides (Tripteroides) bambusa* is common in Palaearctic Japan and Korea (*bambusa*), and Yaeyama (*yaeyamensis*), but does not occur in Amami and Okinawa Guntô. *Aedes (Finlaya) nishikawai* n. sp. and *Heizmannia (Heizmannia) kana* n. sp. are found only in Amami Guntô, their close congeners occur in Palaearctic Japan and Korea, and Taiwan, respectively, but do not exist in other parts of the archipelago. *Uranotaenia (Pseudoficalbia) novobscura* is differentiated only in the Ryukyu Archipelago only; however, a more precise comparison is needed between populations of Southeast Asia and temperate Japan. Such complex specific or subspecific differentiations appear to correlate with the complicated history of repeated upheaval and subsidence or connection and separation of the islands of this archipelago. Much more geological and palaeogeographical information is necessary for a full understanding of the particular character of the Ryukyu Archipelago. However, from the evidence of subspecific differentiation of several species discussed above, it is almost certain that the separation between Amami and Okinawa was later than the isolation of Yaeyama Guntô.

Excluding 4 species, *Culex (Culex) vagans* Wiedemann, *Cx. (Cux.) mimeticus*, *Aedes (Finlaya) togoi* (Theobald) and *Ae. (Aedimorphus) vexans nipponii* (Theobald), whose distribution patterns are somewhat perplexing, all the other mosquitoes of this archipelago are typically Oriental. Five species, *Mimomyia (Etorleptiomyia) elegans* (Taylor), *Mansonia (Coquillettidia) ochracea, Aedes (Geoskusea) baisasi* Knight and Hull, *Culex (Lophoceraomyia) infantulus* and *Cx. (Lop.) cinctellus* Edwards have been found in the Philippines but not in Taiwan. It seems more probable to consider that these species were dispersed by aerial currents rather than assuming a land bridge connection between the Ryukyus and the Philippines.

4. The Ogasawara (Bonin) islands

Only 10 species have been recorded from these islands, and one of these, *Aedes (Stegomyia) aegypti,* is apparently extinct. Thus, at present, 9 species occur there. It is quite interesting that 4 (44.4%) of them are endemic, and that 2 of these endemic species, *Culex (Culex) boninensis* Bohart and *Cx. (Lutzia) shinonagai* n. sp. apparently have no close relatives, each appears to occupy an isolated taxonomical position in their respective subgenera. On the contrary, the 3rd endemic species, *Aedes (Finlaya) savoryi* Bohart is very closely allied to topotypic *Ae. (Fin.) togoi* in both morphological and behavioral characteristics. They may be derived from a common ancestor, with *savoryi* being differentiated by isolation in these secluded islands, while *togoi* seems to be an artificially introduced species at a later time. The 4th endemic species, *Aedes (Stegomyia) wadai* n. sp., was found to belong to the *aegypti* group (cf. TAXONOMIC DISCUSSION of *Ae. wadai*). Thus, it must be of an Ethiopian stock. Other known species are *Culex (Culex) pipiens quinquefasciatus, Cx. (Cux.) tritaeniorhynchus, Cx. (Lutzia) halifaxii* and *Aedes (Stegomyia) albopictus*. The first species is cosmotropical, the other 3 have very wide distributional ranges, but are essentially Oriental. Bohart 1956 (1957) stated that the general character of the Micronesian mosquito fauna is more Oriental than Australian. For the Ogasawara islands, 2 endemic species were added to Bohart (1956 (1957)), with no other changes noted.

TABLE 1. Geographical distribution of species

SPECIES	EXTRALIMITAL DISTRIBUTION																			
			INTRALIMITAL DISTRIBUTION																	
					Palaearctic						Oriental									
	Nearctic	Palaearctic	Korea	Hokkaido	Honshu	Shikoku	Kyushu	Amami	Okinawa	Yaeyama	Ogasawara	Oriental	Australian	Ethiopian	Neotropical					
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O					
Anopheles (Cellia) minimus										J		L								
An. (Cel.) tessellatus									I	J		L	M							
An. (Anopheles) bengalensis								H				L								
An. (Ano.) omorii					E															
An. (Ano.) lindesayii japonicus		B	C	D	E	F	G													
An. (Ano.) koreicus		B	C	D	E	F	G													
An. (Ano.) saperoi saperoi									I											
An. (Ano.) s. ohamai										J										
An. (Ano.) sinensis		B	C	D	E	F	G	H	I	J		L								
An. (Ano.) sp. (Engaru race)				D																
An. (Ano.) pullus			C																	
An. (Ano.) yatsushiroensis		B	C		E		G													
An. (Ano.) sineroides		B	C	D	E	F	G													
An. (Ano.) lesteri			C	D	E		G	H	I	J		L								
Mimomyia (Etorleptiomyia) luzonensis								H	I	J		L								
Mi. (Eto.) elegans									I	J		L	M							
Culiseta (Culicella) nipponica			C	D	E															
Cs. (Culiseta) kanayamensis		B	C	D	E															
Orthopodomyia anopheloides					E	F	G	H	I	J		L								
Mansonia (Mansonioides) uniformis			C		E	F	G	H	I	J		L	M	N						
Ma. (Coquillettidia) ochracea			C		E			H	I	J		L	M							
Ma. (Coq.) crassipes								H	I	J		L	M							
Culex (Culex) fuscocephala										J		L								
Cx. (Cux.) vagans		B	C	D	E		G	H	I			L								
Cx. (Cux). pipiens quinquefasciatus			C	?		F	G	H	I	J	K	L	M	N	O					
Cx. (Cux.) p. pallens		B	C	D	E	F	G													
Cx. (Cux.) p. molestus	A	B		D	E	F	G						M	N	O					
Cx. (Cux.) tritaeniorhynchus		B	C	D	E	F	G	H	I	J	K	L		N						
Cx. (Cux.) pseudovishnui			C		E	F	G	H	I	J		L								
Cx. (Cux.) sitiens			C						I	J		L	M	N						
Cx. (Cux.) whitmorei		B	C		E	F	G	H	I	J		L	M							
Cx. (Cus.) jacksoni		B	C									L								
Cx. (Cux.) mimeticus		B	C	D	E	F	G	H	I	J		L								

TABLE 1 (Continued).

SPECIES	EXTRALIMITAL DISTRIBUTION		INTRALIMITAL DISTRIBUTION									EXTRALIMITAL DISTRIBUTION			
			Palaearctic					Oriental							
	Nearctic	Palaearctic	Korea	Hokkaido	Honshu	Shikoku	Kyushu	Amami	Okinawa	Yaeyama	Ogasawara	Oriental	Australian	Ethiopian	Neotropical
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Cx. (Cux.) orientalis		B	C	D	E	F	G					L			
Cx. (Cux.) boninensis											K				
Cx. (Cux.) bitaeniorhynchus		B	C	D	E	F	G	H	I	J		L	M	N	
Cx. (Cux.) sinensis		B	C		E	F	G	H	I	J		L			
Cx. (Neoculex) rubensis		B?	C	D	E										
Cx. (Eumelanomyia) hayashii hayashii		B	C	D	E	F	G								
Cx. (Eum.) h. ryukyuanus								H	I	J					
Cx. (Eum.) okinawae								H	I	J		L			
Cx. (Eum.) brevipalpis									I	J		L	M		
Cx. (Lophoceraomyia) infantulus			C	D	E	F	G	H	I	J		L			
Cx. (Lop.) cinctellus										J		L			
Cx. (Lop.) rubithoracis					E	F	G	H	I			L			
Cx. (Lop.) bicornutus										J		L			
Cx. (Lop.) tuberis									I	J		L			
Cx. (Culiciomyia) ryukyensis								H	I	J					
Cx. (Cui.) nigropunctatus										J		L			
Cx. (Cui.) pallidothorax					E	F	G	H	I	J		L			
Cx. (Cui.) kyotoensis			C		E	F	G					L			
Cx. (Cui.) sasai			C		E	F	G					L			
Cx. (Barraudius) inatomii		B	C		E										
Cx. (Lutzia) fuscanus		B	C						I	J		L			
Cx. (Lut.) halifaxii		B	C	D	E	F	G	H	I	J	K	L	M		
Cx. (Lut.) shinonagai											K				
Heizmannia (Heizmannia) kana								H							
Hx. (Hez.) lii			C									L			
Aedes (Ochlerotatus) vigilax										J		L	M		
Ae. (Och.) dorsalis	A	B	C	D	E	F	G					L?			
Ae. (Och.) excrucians	A	B		D											
Ae. (Och.) impiger daisetsuzanus				D											
Ae. (Och.) sticticus	A	B		D											
Ae. (Och.) communis	A	B		D											
Ae. (Och.) punctor	A	B		D	E?										
Ae. (Och.) hexodontus hokkaidensis				D											

TABLE 1 (Continued).

SPECIES	EXTRALIMITAL DISTRIBUTION														
			INTRALIMITAL DISTRIBUTION												
				Palaearctic				Oriental							
	Nearctic	Palaearctic	Korea	Hokkaido	Honshu	Shikoku	Kyushu	Amami	Okinawa	Yaeyama	Ogasawara	Oriental	Australian	Ethiopian	Neotropical
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Ae. (Och.) hakusanensis					E										
Ae. (Och.) sp.				D											
Ae. (Och.) intrudens	A	B		D											
Ae. (Och.) diantaeus	A	B		D											
Ae. (Finlaya) japonicus japonicus			C	D	E	F	G								
Ae. (Fin.) j. amamiensis								H							
Ae. (Fin.) japonicus yaeyamensis										J					
Ae. (Fin.) koreicus		B	C												
Ae. (Fin.) hatorii			C		E	F	G					L			
Ae. (Fin.) togoi	A	B	C	D	E	F	G	H	I	J	K	L			
Ae. (Fin.) savoryi											K				
Ae. (Fin.) seoulensis		B	C												
Ae. (Fin.) albocinctus										J		L			
Ae. (Fin.) kobayashii			C	D	E										
Ae. (Fin.) aureostriatus okinawanus							G	H	I						
Ae. (Fin.) a. taiwanus										J		L			
Ae. (Fin.) koreicoides				D	E		G								
Ae. (Fin.) nipponicus		B	C	D	E	F	G								
Ae. (Fin.) nishikawai								H							
Ae. (Fin.) oreophilus		B	C	D	E										
Ae. (Fin.) watasei							G	H	I	J					
Ae. (Stegomyia) riversi							G	H	I	J					
Ae. (Stg.) galloisi		B	C	D	E										
Ae. (Stg.) albopictus		B	C		E	F	G	H	I	J	K	L	M	N	
Ae. (Stg.) flavopictus flavopictus		B	C	D	E	F	G								
Ae. (Stg.) f. downsi								H	I						
Ae. (Stg.) f. miyarai										J					
Ae. (Stg.) aegypti									I?	J	K?	L	M	N	O
Ae. (Stg.) wadai											K				
Ae. (Stg.) chemulpoensis		B	C												
Ae. (Aedimorphus) alboscutellatus					E		G					L	M		
Ae. (Adm.) vexans nipponii		B	C	D	E	F	G	H	I	J		L?			
Ae. (Geoskusea) baisasi										J		L			
Ae. (Neomelaniconion) lineatopennis			C									L	M	N	

TABLE 1 (Continued).

SPECIES	EXTRALIMITAL DISTRIBUTION		INTRALIMITAL DISTRIBUTION														
			Palaearctic					Oriental									
	Nearctic	Palaearctic	Korea	Hokkaido	Honshu	Shikoku	Kyushu	Amami	Okinawa	Yaeyama	Ogasawara	Oriental	Australian	Ethiopian	Neotropical		
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O		
Ae. (Edwardsaedes) imprimens				D	E		G					L	M				
Ae. (Aedes) esoensis		B	C	D	E												
Ae. (Aed.) yamadai		B		D	E												
Ae. (Aed.) sasai		B?		D	E												
Ae. (Verrallina) nobukonis		B?			E?		G			J							
Ae. (Ver.) iriomotensis										J							
Ae. (Ver.) atriisimilis										J							
Armigeres (Armigeres) subalbatus			C		E	F	G	H	I	J		L					
Uranotaenia (Pseudoficalbia) jacksoni									I			L					
Ur. (Pfc.) ohamai										J							
Ur. (Pfc.) yaeyamana										J							
Ur. (Pfc.) novobscura novobscura					E	F	G					L					
Ur. (Pfc.) n. ryukyuana								H	I	J							
Ur. (Pfc.) nivipleura									I	J		L					
Uranotaenia (Uranotaenia) annandalei									I	J		L					
Ur. (Uro.) macfarlanei									I	J		L					
Tripteroides (Tripteroides) bambusa bambusa			C	D	E	F	G										
Tr. (Trp.) b. yaeyamensis										J							
Topomyia (Suaymyia) yanbarensis							G?		I								
Malaya genurostris								H	I	J		L	M				
Toxorhynchites (Toxorhynchites) manicatus yamadai								H									
Tox. (Tox.) m. yaeyamae										J							
Tx. (Tox.) towadensis				D	E	F	G										
Tx. (Tox.) christophi		B	C														
Tx. (Tox.) sp.									I								

TABLE 2. Subspecific differentiation of mosquitoes in the Ruykyu Archipelago

	Palaearctic Region	Ryukyu Archipelago			Oriental Region
		Amami	Okinawa	Yaeyama	
Cx. (Eum.) hayashii	*hayashii*	*ryukyuanus*	*ryukyuanus*	*ryukyuanus*	?
Ae. (Fin.) japonicus	*japonicus*	*amamiensis*	--	*yaeyamensis*	*shintienensis, eucleptes*
Ae. (Fin.) aureostriatus[1]	*okinawanus*[2]	*okinawanus*	*okinawanus*	*taiwanus*	*taiwanus, aureostriatus*[3]
Ae. (Stg.) flavopictus	*flavopictus*	*downsi*	*downsi*	*miyarai*	--
Ur. (Pfc.) novobscura	*novobscura*	*ryukyuana*	*ryukyuana*	*ruykyuana*	*novobscura*
Tp. (Trp.) bambusa	*bambusa*	--	--	*yaeyamensis*	?
Tx. (Tox.) manicatus	--	*yamadai*	--	*yaeyamae*	*manicatus*

[1]Var. *greeni* (Theobald) and var. *dooni* Wattal, Bhatia and Kalra were described from India, and var. *kanaranus* (Barraud) from Ceylon.

[2]Found only in Yakushima, the southernmost island of Palaearctic Japan.

[3]Occurs also in the Papuan subregion.

History of Mosquito Taxonomy in Japan and Korea

In Japan, entomology as a modern science, as well as other natural sciences, commenced their progress after the Meiji Restoration (1868). The honor of having identified mosquitoes of this region for the first time with a Linnean scientific name is awarded to Shônen Matsumura (1872-1960), the last real polyhistor in entomology (Lindroth 1973), and the pioneer of modern entomology in Japan. He published nearly 300 papers on entomology between 1892 and 1945. It was said that, when all his papers were piled upon one another, the pile far exceeded his height. Two mosquito species, *Culex annulatus* (Fabr.) and *C. pipiens* (L.) were included among an enumeration of names of Japanese insect pests in his earliest independent publication, "Gaichû Kujo Zensho" (Compendium of insect pest control) (1897). In 1898, he published "Nippon Konchûgaku" (The Japanese entomology), the first textbook of entomology published in Japan. The publication of this book greatly promoted the later progress of this scientific field in Japan. In this textbook, he enumerated 3 mosquito species with short descriptions. They are *Culex fuscanus* (Wied.), *C. pipiens* (L.) and *C. dives* (Schn.). The first and last species do not appear to be correctly identified. The 2nd species is doubtlessly the common house mosquito, presently known as *Culex pipiens pallens*. Later, in one of his 20 voluminous iconographies of Japanese insects, Matsumura described *Megarrhina towadensis* (*Toxorhynchites towadensis*) from northern Honshu (1916). This is the earliest valid mosquito species among those described as new species by Japanese entomologists.

Yasushi Nawa (1857-1926), a non-government entomologist and one of the pioneers of applied entomology in Japan, presented a collection of 629 specimens of Japanese Diptera to the United States National Museum. This collection appears to have been sent through Kakichi Mitsukuri (1857-1909), professor of Zoology, the Imperial University of Tokyo (presently the University of Tokyo), who greatly contributed towards establishing modern zoology in Japan. Daniel William Coquillett (1856-1911), Honorary Custodian of Diptera of the United States National Museum at that time, worked on this collection and found 124 species, of which 54 were new (1898). Included among the new species were *Culex subalbatus* and *Culex pallens*. The former, now known as *Armigeres subalbatus*, one of the more common mosquitoes in Japan, was the first mosquito species described as a new species from this region. The latter is the common house mosquito, presently treated as one of the components of the *Culex pipi* ıs complex, hereafter being the subject of considerable research.

One of the greater scientific events at the end of the 19th century was the discovery by Ross (1897-98), Grassi (1898) and Bignami and Bastianelli (1898), that malaria was transmitted by mosquitoes. After this discovery, the British Museum (Natural History) took quick action to promote mosquito taxonomy, which was essential for research on control of mosquitoes. An enormous number of specimens was gathered from all over the world. Fred V. Theobald (1868-1930) exclusively performed mosquito taxonomy from 1899 to 1910 at the British Museum. He published a magnificent 5 volume series of "A monograph of the Culicidae or mosquitoes" (1901-10), in addition to 60 smaller papers on mosquitoes. Two species, *Stegomyia fasciata* (Fabricius) (*Aedes aegypti*) and *Stegomyia scutellaris* (Walker) (*Aedes albopictus*) were recorded from Japan for the first time, *Culex japonicus* (*Aedes japonicus*) was described as new in Volume I (1901), and 4 new species were described from Japan in

Volume IV (1907). Although Theobald recorded *Stegomyis fasciata*, the well-known yellow fever mosquito, from Tokyo, its occurence in Palaearctic Japan was not verified by later surveys until 1944-52, when it became established on Amakusa, a small island close to Kyushu. The other 2 species are very common in Japan. Among the 4 new species in Volume IV, *Culicada nipponii* and *Culicelsa togoi* are still valid as *Aedes vexans nipponii* and *Ae. togoi*, respectively. *Leucomyia plegepennis* Theobald is regarded as a synonym of *Culex whitmorei* (Giles), but his record is the first of this species from Japan. *Culex osakaensis* Theobald is regarded as the common house mosquito, *Cx. pipiens pallens*.

Japanese and European scientists in the medical field reacted concurrently to the discovery of Ross and others. There was indigenous malaria distributed sporadically in Japan. As one of the actions taken by the Japanese Government, in July 1901, the Medical Board of the Imperial Army dispatched Jinnosuke Tsuzuki, Surgeon Captain, to Fukagawa, Hokkaido, where the 1st Colonial Battalion of the 7th Division was located. At that time malaria was probably most prevalent in this area of Japan except for Taiwan, and involved many colonial soldiers. Tsuzuki immediately obtained anopheline mosquitoes and finding oocysts and sporozoites in female mosquitoes, then experimentally transmitted malaria to a healthy man by an infected mosquito. After 3 months, on 2 November 1901, the Medical Board sent Tsuzuki to Taiwan for fundamental research for a malaria eradication program. He found 3 anopheline species which might transmit malaria.

During a fairly short period from October 1901 to the middle of 1902, Tsuzuki published at least 8 papers on his surveys of malaria and anopheline mosquitoes. He also proposed 3 new mosquito names. It is quite regretable that Tsuzuki, though appearing to be an able medical scientist, with his papers being ranked as some of the earliest work of mosquito taxonomy in this region, was not a qualified zoological taxonomist. His way of proposing new scientific names was obscure, and his disposition of specimens was inadequate. These circumstances caused some confusion in nomenclature. At this point, it is appropriate to make rather precise comments on his publications.

On 15 October 1901, Tsuzuki in collaboration with F. Ohmachi, published a paper entitled (1901a), "A Report on an investigation on the relation between mosquitoes and malaria in the district under the command of the 7th Division" [Gun'i-gakkai Zasshi (Journal of the Academy of Military Surgeons) No. 123, Supplement: 1-70, with 3 appendices (in Japanese)]. This is his first paper dealing with anopheline mosquitoes, and is an official report responding to the mandate from the Medical Board. In this paper Tsuzuki and Ohmachi provisionally called the anopheline species they obtained in Hokkaido "Anopheles 'Hokkaido'" in Japanese characters, as they could not identify it.

At the same time, Tsuzuki made an abstract from Kerschbaumer's 1901 biological study on European *Anopheles claviger* (Meigen), for Japanese surgeons. This was his 2nd paper (1901a), and was published following his first one (p. 71-80).

Only 10 days later, on 25 October 1901, Tsuzuki published his 3rd paper (1901b), "Results of an investigation on malaria in Hokkaido" [Saikingaku Zasshi (Journal of Bacteriology) No. 71: 1-8 (717-24), (in Japanese)]. In this paper, he gave for the first time a scientific name in Roman characters, "*Anopheles Yesoensis*" for "Anopheles 'Hokkaido'" (in Japanese characters) with a very short diagnostic discussion indicating that his species was different from European *Anopheles claviger* by the wing markings.

On 25 February and 25 March 1902, he published a 4th paper (1902a),

"Report of an investigation on malaria in Taiwan" [Saikingaku Zasshi No. 75: 24-51 (90-117), No. 76: 9-37 (165-193), (in Japanese)]. This paper consists of 11 chapters and 7 appendices. The main paper and appendix 1 were prepared by Tsuzuki, and appendices 2-7 jointly by he and his collaborators. Chapters 1-8 were published in No. 75 on 25 February, and chapters 9-11 and appendices 1-7 in No. 76 on 25 March. All the parts relating to taxonomy were included in the chapters published in No. 75 (25 February). In Chapter 3, he gave descriptions of reasonable magnitude to 3 anopheline species using the names, *A. Jesoensis*, *A. Formosaeniis I* (misprint of *Formosaensis*) and *A. Formosaensis II*. As to the first species, Tsuzuki thought that specimens from Taiwan were the same as those from Hokkaido. The composite form of the latter 2 names is inadmissible for species trivial names as stated by Reid (1968). *Formosaensis I* is now considered conspecific with *Anopheles minimus* Theobald, 1901, and *Formosaensis II* with *Anopheles indefinitis* (Ludlow, 1904).

The following month (April 1902), Tsuzuki published his 5th paper (1902b) [Tokyo Iji Shinshi No. 1253: 1-4 (611-4), (in Japanese)], answering Miyajima's comment (1902) [Mitteil. Med. Ges. Tokyo 16(7): 263-93 (in Japanese)] on Tsuzuki's work.

Tsuzuki's 6th paper (1902c), "Über die Ergebnisse meiner Malariaforschung in Hokkaido (Japan)" [Centralbl. f. Bak. Parasit. u. Infekt. Abt. I. Originale 31(15): 763-8] appeared on 18 June 1902. This was an almost exact German translation of his 3rd paper written in Japanese. In this German edition, the name *Jesoensis* was substituted for the original *Yesoensis*.

Presumably after June (probably in September) in the same year, Tsuzuki published in German his 7th paper (1902d), "Malaria und ihre Vermittler in Japan" [Archiv f. Schif.-u. Tropen-Hyg. 6(9): 285-95, 1902]. This paper was prepared by a rearrangement of chapters 3, 5 and 6 of his 4th paper, and combined some results reported in his 3rd paper. Consequently, nothing new was presented.

On 10 November 1902, he published his 8th paper (1902e), "Distribution of Japanese *Anopheles*" [Gun'i-gakkai Zasshi No. 132: 909-11 (in Japanese)]. He summarized the records of specimens he identified together with published records, and concluded that only one species, *Anopheles Jesoensis*, occurred from Hokkaido to Kyushu. Tsuzuki sent his specimens to several European authorities for proper identification. The results received were that Theobald identified *Jesoensis* as *sinensis* Wiedemann, 1828, and Dönitz identified it as *plumiger* Dönitz, 1901, var. *Jesoensis* Tsuzuki. Other authorities did not reply to him. Dönitz's *plumiger* is now regarded as *sinensis*. It is quite uncertain, however, whether specimens sent by Tsuzuki to these specialists were from Hokkaido, Taiwan, or possibly from other parts of Japan. It is highly probable that Tsuzuki treated more than one species of the *hyrcanus* group, 5 species of which are now recognized in this region. In this respect, a short note on the wings of Tsuzuki's 3 species by Eysell (1902), cannot be overlooked. This paper, "Bemerkungen über die Flügel der japanischen *Anopheles*-Mücken," printed following Tsuzuki's 7th paper, indicated that the wings of Tsuzuki's *Anopheles Jesoensis* had the apical to posterior margin from vein 3 (r_{4+5}) to 6 (1a) intensively black. Thus, this specimen is more likely *lesteri* than *sinensis;* the former species is common in the Fukagawa area, while *sinensis* rarely occurs there. Thus, the status of *Anopheles Jesoensis* is still uncertain, and Tsuzuki's specimens should be ferreted out for a final clarification. This may be difficult, since he never designated the type specimens, and it is doubtful if he prepared

specimens in a proper manner with adequate locality data. During this period, Tsuzuki appears to have written 2 independent publications in Japanese: Tsuzuki and Ohmachi (1901b), "Verification of transmission of malaria by mosquitoes in Japan," and Tsuzuki (1902f), "Malaria Shinsetsu" (Modern malariology). We could not trace them.

In 1907, after a lapse of 5 years, Tsuzuki published a purely entomological study on his malaria mosquitoes, "Über die *Anopheles*-Arten in Japan and einige Beträge zur Kenntnis des Entwicklungsgangs der *Anopheles*-Larven" [Zool. Jahrb., Abt. Syst. Geogr. Biol. Tiere 25(5-6): 525-56]. This paper was the last one published by Tsuzuki on *Anopheles* as far as we know, and dealt with both the immature and adult life stages. He discussed the possible identity of *sinensis* with his *jesoensis*, though he still retained his *jesoensis* (in this paper, he did not capitalize "j"). The material used in this work, however, apparently came from Honshu (Sabae) and Taiwan, thus this paper does not offer any clue to elucidate the true status of Tsuzuki's *Jesoensis* (or *Yesoensis*) of Hokkaido, although his species were better described than before and well illustrated.

Mikinosuke Miyajima (1872-1944), a parasitologist at the School of Medicine, the Imperial University of Kyoto (presently the University of Kyoto), commenced a study on malaria in 1901 in Kyoto and its vicinity while a post-graduate student. As Tsuzuki, he (January 1903) recognized only a single species of *Anopheles* in Palaearctic Japan, but contrary to Tsuzuki, he identified it as *sinensis* following Theobald's diagnosis. In the history of mosquito taxonomy, Miyajima should be noted as the first worker who identified a common Japanese anopheline species as *sinensis*, which has been accepted by almost all later workers. It should be realized that to identify a species, even though it is a common species, must have been by far more difficult for these pioneers at that time than to now describe a new species. Miyajima later became one of the more eminent medical zoologists in Japan.

Charles Lester Marlatt (1863-1954), Division of Entomology, U. S. Department of Agriculture, made a world trip during 1901-02, and stayed in Japan from 1 April to 22 September 1901. This trip covered a large part of Japan from Sapporo to Kyushu. His primary object was to search for natural enemies of a scale insect, *Quadraspidiotus perniciosus* (Comstock), in East Asian countries. During the trip he also gathered mosquitoes from dwellings where he spent his nights. Thus, most of his collections of mosquitoes were of the common house mosquito. He sent all his specimens to Coquillett, who curiously identified all of Marlatt's specimens of the Japanese house mosquito as *Culex pipiens*, but not *pallens*, which he described from Japan only a few years before. Other species Marlatt obtained in Japan were *Anopheles sinensis* and *Culex concolor* Robineau-Desvoidy. The latter species, though the name is treated as a synonym of *fuscanus*, may be *Culex halifaxii*. His picturesque accounts of his mosquito survey were published in 1903.

In 1910, only 11 mosquito species, in the current sense, were known from this region compared to 1,050 species from the world. Daiji Mochizuki, a physician and an assistant professor of the Department of Internal Diseases, Fukuoka School of Medicine (presently the School of Medicine, the University of Kyushu), studied filarial development in 6 mosquito species (1910, 1911). At the time when there were neither culcid taxonomists nor monographs of mosquito taxonomy in this region, it was natural that he could identify only one species, *Anopheles sinensis*. Then, he turned to taxonomy, and found 11 species in the Fukuoka district, nothern Kyushu, and one species, *Stegomyia fasciata* from Okinawa Is., the Ryukyus. Four (including 2 new species, now

invalid) of the 12 species were new to this region (1913). In addition to descriptions for the males and females, he also described the male genitalia for 11 species, the larvae and pupae for 8 species and the eggs for 9 species. The descriptions of the early stages for 6 species, *Culex pallens (Cx. pipiens pallens), Culex biroi* Theobald *(Cx. tritaeniorhynchus), Culex tigripes* de Grandpre and de Charmoy *(Cx. halifaxii), Culex (?) japonicus (Aedes togoi), Stegomyia scutellaris (Aedes albopictus)* and *Desvoidya obturbans* (Walker) *(Armigeres subalbatus),* appear to be the first ones recorded for them. The names given by him to the 9 species are not in current use, and the location of his specimens is uncertain. His descriptions and illustrations, however, have enabled later workers to identify all of them. It appears that he published no further papers on mosquito taxonomy.

At the completion of the Panama Canal, the British Government undertook a survey of the distribution of the yellow fever mosquito, *Stegomyia fasciata (Aedes aegypti),* in Oriental countries, due to the potential of this vector dispersing to nonendemic geographical areas by the growing traffic between the Central and South Americas and Asia. They asked Baron Shinken Makino, Minister of Foreign Affairs, through Sir William Cunningham Greene, British Ambassador in Japan, to have this subject also investigated in Japan. Shinichirô Yamada (1883-1937), a medical entomologist at the Institute of Infectious Diseases, the Imperial University of Tokyo, was assigned to undertake the work. The result of his survey was published in 1916. It reported the occurrence of this species in the Ryukyu islands, Ogasawara (Bonin) islands, Saipan in the Mariana islands, and Jaluit in the Marshall islands. This is the first of Yamada's papers on mosquitoes. Up to 1932, he published 8 papers relating to taxonomy, and described 15 new species (of which 13 are valid) and recorded 7 species new to this region. His descriptions and drawings are excellent. His work also covers Korea and Taiwan. Among his papers, a revision of adult *Anopheles* from Japan, Korea and Taiwan (1924, 1925) is most important. His 1927 study of filarial development in 24 mosquito species has been most frequently cited by later authors from both medical and taxonomic fields. He also took part in joint studies on Japanese encephalitis conducted by the Japan Society for the Promotion of Science. Among the scientists concerned, Yamada was the first to suspect *Culex tritaeniorhynchus* as the principal vector of this disease from the available epidemiological and biological data (Mitamura 1933; Yamada 1934a, b, c), and later, this was fully verified. His untimely death in 1937 during a research trip for kala azar at Tsinan, North China did not allow him to go on to studies on immature mosquitoes. Notwithstanding the deficiency that his taxonomic work was limited mostly to the adult mosquitoes, Yamada should definitely be ranked highest among the pre-World War II culicid taxonomists of this region.

In 1910, when Theobald was transferred fromthe Museum back to agricultural entomology, Frederick Wallace Edwards (1888-1940) was appointed to the staff of the British Museum. Edwards is regarded as one of the greater dipterists in the world. He published 408 papers on Diptera, including numerous ones on mosquitoes. It is not necessary to give an account of his invaluable contributions to the classification of world mosquitoes in this treatise. His contributions to the mosquito fauna of this region were relatively few; the first one (1917) is the description of a new species, *Ochlerotatus (F.) koreicus (Aedes koreicus).* In his excellent revision of mosquitoes of the Palaearctic region (1921b), he named 3 new species from this region and recorded 3 species new to the fauna. Much of the material he described from this region was apparently supplied by Yamada.

As one of the surveys on the yellow fever mosquito in Oriental countries planned by the British Government, W. A. Lamborn, Malaria Bureau, Federated Malay States, visited Nagasaki, Kobe and Yokohama in Japan, as well as Foochow and Shanghai in China between April and June, 1921. He found no species new to the fauna of this region. However, one fact cannot be overlooked, that is, he found *Culex fatigans* Wiedemann *(Culex pipiens quinquefasciatus)* in Nagasaki, both *Culex fatigans* and *Culex pipiens* in Kobe, and that *Culex pipiens* entirely replaced *Culex fatigans* in Yokohama. These data do not conform to present knowledge of the distribution of these forms. Lamborn's account on his trip was printed in 1922.

The 15 years between Yamada's last paper on mosquito taxonomy (1932) and the end of World War II was an unproductive period for mosquito taxonomy here. Three new species and 2 new varieties were described by various authors, and one species new to this region was recorded. One of the new species and the 2 varieties are considered invalid, and one newly recorded species was misidentified. However, 3 important papers were published in this period. Nakayama (1942) clarified in an experiment that *Anopheles koreicus* Yamada and Watanabe and *An. edwardsi* Yamada were mere variations produced by different temperature conditions during the immature stages. This may be the first successful study using an experimental method for mosquito taxonomy in this region. Ishihara (1942) described the eggs, 4th stage larvae and pupae of 8 common species. The study of the immature stages had been greatly neglected in this region. Under this circumstance, this paper is significant. The immatures of 2 species, *Aedes vexans nipponii* and *Ae. japonicus* were described for the first time in this paper. Kawase (1943) found *Culex pipiens autogenicus* Roubaud *(Culex pipiens molestus)*Forskal) in Tokyo. It is unlikely that this form was introduced into Japan at this time. It should be thought that *molestus* was recognized by a scientist for the first time in this region at this occasion. At the end of World War II, 48 species in the present sense had been recorded and immatures of 14 species had been described from this region.

After World War II, mosquito taxonomy in this region made remarkable progress through the labors of the medical entomologists serving with the U. S. military services. Only 12 species, of which 2 were not given full scientific names, had been known from the Ryukyu Archipelago when World War II ceased. After 1945, Richard M. Bohart worked on Okinawa Guntô as a U. S. Navy entomologist, and later on Yaeyama Guntô as a professor of entomology of the University of California, Davis. He published 6 papers, partially in collaboration with Robert L. Ingram, on Ryukyuan mosquitoes during 1946-59, describing 11 new species (8 are valid), recording 24 species for the first time from the archipelago, with a total number of 45 species. In the interim, he published a fine monograph on Micronesian mosquitoes [1956 (1957)], which included mosquitoes of the Ogasawara islands.

As to Japan proper (Hokkaido-Kyushu), Tsai-Yu Hsiao and R. M. Bohart, published general accounts of mosquitoes and mosquito-born diseases in Japan (1946). The 207th Malaria Survey Detachment, Medical Service Corps, U. S. Army, stationed in Kyoto, carried out a general mosquito survey including taxonomy, for 4 years from 1946 to 1949. The results appeared in a sequence of 3 publications. The first one was introduced as preliminary, and was entitled, "Mosquitoes of Japan." It was published on 1 May 1947, and consisted of 2 parts. Part I was a summary of survey data compiled by Captain Walter J. LaCasse, the commander of the detachment. Part II was devoted to larval taxonomy, subtitled, "Larvae of the more common mosquitoes

of Japan," prepared by LaCasse and Satyû Yamaguti. Yamaguti was a parasitologist at the University of Kyoto, and later became the author of "Systema helminthum" in 5 volumes (1958-63). The larvae of *Aedes flavopictus* and *Culex kyotoensis* were described for the first time, under the names of *Aedes galloisi* Yamada and *Culex ryukyensis* Bohart, respectively. On 15 April 1948, they published the 2nd edition in a similar format, and entitled it "Mosquito fauna of Japan and Korea." It included the additional data obtained in 1947 in Part I, and adult taxonomy in Part II. They described a new subspecies, *Aedes (Finlaya) niveus nipponicus*, and a new species, *Orthopodomyia nipponica*; the former is currently treated as a full species, the latter known as *anopheloides*. The 3rd edition, published in 1950, has the same title as the 2nd, but the taxonomy section came first and Part I of the prior editions was rewritten and came last as Appendix II. It resembles a taxonomical publication more than the 2 previous editions, and a new species of *Culiseta* was described. Adult drawings were greatly improved and extremely detailed. They were prepared by 7 Japanese illustrators, and 2 of them, Kei Daishoji and Saburo Shibata, who were on the junior staff at that time, contributed largely to our monograph as the senior illustrators. The 3rd edition was reprinted once in 1955, and has been utilized as the standard reference for identification of mosquitoes from this region.

In LaCasse and Yamaguti's 3rd edition, 50 species, with 40 immatures (49 species and 39 immatures in the current sense), were treated from Japan proper and Korea. Little information on species of high altitudes and Korea was included. Contemporary to LaCasse and Yamaguti, Manabu Sasa, Department of Parasitology, Institute of Infectious Diseases, the University of Tokyo, his coworkers and other culicidologists of Japan surveyed mountain and northern districts of Japan, and contributed to the discovery of new species, and hitherto unrecorded species or immatures of known species. Sasa and Asanuma published a handy manual on Japanese mosquitoes ("Ka o Shiraberu Hito no Tameni") (1948). In this period, 13 new species were described and 9 species were added to the fauna of this region; among them 8 new species were valid and 8 species were veritable new additions to the fauna. Asanuma and Nakagawa published a series of excellent critical papers on pupal chaetotaxy on the generic or subgeneric level (1953-54), and Otsuru and Ohmori reviewed the Japanese species of the *Anopheles hyrcanus* species group (1960). Thus, from 1946 to 1960, 44 species and volumes of information on immature stages were added to the mosquito fauna of this region. The total number of known species was brought to 92.

During the succeeding 11 years from 1961 to 1971, no new taxa were described from this region, and only 5 species were added to the fauna. Another current of study, however, grew during this period. Apparently, "The *Culex pipiens* complex" of Mattingly and others (1951) strongly stimulated Japanese culicidologists. Some of the earlier papers on the Japanese *Culex pipiens* complex comprising at least more or less a taxonomical aspect are Ikuzawa (1955), Bekku (1956) and Kamura (1957-59). In the 1960's, many more papers were published and this trend continues to the present. Some of these papers are Hori (1960a, b, c), Ishii (1961-78), Sasa and his coworkers (1963-67). Their works include hybridization experiments, genetics, ecology, physiology and biochemistry as well as morphology and biogeography. Quite recent and more interesting works on this group by various advanced methods along with Kanda and Oguma's cytotaxonomic study on the *Anopheles hyrcanus* complex were not fully completed at the time of the completion of this draft. Nakata's critical paper (1962) on some of the works of Japanese culicid

taxonomists, including the summary of his own studies and his advocacy of applying experimental methods to taxonomy, was a unique publication during this period. The Southeast Asia Mosquito Project (SEAMP) starting in 1966 (the Medical Entomology Project (MEP) from June 1974) at the U. S. National Museum of Natural History, Smithsonian Institution, under the auspices of the U. S. Army Medical Research and Development Command, has conducted systematic studies on mosquitoes from Southeast Asia. Since 1967, personnel of SEAMP and MEP have published a series of about 30 monographs. Species of the central and southern Ryukyu Archipelago were treated in some of these monographs.

Korean mosquitoes have been greatly neglected. Little work was done before the end of World War II, although 25 species were known at that time. After the War, Hsiao (1946) added one species, and Chu (1956) summarized published records and added 7 species to the Korean fauna. In the 1960's several authors recorded 11 species for the first time from Korea, and Lee (1971) treated all known species with 2 new additions. Three species were added quite recently. Fifty Korean species are treated in our present revision.

During the last 5 years from 1972 to our present revision, a new subspecies and a new species were described from Japan proper by Kamimura and Wada (1974), and from the Ryukyus by Miyagi (1976), respectively. Sasa, Kurihara and Kamimura (1976) published a revised and enlarged edition of Sasa and Asanuma's "A manual of mosquitoes of Japan" (Ka o Shiraberu Hitono Tameni) (1948). During the present project, starting July 1969 and ending at this revision, we have described 9 new species and added 4 species to the fauna. Thus, 113 species are treated in this revision including 3 unnamed taxa.

TAXONOMY - FAMILY CULICIDAE

In this work, only the so-called true mosquitoes are included in the family Culicidae; dixid and chaoborid midges are excluded as different families. The following characters may serve to discriminate true mosquitoes from related families.

ADULT. Ocelli absent. Antenna with scape reduced to a narrow ring; pedicel globose; flagellum very long, slender, 13 segmented. Palpus not distinctly incurved. Labium forming a long proboscis. Mesonotal suture incomplete, short, extending mesocaudally from scutal angle at level just cephalad of mesothoracic spiracle. Wings long, rounded apically, always lying flat over abdomen at rest; membrane without network; veins strong, scaly; vein c continued around margin of wing; sc extending beyond base of r_s; r_{2+3} straight, in line with r_s; cells R and M extending beyond middle of wing. Legs scaly; coxae short.

LARVA. Head distinct, movable, sclerotized, not retracted into prothorax, usually with pigmented eye spots. Antenna inserted laterally, not prehensile. Mouth brush well developed, usually consisting of a large number of slender hairs, rarely modified into 6 to about 10 strong flattened teeth. Thoracic segments fused into one greatly enlarged area, distinctly broader than abdomen, without a median proleg. Abdomen without prolegs; setae 0, 8-I and usually 14-I, II absent; only spiracle of segment VIII functional, the spiracle without 4-5 short fleshy lobes surrounding it; segment X (anal segment) with 4 caudally projecting gills and a midventral brush (4-X).

Many authors split the family Culicidae (excluding Dixidae and Chaobori-

dae) into 3 subfamilies: Anophelinae, Toxorhynchitinae and Culicinae. However, as anophelines appear to be essentially different from the other 2 in all stages in many morphological characters and also some behavioral characters, and as most characters of toxorhynchitines are shared with those of culicines, we divide the family Culicidae into 2 subfamilies, Anophelinae and Culicinae.

KEYS TO SUBFAMILIES OF CULICIDAE

ADULT

Abdomen largely without scales. . . . . ANOPHELINAE (p. 44)
Abdomen largely covered with broad flat scales. . . . CULICINAE (p. 85)

MALE GENITALIA

Proctiger completely membranous, without sclerotized paraproct; claspette well developed; aedeagus tube-like, broadened basally. ANOPHELINAE (p. 44)
Proctiger usually with sclerotized paraproct; when membranous, aedeagus divided and toothed. . . . . CULICINAE (p. 85)

LARVA

Siphon absent; spiracle sessile; maxilla with cardo bar-like, its proximal portion placed under cranium. . . . . ANOPHELINAE (p. 44)
Siphon well developed, spiracle at apex of siphon; maxilla with cardo broad and flat, on same plane as adjacent region of cranium surface. CULICINAE (p. 85)

I. SUBFAMILY ANOPHELINAE

FEMALE. *Head.* Vertex and tempus with numerous erect scales, decumbent scales very few or absent; interocular space with a tuft of long hair-like scales and slender pale bristles. Antenna usually shorter than proboscis; pedicel small. *Thorax.* Anterior pronotal lobe widely separated, with bristles. Postnotum and paratergite bare. Pleural scaling poorly developed; propleural, sternopleural, prealar and upper mesepimeral bristles present; spiraculars present or absent; postspiraculars and lower mesepimerals absent. *Wing.* Squama fringed with hair-like scales; alula bare. Membrane with distinct microtrichia. Veins all dark scaled or spotted with dark and pale scales; rs with basal spur; r_{4+5} with basal spur, often scaled; la terminating beyond cubital fork. *Legs.* Long and very slender, all claws equal and simple; pulvilli undeveloped. *Abdomen.* Usually largely unscaled. Only a single seminal capsule developed, with a number of pale spots.

MALE. *Genitalia.* Segment IX without bristles; lobes of tergum IX variable. Basistyle simple, without mesal membrane, claspette well developed. Dististyle simple, slender, arcuate, with a short apical or subapical claw. Proctiger entirely membranous, without sclerotized paraproct. Aedeagus tube-like, broadened basally.

PUPA. Trumpet short and widely open. Abdomen with setae 9-III-VI at posterolateral angle of each segment, usually well developed, stout and /or

deeply pigmented.

LARVA. *Head.* Length usually subequal to width, collar broad (head not very constricted basally); seta 1-C slender; 2-C well developed; 3-C variously developed, always distinct; 5-7-C often plumose; 11-C strongly plumose; 13-C close to 11-C. Antenna shorter than head; 2,3-A saber-like. Mouth brush composed of a large number of simple hairs. *Mandible* with a row of hair-like spicules dorsolaterally; seta 1-Md usually present; mandibular ring distinct, located proximad of the dorsolateral row of spicules; 5 mandibular spurs, $MdS_{1, 3-5}$ strong, pectinate; MdS_2 fine, hair-like, usually multiple. Mandibular brush well developed. Mandibular comb variously developed. Cutting organ without dorsal spine; one or 2 dorsal teeth; ventral tooth usually well developed lateral denticles, with or without mesal denticles; mesal pecten a mass of closely spaced teeth proximad of ventral tooth; ventral blade and pectinate brush developed. Piliferous process variously developed, the hair-groups more or less reduced. Mandibular hairs well developed, in a single row. *Maxilla* studied only on the genus *Anopheles* (cf. the description of *Anopheles*). Anterior margin of labiogula triangularly produced. Mentum plate with a few strongly sclerotized teeth on each side, the apical tooth single. Aulaeum without marginal spicules, but toothed, the apical tooth double. *Thorax.* Notched organ, a transparent eversible appendage caudomesad of 5,6-P. Seta 13-P present. *Abdomen.* Terga with anteromedian sclerotized plates and often with smaller plates behind them. Setae 1-III-V (often also 1-I, II, VI, VII) palmate with broad leaf-like branches; 6,7-I-II and often 6-III long and plumose; many other thoracic and abdominal setae semiplumose (branched at more than one point). Comb on segment VIII absent. Siphon not developed; spiracle on apicodorsal surface of VIII. A pair of lateral pectinate plates (pecten) developed. Segment X with a posteriorly forked sclerotized ventral bar which appears to support grid distally; saddle incomplete, with dorsomedian caudal process; 1-X usually single, 3-X hooked at tip; 4-X of 16 or more, usually semiplumose hairs on grid.

DISTRIBUTION. Worldwide.

The subfamily Anophelinae of this region consists of a single genus, *Anopheles*.

1. GENUS *ANOPHELES* MEIGEN

Anopheles Meigen, 1818:10. Type-species: *Anopheles maculipennis* Meigen, 1818: Germany.

FEMALE. *Head.* Eyes narrowly to rather widely separated above, contiguous below. Antennal flagellomere (Flm) 1 1.5-2.2 of Flm 2. Palpus as long as or only a little shorter than proboscis, 5 segmented; joints of palpifer-1 and 1-2 indicated by unsclerotized rings, 2-3 usually a complete unsclerotized ring, 3-4 and 4-5 usually complete, occasionally tending to be fused together. *Thorax.* Posterior pronotal lobe glabrous. Scutum elongate, flattened above, with scales mostly hair-like; all scutal bristles present, mostly fine and easily confused with hair-like scales. Scutellum evenly rounded, with evenly distributed bristles. *Wing.* Cell R_2 longer than vein r_{2+3}. *Legs.* Tarsomere 5 of all tarsi shorter than 4.

MALE. Antennal flagellum strongly plumose; flagellomeres 12 and 13 together at most 0.67 of Flm 1-11. Palpus with joint 2-3 usually more completely fused than in female; 4 and 5 swollen, forming a club dorsolaterally

turned. Foretarsomere 5, length of or longer than 4, with several stout setae on ventrobasal swelling; mid- and hindtarsomere 5 shorter than 4. Only one anterior enlarged claw developed in foretarsus, with blunt-tipped submedian and laterobasal teeth; both claws of mid- and hindtarsi equal and simple. *Genitalia*. Sternum IX membranous, without bristles. Basistyle without distinct lobes, usually with tergobasal differentiated setae (parabasal setae); claspette usually divided, with free setae and/or fused filaments (club). Proctiger conical, without cercal setae. Aedeagus often with apical leaflets.

LARVA. *Head*. Setae 5-7-C often plumose, arranged in a more or less transverse line behind antennal base; 4-A branched. Mandibular comb composed of bilaterally pectinate, mostly broad teeth; ventral tooth with several mesal denticles; piliferous process more or less sclerotized, only slightly to moderately protrudent, with several apical hairs. *Maxilla*. Cardo longitudinal, bar-like, strongly sclerotized, with its proximal portion concealed under cranium and reaching about apex of mandibular postartis; cardinal seta 1-Mx at apex, well developed, dendritic or plumose. Mesostipes resembling parallellogram; parartis produced as a strongly sclerotized narrow process at mesobasal corner of mesostipes, and articulating with paracoila through strongly sclerotized rod of parartis; lateral margin with membranous notch; dorsal surface with a broad sclerotized diagonal band from anterolateral to posteromesal corner, barely interrupted at lateral 0.33; twin stipital sensoria just laterad of lacinial suture, short, slender, without basal ring; mesal stipital seta 2-Mx very small, on anterior marginal area; ventral stipital seta 4-Mx branched. Lacinia occupying about mesal 0.2 of dorsal surface of mesostipes; lacinial suture moderately sclerotized, subparallel to mesal margin of mesostipes; proximal lacinial seta 5-Mx near lacinial suture at about level of stipital sensoria; distal lacinial seta 6-Mx very short, on hairy anterior surface at the termination of lacinial suture, usually difficult to see, being hidden among numerous longer hairs. Galea a hairy lateroanterior marginal area, ventrally demarcated by an unsclerotized line parallel to the anterior margin, apparently composed of 3 layers of as many types of hairs; galeal seta 7-Mx very short, at about middle of this area. Palpostipes well developed, longer than mesostipes, apically cylindrical, with basal mesodorsal unsclerotized portion dorsolaterally spinulate, articulating with mandibular postartis at lateral artis; dendritic lateral stipital seta 3-Mx laterally distad of middle; 7 palpal sensory appendages at apex: twin dorsomesal spiniform ones, a triangular dorsolateral flattened spine, a short ventral spiniform one, and a very broad fan-shaped leaflet and 2 equal moderately broad leaflets in between. *Thorax*. Setae 5, 7, 8-P, 8-M, 5, 7, 8-T long and plumose; 1-M with thick stem, strongly plumose; 3-T often with narrow simple leaf-like branches. *Abdomen*. Setae 1-III-VII usually, and 1-I, II sometimes palmate; 6-III long and plumose; 2-X asymmetrically plumose.

DISTRIBUTION. Worldwide, except New Zealand, New Caledonia, Fiji and most of the other Pacific islands, unless introduced.

KEYS TO SUBGENERA OF *ANOPHELES*

ADULT

Costa with at least 4 pale marks in addition to humeral and basal spots; cibarial teeth present. . . . . *Cellia* (p. 47)

Costa with at most 3 pale marks excluding humeral and basal spots; cibarial teeth absent. . . . . *Anopheles* (p. 53)

MALE GENITALIA

Four parabasal setae. . . . . *Cellia* (p. 47)
At most 3 parabasal setae. . . . . *Anopheles* (p. 53)

PUPA

Male genital pouch with lobes ending in a knob; trumpet of angusticorn type. . . . . *Cellia* (p. 47)
Male genital pouch not ending in a knob; trumpet various. *Anopheles* (p. 53)

LARVA

Seta 2-C wide apart and closer to 3-C than to one another. . *Cellia* (p. 47)
Seta 2-C close together, or at most separated by a distance almost equal to that between 2,3-C. . . . . *Anopheles* (p. 53)

SUBGENUS *CELLIA* THEOBALD

Cellia Theobald, 1902: 181; 1903: 107. Type-species: *Anopheles pharoensis* Theobald, 1901d; Cairo.
Myzomyia Blanchard, 1902: 795. Type-species: *Anopheles rossi* Giles, 1899; Calcutta.

ADULT. Cibarial teeth of female well developed; propleural and spiracular bristles present or absent; wing almost always spotted, costa with at least 4 pale marks excluding humeral and basal spots; male genitalia with 4 parabasal setae, not on protuberances; usually a more slender seta laterodistad of the parabasal group; no markedly long seta on sternomesal margin; aedeagus with apical leaflets.

PUPA. Trumpet of angusticorn type; male genital pouch with lobes ending in a knob.

LARVA. Seta 2-C wide apart and closer to 3-C than to one another; 1-A always single, minute, near base of shaft.

DISTRIBUTION. Oriental, Ethiopian and Australian regions.

KEYS TO SPECIES OF *ANOPHELES* (*CELLIA*)

ADULT

Femora and tibiae not speckled with pale spots. . . . . *minimus* (p. 48)
Femora and tibiae speckled with pale spots. . . . . *tessellatus* (p. 51)

MALE GENITALIA

Sternal lobe of claspette with 2-4 setae. . . . . *minimus* (p. 48)
Sternal lobe of claspette with a single seta. . . . . *tessellatus* (p. 51)

PUPA

Seta 9-VII 0.5 or more length of segment; 1-P long, hooked or sinuate. *minimus* (p. 48)

Seta 9-VII less than 0.25 length of the segment; 1-P short and straight. *tessellatus* (p. 51)

LARVA

Abdominal tergal plates nearly as wide or wider than distance between respective setae 1. . . . . *minimus* (p. 48)

Abdominal tergal plates much narrower than distance between respective setae 1. . . . . *tessellatus* (p. 51)

1. *ANOPHELES (CELLIA) MINIMUS* THEOBALD
(Figs. 11, 12, 162; Table 41)

Anopheles minimus Theobald, 1901d: 186 (♀). Type-locality: Pokfulam, Hong Kong.

Anopheles formosaensis I : Miyasaki, 1903: 66, Ishigaki Is., Ryukyu Archipelago.

FEMALE (Fig. 162). Wing length 3.1-3.4 mm. *Head.* Eyes rather widely separated above. Interocular space with a tuft of very long, slender, white scales and shorter narrow white scales. Vertex covered with white or yellowish white, medioanterior erect scales and dark erect scales otherwise, the latter scales extending onto upper tempus; usually 3 pairs of bronze-yellow vertical bristles and 6 dark temporal bristles along eye margin on each side. Clypeus dark brown, without scales. Antenna: pedicel tawny yellow, mesal side a little infuscate, with small hairs and scales; flagellum 0.67-0.71 (3) of proboscis, rather thick; flagellomere 1 1.88-2.16 of Flm 2, with many white narrow scales. Palpus 0.84-0.95 (3) of proboscis; joint 2-3 a complete pale membranous node; 1 and 2 with erect dark scales; patches of white scales at joints 2-3, 3-4, and apex of 4; 5 entirely white scaled; length ratio of 2-5; 3.69-4.82 : 4.28-5.50 : 2.34-2.91 : 1.00 (3). Proboscis 1.10-1.15 (3) of forefemur, dark scaled, with several dark basal bristles. Buccopharynx with 4 papillae before cibarial armature of about 10 long teeth and as many short teeth. *Thorax.* Pronotal integument dark brown; anterior lobe without scales, bearing more than 10 bristles. Scutal integument appearing grayish brown on disk and dark brown in fossal and lateral areas, this varying according to direction of light; apical and lateroapical tufts of long narrow erect white scales present; disk covered with rather long, yellowish white, narrow, curved or hair-like scales. Scutellum covered roughly with pale hair-like scales and bearing a row of more than 10 long brown bristles. Pleural integument dark brown, appearing partly gray according to light, with a continuous transverse pale stripe across middle sternopleuron and on lower margin of mesepimeron; only a few scales on sternopleuron; one (rarely 2) stout propleural bristle; 1-3 (usually 2) minute spiraculars, several prealars and upper mesepimerals, 6-8 sternopleurals divided into upper and lower groups. *Wing.* Vein c with humeral pale spot and presector, sector, subcostal and preapical pale marks; sc with the same pale spot and marks. Remigium pale;

r proximally pale to presector pale mark, accessory sector pale mark fused with sector pale mark, subcostal and preapical pale marks equal in length to those on c, apex of r shortly pale; rs with a basal and a median pale mark; r_2 pale at base and apex; r_3 pale at base and apex, and with a median pale mark; r_{4+5} pale with a very small basal dark spot, and a little longer subbasal and subapical dark spot; m pale in basal 0.33 and with a pale mark at r-m or just distal to m-cu; m_{1+2} and m_{3+4} pale at base and apex; cu pale, with a basal dark mark and a dark spot at fork; cu_1 with pale spots just distad of m-cu and at apex, and a long median pale mark; cu_2 with a long subbasal pale mark and an apical pale spot; 1a with pale marks at base and proximal to middle, tip pale. Apical pale fringe extending from just above termination of r_1 to r_2, often divided in 2; pale fringe spots at terminations of r_3, r_{4+5}, m_{1+2}, m_{3+4}, cu_1 and cu_2; an indistinct pale fringe spot sometimes at termination of 1a. Cell R_2 2.38-2.76 (3) of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Femora, tibiae and tarsi dark scaled, without distinct pale bands. Hindtarsomere 1 1.16-1.20 (3) of tibia. *Abdomen*. Terga and sterna hirsute, especially tergum I. A few scales sometimes present on terga VI-VIII.

MALE (Fig. 12). Wing length 2.7-3.4 mm. Antennal flagellum 0.77-0.81 (3) of proboscis, flagellomeres 12 and 13 together 0.54-0.57 (3) of proboscis, Flm 12 1.55-1.70 of Flm 13. Palpus (Fig. 162) 0.97-1.05 (2) proboscis, with apex of segment 3 a little swollen, with long bristles and white scales; 4 and 5 swollen, fused together leaving a fine suture, with marginal bristles; 4 with a patch of mesoapical pale scales, 5 covered with pale scales on more than apical half. Proboscis 1.36-1.41 (3) forefemur. Cell R_2 1.59-2.06 (9) of vein r_{2+3}. Hindtarsomere 1 1.15-1.21 (5) of hindtibia. *Genitalia*. Tergum IX with a narrow longitudinal sclerotized plate on each side, median area membranous. Sternum IX membranous. Basistyle subcylindrical, broadened from middle toward base, bristled except on apical 0.4 of tergomesal surface and lateral surface at base, scaled on lateral surface; 4 parabasal setae, a long seta present a little laterodistal to parabasal group; tergal lobe of claspette with a club of 2-5 fused filaments*; sternal lobe with 2 (rarely 3) stout setae, lower seta larger, both extending beyond apex of club; hairy on mesal side. Dististyle gently arcuate, slender, a little swollen at base and apex, longer than basistyle, moderately pigmented except apex, with a bristle on concave side near base; claw short, pigmented. Aedeagus with 3,4 apical serrate leaflets of different sizes on each side.

LARVA (Fig. 11). *Head*. Width 0.57-0.62 mm; about as wide as long; brown, with following dark brown patches: a pair of lateral rounded spots before antennal level, a median transverse zigzag broad stripe connected with a posteromedian patch and a pair of anterosubmedian longitudinal broad stripes, a patch along posterior part of frontal ecdysial line, and a pair of posterolateral patches (attachment of mandibular adductor muscle); labrum deeply concave on apical margin; seta 1-C directed mesad, length of distance between bases; 2-C separated by a distance twice that as between 2,3-C; 3-C more than half as long as 2-C; 4-C extending beyond base of 2-C, reaching apex of clypeus; 5-7-C plumose; 5-C usually slightly anterior to, and 6-C slightly posterior to 7-C; 8-10-C about on same level; 8-C slightly mesad of or almost tandem with 6-C; 14-C very small, apparently subplumose; 15-C located ventrad of basal articulation of mentum with hypostomal ridge, subplu-

*In one specimen (#2778), the left claspette has 2 clubs and each club consists of 2 fused filaments.

mose. *Antenna* 0.22-0.26 mm long, straight, dark brown, with a paler mesobasal portion, spinulate excepting lateral surface, spinules on ventromesal surface stronger; seta 1-A single, short, laterodorsally inserted at basal 0.25-0.33; 2,3-A equal, dark brown; 4-A longer than 2-A, 5-7 branched; 6-A shorter than transparent 5-A. *Mandible* with minute microspines ventrolaterally, and fewer and stronger ones dorsolaterally; a row of broad, apically branched hair-like spicules dorsally proximad of this spinose area; seta 1-Md reduced; MdS_1 simple, pale brown, rather slender, evenly curved; MdS_3 subequal to MdS_1 in length; MdS_3 very slightly pigmented, somewhat sigmoid, finely pectinate; $MdS_{4,5}$ depigmented, somewhat sigmoid, pectinate, the pectination fine and mesal on basal half, turning ventrally about at middle, with strong teeth nearly parallel to stem on apical half. Cutting organ with 2 dorsal teeth, most mesodorsal tooth large, simple or bicuspid; mesal pecten of numerous densely planted, blunt-tipped teeth laterodorsally progressively larger, most laterodorsal tooth outstandingly large, subequal to mesal dorsal tooth; ventral tooth with 2 strong lateral denticles, more lateral denticle (VT-4) larger, subequal to, but not reaching apex of VT_0; 3 mesal denticles, VT_1 rather blunt, ventrobasad of $VT_{0,2,3}$ smaller, acutely triangular; 3 ventral blades, VB_1 (dorsalmost) with mesal pectination of short teeth and some laterobasal small teeth, VB_2 mesally and ventrolaterobasally pectinate, VB_3 more slender than others, mesally pectinate, seemingly without laterobasal pectination; pectinate brush of apparently 3 mesal pectinate hairs. Mandibular hairs about 20 or more, each hair apically frayed. *Maxilla*. Cardo basally tapered, with 1-Mx subplumose. Mesostipes and lacinia typical for the genus. Palpostipes fusiform, middorsally minutely spinulate, with several stronger mesodorsal spinules; 3-Mx located dorsolaterally at apical 0.33, dentritic, with numerous branches; apex with 7 appendages typical for the genus. *Mentum plate* usually with 9 teeth including basal small ones. *Thorax*. Setae 1, 2, 4, 5, 7, 8-P, 1, 8-M, 5, 7, 8-T plumose; 5-P with very fine branches; 9-P subplumose, a little shorter than 12-P which is somewhat shorter than 10-P; 11-P fairly long, more than half as long as 9-P, about 0.4 of 10-P; 13-P slender; 6-M, T usually 4 branched; 3-T with slender simple leaflets, their apices very short, truncate; 4-T usually triple; 9-T branched in apical 0.33-0.67. *Abdomen*. Anterior tergal plate usually narrower than (occasionally equal to) distance between setae 1 on segment I, narrower on II and III, narrower to subequal on IV, narrower to broader on V and VI, broader on VII and VIII; seta 0 located posterolaterad of lateral edge of anterior tergal plate on II-VI, posterolaterad to posteromesad of it on VII, posteromesad of it on VIII; small rounded median plate most frequently free from anterior tergal plate, occasionally fused with it anteriorly on II, most frequently completely enclosed by anterior tergal plate, occasionally fused with it anteriorly only on III, completely enclosed by it on IV-VII; II-VII with a pair of small, transversely oblong, submedian plates. Seta 1-I as well developed as 1-II-VII, or, often several basal leaflets or occasionally all leaflets simple; leaflets of 1-II-VII moderately pigmented, each with an apical filament, serrate at base of the filament; 2-IV, V rather stiff; 6-VI as well developed as 6-IV, V; 2-VIII subplumose; 0-III, VIII usually single; 0-IV, V, VII usually double; 11-II, 10-12-III, 3, 11, 12-IV, 10-V, 6, 10-VI, and 13-VII usually triple; usually, 12-I, 7-VII, 4-II and 9-III with 4, 5, 6 and 7 branches respectively. Pecten with 12-14 pectinate teeth of various sizes; 2, 6, 8, 9-S with 7-9, 3-4, 6-10 and 6-9 branches respectively. Segment X spiculate, more strongly on lateroapical portion; saddle covering 0.67 of the segment, well sclerotized; 1-X longer than saddle; 2-X with 13-19 long, dorsal and 5-8 short, ventral branches; 3-X with

5, 6 long, dorsal and 4-7 short, ventral branches; 4-X of 18 subplumose hairs, rarely 16. Anal gills short, 0.84-1.15 length of saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 24♂, 20♀, 99 L, 2 l, 36 p: Yaeyama Guntô (K-0953, K-0954, K-0955, K-0964, K-0975, K-1005, K-1067, K-1476, K-1477, K-2294).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Miyako and Yaeyama Guntô). ORIENTAL REGION (except most parts of Malaya and Borneo).

BIONOMICS. Larvae are found usually in sluggish streamlets at the foot of mountains, often associated with *An. sinensis*. During the course of this study, larvae of *minimus* were only collected in November and December of 1971 on Ishigaki Is. (Tanaka, Saugstad and Mizusawa 1975). Wilkinson et al. (1974) reported that in Thailand, adults are usually found in open areas near forested foothills, that they feed on cattle and water buffalo as well as on humans and that development from egg to pupa took 8-26 days at 24°C.

RELATION TO DISEASES. Throughout many areas of Southeast Asia, *minimus* has been considered an important vector of malaria (Wilkinson et al. 1974). *Anopheles minimus* was the principal vector of malaria in Yaeyama and Miyako Guntô until the period of World War II, with malaria being one of the greatest social problems in Yaeyama Guntô. After the war, an eradication campaign conducted by the Yaeyama Provisional Government (directed by Dr. Shinken Ohama, head of the Public Health Department) and supported by the U. S. Military Government, southern Ryukyus, successfully controlled this species. Due to land development procedures, the habitat of this species has been further restricted and populations of *minimus* have not increased. For 20 years now, *minimus* has been regarded as a very rare species, and malaria is no longer a serious problem in this region. However, occasional small-scale outbreaks of this species were recently reported (Tanaka, Saugstad and Mizusawa 1975; Kamimura 1975). Continuous monitoring for this species may still be necessary.

2. *ANOPHELES (CELLIA) TESSELLATUS* THEOBALD
(Figs. 12, 13, 163, 164; Table 42)

Anopheles tessellatus Theobald, 1901d: 175 (♀). Type-locality: Taipan, Straits Settlements, Malaya.

Anopheles (Cellia) tessellatus: Miyagi, Iha and Kishimoto, 1969: 33, Haneji and Ishikawa, Okinawa Is.; Ôtomi and Sonae, Iriomote Is.; Ryukyu Archipelago.

Descriptions based on specimens from Taiwan.

FEMALE (Figs. 163, 164). Wing length 2.8-2.9 mm. *Head.* Eyes rather widely separated above. Interocular space with a tuft of long wavy white narrow scales and short white narrow scales; vertex covered with white or yellowish white erect scales in anterior half and dark erect scales elsewhere, the dark scales also covering upper tempus; several bronze-brown vertical bristles and 6-8 dark temporal bristles on each side. Clypeus grayish brown, without scales. Antenna: pedicel yellowish brown, with minute hairs; flagellomere 1 1.73-1.80 (2) of Flm 2, covered mesally with pale scales. Palpus 0.93-0.96 (2) of proboscis; joint 2-3 a complete membranous node, 3-4 and 4-5 normal; 1 and base of 2 with erect dark scales; 2 with yellowish pale scales dorsobasally; joint 2-3, apical half of 3, apical 0.67-0.75 of 4 and 5 white scaled, 3 with a patch of dorsal yellowish pale scales; palpus otherwise

dark scaled; length ratio of 2-5; 2.22-2.41 : 3.00-3.24 : 1.50-1.65 : 1.00 (2). Proboscis 1.10-1.13 (2) of forefemur, clothed with dark scales in basal half and pale ochreous scales in apical half, with a few dark bristles at base. Cibarial armature of 2 lateral simple teeth and 8 median basally denticulated teeth, apex of latter a single spine or fimbriated. *Thorax*. Anterior pronotal lobe with integument dark brown, bearing more than 10 bristles; posterior pronotal lobe with integument brown. Scutal integument uniformly light brown, covered roughly with pale yellowish hair-like scales, with apical tuft of narrow white erect scales, lateroapical tuft with broader white or yellowish white erect scales above and dark ones below; scutal bristles bronze-yellow to brown. Scutellum dark in middle, with scales similar to those of scutum, and a row of 11-18 long bristles. Pleural integument brown to dark brown, a pale transverse stripe across middle sternopleuron to lower margin of mesepimeron; one or 2 propleural bristles, one or 2 prealars, a number of sternopleurals, several upper mesepimerals, apparently no spiraculars. *Wing*. Vein c with humeral, presector, sector, subcostal and preapical pale marks, the marks becoming distally longer, a prehumeral pale mark usually present; r with basal pale area extended to a little beyond level of costal presector mark; r_1 with accessory sector pale mark distinct and not fused with sector mark, subcostal mark variable in length, often divided in 2, a pale mark between accessory sector and subcostal marks occasionally present; rs, r_2 and r_3 with variable pale marks or spots, rs pale at base, r_2 pale at apex, r_3 dark at apex with pale scales mixed; r_{4+5} speckled with dark and pale spots; m pale from base to about level of base of rs, distally dark; m_{1+2} and m_{3+4} usually pale at base and apex, with variable pale medial spots; cu speckled with pale and dark spots; la with 4-5 pale marks or spots; apical pale fringe from above r_1 to r_{4+5}, divided by a dark spot between r_2 and r_3; pale fringe spot at termination of each posterior vein. *Legs*. Femora spotted by pale scales, hindfemur with apical pale fringe. Tibiae spotted by pale scales, very narrowly pale at apex. Tarsomere 1 dark at base, spotted by pale scales medially; foretarsomeres 1-4 with apical pale ring, 2-4 with basal pale ring; midtarsomeres 1-3 with apical pale ring, 2 and 3 with indistinct basal pale ring; hindtarsomeres 1-4 with apical pale ring, 2 with one or 2 pale spots. Femora, tibiae and tarsi otherwise dark. Forefemur slightly swollen basally. *Abdomen* hirsute, devoid of scales.

MALE (Fig. 12). Wing length 2.3-2.5 mm. Antennal flagellum 0.86 (1) of proboscis; flagellomere 12 2.12 (1) of Flm 13, both together 0.44 of Flm 1-11. Palpus 1.12 (1) of proboscis; joint 2-3 fused together, traceable by a rather indistinct node and pale integumental ring, 3-4 complete, 4-5 traceable by a slight difference in sclerotization and different scaling; segment 2 with pale bands at base and apex, 3 pale in apical 0.33 and with a long pale patch medially above, 4 and 5 pale with a dark basal band; length ratio of 2-5; 2.89-2.92 : 3.54-3.61 : 1.17-1.23 : 1.00 (1). Proboscis 1.39 (1) forefemur. Foretarsomere 5 longer than 4. *Genitalia*. Tergum IX membranous, lightly pigmented. Basistyle oblong, a little incurved, laterally and sternally bristled, laterally scaled, with a few small tergal bristles in parabasal area; 4 parabasal setae, subequal in thickness and length; a long slender seta present laterodistad of parabasal group; tergal lobe of claspette bearing a club formed by fusion of apparently 4 filaments; sternal lobe pilose, bearing a slender curved seta much longer than club. Dististyle longer than basistyle, slender, arcuate, basally and apically swollen, pigmented, with scattered minute setae on concave side with one larger subbasal seta on concave side and another subapical seta on convex side; claw short, stout, pigmented.

Aedeagus with several fairly long leaflets at apex on each side.

LARVA (Fig. 13). *Head.* Width 0.60 mm in somewhat compressed specimens; about as wide as long; labrum deeply concave on apical margin; seta 2-C separated by a distance about twice that as between 2,3-C;3,4-C very fine; 5-7-C subplumose; 5-C on level of 7-C or a little posterior to it; 6-C slightly posterior to 5-C or on its level. *Antenna* 0.24-0.25 mm long, straight, spiculate; seta 1-A single, fine, inserted at basal 0.21-0.38 of shaft; 4-A double. *Mentum plate* with 9 teeth including a basal abortive tooth on each side. *Thorax.* Setae 2-P and 5-T subplumose; 4,5,8-P,1,8-M and 6,7-T plumose; 11-P moderately long, apically filamentous; 3-T with apparently less than 10 transparent, simple, rather slender leaflets. *Abdomen.* Anterior tergal plates very small, less than 0.33 as wide as distance between setae 1 on I; plate of II much smaller than that of I; plate of VIII broader than that of I, narrower than distance between 1-VIII, 1.8-2.0 times as broad as long; IV-VI with or without a small median plate; VII with a small median plate. Setae 1-I,II with ordinary branches; 1-III-VII with rather broad, transparent, usually simple leaflets; 6-VI as well developed as 6-V. Pecten with 4 large and 7 small simple teeth; 2-S with 3-5 branches; 6,8,9-S each 2-3 branched; 1-X subequal to saddle in length. Anal gill 2.7-3.3length of saddle. saddle.

SPECIMENS EXAMINED. TAIWAN. 2♂, 2♀, 2 L: Neihu, Taipei Hsien, 7 XI 1967, Chung and Lo.

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Gunto). ORIENTAL REGION. MOLUCCAS.

BIONOMICS. *Anopheles tessellatus* appears to be very rare in this region. Miyagi et al. (1969) reported a number of females collected in light and dry ice traps on Iriomote and Okinawa Is. No other record exists.

RELATION TO DISEASES. This species has been reported as a malaria vector in parts of Southeast Asia (Reid 1968) and associated with filariasis transmission (Reisen, Burns and Basio 1972), but its apparent rarity in our region would seem to make it of negligible medical importance.

SUBGENUS *ANOPHELES* MEIGEN

Anopheles Meigen, 1818: 10. Type-species: *Anopheles maculipennis* Meigen, 1818, Germany.

Myzorhynchus Blanchard, 1902: 795. Type-species: *Anopheles sinensis* Wiedemann, 1828, Canton, China.

ADULT. Cibarial teeth undeveloped; propleural bristle always present, spiracular bristles present or absent; wing veins entirely dark or spotted, costa with at most 3 pale marks excluding humeral and basal spots; male genitalia with at most 3 parabasal setae, at least one of them on a protuberance; a markedly long bristle on sternomesal margin; aedeagus with or without apical leaflets.

PUPA. Trumpet of angusticorn or laticorn type; male genital pouch with lobes not ending in a knob.

LARVA. Seta 2-C close together, or at most separated by a distance almost equal to that between 2- and 3-C; 1-A usually branched, rarely single and minute.

DISTRIBUTION. Worldwide, except New Zealand, New Caledonia, Fiji and most of other Pacific islands.

KEYS TO SPECIES OF *ANOPHELES* (*ANOPHELES*)

ADULT

1. Wing without markings. 2
   Wing with markings. 3

2(1). Erect forked scales of vertex dark. . . . . *bengalensis* (p. 57)
   Erect forked scales pale in middle of vertex. . . . . *omorii* (p. 59)

3(1). Clypeus without clumps of scales; palpus unbanded. 4
   Clypeus with clumps of scales laterally; palpus pale banded. 6

4(3). Spiracular bristles absent; hindfemur with a broad pale submedian band. . . . . *lindesayii japonicus* (p. 61)
   Spiracular bristles present; hindfemur without submedian band. . . . 5

5(4). Costa with subcostal pale mark very short, not including veins sc and r_1; remigium dark scaled; r_1 without basal pale mark; fringe spot at termination of cu_2 absent. . . . . *saperoi* (p. 68)
   Costa with subcostal pale mark long, including veins sc and r_1; remigium pale, usually with a dark spot; r_1 with basal pale mark; pale fringe spot at termination of cu_2 present. . . *koreicus* (p. 65)

6(3). Midcoxa without upper patch of pale scales (a few scales occasionally present, but not forming a definite patch); pale fringe spot at termination of vein cu_2 absent. . . . . *lesteri* (p. 83)
   Midcoxa with a distinct upper patch of pale scales; pale fringe spot at termination of vein cu_2 usually present. 7

7(6). Costa usually with pale humeral spot; presector pale mark well-defined; vein 1a with 3 dark marks; hindtarsomere 4 with pale basal band. *sineroides* (p. 81)
   Costa usually without pale humeral spot; presector pale mark ill-defined or obsolete; vein 1a with 2 dark marks; hindtarsomere 4 usually without pale basal band. 8

8(7). Wing without pale apical fringe spot. . . . . *pullus* (p. 79)
   Wing with pale apical fringe spot (very rarely absent). 9

9(8). Pale basal band of palpal segment 3 broader than other pale bands. *yatsushiroensis* (p. 80)
   Pale basal band of palpal segment 3 at most as wide as other pale bands. *sinensis* (p. 72)
   sp. (Engaru race) (p. 79)

MALE GENITALIA

1. Aedeagus without leaflets. 2
   Aedeagus with leaflets. 3

2(1). Tergal lobe of claspette with a club and 2 basally fused filaments; sternal lobe of claspette with 3 setae. . . . . *bengalensis* (p. 57)
   Tergal lobe of claspette with 3 free filaments; sternal lobe of claspette with 4 setae. . . . . *omorii* (p. 59)

3(1). Tergum IX with short broad lobes. 4
   Tergum IX with long, narrow, rod-shaped capitate lobes (*sinensis* group). 6

4(3). Basistyle not scaled; aedeagus with more than 10 simple leaflets on each side; both parabasal setae on a protuberance; most tergal seta of sternal lobe of claspette longer than others.
   lindesayii japonicus (p. 61)
   Basistyle laterally scaled; aedeagus with 3-4 leaflets on each side; lateral parabasal seta not on protuberance; most sternal seta of sternal lobe of claspette longer than others. 5

5(4). Lobes of tergum IX strongly sclerotized, horn-shaped, with apex pointed. . . . . *saperoi* (p. 68)
   Lobes of tergum IX moderately sclerotized, with apex usually broadly rounded or truncate, occasionally bluntly pointed.
   koreicus (p. 65)

6(3). Basistyle with pale scales on sternal surface. . . . . *sinensis* (p. 72)
   pullus (p. 79)
   yatsushiroensis (p. 80)
   sp. (Engaru race) (p. 79)
   Basistyle without pale scales on sternal surface. 7

7(6). Aedeagus with 4-6 leaflets. . . . . *lesteri* (p. 83)
   Aedeagus with 6-11 leaflets. . . . . *sineroides* (p. 81)

PUPA

1. Trumpet of angusticorn type. 2
   Trumpet of laticorn type. 4

2(1). Setae 1-V-VII longer than 5. . . . . *lindesayii japonicus* (p. 61)
   Setae 1-V-VII shorter than 5. 3

3(2). Genital pouch without setae. . . . . *bengalensis* (p. 57)
   Genital pouch with setae. . . . . *omorii* (p. 59)

4(1). Setae 9-III-VIII pigmented, with apex more or less pointed; male palpal sheath not prolonged, not definitely longer than in female. 5

Setae 9-III-VII not pigmented, with apex rounded; male palpal sheath prolonged, definitely longer than in female. 6

5(4). Species of Palaearctic region. . . . . *koreicus* (p. 65)
Species of Ryukyu Archipelago. . . . . *saperoi* (p. 68)

6(4). Rim of trumpet not serrate. 7
Rim of trumpet serrate. 11

7(6). Rim of trumpet thin and pale. 8
Rim of trumpet thick and dark. 9

8(6). Setae 9-V-VII narrower, distinctly tapering from base, with apex narrowly rounded. . . . . *sinensis* (p. 72)
Setae 9-V-VII broader, almost parallel-sided or elongate oval, with apex broadly rounded. . . . . sp. (Engaru race) (p. 79)

9(7). Setae 9-V-VII narrower, distinctly tapering from base, with apex narrowly rounded; cephalothorax with a pair of dark patches. *lesteri* (in part) (p. 83)
Setae 9-V-VII broader, almost parallel-sided or elongate oval, with apex broadly rounded; cephalothorax without dark patches. . . . 10

10(9). Seta 5-V with about 20 or more branches. . . . . *pullus* (p. 79)
Seta 5-V with 2-13 branches. . . . . *sineroides* (p. 81)

11(6). Setae 9-V-VII broader, only slightly tapering apically, with apex broadly rounded; cephalothorax without dark patches. *yatsushiroensis* (p. 80)
Setae 9-V-VII narrower, distinctly tapering from base, with apex narrowly rounded; cephalothorax often with a pair of dark patches. *lesteri* (in part) (p. 83)

LARVA

1. Seta 2-C 4-7 branched, separated by a distance about equal to that between 2, 3-C. . . . . *bengalensis* (p. 57)
Seta 2-C single, close together. 2

2(1). Antenna smooth; seta 1-A and 5-7-C single. . . . . *omorii* (p. 59)
Antenna spinulate, seta 1-A branched; 5-7-C plumose. 3

3(2). Seta 3-C single; 8-C single or double; 1-I 1-4 branched simple seta. *lindesayii japonicus* (p. 61)
Seta 3-C at least 4 branched; 8-C at least 5 branched; 1-I with many slender unserrate leaflets. 4

4(3). Seta 3-C with 10 to numerous branches. . . . . *sinensis* (p. 72)
sp. (Engaru race) (p. 79)
pullus (p. 79)
yatsushiroensis (p. 80)
sineroides (p. 81)
lesteri (p. 83)
Seta 3-C with at most 8 branches. 5

5(4). Species of Palaearctic region. . . . . *koreicus* (p. 65)
Species of Ryukyu Archipelago. . . . . *saperoi* (p. 68)

3. *ANOPHELES (ANOPHELES) BENGALENSIS* PURI
(Figs. 14, 15, 165; Table 43)

Anopheles aitkenii var. *bengalensis* Puri, 1930: 955 (♂, L). Type-locality: Marianbarie (Bengal Terai) and Sukna, India.
Anopheles bengalensis Reid, 1965: 113.
Anopheles aitkenii bengalensis: Kamimura, 1966: 8, Amami Ôshima and Tokunoshima, Ryukyu Archipelago.

FEMALE (Fig. 165). Wing length 3.0-3.3 mm. *Head.* Many long narrow dark erect scales on posterior part of vertex and tempus; more than 10 dark ocular bristles in an irregular row from interocular space to lower tempus, the series remote from eye margin except on interocular space; integument of head rather dark-brown, showing silvery reflection, especially on eye margin, according to direction of light. Clypeus dark brown, without scales. Antennal flagellum 0.68 (2) of proboscis, pedicel brown to dark brown, with a few small hairs; flagellomere 1 1.50-1.63 (2) of Flm 2, with a few scales. Palpus 0.87-0.90 (2) of proboscis, dark scaled; joint 2-3 an unsclerotized node, 4-5 indicated by a very fine suture; length ratio of 2-5 : 3.70-4.16 : 5.04-5.92 : 1.78-2.34 : 1.00 (2). Proboscis 0.95-0.97 (2) of forefemur, dark scaled. *Thorax.* Pronotal lobes without scales; anterior lobe bearing about 10 or less dark bristles. Scutum with integument light brown, devoid of scales; scutal bristles many, bronzy dark brown; a row of acrostichals extending onto middle of prescutellar space, but not reaching posterior margin. Scutellum without scales, bearing a row of more than 10 dark brown bristles together with another anterior row of short bristles. Pleural integument pale brown, upper sternopleuron somewhat darker; one propleural bristle, one or 2 spiraculars, one or 2 prealars, 2 upper and 3-5 lower sternopleurals, 2-7 upper mesepimerals. *Wing.* Veins dark scaled, without pale area. Cell R_2 2.22-2.94 (3) length of vein r_{2+3}. Halter with dark scaled knob. *Legs.* Coxae pale brown. Femora, tibiae and tarsi entirely dark scaled. Hindtarsomere 1 1.12-1.23 (2) of tibia. *Abdomen.* Integument dark brown, hirsute, without scales.

MALE (Figs. 15, 165). Wing length 2.3-2.7 mm. Antennal flagellum 0.60-0.62 (2) of proboscis; flagellomere 12 1.43-1.76 (2) of Flm 13, both 0.58-0.67 (2) of Flm 1-11. Palpus 0.85-0.87 (2) of proboscis; joint 2-3 fused, 3-4 apparently complete; 4, 5 and apex of 3 swollen; 5 hairy; length ratio of 2-5 : 2.65-3.56 : 3.80-5.10 : 1.30-1.73 : 1.00 (2). Proboscis 1.15-1.17 (2) of forefemur. Cell R_2 1.97-2.21 (3) times as long as vein r_{2+3}. *Genitalia.* Tergum IX membranous. Basistyle oblong, twice as long as wide in tergal view, bristled except at base; 2 parabasal setae, outer seta longer than inner one; a long apically curved seta near apex on sternomesal surface; tergal

lobe of claspette with a club consisting of one or 2 fused wide spatulate filaments and 2 incompletely fused setiform filaments; sternal lobe of claspette bearing 3 setae, tergal 2 subequal in thickness, sternal one more slender than others, all the setae about equal to club in length. Dististyle slender, gently arcuate, longer than basistyle, with about 10 scattered minute setae; claw short, stout, lightly pigmented. Aedeagus rather wide at apex, without leaflets.

PUPA. Trumpet of angusticorn type, deeply cleft, with short meatus about 0.33 of its length; rim simple. Wing sheath without patch. Abdominal setae 1-V-VII branched, weak, shorter than respective setae 5, about half as long as their respective segments or shorter; 5-V-VII shorter than their respective segments; 9-III minute; 9-IV-VII slender, setiform, lightly pigmented, usually simple; 9-VII about 0.4 length of segment VII, occasionally apex of seta furcate; 9-VIII usually plumose with thick stem and many branches. Paddle rather narrow, with long fringe hairs. Genital pouch without seta.

LARVA (Fig. 14). *Head.* Width 0.50-0.53 mm; about as wide as long; brown with 4 dark brown frontoclypeal patches (middle, posterior and a lateral pair); labrum deeply concave on apical margin, seta 1-C as long as distance between bases or a little shorter; 2-C most frequently 5,6 branched at basal 0.25-0.33, distance between bases subequal to that between 2,3-C (the latter very slightly wider); 3-C less than half as long as 2-C, forked distad of middle, usually bifid at tip; 5-7-C plumose, 5-C slightly anterior to 6-C which is on level of 7-C; 8-10-C approximately on same level; 14-C very small, with relatively stout stalk and about 10 fine apical branches; 15-C single or bifid at tip; usually 10-C double and 12-C triple. *Antenna* straight, 0.21-0.24 mm long, less than half length of head, spinulate, spinules in one or 2 rows on mesodorsal and lateroventral aspects much stronger than others; seta 1-A inserted at basal 0.14-0.23 (x = 0.17), with 5-9 short branches; 2-A as long as 3-A; 4-A longer than 2-A, 5-10 branched; 6-A shorter than translucent 5-A. *Mandible* with only a few, very fine hair-like microspines midlaterally on dorsal surface; a row of hair-like spicules just proximad of this spinose area, distal spicules short and simple, others long, strongly and densely barbed; twin apically frayed seta 1-Md just dorsad of this row of spicules; MdS_1 brown, rather slender, evenly curved; MdS_2 apparently a short hair-like spur, single or bifid; MdS_{3-5} subequal to MdS_1 in length; MdS_3 paler but stouter than MdS_1, laterally pectinate; MdS_4 and MdS_5 pale, apically frayed, mesally pectinate on apical half. Cutting organ with a single unicuspid dorsal tooth; mesal pecten of densely planted, numerous, bluntly pointed teeth, progressively smaller on mesal aspect; ventral tooth with 2 lateral denticles (VT-1,4), VT-4 larger, as large as but not reaching tip of VT_0; 3 mesal denticles, VT_1 on ventromesal side of VT_0, $VT_{2,3}$ small, pale, acutely triangular; 3 ventral blades; VB_1 curved, stout, basally broadened, slightly exceeding tip of VT_0, with mesal pectination of coarse and short teeth, and with laterobasal pectination of a few sharp teeth; VB_2 almost reaching apex of VB_1, curved, basally narrowed, apparently fused with VB_1 at base, with mesal pectination of longer and more slender teeth; VB_3 straight, basally broadened, with fine mesal pectination; pectinate brush of 3 mesally pectinate hairs. Piliferous process somewhat sclerotized, with a group of apical hairs. About 25 mandibular hairs, each hair apically frayed. *Maxilla:* cardo with seta 1-Mx dendritic. Palpostipes fusiform, dorsally spinulate on basal half, with dendritic 3-Mx laterally at apical 0.33; apex with ordinary 7 appendages (not different from those of *An. sinensis*); mesostipes and lacinia not different from those of *An. sinensis*.

Mentum plate usually with 7 teeth, occasionally with a basal abortive tooth on each side. *Thorax*. Setae 2, 4, 5, 7, 8-P, 1, 8-M, 5, 7, 8-T plumose; 1-P subplumose; 9-P usually triple, branched at basal 0.25-0.33, shorter than 10, 12-P; 11-P single or 2-4 forked at apex, more than twice as long as process of basal tubercle; 9-M occasionally bifid at basal 0.33-0.40, subequal to 10-M in length; 12-M much shorter; 1-T single or forked at apex; 3-T with many slender simple leaflets; 11-T extremely fine; 9-T apically forked, subequal to 10-T; 4, 7-M and 4-T usually triple. *Abdomen*. Integument very finely spiculate ventrally on II-VII, both ventrally and laterally on VIII, entirely and more distinctly on X. Anterior tergal plates narrower than distance between bases of setae 1; IV-VII each with a small longitudinal median plate. Seta 1-I with 7 to more than 10 simple branches, which occasionally develop into slender simple leaflets; 1-II with nearly 20 simple or slightly serrate leaflets; 1-III-VII with broad, serrate, usually poorly pigmented leaflets; 3-I, 8-IV and 2-VI usually single; 12-I, 4, 10, 11-III, 11-IV, 10-V, 12-VI and 3-VII usually triple; 6-V usually 5 branched; 2, 3-VIII subplumose; pecten of 12-15 pectinate teeth; 2-S with 10-13 dendritic branches; 6, 8, 9-S with 2-4, 6-8 and 3-5 branches respectively. *Saddle* 0.25-0.27 mm long; seta 1-X as long as saddle; 2-X with 13-19 long, dorsal and 2-6 short, ventral branches; 3-X with 7-10 long, dorsal and 5-9 short, ventral branches; 4-X usually with 18 subplumose cratal hairs. Anal gills subfusiform, shorter than saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 9♂, 6♀; with associated skins (5 l, 5 p); 22 L, 5 P, 7 1, 12 p: Amami Guntô (I-0284, I-0285, I-1870, I-1893).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami Guntô). TAIWAN. PHILIPPINES. BORNEO. JAVA. SOUTH CHINA. HONG KONG. INDOCHINA. MALAYA. THAILAND. BURMA. EAST INDIA (Bengal and Assam).

BIONOMICS. This species reaches its northern limits in the Ryukyus (Tanaka, Saugstad and Mizusawa 1975). Larvae are found in streamlets at the foot of mountains. According to Kanda and Kamimura (1967), they are also found in irrigation ditches, springs, stream beds, rock pools, etc. of lowland forests on Amami Ôshima and Tokunoshima, and occasionally associated with *Culex hayashii*, *Cx. ryukyensis* and *Cx. orientalis* Edwards (*? = mimeticus*). From April to November, they are said to live under shelter, while in January to March they are found in sun-lit places. Harrison and Scanlon (1975) state that in Thailand, *bengalensis* is associated with clear, cool, usually slowly running water, and indicate that records of this species biting man are suspect due to recent changes in the *aitkenii* group of the subgenus *Anopheles*.

4. *ANOPHELES (ANOPHELES) OMORII* SAKAKIBARA
(Figs. 15, 16, 166; Table 44)

Anopheles omorii: Sakakibara, 1958: 95 (nomina nuda).
Anopheles (Anopheles) omorii Sakakibara, 1959: 288 (♂, ♀, P, L, E). Type-locality: Mt. Tochû, Shizuoka Pref., Japan.

FEMALE (Fig. 166). Wing length 3.3 mm. *Head*. Eyes narrowly separated above. Middle of vertex covered with pale erect scales, tempora and sides of vertex covered with dark erect scales, pale narrow scales covering anteromedian part of vertex including interocular space; more than 10 ocular bristles including those on interocular space on each side, mesal 3, 4 pale yellowish, lateral ones dark, remote from eye margin. Clypeus dark brown,

without scales. Antennal pedicel dark brown; flagellum shorter than proboscis; flagellomere 1 apparently twice as long as Flm 2. Palpus very slightly shorter than proboscis, dark scaled. Proboscis slender, as long as forefemur, dark scaled. *Thorax*. Pronotal lobes with integument brown, devoid of scales; anterior lobe with more than 10 brownish bristles. Scutal integument dark brown, with pale long slender scales on anterior promontory, and hair-like scales along acrostichal and dorsocentral lines and on prescutellar space; series of acrostichal bristles nearly reaching posterior margin; fossal area with more than 10 scattered short bristles. Scutellum with integument rather brown, bearing 20 bristles mostly in a single row, one or 2 lateralmost ones out of the row. Pleural integument brown, without scales; bristles yellowish to dark brown, 7-9 propleurals, 3-5 spiraculars, several prealars, more than 10 sternopleurals, 4, 5 upper mesepimerals. *Wing*. Veins dark scaled; la ending at level of m-cu. Cell R_2 2.6 length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Coxae pale brown, without scales. Femora, tibiae and tarsi dark scaled. Forefemur only slightly basally swollen. Hindtarsomere 1 1.2 of tibia. *Abdomen*. Dark brown, hirsute, without scales.

MALE (Figs. 15, 166). Wing length 2.8 mm. Antennal flagellum 0.75 of proboscis; flagellomere 12 1.5 of Flm 13, both 0.67 of Flm 1-11. Palpus 0.9 of proboscis; Flm 4 and Flm 5 broadened. Proboscis slightly longer than forefemur. Cell R_2 2.5 length of vein r_{2+3}. *Genitalia*. Tergum IX with fairly broad sclerotized parts on both sides, without definitely differentiated lobes. Basistyle about twice as long as wide in sternal view, bristled except for tergobasal area, with long sternoapical bristles; 2 parabasal setae, each on a protuberance, lateral one stronger than other; a long, apically curved sternomesal seta at apical 0.2; tergal lobe of claspette apparently well sclerotized, elliptical in tergal view, with 3 free spatulate filaments; sternal lobe of claspette bearing 4 setae, tergolateral 2 long and thick, extending beyond apex of filaments, sternomesal 2 short. Dististyle slender, about as long as basistyle, with about 10 or more minute setae on sternomesal side and a few on other side near apex; claw short, stout, pigmented. Aedeagus lacking apical leaflets.

PUPA (After Sakakibara 1959). Trumpet of angusticorn type. Abdominal setae 1-VI, VII forked, weak, shorter than respective setae 5; 5-VI 0.38 length of segment VII, with 6-8 slender branches, or spiniform with barbs; 5-VII 0.45 length of segment VIII, spiniform, barbed; 9-VI, VII spiniform, simple or barbed; 9-VIII spiniform, barbed. Paddle rather narrow, with short stiff fringe spicules. Genital pouch with a pair of 1-3 branched setae.

LARVA (Fig. 16). *Head*. Brown; labrum concave on apical margin; all dorsal setae single except for 3-C; 2-C rather close together; 3-C separated from 2-C by a little more than distance between bases of 2-C; 14-C moderately developed. *Antenna* straight, 0.19-0.25 mm long, brown, smooth; 1-A single, very short, inserted at basal 0.33-0.52 (5) of shaft; 4-A 3-5 branched. No dissected specimen available for mouthparts description. *Thorax*. Prothorax ventrally spiculate; 2, 4, 5, 7, 8-P, 1, 8-M, 5, 7, 8-T plumose; 1-P usually with a few lateral branches; 6-P fairly long; branches of 8-P rather short; 9-P stronger than 10, 12-P; 11-P minute; 9-M, T markedly stronger than 10-M, T respectively, medially with strong barbs or short branches; 3-T not modified. *Abdomen*. Integument spiculate on small areas around setae 10-13-I, entire ventral surface on segments II-VII and entire surface except for a narrow dorsomedian area on VIII. Anterior tergal plates much narrower than distance between bases of setae 1, that of VIII 1.97-2.72 (4) times as wide as long; segments III-VII each with a small deformed median plate. Seta 1-I

simple, usually single; 1-II-VII with broad translucent serrate leaflets, usually colorless, occasionally brownish on II-VI, each leaflet with apex narrowly truncate; 6-II-VI plumose or subplumose; 2-IV fairly long, 2-IV-VI stronger than respective setae 3. Pecten with 12-20 teeth of equal size and 2-7 additional small teeth. *Saddle* 0.26-0.31 mm long excluding dorsoapical process; seta 4-X of 16-18 subplumose cratal hairs. Anal gills 0.7-1.0 (3) length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 1♀, 4 L: Honshu (Mt. Tochû, Shizuoka Pref., 27 VIII 1956, tree hole, Sakakibara, KKCOL).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu).

DISCUSSION. *Anopheles (Anopheles) omorii*, endemic to Japan, has no close congeners in the adjacent areas; its closest relatives appear to be the west Eurasian *An. (Ano.) plumbeus* Stephens and North American *An. (Ano.) barberi* Coquillett and *An. (Ano.) judithae* Zavortink. It is interesting that only *omorii* is confined to a very small area (Honshu), while 2 of the other species are distributed over vast areas. It might be inferred that these species had a common origin, with *omorii* inhabiting East Asia, but *omorii* became extinct on the continent and remained on this Japanese island as a relic.

BIONOMICS. One of the rarest mosquitoes in Japan; the larvae are found in tree holes in mountains. Biological data were given by Sakakibara (1960); the larvae were found throughout the year, and hibernate in the first and 2nd instar. It is not known to bite man; however, its relative *An. barberi* does bite man and has transmitted vivax malaria under experimental conditions (Zavortink 1969 (1970)).

5. *ANOPHELES (ANOPHELES) LINDESAYI JAPONICUS* YAMADA*
(Figs. 17, 18, 163, 164; Table 45)

Anopheles japonicus Yamada, 1918: 689 (♀). Type-locality: Kanayama and Rubeshibe, Hokkaido, Japan.

Anopheles (Anopheles) lindesayi japonicus: LaCasse and Yamaguti, 1950: 17 (♂, ♀, L); Whang, 1962: 39, Guidandong, Korea.

FEMALE (Figs. 163, 164). Wing length 4.1-5.4 mm. *Head.* Eyes narrowly separated above. Interocular space with white, very long, slender scales and pale yellowish slender bristles; vertex with white anteromedian patch formed by narrow pointed scales and erect scales; remainder of vertex and tempus covered with dark erect scales; about 10 or more dark brown bristles along eye margin, those on vertex a little distant from eye, a few most mesal bristles pale brown. Clypeus dark brown, without scales. Antenna: pedicel brown, infuscate on mesal surface, with only a few minute setae or none, without scales; flagellum 0.60-0.65 (4) of proboscis; flagellomere 1 1.79-1.86 (4) of Flm 2, with scales, remaining flagellomeres lacking scales. Palpus 0.86-0.97 (5) of proboscis, entirely dark scaled, scales on segment 1 and base of 2 somewhat erect (the segments appearing not very shaggy), becoming decumbent distally on 2; length ratio of 2-5 : 1.64-2.33 : 2.36-2.83 : 1.26-1.78 : 1.00 (5). Proboscis 1.05-1.23 (5) of forefemur, clothed with dark decumbent scales, with several basal bristles. *Thorax.* Pronotal integument dark brown; anterior lobe densly covered with dark brown erect scales, anterodorsally bearing more than 10 bristles. Scutum with

*The nominal subspecies does not occur in this region. Several additional subspecies occur elsewhere.

light grayish brown broad median area contrasting with dark brown lateral areas, covered with brown hair-like scales; anterior margin with a clump of white long narrow scales at middle, several dark narrow scales on lateral aspect; scutal bristles brown to dark brown. Scutellum light brown, bearing more than 20 mostly dark bristles arranged densely laterally and sparsely mesally, several mesal bristles pale brown; more than 10 short bristles or hair-like scales also present. Pleura dark brown, with a rather ill-defined pale stripe across middle sternopleuron and lower margin of mesepimeron; midposterior sternopleuron often with some dark scales; pleural bristles brown to dark brown, 2-6 propleurals, 9 to more than 10 prealars, 2-5 upper sternopleurals, 3-7 midposterior sternopleurals, 2-9 rather stiff upper mesepimerals, no spiraculars. *Wing*. Costa with a single apical pale mark also covering apices of veins r_1 and r_2; h bare; remigium dark scaled; r with basal pale spot, occasionally formed by only 2 or 3 scales; r_3 with a rather short median pale mark; r_{4+5} with subbasal pale mark and often (33%) with a small apical pale spot; m_{1+2} with subbasal pale mark; m_{3+4} usually (90%) with apical pale spot; cu_1 with a small basal pale spot, a short median pale mark just distal to m-cu, and subapical pale mark, rarely (10%) with one or 2 pale scales at tip; cu_2 with a short basal pale mark and frequently with apical pale spot (47%) or a few pale scales at tip (32%); la with apical pale spot; rather obscure pale fringe spots usually (89%) present at termination of cu_2 and occasionally at terminations of m_{3+4} (11%), cu_1 (22%) and la with apical pale spot; rather obscure pale fringe spots usually (89%) present at termination of cu_2 and occasionally at terminations of m_{3+4} (11%), cu_1 (22%) and la (6%). Cell R_2 2.29-2.66 (5) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Coxae pale, without scales. Femora with pale apical fringe and pale basal band, the latter narrowest in forefemur, broadest in hindfemur (0.17-0.25 length of the femur and usually not ventrally broadened); hindfemur with a broad pale band just distal to middle, and band slightly widened ventrally, subequal to apical dark area in length; tibiae with pale apical fringe; legs otherwise dark scaled. Forefemur slightly swollen basally; hindtarsomere 1 1.03-1.26 (5) of tibia. *Abdomen*. Dark brown, without scales, covered with brownish hairs.

MALE (Fig. 17). Wing length 3.7-5.1 mm. Antennal flagellomere 12 1.56-1.75 (5) of Flm 13, both 0.54-0.60 (5) of Flm 1-11. Palpus 0.80-0.94 (5) of proboscis; 4, 5 and apex of 3 swollen; apex of 3 and margins of 4 bearing long bristles; length ratio of 2-5; 1.31-1.56 : 1.77-2.08 : 0.92-0.96 : 1.00 (5). Proboscis 1.38-1.47 (5) of forefemur. *Wing*. Usually with pale scaled area longer than in female; vein r and basal area of la occasionally with pale scales; r_{4+5} with subbasal pale mark occasionally well developed and reaching apical 0.25. Cell R_2 1.71-2.30 (5) length of vein r_{2+3}. Foretarsomere 5 as long as 4; hindtarsomere 1 1.14-1.34 (5) of tibia. *Genitalia*. Tergum IX with lobes broadly triangular, widely separated, not very protrudent and moderately sclerotized. Basistyle 2.1-2.6 (3) times as long as wide, without scales, bristled except on dorsobasal area; 2 (rarely 3) parabasal setae, both located on a protuberance, lateral one longer than other; one long sternomesal seta; dorsal lobe of claspette sclerotized, bearing a club formed by 2-4 (usually 3) basally fused filaments; sternal lobe of claspette pilose, bearing 2 or 3 setae, dorsalmost always longest and extending a little beyond apex of club, other one or 2 setae quite variable in size. Dististyle 1.1-1.3 (4) of basistyle, curved, narrowest in middle, minutely ciliate on convex side near base, with a row of minute setae on sternal side, and a few minute setae on convex side near apex; claw short, stout, pigmented. Aedeagus 0.33-0.40 length of basistyle, apex with 14-19 simple leaflets of various sizes on each side.

PUPA. Trumpet of angusticorn type, deeply cleft, with meatus 0.33-0.40 of its length; rim simple. Wing sheath with occasionally obsolete, dark, rather broad longitudinal stripes. Abdominal setae 1-V-VIII usually single, occasionally double, as long as or longer than their respective segments, longer than respective setae 5; 5-V-VII slightly shorter than their respective segments; 9-III minute; 9-IV-VII slender, a little curved, brownish, simple; 9-VII about 0.4 or slightly less of the segment; 9-VIII subplumose. Paddle narrow, with long fringe hairs; 1-P slender, hooked at tip.

LARVA (Fig. 18). *Head.* Width 0.69-0.79 mm; length equal to or a little exceeding width; seta 1-C curved mesad, longer than distance between bases; 2-C single, close together; 3-C single, about 0.5 of 2-C; 5-7-C plumose, 5,7-C usually on same level, 6-C slightly posteriad of them; 8-10-C approximately on same level; 8-C usually single; 14-C brush-like. *Antenna* 0.31-0.38 mm long, slightly curved, apically infuscate, finely spinulate, sparse dorsolateral spinulation; 1-A very short, inserted at basal 0.11-0.18, 3-8 branched; 2,3-A subequal; 4-A 3-9 branched, longer than 2-A; 5-A transparent, longer than 6-A. *Mandible* with many microspines midlaterally on dorsal surface, fewer and finer ones on ventral surface; proximal to the dorsal spinose area, a row of rather broad hair-like spicules present, distal spicules apically branched, proximal spicules long with lateral branches or long barbs; twin 1-Md on about same level as this row of spicules but on ventral surface, both setae usually simple, occasionally with fine barbs, proximal seta slightly longer than the other; MdS_1 simple, pigmented, evenly arcuate; MdS_2 consisting of a few short hairs; MdS_3 equal to MdS_1 in length, depigmented, sigmoid, MdS_3 finely pectinate, $MdS_{4,5}$ with pectination fine and mesal in basal half, turned ventrally distal to middle and becoming coarser toward apex. Cutting organ with dorsal tooth single, simple, stout, triangular, very dark; mesal pecten of numerous teeth progressively finer and paler mesoventrally, most laterodorsal tooth outstandingly large, a little larger than dorsal tooth; ventral tooth with 2 strong dark lateral denticles (VT-1,4) and 4 small mesal denticles (VT_{1-4}), VT-1 as long as VT_0, VT_1 larger than VT_{2-4}, VT_4 bi- or tricuspid; 3 ventral blades, dorsalmost (VB_1) with fine mesoventral and laterobasal pectination, $VB_{2,3}$ progressively shorter, both with strong mesal pectination; pectinate brush of 3 mesoapically pectinate hairs. Piliferous process only a little protrudent, moderately sclerotized, with several short hairs apically. Mandibular hairs 22-26, barbed laterally and frayed apically. *Maxilla* with spinules on palpostipes stouter than those of *sinensis;* 2 ventromedian leaf-like appendages unequal in length, depigmented apically; otherwise identical with *sinensis*. *Thorax.* Setae 1,2,4,5,7,8-P,1,8-M,5,7,8-T plumose; 9,10,12-P equal in length; 11-P 5-7 times as long as process of basal tubercles; 13-P slender, somewhat dendritic; 11-M,T very short; 12-M,T short; 3-T with simple slender transparent leaf-like branches; 1,11-T usually single; usually, 6-M triple and 12-T double. *Abdomen.* Integument ventrally spiculate from segment II, gradually extending laterally toward posterior segments, X only dorsobasally smooth. Anterior tergal plates I-VII much narrower than distance between bases of setae 1; that of VIII largest, about 3 times as broad as long; II- or III-VII each with a small median plate. Seta 1-I short, simple; 1-II-VII palmate with pigmented serrate leaflets, apex of each leaflet very narrow; 6-III very sparsely plumose, with both stem and branches distinctly more slender than in 6-I,II; 8-II and 12-VI usually single; 11-VII usually double; 12-IV, 2,7-VI and 13-VII usually triple. Pecten with 17-24 strongly pectinate teeth; 1-S usually triple; 2,6,8,9-S with 6-9,2-4,2-4 and 3-6 branches respectively. *Saddle* 0.33-0.39 mm long; seta 1-X 1.4-1.7 times as

long as saddle; 2-X with 12-17 dorsal and 2-5 ventral branches; 3-X with 6-8 long dorsal and 3-5 short ventral branches; 4-X of 17-18 plumose hairs. Dorsal anal gill 1.0-1.5 length of saddle, ventral gill usually shorter than dorsal gill, at most equal to it.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 6♂, 6♀, 12 L: Hokkaido (A-0200). 27♂, 18♀; with associated skins (1 l, 1 p); 56 L, 11 l, 30 p: (C-0390, C-1141, C-1147, C-1159, C-1480, D-0751, D-1579, E-1698). KOREA. 1♂, 1♀: Cheju Do (M-0861, M-0862).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula, Cheju Do). NORTH CHINA.

TAXONOMIC DISCUSSION. The Japanese population of *An. lindesayi* has been distinguished as subspecies *japonicus* primarily on the absence of a pale terminal spot on vein r_3, the presence of a pale terminal spot on cu_1, the much broader "outstanding" scales of the wing veins, the shorter pale basal area of the hindfemur (0.17 length of the femur), and the more slender parabasal setae (spines) (Yamada 1924). Christophers (1933) stated, "There is a considerable amount of variation in the pale spots at the ends of certain veins in the type-form. Most usually there is a pale spot at the end of 3, 4.2, 5.2 and 6, ... " Many of the Japanese specimens are identical with this most usual form in the type-form. The extent of the basal pale area of the hindfemur is utilized by Christophers (1933) and Reid (1968) for discrimination of 6 local forms. The subspecies *japonicus* is said to have this pale area 0.17 length of the femur and more extensive below than above. Actually, it varies up to nearly 0.25 length of the femur, and is not always longer ventrally than dorsally. We examined many specimens of subspecies *pleccau* Koidzumi from Taiwan at the U. S. Naval Medical Research Unit No. 2 laboratory. The basal pale area varies from a very narrow ring to nearly 0.25 length of the femur, and is not always longer ventrally than dorsally. This wide variation in *pleccau* ranges from the narrowest *nilgiricus* Christophers type through the intermediate *benguetensis* King and *cameronensis* Edwards type to the *japonicus* type (next to the broadest type-form). Thus, the scaling of the wing and hindfemur lose their strong bases for separating these local forms. However, it is still possible that more or less discrete local populations of *lindesayi* may have evolved, as its distribution ranges from the tropics to the northern temperate district, and its habitat is usually restricted to mountainous areas. The apparent absence of this species through the Ryukyu Archipelago, though it is common in both Taiwan and palaearctic Japan, suggests a complex history for this species. There is some variation in the immature stages. Pupal seta 1-V is single or double in Japanese specimens (31 from 4 localities), 3 to more than 10 branched (branching irregular) in 5 Taiwanese specimens (2 in TPMPI, 3 in USNM), and double in 1 specimen from Calso, Luzon (USNM). Larval seta 1-S is 3-6 branched (20; usually 3-4) in Japanese specimens, 6-8 (9; $x = 6.8$) branched in Taiwan specimens (1 specimen in TPMRI, 8 in USNM), 4-6 (14; $x = 4.5$) branched in specimens from Yunnan, south China (USNM) and 3-8 (24; $x = 5.6$) branched in specimens from the Philippines (USNM). Immature stages of the tropical population should be studied in detail. Yamada' (1924) also indicated that the shape of the wing scales and the parabasal seta should be restudied. Until further studies are accomplished, we are retaining

japonicus as a subspecies.

BIONOMICS. Larvae occur most frequently in pools on stream beds in mountains from 2 to 1, 500 m altitude. They also are found in stagnant, even occasionally turbid water. Common throughout Japan, but usually not attracted to light traps in any numbers.

6. *ANOPHELES (ANOPHELES) KOREICUS* YAMADA AND WATANABE (Figs. 17, 18, 163, 164; Table 46)

Anopheles koreicus Yamada and Watanabe, 1918: 206 (♀). Type-locality: Pyeoncheing, Korea.

Anopheles (Anopheles) punctibasis Edwards, 1921b: 274 (♂, ♀). Type-locality: Nagasaki, Kyushu, Japan.

Anopheles edwardsi Yamada, 1924: 238 (♀). Type-locality: Inokashira, Tokyo, Japan; Nakayama, 1942: 95 (synonymy).

Anopheles koreicus var. *hisaoe* Tsuchimoto, 1944 (1948): 366 (♂, ♀, L). Type-locality: Kameyama-mura, Hiroshima Pref., Japan; Kamimura, 1966: 8 (synonomy).

Anopheles (Anopheles) koreicus koreicus: LaCasse and Yamaguti, 1950: 27 (♂, ♀, L).

Anopheles (Anopheles) koreicus edwardsi: LaCasse and Yamaguti, 1950: 32 (♂, ♀, L).

FEMALE (Figs. 163, 164). Wing length 3.6-5.3 mm. *Head.* Eyes narrowly separated above. Interocular space with white slender scales and long pale yellowish brown bristles; vertex with a large white anteromedian patch formed by pointed scales and erect scales, occasionally reaching posterior margin; remainder of vertex and tempus covered with dark brown erect scales; about 10 or more ocular bristles, those on pale scaled area of vertex pale brown and a little distant from eye, those on dark scaled area dark brown. Clypeus very dark, without scales. Antenna: pedicel tawny brown, infuscate and with dark grayish brown scales mesally; flagellum 0.68-0.75 (4) of proboscis; flagellomere 1 2.0-2.1 (3) of Flm 2, with many gray scales; remaining flagellomeres lacking scales. Palpus 0.90-1.04 (4) of proboscis, entirely dark scaled, segments 1 and 2 with erect scales; length ratio of 2-5 : 1.94-2.74 : 3.13-4.10 : 1.44-2.00 : 1.00 (4). Proboscis 1.03-1.06 (2) of forefemur, dark scaled, basal area with somewhat erect scales and several bristles. *Thorax.* Pronotal integument dark brown; anterior pronotal lobe with a cluster of dark gray scales dorsally, bearing more than 10 fine bristles. Scutum pale grayish brown medially and dark brown laterally in dorsal view, usually with a pair of rather indistinct median eye spots and a distinct dark spot on posterior margin, the latter extending onto scutellum; pale yellowish brown hair-like scales covering scutum; anterior margin with white narrow scales mesally and pale grayish brown, somewhat broader scales laterally; scutal bristles mostly pale brown, short and easily confused with hair-like scales, only posterior dorsocentrals and some of supraalars long and distinct. Scutellum with about 20 or more pale brown bristles together with concolorous hair-like scales, only several lateral bristles dark brown. Pleura dark brown, upper and midposterior sternopleuron usually with pale narrow scales; upper mesepimeron often with 1 or 2, pale or dark, narrow scales; pleural bristles fine, pale yellowish brown, only occasionally some of upper mesepimeral bristles dark brown; 4-7 propleurals, 6 to more than 10 spiraculars, 6 to

more than 10 upper sternopleurals, about 10 or more lower sternopleurals, 6-12 upper mesepimerals. *Wing*. Costa with basal, humeral, subcostal and apical pale marks; frequently (40 and 50% respectively) basal and humeral mark very short; subcostal pale mark including veins sc and r_1; apical pale mark including r_1 and r_2; often sector pale mark present. Humeral crossvein bare. Remigium usually (82%) with a single dark or pale brown small spot, or entirely pale; r with basal pale spot, presector and sector pale marks, presector pale mark occasionally shortened or mixed with dark scales; r_1 with several pale scales proximad of subcostal pale mark, occasionally developed to a distinct mark; rs entirely dark or with median pale mark; r_{2+3} entirely dark or with apical pale mark; tip of r_2 dark; r_3 with median pale mark as long as basal dark area but shorter than apical dark area; r_{4+5} dark at base and tip, variously scaled in-between; m entirely dark, or with a few pale scales at base and long median pale mark on level of sector pale mark or r_1; m_{1+2} and m_{3+4} each with 2 median pale marks; cu pale, with median dark mark; cu_1 pale, with 4 dark marks, basal dark mark often very short; cu_2 pale, with subapical dark spot; la pale, with basal dark spot, median and apical dark marks; apical pale fringe from r_2 to r_{4+5}; a pale fringe spot at termination of cu_2. Cell R_2 2.11-3.32 (7) of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Coxae dark brown, only hindcoxa occasionally with a few small scales. Femora and tibiae with pale basal band and apical fringe; mid- and hindfemora posteroventrally pale, the pale area apically narrowed, not reaching apex; fore- and midtarsomeres 1, 2 and hindtarsomeres 1-4 with both basal and apical pale bands, fore- and midtarsomere 3 and hindtarsomere 5 with basal pale band. Forefemur basally swollen; hindtarsomere 1 1.05-1.18 (5) of tibia. *Abdomen*. Integument dark brown, covered with dark brown hairs; sternum VII with a cluster of medioapical dark scales.

MALE (Fig. 17). Wing length 3.6-4.5 mm. Antenna: pedicel glabrous; flagellum 0.78-0.85 (2) of proboscis; flagellomere 12 1.83-1.93 (2) of Flm 13, both 0.52-0.53 (2) of Flm 1-11. Palpal segments 4, 5 and apex of 3 swollen, apex of 3 and margins of 4 with long bristles; length ratio of 2-5 : 1.80-1.88 : 2.40-2.58 : 0.92-0.95 : 1.00 (2). Some of spiracular bristles occasionally replaced by white rather broad scales. Wing with humeral pale spot rarely lacking; presector pale mark on vein r and presubcostal pale mark of r_1 more developed than in female; r_{4+5} largely pale except for basal and apical dark spots. Cell R_2 2.15-2.40 (4) of vein r_{2+3}. Foretarsomere 5 as long as 4. Abdominal sternum VII without cluster of scales. *Genitalia*. Tergum IX with moderately sclerotized, moderately protrudent, widely separated, trapezoidal lobes. Sternum IX somewhat sclerotized. Basistyle subcylindrical, heavily covered with dark lateral scales, bearing apical and lateral long bristles, short bristles otherwise; 2 parabasal setae, mesal one thicker but shorter, located on a protuberance; a long sternomesal seta; tergal lobe of claspette sclerotized, bearing a club formed by 4-5 incompletely fused filaments; occasionally one filament free; sternal lobe of claspette pilose, with 2 or 3 setae, sternal seta longest, tergal seta extending beyond apex of club, median seta fine or reduced. Dististyle arcuate, broadest at base, narrowest in middle, minutely ciliate basally on convex side, with a row of minute setae on sternal side, and a few minute setae apically on convex side; claw short, stout, pigmented. Aedeagus with 3-6 apical leaflets on each side; most distal leaflet shortest, laterally serrate, usually shortly bifurcate apically; 2nd leaflet longest, then leaflets diminishing in size towards most proximal leaflet.

PUPA. Male palpal sheath not markedly prolonged, and not definitely

longer than in female. Trumpet of laticorn type, with simple thin rim. Wing sheath with dark longitudinal stripes, occasionally obsolete. Abdominal seta 1-V 1-5 (most frequently 1; (5)) branched, 1-VI, VII single or double, shorter than their respective segments, a little longer than respective setae 5; 9-III-VIII dark brown; 9-III, IV short but stout, blunt-tipped; 9-V-VII normally developed, tapered from base to bluntly pointed apex; 9-VII 0.16-0.20 (5; x = 0.18) length of the segment; 9-VIII with many slender lateral branches. Paddle broad, with short fringe spicules lateroapically; 1-P not hooked at tip.

LARVA (Fig. 18). *Head.* Width 1.07-1.19 mm (4); slightly longer than wide; seta 1-C curved mesad, longer than distance between bases; 2-C single, close together; 3-C distally branched, not typically dendritic, a little more than half as long as 2-C; 4-C apically bifid or single; 5-7-C plumose, usually 5, 6-C on about same level and a little posteriad of 7-C; 8, 9-C subplumose, 9-C a little anterior of 8-C; 14-C plumose with relatively thick stem and fine branches; 15-C subplumose or dendritic. *Antenna* 0.29-0.37 mm long, straight, narrowly dark brown apically, spinulate except laterally, spinules finer ventrally; surface covered with somewhat whorled pattern; seta 1-A inserted at basal 0.21-0.31 of shaft, short, 4-8 branched, occasionally dendritic; 4-A longer than 2-A, 4-6 branched; 5-A transparent, larger than 6-A. *Mandible* (1 dissected specimen) with a group of microspines laterally (the spinose area extending both dorsally and ventrally), dorsal microspines a little stronger; proximad of this dorsal spinose area, a row of strongly barbed hair-like spicules, some distal spicules thick basally and branched apically; twin 1-Md in ventral spinose area, strongly barbed or almost plumose with stout branches; MdS_1 rather slender, brown, arcuate; MdS_2 of 2 long and several short hairs; MdS_{3-5} equal to MdS_1 in length, a little broader than it, somewhat sigmoid; MdS_3 with fine pectination, $MdS_{4,5}$ with basally fine and apically strong pectination. Cutting organ with apparently a single dorsal tooth (difficult to see - this area extremely dark); mesal pecten of numerous blunt-tipped teeth, becoming weaker and paler mesoventrally, most laterodorsal tooth largest; ventral tooth with 2 strong dark lateral denticles (VT-1, 4), both not reaching apex of VT_0; 3 mesal denticles, VT_1 rather strong, VT_2 smallest; 2 ventral blades, VB_1 almost reaching apex of VT_0, with rather obscure mesoapical and fine laterobasal pectination, VB_2 only slightly shorter than VB_1, with distinct mesal pectination; pectinate brush 2 haired. Piliferous process moderately protrudent and moderately sclerotized, with several apical hairs, at least one of the hairs strongly thickened basally. Mandibular hairs about 20, each apically frayed, several median hairs also anterolaterally frayed. *Maxilla* essentially not different from that of *sinensis*. *Mentum plate* with 9 teeth (3). *Thorax.* Setae 2, 4, 5, 7, 8-P, 1, 8-M, 5, 7, 8-T plumose; 9, 10, 12-P subequal in length; 11-P 3-6 times as long as process of basal tubercle; 9-M, T longer than 10-M, T respectively; 11-M, T very short; 12-M, T short; 3-T with simple transparent leaflets; usually, 11-T single, 4-M double, 11-P and 13-T triple. *Abdomen.* Integument ventrally spiculate from segment II, the spiculate area broadened toward posterior segments, X dorsobasally glabrous only. Anterior tergal plate distinctly narrower than distance between setae I, that of VIII 1.65 (1) times as broad as long; III-VII with small median plates. Setae 1-I, II with narrow simple transparent leaflets; 1-III-VII with broad serrate pigmented leaflets, apex of each very narrow and unpigmented, but not filamentous; 6-III plumose; usually, 11-I triple, 2-V double and 1-VIII single. Pecten with 18-29 teeth (8-12 long and 9-18 short); 2, 6, 8, 9-S with 6-11, 2-4, 4-6 and 5-8 branches respectively. Saddle 0.80-0.91 mm long; 1-X a little longer than saddle; 2-X

with 13-16 dorsal and 4-6 ventral branches; 3-X with 6-9 long dorsal and 2-4 short ventral branches; 4-X of 18 cratal plumose hairs. Anal gills 1.3-2.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 4♀, 4 L, 3 p: Honshu (C-0171, C-1479, C-2296). KOREA. 3♂, 9♀; with associated skins (2 l, 2 p): Korean Peninsula (L-2022, L-2023).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu). KOREA (Korean Peninsula). NORTH CHINA.

TAXONOMIC DISCUSSION. Nakayama (1942) elucidated that *edwardsi* was a type produced by low-temperature conditions in the immature stage.

BIONOMICS. Larvae are found more frequently in low mountain regions in relatively cool water, such as springs and stream bed pools. Apparently relatively uncommon. Biery and Burns (1973a, b) found *koreicus* to comprise well under 1% of the total anophelines collected at Misawa Air Base and a little over 1% of those collected at Yokota Air Base, and not quite 3% of anophelines collected at several U. S. Air Force installations in Korea.

7A. *ANOPHELES (ANOPHELES) SAPEROI SAPEROI* BOHART AND INGRAM* (Figs. 19, 20, 167, Table 47)

Anopheles (Anopheles) saperoi Bohart and Ingram, 1946a: 46 (♀, L, E). Type-locality: Chizuka, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 167). Wing length 3.7-4.5 mm. *Head.* Interocular space with white slender scales and long pale yellow bristles; vertex with a white anteromedian patch of erect scales, remainder of vertex and tempus covered with dark erect scales; about 10 or more ocular bristles, several mesal bristles bronze-yellow and a little distant from eye, others dark and close to eye. Clypeus dark brown, without scales. Antenna: pedicel dark brown, with scales; flagellum 0.70 (1) of proboscis; flagellomere 1 1.76 of Flm 2, with dark scales, remaining flagellomeres lacking scales. Palpus 0.95 (1) of proboscis, entirely dark scaled; joint 2-3 a node of complete unsclerotized ring, joints 3-4 and 4-5 normal; 1 and 2 with erect scales; length ratio of 2-5 : 2.15-2.20 : 3.45-3.55 : 1.75-1.80 : 1.00. Proboscis 1.07 (1) of forefemur, dark scaled, with erect scales and several bristles at base. *Thorax.* Pronotal integument rather dark brown; anterior pronotal lobe with a cluster of dark erect anterodorsal scales, with more than 10 bristles. Scutal integument pale grayish brown mesally, dark brown laterally in dorsal view, covered roughly with bronze-yellow hair-like scales; most scutal bristles hardly distinguishable from hair-like scales, only posterior dorsocentrals and some of supra-alars long and distinct. Scutellum dark in middle, pale grayish brown laterally, with scattered pale yellowish hair-like scales, bearing 16-18 dark brown bristles together with a number of short bristles. Pleural integument dark brown; occasionally sternopleuron with a few scales; 4-6 propleural bristles, 3-5 spiraculars, more than 10 prealars, 2-5 upper sternopleurals, 4-8 mid-posterior sternopleurals, 6-11 upper mesepimerals. *Wing.* Costa with very small humeral pale spot (occasionally lacking), subcostal pale spot and apical pale mark; subcostal pale spot at most extending only onto anterior side of vein r_1; apical pale mark covering r_1 and r_2. Humeral crossvein bare. Remigium with dark scales; r with presector and sector pale marks; r_3 with subbasal pale mark as long as basal dark area; r_{4+5} with subbasal pale mark, apical dark area mixed with a few pale scales; m basally dark, becoming apically

*The 2 subspecies of *Anopheles saperoi* occur in this region.

lighter; m_{1+2} and m_{3+4} with subbasal pale mark, apical dark area mixed with pale scales; cu pale, with subbasal dark mark, apical pale area mixed with dark scales; cu_1 pale, with 4 dark marks: at base, m-cu, apex and between m-cu and apex; cu_2 with apical dark mark, basal pale area mixed with dark scales; la pale, with a few dark scales at base, with median and apical dark marks, basal pale area with scattered dark scales. Apical pale fringe from cell R_1 to R_{4+5}; no pale fringe spots at terminations of posterior veins. Cell R_2 2.17-3.00 (4) of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Coxae brown, devoid of scales. Femora with pale narrow basal band and apical fringe; tibiae with pale scales at apex; tarsomeres 1-3 of fore- and midtarsi and 1-4 of hindtarsus with both basal and apical pale bands; hindtarsomere 5 with pale basal band; occasionally in fore- and midtarsi, apical band of 3 indistinct, or joint 4-5 also with an articular band. Forefemur basally swollen; hindtarsomere 1 1.16-1.17 (3) of tibia. *Abdomen*. Dark brown, hirsute; sternum VII with a cluster of medioapical dark scales.

MALE (Figs. 20, 167). Wing length 3.5-3.6 mm. Antenna: pedicel glabrous; flagellum 0.8 (1) of proboscis; flagellomere 12 2.09 (1) of Flm 13, both 0.55 of Flm 1-11. Palpus 1.03 (1) of proboscis; joint 2-3 fused, 3-4 and 4-5 normal; 4, 5 and apex of 3 swollen, apex of 3 and margins of 4 with rather long bristles; length ratio of 2-5 : 2.00 : 2.84 : 1.15 : 1.00 (1). Proboscis 1.19 (1) of forefemur. Wing with usually more pale scales than in female: subcostal spot on vein c as long as apical pale mark and extending onto both sides of r_1, r_{4+5} only dark at base and apex, m_{1+2} and m_{3+4} with long median pale mark, cu_2 only narrowly dark at apex. Foretarsomere 5 as long as 4; hindtarsomere 1 1.18-1.21 (2) of tibia. Abdominal sternum VII without cluster of scales. *Genitalia*. Tergum IX a moderately sclerotized broad band in middle, lobes short, broadly horn-shaped, moderately sclerotized, widely separated. Basistyle subcylindrical, a little broadened basally, twice as long as wide, bristled except tergobasal area, with dark lateral scales; 2 parabasal setae, mesal seta shorter but stouter, located on a protuberance; a long sterno-mesal seta; tergal lobe of claspette sclerotized, bearing a club formed by incomplete fusion of 4, 5 spatulate filaments; sternal lobe of claspette pilose, bearing 2 apically curved long setae, tergal seta shorter than sternal one, both extending beyond apex of club. Dististyle longer than basistyle, gently arcuate, broadest at base, narrowest in middle, ciliate on convex side near base, with a row of minute setae on sternal side and a few at apex on convex side; claw pigmented, short, stout. Aedeagus with 3-5 setiform apical leaflets of assorted lengths on each side, apicalmost leaflet shortest, less than half length of longest second leaflet, apically bifid; others simple; 5th (basalmost) very fine.

PUPA. Male palpal sheath not markedly prolonged, and not definitely longer than in female. Trumpet of laticorn type, with simple thin rim. Wing sheath with dark longitudinal stripes. Abdominal seta 1-V 2-4 (13; most frequently 3) branched, 1-VI, VII single or double, a little shorter than their respective segments, a little longer than the respective setae 5; 9-III-VIII dark brown; 9-III variable in length, but always shorter than 9-IV, 9-III, IV blunt-tipped; 9-V-VII in general slightly longer and with more acute apices than in *koreicus;* 9-VII 0.21-0.30 (14; $x = 0.26$) length of the segment; 9-VIII a little paler, with 4 to about 10 lateral branches. Paddle broad, with short fringe spicules lateroapically; 1-P not hooked at tip.

LARVA (Fig. 19). *Head*. Width 0.68-0.74 mm in somewhat compressed specimens; about as wide as long; labrum concave on apical margin; seta 2-C single, close together; 3-C rather irregularly branched, longer than distance

between bases, shorter than or subequal to 2-C; 4-C usually a little thickened in basal half, apically filamentous, single or 2,3 branched apically, occasionally with a branch in basal half; 5-7-C plumose, 5,6-C on a level slightly posterior to 7-C; 8-C posterior to 9-C which is about on level of 10-C; 14-C tufted. *Antenna* 0.25-0.28 mm long, straight, spiculate except laterally, spicules usually apically sparse; seta 1-A short, inserted at basal 0.20-0.36, reaching about middle of shaft or a little beyond; 4-A a little longer than 2-A; 6-A shorter than transparent 5-A. *Mandible* with a group of microspines laterally (the spinose area extending both dorsally and ventrally), dorsal microspines stronger than ventral ones; proximad of this spinose area dorsally, a row of strongly barbed hair-like spicules; twin 1-Md in ventral spinose area, stout, barbed or irregularly branched, proximal seta stronger, MdS_1 rather slender, brown, arcuate; MdS_2 of 3 hair-like spurs; MdS_{3-5} subequal to MdS_1 in length, a little broader, somewhat sigmoid; MdS_3 with fine pectination; $MdS_{4,5}$ with basally fine, apically strong pectination. Cutting organ with 2 unicuspid dorsal teeth; mesal pecten of numerous blunt-tipped teeth, becoming weaker and mesoventrally paler, most laterodorsal tooth largest; ventral tooth with 2 strong lateral denticles (VT-1, 4), both not reaching apex of VT_0; 3 mesal denticles, VT_1 dorsobasally appressed on VT_0, VT_2 very small, VT_3 of moderate size; 3 ventral blades, VB_1 almost reaching apex of VT_0, with mesal pectination in apical half; VB_2 slightly shorter and definitely more slender than VB_1, with pectination more distinct than in VB_1, VB_3 distinctly shorter than VB_2, with pectination similar to VB_2; pectinate brush of 3 long hairs. Piliferous process well protrudent, moderately sclerotized, with an anteroapical hair-group. Mandibular hairs 23-28, each apically frayed, most posterior hairs also anterolaterally frayed. *Maxilla* not significantly different from that of *sinensis*. *Mentum plate* with 7 strong and a pair of basal abortive teeth; median and 2 pairs of laterobasal teeth subequal, submedian pair distinctly smaller. *Thorax*. Setae 1,2-P subplumose; 4,5,7,8-P plumose; 9,10, 12-P subequal (12-P usually slightly longer); 11-P slender, more than twice as long as process of basal tubercle; 13-P short; 2-M forked just at tip, or single; 8-M sparsely plumose; 12-M, T short and weak; 1-T occasionally forked just at tip; 3-T with many transparent simple slender leaflets, appearing brush-like; 5,7,8-T plumose; usually, 0-P and 11-T single, 4-M double, and 6-M triple. *Abdomen*. Dorsal plate I narrower than distance between 1-I, dorsal plate VIII 1.47-1.61 (5) times as broad as long. Setae 1-I, II with transparent slender simple leaflets (similar to 3-T), usually with fewer leaflets than 1-III-VII; 1-III-VIII palmate, with serrate, basally pigmented and apically translucent leaflets; 6-III plumose; 2-VIII subplumose; 6-IV and 2-V usually double; 5,11-I, 4, 11, 12-IV, 11-V, 7-VI and 6-VII usually triple; 5-IV and 7-V usually 4 branched. Pecten with 7-10 long and 10-12 short teeth; seta 1-S usually 5 branched; 2,6,8,9-S with 4-9, 2-3, 3-5 and 5-7 branches respectively; 2-X subplumose with much fewer branching ventrally; 3-X with 6-8 long, apically curved, dorsal and a few short ventral branches. Segment X spiculate as in *An. (Ano.) lesteri*. Anal gills approximately length of saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 2♂, 5♀, 21 L, 10 P, 23 p: Okinawa Gunto (J-0503, J-0539, J-0904, J-1493, J-2076, J-2108, J-2209, J-2295).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa Gunto).

TAXONOMIC DISCUSSION. Endemic species. Reid (1968) placed this species in the "*albotaeniatus* group," but resemblance in the male genitalia and especially larvae suggests that *saperoi* will be more closely allied to *koreicus* (Tanaka, Saugstad and Mizusawa 1975).

7B. *ANOPHELES (ANOPHELES) SAPEROI OHAMAI* OHAMA

Anopheles ohamai Ohama, 1947b: 9 (♂, ♀, L). Type-locality: Ishigaki Is., Ryukyu Archipelago.
Anopheles (Anopheles) saperoi ohamai: Tanaka, Saugstad and Mizusawa, 1975: 210.

Anopheles ohamai was treated as a synonym of *saperoi* by Teller and Gentry (1955); it was regarded as a distinct species by Ohama (1955) and Bohart (1959). Sasa and Kamimura (1971) suggested the necessity of restudying its status. Tanaka, Saugstad and Mizusawa (1975) provisionally treated *ohamai* as a subspecies of *saperoi*. The differentiating characteristics indicated by Ohama (1955) and Bohart (1959) are: 1) the pale subcostal spot on vein c is shorter than the pale apical mark in *saperoi*, as long as it is in *ohamai;* 2) larval seta 3-C 4-7 branched in *saperoi*, 3-5 in *ohamai;* 3) 4-C is longer in *saperoi* than in *ohamai*. We examined 6 males, 6 females and 16 larvae of *ohamai* which were compared with 2 males, 5 females and 20 larvae of *saperoi* from Okinawa. The pale subcostal mark on c in the female is in general elongate and longer in *ohamai* than in *saperoi*, not different in the male. Larval seta 3-C is 4-7 branched in *saperoi*, 3-6 in *ohamai;* 4-C does not appear to be different. The larval seta 3-VIII, one of the 2 characters in question (Tanaka, Saugstad and Mizusawa 1975), was found to be 9-15 branched in *saperoi*, 7-12 branched in *ohamai*. The differences in 3-C and 3-VIII may not be of specific significance. We still lack enough material to evaluate another character in question, the relative length of hindtarsomere 1 to the tibia in the male. However, this difference also does not seem to be so important. Though differences detected are very slight, material of both species is insufficient and the knowledge of the pupa, one of the most important stages, of *ohamai* is lacking. Thus, it is still difficult to ascertain the status of *ohamai*. Therefore, we retain our provisional treatment of 1975, until new material becomes available.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 6♂, 6♀, 19 L: Yaeyama Gunto (topotypes 4♂, 6♀: Ishigaki Is., Ohama, USNM; 12 L: Ishigaki Is., mountain stream pool, Ohama, USNM. 1 L: Fannan Riv., Ishigaki Is., 17 X 1951, Bohart, USNM. 1 L: Sakieda, Ishigaki Is., 27 I 1964, stream, Miyara, YHS; 2 L: Sakieda, Ishigaki Is., 9 IV 1964, stream, Miyara, YHS. 2 L: Iriomote Is., 21 VII 1965, blocked stream, Sasa, KKCOL; 1 L: Iriomote Is., 17 IX 1965, blocked stream, Sasa, KKCOL. 2♂: K-1492).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Gunto).

BIONOMICS. Subspecies *saperoi* appears to be restricted to the northern mountain region of Okinawa Island. We obtained it at Mt. Onishi and Yona; 2 larvae were found on a rapid streamlet in the dark woods of Mt. Onishi. According to Ohama (1947a), subspecies *ohamai* was fairly common at that time; the larvae breed exclusively on mountain streamlets but have never been found associated with *minimus*. It now appears very rare; the latest known specimen being a larva collected on Iriomote Is. in 1965 (Tanaka, Saugstad and Mizusawa 1975). United States Air Force records of *saperoi* from Palaearctic Japan and Korea (Biery and Burns 1973a, b) may be misidentifications, and should be restudied.

8. *ANOPHELES (ANOPHELES) SINENSIS* WIEDEMANN
(Figs. 18, 20, 168, 169; Table 48)

Anopheles sinensis Wiedemann, 1828: 547 (♂, ♀). Type-locality: Canton, China; Miyajima, 1903: 23, Shirakawa, Tokyo, Kanagawa, Hamamatsu, Nagoya and Otsu, Honshu, Japan.
Anopheles jesoensis: Tsuzuki, 1902d: 286, Jeso and Hondo, Japan (in part); Miyasaki, 1903: 66, Ishigaki Is., Ryukyu Archipelago.
Anopheles yesoensis: Office of the Surgeon, the Japanese Army in Korea, 1907; Korea (after M. Yamada, 1936: 191).
Anopheles hyrcanus var. *sinensis:* Yamada, 1924: 223.
Anopheles (Anopheles) sinensis: LaCasse and Yamaguti, 1950: 12 (♂, ♀, L).
Anopheles niggerimus: Sasa, Ogata, Hara and Kano, Mar. 1961: 20 (misspelling of *nigerrimus*) (misidentification).
Anopheles (Anoph.) niggerimus: Hara, July 1961: 161; Hara, 1966: 1 (misspelling of *nigerrimus*); Tanaka, Saugstad and Mizusawa, 1975: 211 (misidentification of Hara).

FEMALE (Figs. 168, 169). Wing length 3.7-4.8 mm. *Head.* Eyes narrowly separated above. Interocular space with white long slender scales and pale-yellowish slender bristles; anteromedian part of vertex covered with white erect scales, remainder of vertex and tempus covered with brown erect scales becoming darker laterally; more than 10 dark brown bristles along eye margin, those on vertex a little distant from eye. Clypeus brown to dark brown, with a clump of dark brown erect scales laterally. Antenna: pedicel rather dark brown, with short bristles and white or pale brown small scales; flagellum 0.68-0.78 of proboscis; flagellomere 1 1.71-1.89 of Flm 2; basal 3-5 flagellomeres with pale scales. Palpus 0.92-0.98 (8) of proboscis; joint 2-3 a node consisting of a complete unsclerotized ring, 3-4 and 4-5 complete; segments 1 and 2 with dark brown erect scales becoming distally decumbent on 2, often a number of mesodorsal pale scales on 2; 3-5 with dark decumbent scales, 3 often (67%) with a small dorsobasal patch of pale scales and occasionally with several pale dorsal scales; joints 3-4 and 4-5 each with a mesoventrally incomplete ring of pale scales; apical 0.33-0.50 of 5 pale scaled, occasionally apical pale area and basal pale ring developed and most of the segment covered with pale scales; length ratio 2-5 : 1.50-2.23 : 2.35-3.07 : 1.41-1.71 : 1.00. Proboscis 1.07-1.15 (5) of forefemur, dark scaled, with erect scales and several basal bristles. *Thorax.* Pronotal integument rather dark brown, anterior pronotal lobe densely covered with anterodorsal dark brown erect scales, bearing more than 10 bristles. Scutal integument brown, covered with pale yellowish hair-like scales; anterior margin with white long slender scales mesally and broader and darker scales laterally; posterior dorsocentral and supraalar bristles brownish, rather long, all the other scutal bristles fine and pale brown, usually difficult to discriminate from hair-like scales. Scutellum with pale hair-like scales and a row of about 20 bristles, several lateral ones long and brownish, median ones usually shorter and paler. Pleura pale brown to dark brown according to light; in side view, 2 dark brown transverse bands across side of thorax, one from posterior pronotal lobe through postspiracular area and upper mesepimeron to upper metapleuron and extending to laterotergite of abdominal segment I, another from propleuron to mesomeron; occasionally prealar knob and usually upper and midposterior sternopleuron with a few pale narrow scales; 5-12 propleural bristles, 3-9 spiracu-

lars, about 10 or more prealars, 2-10 upper sternopleurals, 5 to about 10 midposterior sternopleurals, 6 to more than 10 upper mesepimerals. *Wing*. Vein c with distinct subcostal and preapical pale marks; subcostal pale mark usually (87%) including sc and r_1, occasionally (12%) posterior side of r_1 dark scaled, very rarely (1%) both sides of r_1 dark; preapical pale mark including r_1 and r_2; area proximal to subcostal pale mark frequently (57%) with scattered pale brown scales on posterior margin. Humeral crossvein often (60%) with one or a few scales. Basal half of sc unscaled dorsally, sparsely dark scaled ventrally, distal half dark scaled except tip. Remigium with usually 2, rarely 1, spots of brown scales on posterior side, the spots occasionally developed to long dark marks and rarely fused together; r-r_1 with mixed pale and dark scales in proximal 0.20-0.25, sector pale mark distinct, a short area distad of sector pale mark very dark (rs begins from this area), area between this dark area and subcostal pale mark with mixed dark and pale scales, occasionally almost entirely dark or almost entirely pale, area distad of subcostal pale mark quite dark or with an irregular row of pale scales proximally, tip of r_1 dark; rs dark at base, remainder with mixed pale and dark scales or entirely pale; r_{2+3} with mixed pale and dark scales in basal 0.33, pale in distal 0.67, or entirely pale; r_2 dark except subapical pale mark; r_3 basally dark, gray to dark apically and pale inbetween, basal dark and median pale areas equal in length, apical gray to dark area a little longer and often mixed with pale scales, tip darker; r_{4+5} with basal and apical dark spots and a subbasal white spot, area between subbasal white spot and apical dark spot with mixed pale and dark scales, gradually darker distally; m entirely pale scaled, or mixed with dark gray scales, becoming paler distally; m_{1+2} with basal and apical dark spots, pale inbetween, mixed with gray or dark scales in the distal half; m_{3+4} with basal dark spot and apical dark mark, pale inbetween, mixed with gray scales in the distal half; cu occasionally with 1 or 2 dark scales at base, with distinct subbasal dark mark approximately equal to basal pale area in length or slightly shorter, remainder pale scaled; cu_1 with basal, m-cu and apical dark spots, and almost always (97%) with an ill-defined, rather long mark of gray or dark scales in apical pale area, rarely (6%) basal and m-cu spots fused together; cu_2 pale scaled except dark apical spot; 1a with median and apical dark marks, apical dark mark covering distal 0.1-0.3 of the vein, rarely (5%) one dark scale present at base, or one or a few dark scales between base and median dark mark; subbasal dark mark of cu separated from median dark mark of la by a little more than to more than twice its length; apical pale fringe spot from cell R_1 to middle of R_{4+5} and almost always distinct, rarely (3%) grayish brown or lacking; pale fringe spot at termination of cu_2 usually (80%) present, variable in size, and usually not distinctly pale. Cell R_2 1.70-2.25 of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Forecoxa with both pale and dark scales on anterior surface, pale scales posteroapically; midcoxa with both upper and lower patches of pale scales; hindcoxa with some pale scales. Midfemur pale on posterior surface, with apical pale fringe occasionally indistinct; hindfemur pale on both anterior and posterior surfaces, the pale area apically narrowed and not reaching apex, apical pale fringe occasionally indistinct; foretibia ventrally pale; midtibia pale on dorsoposterior aspect; hindtibia ventrally pale, with apical pale fringe; fore- and midtarsomere 1 with pale ventral scales, 1-3 with pale apical bands, the bands occasionally rather obscure ventrally in midtarsus, 4 sometimes with a few pale scales at apex dorsally; hindtarsomeres 1-4 with pale apical bands occasionally obscure ventrally; these tarsal pale bands as long as to nearly twice as long as tarsal width; hindtarsomeres 4 and 5 occasionally with a com-

plete (1% and 8% respectively), or incomplete (10% and 14% respectively) pale basal band; femora, tibiae and tarsi otherwise dark scaled. Forefemur basally swollen; hindtarsomere 1 1.10-1.19 of tibia. *Abdomen.* Dark brown, covered with bronze-yellow hairs; sternum VII with a clump of dark scales medioapically, often pale scales present apically and basally in the clump.

MALE (Figs. 20, 168). Wing length 3.7-4.7 mm. Antenna: pedicel without scales and bristles; flagellum 0.76-0.81 of proboscis; flagellomere 12 1.39-1.56 of Flm 13, both 0.59-0.67 of Flm 1-11. Palpus 0.94-1.05 (9) of proboscis; joint 2-3 fused, 3-4 and 4-5 normal; 4 and 5, and apex of 3 swollen; 4 and apex of 3 with numerous long mesoventral tufted bristles; 2 with pale erect dorsal scales among dark ones; 3 without basal band of pale scales, often with pale scales above; 4 pale scaled dorsally and basally; joint 4-5 with ring of pale scales; apex of 5 pale scaled laterodorsally; length ratio of 2-5 : 1.24-1.47 : 1.74-2.04 : 0.83-0.92 : 1.00 (9). Proboscis 1.30-1.39 (5) of forefemur. Subcostal pale mark almost always covering both sides of vein r_1; humeral crossvein frequently (71%) lacking scales; cu_1 frequently (62%) without dark mark between m-cu and apical dark spot; cell R_2 1.63-2.05 of vein r_{2+3}. Foretarsomere 5 about as long as 4, with several stout ventrobasal setae. Hindtarsomere 5 often with a complete (16%) or incomplete (29%) pale basal band. Hindtarsomere 1 1.04-1.18 of tibia. Foretarsal claw single, with median and laterobasal teeth. *Genitalia.* Tergum IX with a pair of parallel, rod-shaped, capitate, well sclerotized and widely separated lobes. Basistyle about twice (1.9-2.4) as long as wide, with pale scales sternally and dark scales laterally, covered with rather short bristles throughout, rather long bristles laterally; parabasal setae usually 2, rarely (4%) 3, the mesal seta located on a protuberance, shorter but stouter than lateral seta, just curved at apex; a long sternomesal seta about at middle; dorsal lobe of claspette moderately sclerotized, with a club formed by fusion of 4-6 filaments; sternal lobe of claspette pilose, with 2 (rarely 3) setae, both longer than club, sternomesal seta longer than the other. Dististyle slightly longer than basistyle, well arcuate, broadest at base, narrowed distally a little beyond middle, then broadened again apically, with a row of minute setae on concave side and a few minute setae at apex; claw short, stout and pigmented. Aedeagus half as long as basistyle; apex with 3-6 (most frequently 5) leaflets on each side apically; most distal leaflet largest, apically serrate and basally denticulate; middle medium-sized ones usually basally denticulate, weakly serrate or simple apically; proximal short slender leaflets usually simple.

PUPA. Male palpal sheath markedly prolonged and much longer than in female. Trumpet of laticorn type, with simple thin rim. Wing sheath usually with rows of dark spots, rarely quite pale, never with checkered stripes. Abdominal setae 1-V-VII branched, shorter than the segment, a little longer than respective setae 5; 5-V 5-19 branched; 9-III-VII unpigmented, apically tapering, with blunt tip; 9-III half as long as 9-VII; 9-VII about 0.14-0.17 as long as the segment; 9-VIII plumose with thick stem and many slender branches. Paddle broad, with some short fringe spicules apically.

LARVA (Fig. 18). *Head.* Width 0.66-0.70 mm; usually somewhat longer than wide, brown; seta 1-C curved mesad, a little longer than distance between bases; 2-C single, close together; 3-C strongly dendritic, a little more than half as long as 2-C, with branches fine and tapering; 5-7-C plumose, on about same level or 5, 6-C slightly posteriad of 7-C; 8, 10-C on about same level, 9-C anterior to them; 13, 15-C subplumose; 14-C apparently subplumose, with thick stem and fine branches; usually, 4-C triple and 10-C double. *Antenna* 0.29-0.34 mm long, a little less than half as long as head, straight, narrowly

dark at apex, spinulate, spinules fine laterodorsally and sparse apically; 1-A inserted at basal 0.37-0.45 of shaft, 2-8 branched, not reaching apex of shaft; 4-A longer than 2-A, 3-10 branched; 5-A transparent, as long as 6-A, but broader. *Mandible* with a number of needle-like microspines midlaterally on dorsal surface, also several very fine ones on ventral surface; proximad of this dorsal spinose area, a row of strongly and irregularly barbed, rather broad hair-like spicules, occasionally some of the spicules apically branched; twin barbed 1-Md directly ventrad of this row of spicules, proximal seta longer. MdS_1 pigmented, slender, curved; MdS_2 consisting of several short hairs; MdS_{3-5} as long as MdS_1, broader, unpigmented, somewhat sigmoid; MdS_3 finely pectinate; $MdS_{4,5}$ finely pectinate basally, strongly apically. Cutting organ with 2 unicuspid dorsal teeth; mesal pecten of numerous blunt-tipped teeth, several most dorsolateral teeth as large as dorsal teeth, others becoming more slender and paler mesoventrally; ventral tooth with 2 strong lateral denticles (VT-1, 4), both not reaching apex of VT_0, 3-4 rather small mesal denticles; 3 ventral blades, VB_1 (dorsalmost) broadest, reaching apex of VT_0, coarsely serrate mesoapically and laterobasally; VB_2 as long as VB_1, with distinct mesoapical pectination; VB_3 shorter than VB_2, with distinct, basally finer pectination; pectinate brush of 3 fairly long, sigmoid, mesoapically pectinate hairs. Piliferous process moderately protrudent and moderately sclerotized, with several short hairs anteroapically. Mandibular hairs 21-30, several distal hairs simple, others laterally barbed and apically frayed. *Maxilla*. Cardo with dendritic 1-Mx near apex. Mesostipes sclerotized on caudal 0.67-0.75 of ventral surface; dorsal surface very hairy; twin stipital sensoria close to lacinial suture at middle, posterior sensorium somewhat shorter; 4-Mx at middle of anterior margin of sclerotized area. Palpostipes fusiform, dorsomedially spinulate, with dendritic 3-Mx distal to middle; apex with ordinary 7 appendages. *Mentum plate* with 7 teeth. *Thorax*. Seta 1-P single or 2, 3 forked at tip; 2-P subplumose; 4, 5, 7, 8-P, 1, 8-M, 5, 7, 8-T plumose; 9, 12-P usually equal and slightly longer than 10-P; 11-P 1.5-3.5 times as long as process of basal tubercle; 9-M, T longer than 10-M, T respectively; 11-M, T very short; 12-M, T short; 3-T with transparent simple slender leaflets; usually, 0-P and 2-T single, 12-T double, 7-M and 13-T triple. *Abdomen*. Integument ventrally spiculate, only spiculate on a single anterior area between setae 13 on segment I, on 2 anterior and posterior areas between setae 13 on II-VII; segment X ventrally spiculate, apically and dorsomedially, apical membranous area with numerous stiff hairs. Anterior tergal plate narrower than distance of setae 1, that on VIII 1.60-1.81 times as broad as median length; III-VII each with a small median plate. Setae 1-I, II with transparent simple slender leaflets; 1-III-VII with pigmented, serrate, rather broad leaflets, apices of leaflets unpigmented and narrow but not filamentous; 6-III plumose; 2-VIII subplumose; 3-II usually single; 8-III, 6-IV, V and 10, 11-VI usually double; 0-III, IV usually triple. Pecten with 8-10 long and 11-16 small pectinate teeth (20-25 in total); 2, 6, 8, 9-S with 4-7, 1-3, 4-7 and 6-9 branches respectively; 1-X longer than saddle; 2-X with 14-17 dorsal and 3-8 ventral branches; 3-X with 5-9 long dorsal and 3-5 short ventral branches; 4-X of 18 cratal subplumose hairs. Anal gills tapering to bluntly pointed apex, 1.0-2.1 length of saddle.

EGG. Deck broad.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 32♂, 44♀, with associated skins (36 l, 36 p); 1 l, 26 p: Honshu (C-0046, C-1497, C-1503, C-1823, C-1826, C-1900, C-1901, C-1902, C-1904, C-1905, C-1956, D-0051, D-0057, D-0064, D-0066, D-0393, D-0394, F-0226, F-0231). 1♀ with associated skins

(1 l, 1 p): Shikoku (G-1276). 69♂, 97♀; with associated skins (31 l, 31 p); 1 P, 3 l, 37 p: Kyushu (H-0078, H-1895, H-1977, H-1979, H-1980, H-1981, H-1982, H-1983, H-1984, H-1986, H-1988, H-1989, H-1990, H-1991, H-1996, H-1997, H-1998, H-2001, H-2002, H-2015, H-2016, H-2017, H-2018, H-2019, H-2020, H-2297, H-2298, H-2299). 13♂, 8♀; with associated skins (8 l, 8 p); 6 p: Tsushima (H-2009, H-2010, H-2011, H-2012). KOREA. 14♂, 27♀; with associated skins (30 l, 30 p); 1 P, 6 p: (L-0834, L-0840, L-0841, L-0872, L-1958, L-1964, L-1966, L-1967, L-1968, L-1969, L-1974, L-1975, L-1976, L-2022). RYUKYU ARCHIPELAGO. 2♂, 11♀; with associated skins (5 l, 5 p): Amami Guntô (*Anopheles niggerimus* of Hara, 3♀: Ariya, Amami Ôshima, JHCOL. I-0234, I-0307, I-0310, I-0313, I-1855, I-1875). 1♂, 6♀: Okinawa Guntô (J-0530, J-0533, J-0534, J-1494). 18♂, 27♀; with associated skins (1 l, 1 p); 1 P, 3 p: Yaeyama Guntô (K-0145, K-0588, K-0597, K-0625, K-0656, K-0664, K-0665, K-0666, K-0722, K-0726, K-0975, K-0996, K-0997, K-1036, K-1070, K-1071, K-1301, K-1303, K-1386, K-1398, K-1495). 40 L, 20 p from a colony at the 406th Medical Laboratory, originated in Sagamihara, Kanagawa Pref., Japan.

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Tsushima). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). ?SIBERIA. ?MANCHURIA. NORTH AND SOUTH CHINA. TAIWAN. HONG KONG. VIETNAM. CAMBODIA. THAILAND. MALAYA. SINGAPORE. SUMATRA. BURMA. ASSAM. AFGHANISTAN.

TAXONOMIC DISCUSSION. Larvae of *An. (Ano.) sinensis*, sp. (Eugaru race), *sineroides* Yamada and *lesteri* are almost indistinguishable. Slightly different patterns in the branching of some body setae observed are shown in Tables 3 and 4. For a detailed discussion of relationships within the *An. hyrcanus* complex, see Harrison (1972, 1973).

TABLE 3. Comparison of branching of some body setae of the larvae of *Anopheles (Anopheles) sinensis* and its allied species.

	sinensis			Engaru race			*sineroides*			*lesteri*		
Seta	Range	(Mean)	No.	Range	(Mean)	No.	Range	(Mean)	No.	Range	(Mean)	No.
3-C	30-89[1]	(46.6)	18	26-85	(48.5)	14	18-34[2]	(25.0)	20	16-46	(31.2)	16
7-C	16-23	(19.1)	29	16-23	(19.4)	10	13-19	(16.7)	11	11-17	(14.2)	14
9-C	5-8	(6.1)	30	5-9	(6.2)	10	7-11	(8.3)	20	5-11	(7.8)	15
14-M	12-22	(15.8)	30	10-17	(13.1)	10	8-14	(11.0)	25	5-20	(-)	15
5-II	8-14	(10.4)	30	10-19	(13.3)	35	9-12	(10.5)	11	6-11	(7.8)	15
9-II	10-18	(12.0)	30	9-15	(12.3)	10	6-14	(9.8)	20	5-9	(6.8)	18
4-III	4-5	(4.4)	30	5-8	(6.0)	35	5-6	(5.3)	10	3-6	(4.6)	15
9-III	8-12	(9.9)	30	10-15	(12.6)	20	7-13	(9.9)	11	6-10	(7.4)	15
4-IV	2-6	(4.4)	30	5-8	(6.4)	20	4-6	(4.9)	20	4-8	(5.3)	18

[1]Range 22-60 in Otsuru and Ohmori (1960).
[2]Range 10-31 in Otsuru and Ohmori (1960).

TABLE 4. Comparison of branching of some body setae of the larvae of *Anopheles (Anopheles) sinensis* and its allied species.

Species		*sinensis*	Engaru race	*sineroides*	*lesteri*
Specimens examined		123	69	26	25
Seta	Branches	%	%	%	%
6-IV	1	0.8	0.0	0.0	0.0
	2	89.5	33.4	53.8	26.1
	3	8.1	39.1	30.8	65.2
	4	1.6	26.1	11.5	8.7
	5	0.0	1.4	3.8	0.0
6-V	1	4.5	0.0	0.0	0.0
	2	89.2	66.1	42.8	32.0
	3	6.3	32.2	52.3	68.0
	4	0.0	1.7	4.8	0.0

BIONOMICS. *Anopheles sinensis* is the most common anopheline species in Japan including the Ryukyu Archipelago, and excluding Hokkaido. The larvae are found most frequently in rice fields and open stagnant but relatively clean water, also in stream pools or sluggish streams. They are most often associated with *Culex tritaeniorhynchus*. *Culex hayashii* is also frequently found together with *An. sinensis* (LaCasse and Yamaguti 1950). This species hibernates in the adult stage, and also in the larval stage in the Ryukyus.

Harrison and Scanlon (1975) found larvae in Thailand from a variety of habitats, from marshes to ditches and swamps. They stated that all of these habitats were normally fresh, shallow, usually with emergent vegetation, and exposed to the sun. These authors also found *sinensis* to be largely zoophilic, rarely biting man. In laboratory studies, Miyagi (1972b) found *sinensis* to feed far more readily on birds (chicks) than mammals (mice).

RELATION TO DISEASES. Since the publication of Tsuzuki's early investigations (1901b), *An. sinensis* has long been suspected to be the most important vector of malaria in temperate Japan including Hokkaido and Okinawa Is. However, indigenous malaria in Japan has occurred only sporadically, and recently it appears to have been almost extinguished even though this species is always abundant throughout Japan except for Hokkaido. This may be due to past misidentifications of *lesteri* as *sinensis*. Kamimura (1966) suggested that Tsuzuki's *yesoensis (jesoensis)* might be *lesteri*. Harrison (1973) concluded that *lesteri* and not *sinensis* might well be the most significant parasite vector in much of Asia. Harrison and Scanlon (1975) stated, "Apparently *sinensis* is of little or no significance to human health in Thailand." They found the species zoophilic, exophilic and its distribution not correlated with areas of malaria transmission. The role of this species to indigenous malaria of Japan is now doubtful and should be restudied. Kanda, Joo and Choi (1975) considered *sinensis* a likely vector of *Brugia malayi* (Brug) in Korea and cited other authors reaching the same conclusion for China.

9. *ANOPHELES (ANOPHELES)* SP. (ENGARU RACE)* (Fig. 21; Table 49)

Anopheles sp. Oguma and Kanda, 1972: 231. Engaru, Hokkaido, Japan.

Wing length 4.2-6.1 mm (female), 4.1-5.5 mm (male).

Differing from *sinensis* in the following characteristics.

ADULT. Costa occasionally (6% in female, 50% in male) with a small pale humeral spot; humeral crossvein always bare; vein cu_1 (male) more often (94%) with a dark mark between m-cu and apical dark spot; 1a more frequently (30% in male, 59% in female) with one or a few dark scales at or near base; seta of sternal lobe of claspette more often (40%) 3.

PUPA. Wing sheath with rows of usually more obscure dark spots, occasionally with slight indication of checkered stripes. Abdominal seta 5-V 5-11 branched; 9-V-VII not tapered from base, but parallel-sided or elongate-oval.

LARVA (Fig. 21). No definite differences were detected between this species and *sinensis*, *vide* Tables 3 and 4.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 20♂, 23♀, with associated skins 43 l, 43 p); 1 P, 24 p: Hokkaido (A-1642, A-1655, A-1912, A-1913, A-1914, A-1916, A-1928, A-1933, A-1939, A-1940, A-1943, A-1946, A-1947, A-1949, A-1950).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido).

DISCUSSION. This species is apparently a dominant species in Hokkaido except for the most southern district. Oguma and Kanda (1972) found that this species could not be hybridized with *sinensis* (F_1 male was sterile), and recognized it as a distinct species. This species is quite difficult to discriminate from *sinensis* phenotypically; as described above, only the pupa has one definite differentiating character.

BIONOMICS. The larvae are found chiefly in rice fields, also in ground pools and ponds. Kanda and Oguma (1978) stated that larvae were also found in small creeks, and that the adults feed on cattle.

10. *ANOPHELES (ANOPHELES) PULLUS* M. YAMADA (Figs. 20, 169)

Anopheles (Anopheles) pullus M. Yamada, 1937: 238 (♂, ♀, P, L, E). Type-locality: Seiryori, Keiki-do; Keijo; Ronzan, Sintoson and Saisen, South Tyusei-do; Korea.

Wing length 4.2-5.6 mm (female), 4.4-5.0 mm (male).

Differing from *sinensis* in the following characteristics.

ADULT (Figs. 20, 169). Female flagellomere 1 1.83-2.10 (2) of Flm 2. Male palpus with ratio of segments 2-5: 1.12 : 1.69 : 0.81 : 1.00 (1). Costa

*This species has subsequently been described as *An. (Ano.) engarensis* by Kanda and Oguma (1978). Their character separating the larvae of this taxon from those of *sinensis* was not found by us (sum of branches of setae 5-II + 5-V).

more often (89% in female, 60% in male) lacking pale scales in an area proximal to subcostal pale mark; subcostal pale spot most frequently (55% in female, 40% in male) extending to only anterior side of vein r_1, otherwise including tip of sc only (33% in female, 20% in male), or covering both sides of r_1 (11% in female, 40% in male); female occasionally (30%) lacking subapical pale spot; humeral crossvein usually (92% in female) or always (male) bare; remigium frequently (73% in female, 60% in male) lacking dark spots; r (female) often (44%) with a distinct presector pale mark; cu_1 (female) with basal and m-cu dark spots more often (38%) fused together; female without apical fringe spot; fringe spot at termination of cu_2 absent (female, male). Aedeagus with 5-8 apical leaflets on each side, shape of the leaflets not different from that of *sinensis*.

PUPA. Trumpet rim dark and apparently thick, but not serrate (similar to that of *sineroides*); wing sheath with checkered stripes, occasionally transverse stripes faint and broken; abdominal setae 9-III-VII only slightly tapering apically (similar to those of *sineroides*), 9-III variable in length, 0.24-0.64 (4) of 9-VII; 9-VII broader and more widely rounded at tip than in *sinensis* 0.11-0.15 (4) as long as segment VII.

LARVA. Seta 1-A often reaching apex of shaft; 1-III-VII usually more deeply pigmented than in *sinensis*.

EGG. Deck narrower than in *sinensis* (M. Yamada 1937).

SPECIMENS EXAMINED. KOREA. 8♂, 11♀ with associated skins (4 l, 4 p); 3 l: Korean Peninsula (L-0881, L-1486, L-2028, L-2029, L-2134, L-2135).

DISTRIBUTION. KOREA (Korean Peninsula).

TAXONOMIC DISCUSSION. *Anopheles (Anopheles) pullus* appears morphologically distinct from *An. (Ano.) sinensis*. Kanda and Oguma (1971) reported the fertility and normal pairing of the salivary gland chromosomes of the hybrid F_1 between these 2 species. Their hybridization experiments were based on induced copulation. It must be clarified whether or not a mating or premating isolating mechanism exists between these 2 species.

BIONOMICS. According to M. Yamada (1937), larvae of *An. pullus* occur in relatively cool water (about 19°C), where *Potamogeton crispus, Najas graminen, Ceratophyllum demersum,* etc., grow. They are found from April to November, and in July and August in shaded springs, ponds and other ground pools of highlands, but not in the rice fields of lowlands, where the population of *An. sinensis* becomes highest in this season, while *pullus* is most abundant in autumn. He found numerous engorged females in houses and stables. This species was not reported as occurring in light trap collections made at several U. S. air bases in Korea during 1970-72 (Biery and Burns 1973a).

11. *ANOPHELES (ANOPHELES) YATSUSHIROENSIS* MIYAZAKI (Fig. 163)

Anopheles yatsushiroensis Miyazaki, 1951: 195 (♂, ♀, E). Type-locality: Yatsushiro, Kyushu, Japan; Hong and Ree, 1968: 119, Seoul; Asan Gun, Chungchong Namdo; Chungup Gun, Cholla Pukdo; Andong Fun and Chongsong Gun, Kyongsang Pukdo, Korea.

Wing length 4.1-5.5 mm (female), 4.8 mm (male).
Differing from *sinensis* in the following characteristics.

ADULT (Fig. 163). Palpus usually with more pale scales above; female with pale band of joint 3-4 broader than those on joint 4-5 and at apex of segment 5. Costa (female) more often (6/7) lacking pale scales in an area proximal to subcostal pale mark; remigium frequently (6/7 in female, 1/4 in male) lacking dark spots; vein r (female) frequently (5/7) with a well developed presector pale mark, occasionally whole area proximal to sector pale mark entirely pale. Legs occasionally lacking all pale tarsal bands; pale apical band of hindtarsomere 4 apparently more often lacking.

PUPA. Trumpet with thick and partially serrate rim (slightly thicker than in *sineroides*, the serration weaker than in typical *lesteri*). Wing sheath with faint checkered stripes, usually intersecting points darker, occasionally appearing as rounded spots. Abdominal seta 5-V 37 (1) branched (usually about 20 or more); 9-III-VII only slightly tapering apically or elongate oblong, rounded at apex (the shape similar to those of *sineroides*); 9-VII 0.13 (2) as long as the segment.

LARVA. Seta 1-A 8-11 (3) branched, fully reaching apex of shaft in one specimen, extending beyond it in 2; 4-M 4-10 (3) branched.

EGG. Deck narrower than in *sinensis*, and slightly broader than in *lesteri* (Otsuru and Omori 1960).

SPECIMENS EXAMINED. KOREA. 2♂, 11♀, 3 l, 3 p: Korean Peninsula (L-0882, L-0883, L-0884, L-1487, L-2133, L-2136, L-2137, L-2138, L-2139).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Kyushu). KOREA (Korean Peninsula). NORTH CHINA.

TAXONOMIC DISCUSSION. *Anopheles (Ano.) yatsushiroensis* apparently has not been collected during the past 10 years in Japan. All material of this species was provided from Korea mainly by Mr. Lee. Wing pale marks, and palpal and tarsal pale bands seem to be more variable than in *An. (Ano.) sinensis*. Pupae of *yatsushiroensis* have a thick and serrate margin of the trumpet, and the wing sheath has checkered stripes, but no rows of dark spots. The egg has a narrow deck (Otsuru and Ohmori 1960). These characters may be sufficient to treat *yatsushiroensis* as distinct from *sinensis*. Kanda and Oguma (1971) found the fertility and complete pairing of the salivary gland chromosomes of the hybrid F_1 between these 2 species. As is the case with *pullus* and *sinensis*, presence of absence of an isolating mechanism at mating or premating stage need to be determined, as Kanda and Oguma's hybridization experiments were done by induced copulation.

BIONOMICS. According to Otsuru and Ohmori (1960), the larvae of *An. yatsushiroensis* are found in paddy fields, irrigation ditches, creeks and so forth; adult populations are highest in June and October.

12. *ANOPHELES (ANOPHELES) SINEROIDES* YAMADA
(Figs. 18, 20, 163, 169; Table 50)

Anopheles sineroides Yamada, 1924: 233 (♂, ♀). Type-locality: Bibai, Hokkaido, Japan; M. Yamada, 1936: 195, Seiryori, Roryoshin, Keiryusan, Ronzan, Taiden and Heisho, Korea.
Anopheles (Anopheles) sineroides: LaCasse and Yamaguti, 1950: 23 (♂, ♀, L).

Wing length 3.3-6.5 mm (female), 3.9-5.6 mm (male).

Differing from *sinensis* in the following characteristics.

ADULT (Figs. 20, 163, 169). *Head.* Several most mesal vertical bristles pale yellowish brown; male with antennal flagellomeres 12 and 13 together

0.56-0.58 of Flm 1-11, and Flm 12 1.63-1.75 of Flm 13; palpal segment 3 usually (97% - female) or always (male) with basal band or dorsobasal patch of pale scales. *Thorax*. Propleuron and prealar knob usually with several pale scales, occasionally spiracular area and upper mesepimeron with a few pale scales. *Wing*. Contrast of pale and dark markings more distinct. Costa usually (94% - female, 87% - male) with humeral pale spot, basal pale spot present in 28% of females, basal area proximal to subcostal pale mark with scattered pale scales in 39% of females and 42% of males, only 4% of females and 6% of males with the area entirely dark; remigium with one (70% - female, 8% - male) or 2 (15% - female, 85% - male) brown spots, occasionally (15% - female, 8% - male) entirely pale: vein r often (22% - female, 48% - male) with a distinct presector pale mark, or else presector area with mixed pale and dark scales; subcostal pale mark always covering both sides of r_1; m dark scaled at base, white or pale-gray scaled at apex and variously scaled inbetween; m_{1+2} and m_{3+4} often with a distinct median dark mark; cu often with scattered dark scales distad of subbasal dark mark; cu_1 always with dark mark between m-cu and apical dark spots; la with a distinct subbasal dark mark (73% - female, 36% - male), or else with several dark scales in addition to median and apical dark marks; pale fringe spot at termination of cu_2 always present and distinct. *Legs*. Hindtarsomere 2 sometimes (7% - female, 13% - male) with incomplete pale basal band; tersomere 3 often (42% - female, 91% - male) with complete or incomplete pale basal band; tarsomere 4 with pale basal band always complete in males, ventrally interrupted in 25% of females; tarsomere 5 often (34% - female, 83% - male) with complete or incomplete pale basal band. *Male genitalia*. Basistyle usually without scales on sternal surface; aedeagus with 6-11 apical leaflets on each side; 1-4 most apical leaflets largest, apically serrate and basally denticulate; middle 2-6 slender, but equal to apical ones in length, basally denticulate; most proximal 1-4 short, slender and simple.

PUPA. Trumpet rim thick, not serrate. Wing sheath without rows of dark spots, quite pale or with checkered dark stripes. Abdominal seta 5-V 2-13 branched; 9-V-VII parallel-sided or elongate-oval, not tapered from base.

LARVA (Fig. 18). Seta 3-C in general with fewer branches and branches rather stiff up to apex; no other definite differences were detected between this species and *sinensis;* cf. Tables 3 and 4.

EGG. Deck narrower than in *sinensis*, slightly broader than in *lesteri* (Otsuru and Omori 1960).

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 15♂, 10♀; with associated skins (12 l, 12 p); 1 p: Hokkaido (A-1911, A-1916, A-1928, A-1934, A-1937, A-1942, A-1947). 12♂, 22♀; with associated skins (4 l, 4 p); 16 p: Honshu (B-0355, B-1196, C-1496, C-1497, C-1498, C-1499, C-1500, C-1501, C-1502, C-1503, C-1900, C-1905, C-1956). KOREA. 3♂, 11♀; with associated skins (8 l, 8 p); 2 l, 8 p: Korean Peninsula. (L-0816, L-1968, L-1969, L-1976, L-2023). 3♂, 12♀: Cheju Do (M-0852, M-0853, M-0877).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsuchima). KOREA (Korean Peninsula, Cheju Do). NORTH CHINA.

BIONOMICS. *Anopheles (Ano.) sineroides* occurs more frequently at higher elevations than in lowlands in Honshu, Shikoku and Kyushu. Larvae were obtained from ponds and ground pools, also from rock holes in Cheju Do; found associated with *An. lesteri, An.* sp. (Engaru race) and *Culex rubensis* Sasa and Takahashi in Hokkaido. They occur in fresh clean water in well

shaded margins of small streams, ditches and ground pools, and are associated with *An. koreicus*, *An. lindesayi* Giles, *An. sinensis* and *Cx. rubensis* (LaCasse and Yamaguti 1950). Biery and Burns (1973a, b) found *sineroides* to be the 2nd most abundant anopheline collected in light traps in Japan and Korea in 1970-72 (23.1% of all *Anopheles* collected in Japan, 31.7% in Korea). Their only collecting site which had a preponderance of *sineroides* over *sinensis* was the northernmost, Chitose Air Base on Hokkaido.

13. *ANOPHELES (ANOPHELES) LESTERI* BAISAS AND HU (Figs. 22, 163, 169, 170; Table 51)

?Anopheles yesoensis Tsuzuki, 1901b: 717 (A). Type-locality: Sapporo, Fukagawa and Asahikawa, Hokkaido, Japan.
?Anopheles jesoensis: Tsuzuki, 1902d: 286 (in part).
Anopheles hyrcanus var. *lesteri* Baisas and Hu, 1936: 229 (♀, P, L, E). Type-locality: Santa Mesa of Manila, Luzon, Philippines; Otsuru, 1949: 144 (E), Fukuoka, Kyushu, Japan.
Anopheles (Anopheles) lesteri: Whang, 1962: 39, Tansan, Wondang, Guidandong and Susan, Korea.
Anopheles lesteri: Tanaka, 1971b: 80, Okinawa Is., Ryukyu Archipelago.

Wing length 3.3-5.4 mm (female), 3.1-5.3 mm (male).
Differing from *sinensis* in the following characteristics.
ADULT (Figs. 163, 169, 170). *Head.* Male palpus with ratio of segments 2-5 : 1.12-1.29 : 1.60-1.75 : 0.75-0.81 : 1.00. Female palpal joint 2-3 more frequently (91%) with an incomplete ring or a dorsal patch of pale scales. *Thorax.* Pleural bristles rather fewer, 3-10 propleurals, 1-6 spiraculars, 3-9 prealars, 2-6 upper sternopleurals, 3-15 upper mesepimerals. *Wing.* Costa proximal to subcostal pale spot usually (94% - female) or always (male) entirely dark; subcostal pale spot shorter, most frequently (62% - female, 47% - male) expanding to only anterior side of vein r_1, occasionally (5% - female, 47% - male) covering both sides of r_1, or including only tip of sc (33% - female, 6% - male). Humeral crossvein always bare; r with sector pale mark usually less distinct, often mixed with gray or dark scales; area proximal to sector pale mark occasionally (29% - female, 5% - male) almost entirely dark; r_{4+5} with median pale area usually mixed with fewer dark scales and often (44% - female) entirely pale; cu_1 with basal and m-cu spots more often (25% - female, 11% - male) fused together; no pale fringe spot at termination of cu_2. Cell R_2 (female) 2.00-2.49 of vein r_{2+3}. *Legs.* Upper midcoxa usually (82% - female, 89% - male) lacking scales, occasionally (18% - female, 11% - male) with a few pale or grayish brown scales, but not forming a definite patch; lower midcoxa frequently (64% - female, 70% - male) with more scales than upper area, but not forming a distinct patch as in *sinensis*, male rarely (5%) with a distinct patch of pale scales, otherwise (36% - female, 25% - male) unscaled. Tarsal pale apical bands usually narrower, that of hindtarsomere 4 usually incomplete, rarely lacking; hindtarsomere 4 less frequently (7% - female, 0% - male) with pale basal band, male usually (94%) lacking pale basal band on tarsomere 5, otherwise (6%) with only an incomplete band. *Male genitalia.* Basistyle without pale scales on sternal surface, occasionally with only a few brownish scales.
PUPA. Trumpet rim thick and serrate, the serration weak in Hokkaido population; cephalothorax with or without a pair of dark spots near base of

trumpets; wing sheath without rows of dark spots but with checkered dark stripes. Abdominal seta 5-V 10 to about 30 branched.

LARVA (Fig. 22). Branches of seta 3-C rather stiffer up to apex; 9-II 5-9 branched (10-18 in *sinensis*). No other definite differences were detected between this species and *sinensis*; cf. Tables 3 and 4.

EGG. Deck narrowest among the species of *sinensis* group of this region.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 8♀; with associated skins (3 l, 3 p); 2 p: Hokkaido (A-1916). 37♂, 4♀; with associated skins (1 l, 1 p), 8 L, 3 l, 21 p: Honshu (F-0229, F-0230, F-0231). RYUKYU ARCHIPELAGO. 1♂, 1♀; with associated skins (2 l, 2 p): Amami Guntô (I-0292, I-1855). 2♂, 2♀; with associated skins (4 l, 4 p): Okinawa Guntô (J-1481, J-1481a). 3♂, 7♀, 3 p: Yaeyama Guntô (K-0666, K-0919, K-1021, K-1056, K-1069, K-1070, K-1386).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Kyushu). KOREA (Korean Peninsula). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). SOUTH CHINA. HONG KONG. PHILIPPINES. BORNEO. VIETNAM. THAILAND. MALAYA. SINGAPORE.

TAXONOMIC DISCUSSION. The characteristic serrate margin of the pupal trumpet is constant in specimens from Utôma, Okayama Pref., western Honshu and the Ryukyu Archipelago. In the Hokkaido population, it is not distinctly serrate and apparently similar to that of *sineroides*. These 2 species are, however, easily separated by the shape of abdominal setae 9-II-VII. Paired dark spots near the trumpet bases indicated by Ohmori (1959) as a specific character, were constantly found in the specimens we examined from Hokkaido, Honshu and Okinawa Is., and 1 female from Amami Ôshima; they are lacking in specimens from Yaeyama and 1 male from Amami Ôshima. (Tanaka, Saugstad and Mizusawa 1975).

Japanese populations of *lesteri* have been regarded as the nominate subspecies of *lesteri* described from the Philippines. This relationship has not been well studied, however, and they may not be homogenous populations, as the above mentioned characters suggest. Recently, Xu and Feng (1975) described subspecies *anthropophagus* from central and south China. One of the subspecific characters indicated by them is that the size of the egg (in microns) is larger than *lesteri* (s. s.), x = 558.6 x 192.4 in *anthropophagus*, 516.3 x 178.3 in *lesteri* (s. s.) (Baisas and Hu 1936). In Japanese *lesteri*, it appears variable, 636.4 x 234.8 in ?Honshu (Otsuru and Ohmori 1960), 560 x 207 in Kyushu, and 540 x 189 in Okinawa (Otsuru et al. 1976). The deck is narrowest in Japanese *lesteri* (5.7-14.3 - Otsuru and Ohmori 1960), broadest in *lesteri* (s. s.) (16.6-33.2; x = 21.6 - Baisas and Hu 1936), intermediate in *anthropophagus* (12.9-20.6; x = 18.5-Xu and Feng 1975). Subspecies *anthropophagus* has a pair of dark spots at the trumpet bases; this character appears to be constant in the population of Palaearctic Japan, but variable in the Ruykyu population (Tanaka, Saugstad and Mizusawa 1975) and also in Hong Kong (Harrison 1973). Subspecies *anthropophagus* is said to be strongly anthropophilic contrary to subspecies *lesteri* and subspecies *paraliae* Sandosham. Japanese *lesteri* needs further study concerning feeding preferences.

Kamimura (1968, 1976a, b) suspected that Tsuzuki's (1901b, 1902d) *yesoensis* (*jesoensis*, in part) described from Hokkaido might be *lesteri*. This is fairly reasonable, since true *sinensis* is very rare in most of Hokkaido. On the other hand, *lesteri* is common in Hokkaido including the Fukagawa area, where Tsuzuki made an investigation of indigenous malaria and anopheline mosquitoes. Eysell (1902) indicated that Tsuzuki's specimens had the entirely dark fringe

scales from vein r_{4+5} to la (pale fringe spot at the termination of cu_2 absent). Tsuzuki (1901b) claimed that he verified transmission of malaria by his *yesoensis*. The role of *sinensis* in malaria transmission has been doubted in China (Ho et al. 1962) and Thailand (Harrison and Scanlon 1975), and *lesteri anthropophagus* assumes this role in central and south China (Ho et al. 1962; Xu and Feng 1975). Japanese *lesteri* is still uncertain as to its subspecific position, but the evidence mentioned above suggests that it might be closer to *anthropophagus* than *lesteri* (s.s.). This may support Kamimura's view, and here, *yesoensis* and *jesoensis* (in part) are treated as doubtful synonyms of *lesteri* (s.l.). If the type-specimens of *jesoensis* (or *yesoensis*), (their location is presently unknown) are found to verify this conjecture, the name *jesoensis* (or *yesoensis*) is to replace *lesteri*, as *jesoensis* (or *yesoensis*) is senior to it.

BIONOMICS. The distribution of *An. lesteri* is apparently sporadic in Honshu and Kyushu, but appears to be ubiquitous in the Ryukyus and Hokkaido. However, further investigation is necessary in Honshu and Kyushu, because this species has been confused with *sinensis* by most medical entomologists of this region. In Honshu and Kyushu, this species has been found more frequently in coastal regions than inland. The larvae occur in marshes, ground pools, ponds, rice fields and other impounded waters in Yaeyama, a collection of larvae was taken from a sluggish stream. Contrary to *sinensis*, *lesteri* seems to prefer places which are cooler and shaded. Peaks in the adult population occur during June and October in Honshu and Kyushu (Otsuru and Ohmori 1960), and during the summer season in Hokkaido (Kamimura 1976b).

RELATION TO DISEASES. It appears very probable that the primary vector of indigenous malaria in Japan may be *lesteri* rather than *sinensis*, as suggested by Otsuru (1949) and Kamimura (1968). Recent studies on the taxonomy of the *An. hyrcanus* complex by Harrison (1972, 1973) lend greater credulence to this possibility.

II. SUBFAMILY CULICINAE

ADULT. Vertex covered with decumbent scales, erect forked scales usually present. Female palpus short. Scutum usually short, moderately to strongly arched, covered with narrow or broad scales. Abdomen usually mostly covered with broad flat scales. *Male genitalia*. Proctiger usually with more or less strongly sclerotized paraproct (excepting Uranotaeniini). Aedeagus never with apical leaflets.

LARVA. Most body setae, when multiple, branched at one point, not plumose as in Anophelinae; 2-C absent or rudimentary, 3-C usually very short. *Maxilla*. Cardo broad and flat, on same plane as adjacent cranial surface; lateral stipital setae 2-Mx lacking in most groups; galea together with galeal seta 7-Mx absent. Palpostipes with 5 or less sensory appendages (palpal sensoria) at apex, all spiniform, $S_{1,2,4}$ ring-based. Prothorax without eversible appendage (notched organ); 13-P present or absent. Abdominal setae 1-I-VII never palmate. Siphon always developed, spiracle at apex of siphon.

DISTRIBUTION. Worldwide.

KEYS TO TRIBES OF CULICINAE

ADULT

1. Proboscis strongly curved ventrocaudally about at middle, rigid in basal half, slender in apical half; scutellum evenly rounded; cell R_2 shorter than vein r_{2+3}; spiracular bristles present. TOXORHYNCHITINI (p. 489)

   Proboscis usually straight or nearly so, of even thickness, occasionally swollen apically; scutellum trilobed. 2

2(1). Spiracular bristles usually absent; when present, vein sc with many ventral bristles at base; squama with fringe scales. CULICINI (p. 87)

   Spiracular bristles present; vein sc without many ventral bristles at base. 3

3(2). Wing membrane without distinct microtrichia; cell R_2 shorter than vein r_{2+3}, squama bare; vein 1a ending at or proximad of level of cubital fork. . . . . URANOTAENIINI (p. 450)

   Wing membrane with distinct microtrichia; cell R_2 longer than vein r_{2+3}; squama and vein 1a variable. . . . . SABETHINI (p. 475)

MALE GENITALIA

Proctiger nearly membranous, without strongly sclerotized paraproct. URANOTAENIINI (p. 450)

Proctiger with strongly sclerotized paraproct. . . . CULICINI (p. 87)
SABETHINI (p. 475)
TOXORHYNCHITINI (p. 489)

LARVA

1. Maxilla with cardo becoming a part of cranium, indicated only by presence of seta 1-Mx; mouth brush of 6 to about 10 strong teeth; abdominal segments I-VII each with 3 strongly sclerotized calli on each side, most setae arising from these calli in groups. TOXORHYNCHITINI (p. 489)

   Maxilla with cardo distinct, when completely fused with cranium, recognized as a triangularly produced portion of cranium; mouth brush of numerous slender to stiff hairs; abdomen without strongly developed calli. 2

2(1). Maxilla with cardo hinged with cranial process; mesostipes transverse, including lacinia with 3 ring-based setae; palpostipes distinctly longer than mesostipes, with palpal sensoria as strongly developed as stipital sensoria; setae 14-C and 1-Mx close together; hypostomal suture absent or incomplete, never reaching posterior tentorial pit. URANOTAENIINI (p. 450)

Head without cranial process bearing cardo; mesostipes rarely transverse, including lacinia usually with 4 ring-based setae; palpostipes variable, usually short, palpal sensoria very short; setae 14-C and 1-Mx separated; hypostomal suture varied. 3

3(2). Seta 3-C dorsal; 4-X usually of 4 or more hairs; grid usually developed. CULICINI (p. 87)

Seta 3-C ventral; 4-X of a single hair; grid absent. SABETHINI (p. 475)

(i) TRIBE CULICINI

FEMALE. *Head.* Decumbent scales of vertex variable; vertical bristles usually in a continuous row, projecting anteromesally; temporal bristles finer, directed anteriorly. Palpus 3-4 segmented; 4, when present, always minute. Proboscis slender, of even thickness, straight or slightly bent ventrally, occasionally swollen apically. *Thorax.* Anterior pronotal lobes widely or narrowly separated, usually with many bristles; posterior pronotal lobe with at least one, usually several to many bristles posteriorly. Scutal bristles variable. Scutellum trilobed, with bristles grouped on lobes, absent between lobes: scutellar scales variable. Postnotum bare or bristled. Paratergite narrow to moderately broad. Pleural bristles variable in number, often many on propleuron, prealar knob, sternopleuron and upper mesepimeron; spiracular bristles usually absent (except for *Culiseta* in this region), postspiraculars and lower mesepimerals present or absent, sternopleurals usually along upper to posterior margin. Level of base of hindcoxa variable. *Wing.* Membrane with distinct microtrichia. Squama and alula with fringe scales. Cell R_2 usually as long as or longer than vein r_{2+3}; r_{4+5} without basal spur; m-cu proximad of r-m; 1a extending beyond level of cubital fork. *Legs.* Hindtarsomere 1 shorter to longer than tibia. Claws usually equal; pulvilli variable.

MALE. Palpus extremely variable. Fore- and midtarsomeres 4 and 5 often modified. Anterior claw of fore- and midtarsi usually enlarged; hindtarsal claws equal. *Genitalia.* Quite variable. Proctiger with strongly sclerotized paraproct.

LARVA. *Head.* Seta 3-C dorsal; 5-8-C not in a line. Antenna with 2, 3-A distad of 1-A. Mouth brush of numerous slender or fewer stiff hairs. *Mandible* with 3-5 spurs. *Maxilla.* Cardo triangular, separated from cranium, or narrowly fused with it mesobasally, or completely fused along its entire basal margin, the suture present or absent, when absent, the cardo recognized as a triangularly produced portion of cranium, the cardinal seta 1-Mx located on this portion. Mesostipes variable, most often longer than wide, usually with 2 ring-based setae (2, 4-Mx). Lacinia occupying mesal half of dorsal surface of mesostipes, usually with 2 ring-based setae (5, 6-Mx). Palpostipes usually not very strongly developed, palpal sensoria very small. *Mentum plate* not very short, usually triangular or somewhat pentagonal. Aulaeum fringed. *Thorax.* Usually pale, seta 13-P usually absent. *Abdomen.* Usually pale; I-VII without strongly developed calli; comb scales of VIII usually present. *Siphon.* Acus and pecten present or absent; 1-S variable; 4-X of at least 4 hairs, most often 8 or more.

DISTRIBUTION. Worldwide.

KEYS TO GENERA OF CULICINI

FEMALE ADULT

1. Spiracular bristles present; vein sc with ventral bristles at base. *Culiseta* (p. 98)
   Spiracular bristles absent; vein sc lacking ventral bristles at base. . 2

2(1). Postspiracular bristles usually absent. 3
   Postspiracular bristles usually present. 7

3(2). Proboscis more or less swollen distally. . . . . *Mimomyia* (p. 90)
   Proboscis simple. 4

4(3). Pulvilli well developed. . . . . *Culex* (p. 124)
   Pulvilli absent or inconspicuous. 5

5(4). Anterior pronotal lobes approximated; postnotum usually with bristles. *Heizmannia* (p. 247)
   Anterior pronotal lobes widely separated; postnotum bare. 6

6(5). Foretarsomere 1 shorter than 2-5 together. *Mansonia* (in part) (p. 113)
   Foretarsomere 1 longer than 2-5 together. . . *Orthopodomyia* (p. 107)

7(2). Most wing scales asymmetrical and very broad. *Mansonia* (in part) (p. 113)
   Wing scales symmetrical and narrow. 8

8(7). Paratergite narrow; base of mesomeron slightly to well above that of hindcoxa; proboscis straight. . . . . *Aedes* (p. 253)
   Paratergite rather broad; base of mesomeron at level of that of hindcoxa; proboscis rather stout, somewhat curved ventrally in repose. *Armigeres* (p. 445)

MALE GENITALIA

1. Basistyle with subapical lobe bearing modified thick setae; dististyle inserted on vertical plane. 2
   Basistyle without such subapical lobe; dististyle inserted obliquely or horizontally. 3

2(1). Paraproct with apical crest of many spines. . . . . *Culex* (p. 124)
   Paraproct with apex simple. . . . . *Heizmannia* (p. 247)

3(1). Dististyle with a comb-like row of 4 or more apical claws; paraproct without strongly sclerotized apical teeth. . . . *Armigeres* (p. 445)
   Dististyle with a single apical (occasionally removed basally) claw or without it; paraproct with at least one strongly sclerotized apical tooth. 4

4(3). Basityle without mesal membrane; claspette a triangular basal lobe, with stout apical setae and finer tergal bristles. 5
Basistyle with mesal membrane; claspette variable, or absent. . . . 7

5(4). Tergum VIII simple. . . . . *Mimomyia* (p. 90)
Tergum VIII with a medioapical lobe. 6

6(5). Medioapical lobe of tergum VIII with bristles or modified setae; tergum IX more or less medioapically concave, usually with many bristles on each side. . . . . *Culiseta* (p. 98)
Medioapical lobe of tergum VIII without bristles or setae; tergum IX medioapically convex, without bristles or with only a few on each side. . . . . *Orthopodomyia* (p. 107)

7(4). Paraproct with at least 3 apical teeth. . . . . *Mansonia* (p. 113)
Paraproct with at most 2 apical teeth, or a uniformly sclerotized rod-like structure. . . . . *Aedes* (p. 253)

LARVA

1. Median dorsal valve of siphon strongly developed, fixed, with serrate dorsal margin. . . . . *Mansonia* (p. 113)
Median dorsal valve of siphon short, movable, simple. 2

2(1). Antenna articulated just distad of setae 2,3-A; palpostipes with lateral stipital seta 2-Mx. . . . . *Mimomyia* (p. 90)
Antenna not articulated; palpostipes without lateral stipital seta 2-Mx. 3

3(2). Seta 1-S of 3 or more pairs. . . . . *Culex* (p. 124)
Seta 1-S of a single pair. 4

4(3). Pecten present. 5
Pecten absent. 7

5(4). Seta 1-S at base of siphon. . . . . *Culiseta* (p. 98)
Seta 1-S well distad from base of siphon. 6

6(5). Seta 6-C with a single main and one or a few much finer branches. *Heizmannia* (p. 247)
Seta 6-C single, or with equal branches, or fan-shaped. . *Aedes* (p. 253)

7(4). Abdominal segment VIII with a large sclerotized plate bearing comb scales of different types; cardo free from cranium; a single stipital sensorium. . . . . *Orthopodomyia* (p. 107)
Abdominal segment VIII without sclerotized plate; comb scales of a single type; cardo completely fused with cranium along its entire basal margin; twin stipital sensoria. . . . . *Armigeres* (p. 445)

2. GENUS *MIMOMYIA* THEOBALD

Mimomyia Theobald, 1903: 304. Type-species: *Mi. splendens* Theobald, 1903, Africa; Mattingly, 1971: 1 (resurrection to genus).

Small to medium-sized mosquitoes, often beautifully ornamented by scales and integumental patches. Larvae characterized by segmented antennae.

FEMALE. *Head.* Eyes contiguous or separated above. Scaling of vertex variable. Antenna as long as or longer than proboscis; flagellomere 1 1.0-1.5 of Flm 2 (subgenera *Etorleptiomyia* and *Ravenalites*) or 1.5-3.0 (subgenus *Mimomyia*). Palpus less than 0.33 of proboscis. Proboscis longer than fore-femur, with apex scarcely to distinctly swollen. *Thorax.* Anterior pronotal lobe well separated; both pronotal lobes usually with broad scales, occasionally anterior lobe with some narrow scales; posterior pronotal bristles along posterior margin, less than 10 (*Mimomyia* and *Etorleptiomyia*) or 10 or more (*Ravenalites*). Scutum strongly arched, scales mostly narrow; acrostichal bristles present or absent, other scutal bristles developed. Scutellar scales variable, all narrow (*Mimomyia*), or all or mostly broad (*Etorleptiomyia* and *Ravenalites*). Postnotum bare. Paratergite narrow, unscaled. Pleura with scale patches on propleuron, postspiracular area, sternopleuron and mesepimeron; propleural, sternopleural and prealar bristles present; spiracular, postspiracular and lower mesepimeral bristles absent; upper mesepimeral bristles usually confined to upper area, occasionally some fine bristles scattered on lower area. Base of mesomeron well above that of hindcoxa. *Wing.* Squama fringed with hair-like scales (*Mimomyia* and *Etorleptiomyia*) or with broad scales (*Ravenalites*); alula bare (*Mimomyia*) or with broad scales (*Etorleptiomyia* and *Ravenalites*). Basal remigial bristles absent. Veins with very broad scales, occasionally nearly bare apically (*Mimomyia*). Cell R_2 shorter to longer than vein r_{2+3}, usually shorter in *Mimomyia*, much longer in *Etorleptiomyia* and *Ravenalites*. *Legs.* Pulvilli undeveloped. Claws equal and simple. *Abdomen.* Blunt tipped; tergum I hirsute, extensively scaled; laterotergite unscaled. Seminal capsules one or 3.

MALE. Antenna strongly plumose; flagellomere 12 and Flm 13 elongate. Palpus 4-segmented, as long as or longer than proboscis and with apex hairy (*Mimomyia*), or shorter than proboscis and with apex not hairy (*Etoleptiomyia* and *Ravenalites*). Proboscis apically swollen. Foretarsomere 4 a little shortened, about 3 times as long as wide; 5 longer than 4, moderately modified, with 2 pairs of short curved setae on top of ventrobasal swelling and one pair of stiff lateral setae; midtarsomere 5 not modified, as long as or a little shorter than 4. Anterior claw of fore- and midtarsi enlarged, with a sharp laterobasal tooth; posterior claw short and simple; both claws of hindtarsus equal and simple. *Genitalia.* Tergum IX poorly sclerotized, with lobe single or paired, bristled. Sternum IX semicircular, without bristles. Basistyle scaled, with claspette (basal lobe) bearing thick setae, without mesal membrane and apical lobe. Dististyle simple, with terminal claw. Cercal seta present; paraproct with a few sclerotized apical teeth. Aedeagus poorly sclerotized, paired, simple.

LARVA. *Head.* Distinctly wider than long; ventral side of head capsule very short; seta 2-C absent; 4-7-C at about level of antenna; 11-C very long. Posterior tentorial pit close to collar; hypostomal suture usually absent. *Antenna* long, with membranous ring just distad of 2,3-A (appearing segmented); 1-A well developed, branched; 2,3-A removed from apex; 2-4-A single

(*Mimomyia*, *Etorleptiomyia*) or branched (*Ravenalites*). Mouth brush of numerous fine hairs. *Mandible*. Microspines of dorsolateral surface long. Mandibular spurs 4 (*Mimomyia*, after Knight 1971) or 5 (*Etorleptiomyia*). Mandibular brush well developed; mandibular comb rather reduced. Cutting organ with 2 dorsal teeth; ventral tooth with lateral denticle VT-4; 2 ventral blades, VB_1 far extending beyond apex of VT_0; pectinate brush developed. Membranous process protrudent, with usual 5 hair groups. Mandibular hairs divided into 2 groups, hairs of distal group irregularly spaced, those of proximal group closely spaced. *Maxilla*. Studied in detail only in *Mi. (Eto.) luzonensis* (Ludlow). Cardo free; mesostipes longer than wide, without spine-like strong spicules; 2 stipital sensoria, distad of middle; dorsal stipital seta 2-Mx short; ventral stipital seta 4-Mx longer. Maxillary brush with very long hairs. Parartis without sclerotized protrusion. Pseudoartis undeveloped. Lacinia occupying mesal half of dorsal surface of mesostipes; proximal lacinial seta 5-Mx at about middle, proximad of level of stipital sensoria; distal lacinial seta 6-Mx simple. Palpostipes short; lateral stipital seta 3-Mx present; apex with ampulla and 5 palpal sensoria. *Mentum plate* triangular. *Thorax*. Setae 1-3-P without basal callus; 12-P strong, much longer than 9, 10-P; 13-P absent; basal calli of 9-12-M, T very large, each with a prominent spine; 7-T with basal callus. *Abdomen*. Setae 6-I-VI and 7-I strong; 12-I present; 4-III-VI mesad of respective setae 1. Comb scales in a single row or a patch. *Siphon* usually markedly narrowed apically, with acus free or attached; pecten absent or greatly reduced, of at most 4 teeth; 1-S of a single pair of subventral setae, inserted at not less than basal 0.25 of siphon; 2-S apical, sometimes branched. *Saddle* complete, with apical margin spiculate; 4-X of 4-8 hairs; grid poorly developed.

DISTRIBUTION. Oriental region, Papuan subregion, Solomon Is., Northern Australia, Ethiopian region (except for Malagasy subregion).

Two species of the subgenus *Etorleptiomyia* occur in the Ryukyu Archipelago.

SUBGENUS *ETORLEPTIOMYIA* THEOBALD

Etorleptiomyia Theobald, 1904a: 71. Type species: *Eto. mediolineata* Theobald, 1904a, Tropical Africa.

The subgeneric characteristics are given in the description of the genus.

DISTRIBUTION. Same as that of the genus.

KEYS TO SPECIES OF *MIMOMYIA (ETORLEPTIOMYIA)*

FEMALE ADULT

Acrostichal bristles present; abdominal terga with a dark longitudinal median band through II-VIII. . . . . *luzonensis* (p. 92)

Acrostichal bristles absent; abdominal terga each with pale mediobasal, lateral and laterobasal patches. . . . . *elegans* (p. 95)

MALE GENITALIA

Aedeagus weakly broadened in apical half, about 1.5 as long as wide. *luzonensis* (p. 92)
Aedeagus more strongly broadened in apical half, about 1.2 as long as wide. . . . . *elegans* (p. 95)

LARVA

Seta 1-C trifid; comb scales in a single row, with apical spine distinctly larger than lateral spicules. . . . . *luzonensis* (p. 92)
Seta 1-C simple; comb scales in a double row, more or less uniformly fringed with spicules (after Mattingly 1957a). . . . *elegans* (p. 95)

14. *MIMOMYIA (ETORLEPTIOMYIA) LUZONENSIS* (LUDLOW)
(Figs. 23, 24, 171; Table 52)

O'Reillia luzonensis Ludlow, 1905a: 101 (♀). Type-locality: Bayambang, Luzon, Philippines.
Ficalbia (Etorleptiomyia) luzonensis: Bohart and Ingram, 1946b: 60, Okinawa Is., Ryukyu Archipelago.

Descriptions based on specimens from Ryukyu Archipelago and Taiwan.

FEMALE (Fig. 171). Wing length 2.2-2.9 mm. *Head.* Vertex covered with narrow white curved scales in middle and broad dark scales on both sides; tempus covered with white or gray scales, an indistinct patch of rather dark scales close to eye; erect forked scales large, covering posterior half of vertex; median scales each with broad pale apex and narrow brownish base; lateral scales dark; 5-7 vertical and 3 temporal bristles on each side. Clypeus dark brown. Antennae about as long as proboscis; pedicel deep brown, roughly covered with white moderately broad scales; flagellomere 1 about 1.33 of Flm 2, with white moderately broad scales. Palpus about 0.17 of proboscis, clothed with very dark scales, apex white scaled, a few white scales scattered elsewhere. Proboscis longer than forefemur, somewhat swollen on apical 0.2, clothed with very dark scales at about basal 0.2 and at extreme tip, otherwise clothed with pale yellowish scales and speckled with dark scales, with 4 ventrobasal bristles. *Thorax.* Integument of pronotal lobes dark brown; anterior lobe with white broad scales, bearing more than 10 bristles; posterior lobe largely covered with anterodorsal dark broad scales and posteroventral white scales, bearing 3-5 dark bristles. Scutal integument dark brown, covered with whitish and pitchy brown scales, the whitish scales forming a very wide anterior median stripe and a pair of rather ill-defined ocellate patches just behind scutal suture; white scales also present along humeral margin, on prefossal portion and prescutellar area; a group of large dark upright scales on supra-alar area; all scutal bristles developed, 1-3 posterior fossal bristles just behind level of scutal angle. Scutellum mostly covered with white broad scales, a few dark broad scales on each lateral lobe and many at base of median lobe; 4-6 black stout scutellar bristles, a few small yellowish ones often present. Pleural integument dark brown on post- and subspiracular

areas and greater anterior part of sternopleuron, pale dirty yellow in posterior margin of sternopleuron and mesepimeron; patches of broad white scales on propleuron, postspiracular area, upper sternopleuron, lower posterior sternopleuron and upper mesepimeron; pleural bristles rather few, 4-5 (4) propleurals, 3-7 (4) prealars, 6-10 (5) sternopleurals and several upper mesepimerals. *Wing*. Alula with pale brown scales. Veins mottled with dark and pale scales, most scales very broad, many asymmetrical; cell R_2 5 times length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Forecoxa pale scaled and mottled with dark scales; midcoxa dark scaled and speckled with pale scales; hindcoxa usually only with dark scales. Forefemur with anterior surface and apical 0.33 dark scaled and speckled with pale scales, remainder pale scaled; mid- and hindfemora dark scaled at apex and on anterior surface and speckled with pale scales, remainder pale scaled. Tibiae speckled with dark and pale scales, pale scales predominant posteroventrally. Tarsi clothed with pale yellowish scales; tarsomere 1 speckled with dark scales and having a dark subapical band, 2 with dark narrow subbasal and subapical bands, 3-5 each with a dark broad, usually incomplete median band, underside of tarsomeres pale scaled. *Abdomen*. Tergum I covered with pale broad scales, with a pair of laterposterior ill-defined patches of dark scales; II-VIII with a continuous median broad line of dark scales, pale scaled and speckled with dark scales on both sides, dark scales predominant on laterobasal and lateral margins. Sterna mainly pale scaled and speckled with dark scales. Seminal capsule single.

MALE (Figs. 24, 171). Wing length 2.5 mm. Palpus 0.8 of proboscis, clothed with pale yellowish scales and speckled with dark scales; 2 and 3 very long; 4 (apical segment) short, dark scaled, with 5-6 subapical setae, apex rounded and fringed with white scales. Proboscis considerably swollen on apical 0.40-0.44 and speckled with dark and pale scales, dark scaled at base, otherwise clothed with pale yellowish scales. Hindtarsomere 1 0.90-0.96 (2) of tibia. *Genitalia*. Tergum IX with lobes well protrudent and separated, each bearing 3-6 fairly long bristles. Basistyle subcylindrical, 2.5-2.8 times as long as wide, bristled over entire surface, laterally scaled and ventrally; claspette conical, poorly sclerotized, bearing 2 stout setae and more than 10 bristles. Dististyle gently arcuate, swollen at base, about 0.6 length of basistyle; claw short and stout. Paraproct strongly sclerotized at apex and usually with 3 teeth, lateral teeth directed lateroapically, median tooth largest, recurved; 3-5 cercal setae. Aedeagus poorly sclerotized, fairly large, 1.43-1.62 (4) as long as wide, constricted at middle, open tergally and sternally, apparently with only membraneous connections at apex and base; tergal orifice wide at base and narrowed toward apex; sternal orifice rather wide at base, nearly closed at middle (sometimes both edges overlapping), then widened again toward apex.

LARVA (Fig. 23). *Head*. Width 0.86-0.97 mm; brownish yellow, 1.24-1.40 times as wide as long, seta 1-C stout, with a short lateral branch on each side near base; 4-C cephalad of 7-C, substellate, the branches noticeably unequal, occasionally with 1 or 2 barbs; 5,6-C longer than cranium, 6-C a little longer than, well laterad and a little cephalad of 5-C, caudad to level of 7-C; 7-C usually a little caudad of a line drawn through 5,6-C; 11-C usually triple, about as long as, or longer than cranium; 14-C well caudad of anterior margin of cranium, almost directly mesad of 12-C. *Antenna* 0.53-0.61 mm long, slightly bowed, pale except for some light basal pigmentation, bearing numerous large spicules on lateral, dorsal and ventral aspects of proximal part, and a few on lateral aspect of distal part, portion proximad of 2,3-A about 4.5 times length of distal articulated portion; 1-A 8-12 branched, barbed, a little shorter

than shaft, inserted at basal 0.46-0.55 (x = 0.50); 2,3-A subequal, about 0.75 of shaft length; 4-A a little shorter. *Mandible* (1 dissected specimen) with a patch of long, needle-like microspines confined to the proximal portion of the lateral aspect; MdS_1 longest, dark yellow; MdS_2 multiple, pale, about 0.5 length of MdS_1; MdS_3 very short, yellowish; MdS_4 about 0.75 length of MdS_1, pale yellow; MdS_5 a little shorter than MdS_2, pale yellow, fairly broad, coarsely pectinate on mesal margin. Cutting organ with simple dorsal teeth, the lateral tooth very small, the mesal tooth as large as VT_0; a bicuspid denticle immediately mesad of it; ventral tooth with VT-4 spiniform, nearly attaining tip of VT_0; VT_0 subacute, deeply emarginate at base, VT_{1-3} subequal, weakly sclerotized, very pale, elongate-triangular, VT_1 blunter than the others; VB_1 finely pectinate on caudal margin; pectinate brush of about 6-8 bilaterally pectinate hairs, the most proximal one somewhat reduced. Piliferous process moderately protrudent, labula not extending beyond apex of anterior part, with a basal flap or lobe-like structure. Mandibular hairs (4-6) + (8-11), 14-15 in total. *Maxilla* (a single dissected specimen). Cardo with 1-Mx 2-4 branched. Mesostipes 1.4-1.5 times as long as wide, the mesal margin with a row of several rather stiff medial spicules and several rather thick basal unilaterally pectinate spicules; stipital sensoria on distal 0.33; 2-Mx near apex; 4-Mx moderately pigmented, longer and much stouter than 2-Mx. Maxillary brush consisting of a dorsal row of slender hairs and a lateroventral group of strongly barbed shorter hairs, several most distal dorsal hairs very long, rather broadened, sparsely and finely barbed. Lacinia with 5-Mx at about middle, 6-Mx short. Palpostipes excluding lateral artis less than 0.5 as long as mesostipes, apically narrowed, with lateroventral longitudinal unsclerotized band from near base to apex, 3-Mx on basal 0.33 of dorsolateral aspect; apex with ampulla and 5 palpal sensoria, $S_3 > S_1 > S_2 \doteq S_4 \doteq S_5$ in length, S_{3-5} mesally close together on apex. *Mentum plate* with 21-22 teeth, the apical tooth subacute, 2.5 times as broad as closest flanking teeth. Aulaeum without median tooth. *Thorax*. Setae 1-3-P nearly tandem, 1-P a little shorter than cranium, strongly barbed on basal 0.33, 2-P smooth, 3-P lightly barbed; 4-P occasionally lightly barbed; 5,7-P usually triple, 7-P noticeably larger than 5-P; 12-P about 1.5 times length of cranium, lightly barbed; 6-M usually triple; 5-T sometimes lightly barbed; 7-T 1.5 times length of cranium; 12-T often basally single, then apically splitting into 2 or more branches. *Abdomen*. Setae 1,2-I usually double, 2-I rarely lightly barbed; 6-I, II usually 5 branched, 6-III-VI usually double; 7-II relatively small, but with a few strong barbs; 9, 12-II usually double; 1-III-VI usually 4 branched, lightly barbed, branches of 1, 3-VII usually greatly unequal; 12-VII shorter than 7-VII; 1-VIII usually triple, one branch usually much smaller than the others, barbing variable; 2,4-VIII usually double, slender; 3-VIII usually 5 branched, strongly barbed; 5-VIII usually 4 branched and smooth. Comb scales 8-15 in a single somewhat sinuate row, individual scales elongate, with a rather weak apical spine, laterally fringed, with fairly large spicules, the apical spine distinctly larger than the lateral spicules. *Siphon* yellowish to yellow-brown, with a narrow dark basal ring, indistinctly darker on apical 0.33, with acus free, slightly to moderately curved, a little constricted near base, inflated to greater than basal diameter at about basal 0.33, then tapering gradually, apical diameter about 0.33 of maximal diameter; pecten absent; length 1.04-1.29 mm, index 4.78-6.15 (x = 5.68); microsculpture of fish scale-like imbrication, becoming fainter distad; 1-S inserted at basal 0.27-0.37 (x = 0.32), 1.9-2.6 times diameter at insertion in Okinawa specimens (1.7-2.1 times siphon diameter at insertion in Taiwan specimens as they tend to have slightly more inflated

siphons); 2-S short, stout, bifurcate, apices acute. *Saddle* 0.27-0.32 mm long, with numerous laterodorsal spicules except on median dorsal line, becoming strong and spinelike on caudal aspect, largest between bases of 1,3-X; 1-X about 3 times saddle length, 2-X usually 4 branched, branches progressively longer ventrad (shortest branch 1.5-2.0 of saddle length, longest branch 3.5-4.0 of saddle length): 3-X usually triple, a little longer than 2-X, branches progressively longer ventrad; 4-X of 6-8 cratal hairs, the caudalmost 2 usually double, remainder single, up to 5 times saddle length. Anal gills fusiform, 0.67-0.88 length of saddle, ventral gill usually slightly longer than dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 3♂, 4♀, 5 L: Okinawa Guntô (J-1624, J-1625, J-2150, J-2151, J-2152, J-2307). TAIWAN. 9♂, 10♀, 6 L (5♂, 5♀: Neihu, Taipei Hsien, 22 XI 1973, ground pool, Lien; 2♂, 3♀, 6 L: Neihu, Taipei Hsien, 1 XII 1973, blocked stream, Lien and Mizusawa; 2♂, 2♀: Taiwan mainland).

DISTRIBUTION. RUYKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). ORIENTAL REGION.

BIONOMICS. Apparently not common. Adults are attracted to light. Larvae were obtained in ground pools. In the Philippines, they have also been reported from ponds, carabao wallows and rice fields by Dowell, Libay and Baisas (1965). Basio, White and Reisen (1970) noted an apparent preference for open field-type pools containing decayed rice plants and green algae. This species is of no medical importance.

15. *MIMOMYIA (ETORLEPTIOMYIA) ELEGANS* (TAYLOR) (SENSU MATTINGLY, 1957a) (Figs. 24, 172)

Dixomyia elegans Taylor, 1914: 703 (♀). Type-locality: Townsville, Queensland, Australia.

Ficalbia (Etorleptiomyia) elegans: Mattingly, 1957a: 46; Tanaka, Saugstad and Mizusawa, 1973: 284, Ishigaki and Iriomote Is., Ryukyu Archipelago.

FEMALE (Fig. 172) (description based on 4 specimens). Wing length 3.0-3.3 mm. *Head.* Eyes narrowly separated above; interocular space covered with pale yellowish brown, narrow curved scales; vertex covered with pale yellowish brown, narrow or crescent-shaped scales and concolorous long erect forked scales in middle; sides of vertex covered with dark broad scales and posteriorly with dark erect forked scales; tempus covered with dark broad scales, with a patch of pale yellowish brown broad scales close to eye; 5-7 dark vertical bristles including 2 on interocular space and 2-3 dark temporal bristles on each side. Clypeus dark brown. Antenna: pedicel brown, infuscate above, covered with pale yellowish brown broad scales, bearing small mesal hairs; flagellum 1.2 of proboscis; flagellomere 1 pale in basal half, dark otherwise, with broad pale scales on mesal side of basal half, 1.3 length of Flm 2. Palpus 0.25 of proboscis, dark scaled with pale apical fringe. Proboscis 1.2 of forefemur, a little swollen in apical 0.2; basal 0.25 and apical swollen part dark scaled, intervening area clothed with pale yellowish brown scales, with scattered dark dorsal scales. *Thorax.* Anterior pronotal lobe with integument dark brown in upper 0.67 and lower margin, pale in lower 0.33, covered with dark erect broad scales on dark area and pale erect broad scales on pale area, bearing more than 10 bristles which are dark on dark area and pale on

pale area; posterior pronotal lobe with integument dark brown, covered with broad dark scales intermixed with a few broad pale scales, bearing 5-7 brown bristles. Scutal integument dark brown, covered with yellowish brown and dark narrow or crescent-shaped scales; the yellowish brown scales forming a wide median stripe extending posteriorly along posterior dorsocentral lines and laterally behind fossal area on both sides; an irregular ill-defined stripe of yellowish brown scales along or near side margin from apex to scutal angle on each side; supraalar area above paratergite covered with white crescent-shaped scales, the scales on posterior part very long, erect and outstanding; posterior supraalar area with outstanding dark erect long scales; prescutellar space covered with dark scales intermixed with pale yellowish brown ones; acrostichal bristles absent except for 2 brownish apical pairs; other scutal bristles developed, blackish brown except pale brown antealars; 3-4 humerals, 2-3 angulars, a short row of bristles on posterior fossal area close to anterior dorsocentral series. Scutellum with integument paler than scutum; each lobe covered with dark broad basal scales and pale apical ones, sometimes pale scales reaching base on median lobe, each lobe bearing 5-9 dark bristles of various sizes, 4 bristles on each lateral lobe and 7 on median lobe large. Pleural integument pale brown, with a conspicuous very dark brown patch occupying anterior half of postspiracular area and uppermost part of subspiracular area; a dark brown smaller patch just below anterior angle of sternopleuron and a small brown patch on posterior margin on level of the anterior patch; upper margin of sternopleuron, upper and lower mesepimeron slightly infuscate; lower end of sternopleuron and lower half of mesepimeron becoming dark; patches of broad pale scales on propleuron, posterior postspiracular area, upper sternopleuron above dark integumental patches, lower sternopleuron below posterior integumental patch, and on upper mesepimeron; pleural bristles yellowish brown or pale brown except for a few dark long bristles in the dark patch of posterior margin of sternopleuron; 5-6 propleurals, 3-4 of them long; 4-5 prealars, more than 10 sternopleurals along upper to posterior margin, 9-15 upper mesepimerals. *Wing*. Alula with pale and dark broad scales. Veins dark scaled and speckled with pale scales. Cell R_2 5.19-5.26 (2) of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Fore- and hindcoxae pale, midcoxa dark brown, each covered with broad scales on anteriolateral surface; scales of forecoxa pale in upper half and dark in lower half, scales of midcoxa all dark, those of hindcoxa dark in upper half and pale in lower half. Forefemur pale scaled in basal 0.25, mottled with dark and pale scales otherwise on anterior surface, with apical pale fringe, posterior surface mainly pale scaled, with narrow apical dark area; midfemur dark scaled, with scattered pale scales on anterior surface, posterior surface mainly pale scaled, with apical 0.25 dark scaled and intermixed with pale scales; hindfemur dark scaled on anterior surface, pale scaled on basal 0.80-0.84 of posterior surface. Tibiae dark scaled, speckled with pale scales, with pale apical fringe. Tarsi dark scaled, tarsomeres 1-4 with both basal and apical pale bands, 5 usually with pale basal band, sometimes obsolete, 1 with scattered pale scales in median dark area, pale scales sometimes forming an incomplete band at middle. Hindtarsomere 1 0.84-0.85 (3) of tibia. *Abdomen*. Tergum I medially pale scaled and laterally dark scaled; II-VII dark scaled, each with a pair of laterobasal spots, a pair of ill-defined lateromedian patches and a mediobasal patch of pale scales, the lattermost spot becoming smaller toward posterior segments and faded away on VI and/or VII; the laterobasal spots larger on VII; VIII dark scaled and with laterobasal spots. Sterna pale scaled, each sternum with laterobasal and

medioapical small spots of dark scales. Seminal capsule single; postgenital plate broadened apically, deeply concave at middle of apex.

MALE (Figs. 24, 172) (description based on 1 specimen). Wing length 3.1 mm. Antenna as long as proboscis; flagellomere 12 slightly shorter than Flm 13, both longer than Flm 1-11. Palpus 0.8 of proboscis, dark scaled from base of segment 2, length of the dark-scaled area equal to basal dark area of proboscis, palpus otherwise pale scaled with 2 bands of dark scales at joint of 3 and 4 and at swollen apex of 4, the latter very dark, dark scales scattered on pale area especially on dorsal surface; 5 very short, pale scaled. Proboscis considerably swollen in apical 0.33, dark scaled in basal 0.2, with a distinct pale band just proximal to swollen part, intervening part pale scaled with scattered dark scales forming an incomplete band just proximal to the pale band; apical swollen part clothed with dark scales and with scattered pale scales. Cell R_2 3.55 of vein r_{2+3}. Abdominal terga with pale scales more diffused than in female. *Genitalia*. Tergum IX with lobes distinctly produced and rather narrowly separated, each bearing 7-10 bristles. Basistyle subcylindrical, about twice as long as wide, covered with moderately long bristles over entire surface, scaled throughout except mesal half of tergal surface; claspette rather long, moderately protrudent, more strongly sclerotized than other part of basistyle, bearing 3 stout setae and less than 10 bristles. Dististyle 0.6 length of basistyle, slender, gently arcuate, broadened at base; claw 0.1 of dististyle, spatuliform. Cercal setae 3; paraproct moderately sclerotized, with 3 strongly sclerotized acute teeth at apex, most mesal tooth largest. Aedeagus poorly sclerotized, 1.21 times as long as wide, bulbous, tergal side widely open, the opening apparently constricted at apical 0.4; sternal side narrowly open.

LARVA. Specimens from this region not available.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 1♀: Okinawa Gunto (J-1779). 1♂, 3♀: Yaeyama Gunto (K-1401, K-1402, K-1417).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Gunto). PHILIPPINES. MALAYA. THAILAND. SUMATRA. NEW GUINEA. BISMARCK ARCHIPELAGO. SOLOMON ISLANDS. AUSTRALIA.

TAXONOMIC DISCUSSION. Belkin (1962) stated that typical *elegans* from Queensland, Australia, was markedly different from specimens seen from all other areas including Southeast Asia. He described 2 species from the *elegans* complex of the South Pacific. We concur that the species of Southeast Asia may be different from both typical *elegans* and also species of the South Pacific, however, no other name is available for the species of this area. Hence, we follow Mattingly (1957a) in using the taxon *elegans*. Ryukyuan specimens appear to have the patterns of pale scales on the scutum and abdomen more developed than in those of the other areas (Tanaka, Saugstad and Mizusawa 1975).

BIONOMICS. *Mimomyia elegans* is apparently very rare in this region. Kamimura (1976b) obtained larvae of this species in a ground pool on Iriomote Island. One female was obtained in a light trap.

3. GENUS *CULISETA* FELT

Culiseta Felt, 1904: 391c. Type-species: *Culex absobrinus* Felt, 1904; United States.

Medium-sized to large mosquitoes; larvae with seta 1-S at base of siphon.

FEMALE. *Head.* Eyes contiguous or narrowly separated above and below. Vertex with decumbent scales all narrow; erect scales numerous, covering almost entire vertex, occasionally excepting anterior part; rather many vertical bristles and several temporals on each side. Antenna shorter than proboscis; flagellomere 1 1.1-1.5 of Flm 2. Palpus less than 0.33 of proboscis; minute 4 present. Proboscis as long as or longer than forefemur. *Thorax.* Anterior pronotal lobes widely separated, scaled and bristled; posterior pronotal lobe with bristles near posterior margin, often scaled. Scutum with narrow scales only; all scutal bristles present, rather short, occasionally middle of fossal area lacking bristles. Scutellum usually with narrow scales only, rarely with broad scales. Postnotum bare. Paratergite narrow, scaled or bare. Pleura with scale patches variable, metameron sometimes scaled; propleuron, spiracular area, upper to posterior sternopleuron and upper mesepimeron with bristles; postspiracular area without bristles or with a few fine bristles close to paratergite; 2 or more lower mesepimeral bristles usually near anterior margin in middle. Base of mesomeron well above that of hindcoxa. *Wing.* Often with dark pattern of scales and infuscation of membrane. Squama and alula fringed with hair-like scales. Base of vein sc with many bristles at base ventrally; remigium with a few dorsal bristles; cell R_2 longer than vein r_{2+3}; 1a somewhat sinuous. *Legs.* Fore- and midtarsomere 5 as long as or a little longer than 4; hindtarsomere 1 shorter than tibia. Pulvilli undeveloped. Claws equal and simple. *Abdomen.* Tergum I hirsute; laterotergite unscaled. Seminal capsules 3, equal.

MALE. Antenna strongly plumose, distinctly shorter than proboscis; flagellomeres 12 and 13 elongate. Palpus at least as long as proboscis; apical 2 segments not shortened, with or without long bristles. Proboscis longer than forefemur. Fore- and midtarsomere 4 shortened; fore- and midtarsomere 5, much longer than 4, modified, with several stout setae on ventrobasal swelling, setiferous midventral process developed in foretarsomere 5, not developed in midtarsomere 5. Anterior claw of fore- and midtarsi enlarged, with blunt-tipped median and laterobasal teeth, posterior claw with a subbasal tooth; both claws of hindtarsus equal and simple. *Genitalia.* Tergum VIII with median caudal lobe bristled, the bristles occasionally modified. Tergum IX with lobes barely to distinctly protrudent, bristled. Sternum IX with or without bristles. Basistyle long, usually unscaled, with mesal surface completely sclerotized; claspette (basal mesal lobe) short, usually with a few strong setae together with many fine bristles. Dististyle simple, with terminal claw. Cercal setae present; paraproct with strongly sclerotized apical tooth (teeth). Aedeagus rather simple, cylindrical or conical, usually with a wide tergobasal opening and a narrow median sternal slit.

LARVA. *Head.* Distinctly wider than long; seta 2-C absent; 5, 6-C posteriad of 7-C. *Antenna* variable in length, spiculate; 1-A branched, variable in position; 2-6-A variable in development and position. *Mandible* with a group of simple microspines dorsolaterally near base. Mandibular spurs 5,

MdS_1 longest; MdS_2 multiple, slender; $MdS_{3,4}$ similar to MdS_1 but shorter; MdS_5 short. Mandibular brush well developed; mandibular comb variable. Cutting organ with a single dorsal spine; 2 dorsal teeth, lateral tooth smaller; ventral tooth with 1-3 lateral (VT-1, 2, 4) and 3 mesal (VT_{1-3}) denticles; ventral blade extending beyond apex of VT_0, mesally pectinate; pectinate brush well developed. Piliferous process well protrudent, distinctly apically cleft, with 3-5 hair groups; labula not extending beyond apex of anterior part. Mandibular hairs divided into 2 groups. *Maxilla.* Cardo triangular, mediobasally fused with cranium. Mesostipes variable; stipital sensoria twinned; parartis without strongly sclerotized protrusion, articulating with a sclerotized rod of paracoila; pseudoartis undeveloped. Palpostipes variable in size, with or without lateral stipital seta 3-Mx; apex with ampulla and 5 palpal sensoria. *Mentum plate* triangular; aulaeum with or without median tooth. *Thorax.* Setae 1-3-P on a common callus; 13-P absent. *Abdomen.* Setae 6-I-VI and often 7-I strong, 6-I, II more or less differentiated from 6-III-VI; 12-I present; 13-II, VI and often 4-I, 6-VII and some of setae 7 dendritic; 1-III-VII and 13-III-VI often more or less developed. Comb scales present. *Siphon* with acus and pecten; 1-S at or near base of siphon, accessory subventral and subdorsal setae occasionally present. *Saddle* complete; 2-X multibranched; 3-X single or branched; 4-X of 10 or more cratal hairs, precratal hairs present.

DISTRIBUTION. Worldwide.

Seven subgenera have been recognized; 3 of them were raised to full generic status by Maslov (1967), but Dobrotworsky (1971) still treated them as subgenera. We have just 2 groups in our region, *Culicella* and *Culiseta;* both are definitely subgenera of *Culiseta* and only well defined by larval characters.

KEY TO SUBGENERA OF THE GENUS *CULISETA*

LARVA

Antenna nearly length of head; seta 1-A inserted in apical 0.4 of shaft; siphon without a row of simple hairs distad of pecten. *Culicella* (p. 100)

Antenna about 0.5 length of head; seta 1-A inserted in basal half of shaft; siphon with a row of simple hairs distad of pecten. *Culiseta* (p. 103)

KEYS TO SPECIES OF THE GENUS *CULISETA*

FEMALE ADULT

Yellowish species; abdomen uniformly yellow scaled; tarsi pale banded. *nipponica* (p. 100)

Dark species; abdominal terga dark scaled, with pale basal bands; tarsi unbanded. . . . . *kanayamensis* (p. 104)

MALE GENITALIA

Aedeagus roughly square, only slightly constricted at apical 0.4, apex more strongly sclerotized than remainder. . . . *nipponica* (p. 100)
Aedeagus roughly triangular, broadest near base, strongly constricted at basal 0.25, tapering from middle toward apex, which is as well sclerotized as remainder. . . . . *kanayamensis* (p. 104)

LARVA

Antenna nearly length of head; seta 1-A inserted at apical 0.33 of shaft; aulaeum with a triangular sclerotized apical tooth; siphon without a row of simple hairs distad of pecten. . *nipponica* (p. 100)
Antenna about 0.5 length of head; seta 1-A inserted at basal 0.4 of shaft; aulaeum without apical tooth; siphon with a row of simple hairs immediately distad of pecten. . . . . *kanayamensis* (p. 104)

SUBGENUS *CULICELLA* FELT

Culicella Felt, 1904: 391c. Type-species: *Culex dyari* Coquillett, 1902; United States.

FEMALE. Spiracular bristles many (scanty in Australian species). Wing membrane without distinct spots; bristles on underside of base of subcosta usually numerous (scanty in Australian species); vein m-cu distinctly proximad of r-m. Tarsi pale banded.

MALE. Palpus as long as or longer than proboscis, segments 4, 5 and apex of 3 hairy. Tergum IX without protrudent lobes; basistyle without subapical lobe or subapical patch of hairs.

LARVA. *Head* broad; antenna about as long as head; seta 1-A inserted distad of middle, well developed; 2, 3-A long, removed from apex. Mouth brush well developed. *Mandible:* mandibular comb of more than 10 spiculate prominences, each prominence with a single long filamentous spicule. *Maxilla* of filter-feeding type. Mesostipes distinctly longer than wide, without strong spine-like spicules; hairs of maxillary brush very long and slender. Lacinia with all spicules slender. Palpostipes very short, less than half as long as mesostipes. *Aulaeum* with median tooth. *Abdomen.* Comb scales numerous in a patch. Siphon long; pecten of spine-like teeth only, without simple hairs distally; 1-S at base of siphon, no accessory setae. Seta 3-X branched; 4-X with precratal hairs on saddle.

DISTRIBUTION. Holarctic and Australian regions. The subgenus is represented by a single species in this region.

16. *CULISETA (CULICELLA) NIPPONICA* LACASSE AND YAMAGUTI (Figs. 25, 26, 173; Table 53)

Theobaldia (Culicella) sp.: Shogaki, 1950: 3, Akan-kohan, Hokkaido, Japan.

Culiseta (Culicella) nipponica LaCasse and Yamaguti, 1950: 84 (L). Type-locality: Lake Akan, Hokkaido, Japan; Stone, 1961: 44, Korea.

FEMALE (Fig. 173). Wing length 5.1-5.7 mm. *Head.* Eyes contiguous above and below. Vertex covered with pale golden yellow narrow curved scales and dark long erect forked scales, several erect scales also on upper tempus, a small group of dark hair-like scales close to eye margin on each side near middle; tempus covered with pale rather narrow scales; 7-10 vertical and several temporal dark bristles on each side. Clypeus brown. Antenna: pedicel brown, with dark small bristles on mesal surface; flagellomere 1 1.48 (1) of Flm 2, with a few brownish scales on mesal side. Palpus brown in middle, infuscate at apex and base, 0.25 length of proboscis, bearing many dark bristles especially on 2; segment 3 2.32 (1) of 2; 4 very small. Proboscis light brown in basal 0.75, dark in apical 0.25, about as long as forefemur. *Thorax.* Anterior pronotal lobe yellowish brown, with bronzy dark narrow curved scales and many dark bristles; posterior pronotal lobe yellowish brown, covered with bronzy dark hair-like curved scales and bearing 7-9 dark bristles along posterior margin. Scutum with integument mostly dark brown, light brown in a pair of submedian longitudinal lines, lines along scutal suture and in supraalar and prescutellar areas, covered with bronzy dark narrow curved scales except on submedian lines, scutal suture, prescutellar space, and posterior part of supraalar area where the integument is bare; scales on supra-alar margins and on margin of prescutellar space paler; scutal bristles dark bronzy. Scutellum roughly covered with pale golden yellow narrow curved scales and bearing 8-10 bronzy dark or bronzy brown long bristles on each lobe, lateral lobes with 1-3 small additional bristles. Pleural integument yellowish brown; propleuron with pale golden yellow narrow or rather narrow scales; subspiracular area bare; pale golden yellow narrow curved scales on postspiracular area, upper and posterior margins of sternopleuron and on upper mesepimeron; many dark or pale yellow propleural bristles, 6-8 spiraculars, no postspiraculars; many fine yellow sternopleurals along upper to posterior margin, 2 long and dark bristles at middle of posterior margin; many fine upper mesepimerals, 2 lower mesepimerals. *Wing.* Base of vein r_{4+5} densely scaled. Halter with pale scaled brown knob. *Legs.* Forecoxa covered with brown rather narrow scales on anterior surface, with pale yellowish latero-basal scales; mid- and hindcoxae with pale yellowish rather narrow scales. Femora, tibiae and tarsi clothed with dark brown scales except on the parts described below. Forefemur pale scaled in posterior half; midfemur pale scaled on most posterior surface; hindfemur basally pale scaled on lower half of anterior surface and most of posterior surface; foretibia mostly pale scaled; midtibia with a white streak on each side, the streak on posterior side wide, that on anterior side obscure; hindtibia with a white streak on each side; foretarsomere 1 with a white streak on each side, the streak on anterior side rather obscure, 1-5 each with a pale basal band, the bands usually incomplete, 1 and 2 with white scales at apex forming articular bands with white basal bands of 2 and 3, midtarsomeres 1 and 2 with a pale streak on posterior side and with both basal and apical incomplete pale bands, 3-5 each with incomplete pale basal band, the band of 5 usually indistinct; hindtarsomeres 1 and 2 with a pale streak on each side, 3 with a pale streak on anterior side, 1 and 2 with both basal and apical incomplete pale bands, 3 and 4 each with an incomplete pale basal band. Foretarsomere 5 slightly longer than 4; hindtarsomere 1 0.76-0.86 (3) of tibia. *Abdomen.* Covered with golden yellow scales.

MALE (Figs. 26, 173). Wing length 4.5-4.8 mm. Antenna slightly more

than half as long as palpus. Palpus nearly half as long again as proboscis, clothed with pale golden scales; segment 3 with a basal and a subapical band of dark brownish scales; 4, 5 and basal half of 2 with scattered dark brownish scales; length ratio of 2-5 : 0.8 : 1.6 : 1.0 : 1.0. Proboscis slightly longer than forefemur. *Genitalia*. Tergum VIII slightly protrudent at middle of apical margin, with several stout setae. Tergum IX with lobes barely protrudent, wide, bearing 7-13 bristles. Sternum IX crescent-shaped, without bristles. Basistyle subtriangular, apically tapering, about 2.3 times as long as basal width, bristled except on ventral basal part, lateral bristles larger; claspette triangular, with 6, 7 stout setae at apex (apicalmost one largest), covered with bristles on tergal surface; apical lobe absent. Dististyle 0.6 length of basistyle, narrow, slightly widened basally, curved before apex, with several minute setae on apical half; claw very short. Paraproct strongly sclerotized at apex, usually with 3 (sometimes 2) stout recurved spine-like teeth; cercal setae 4-7. Aedeagus slightly constricted at about apical 0.6, 1.45-1.77 (2) times as long as wide, divided by a wide tergal orifice and a narrow sternal median slit, apparently connected only at apex tergally, more or less protrudent at middle of apex, well sclerotized at apex and mesosternal edges.

LARVA (Fig. 25). *Head*. Width 1.58-1.69 mm (2); yellowish brown, 1.47-1.50 (2) times as wide as long; labrum with anterior margin straight; seta 1-C slender, poorly pigmented, 0.38-0.50 (8) as long as distance between bases; 4-C about on level of 7-C; 5, 7-C on a line; 6-C occasionally with a short accessory branch at base; usually, 8-C double and 14-C single. *Antenna* 0.91-1.03 mm (2) long, nearly as long as head, somewhat sigmoid, brown at base and distad of 1-A, strongly spiculate excepting apex; 1-A inserted at apical 0.29-0.36, with about 30 barbed branches, extending far beyond tip of shaft; 2, 3-A at apical 0.10-0.14 (6), fairly long, pigmented; 4, 6-A apical; 4-A subequal to 2-A; 6-A short; 5-A shorter than 6-A, with an accessory sensorium on proximal division. *Mandible* (1 dissected specimen) with a number of hair-like microspines dorsolaterally near base; MdS_1 lightly pigmented, MdS_3 and MdS_4 progressively shorter, pale; MdS_2 about half as long as MdS_1; MdS_5 pale, 0.5 of MdS_1. Mandibular comb of 14-17 hairy prominences (teeth). Cutting organ with 2 simple dorsal teeth, mesal tooth larger than VT_0; ventral tooth with one lateral (VT-4) and 3 mesal denticles (VT_{1-3}), VT_2 longer than VT_1 and VT_3; ventral blade rather slender, with fine mesal pectination; pectinate brush of 16 hairs. Piliferous process with only 3 groups of hairs ($PPH_{1, 2, 4}$); a rather large sclerotized round prominence about at the site of PPH_3; a few denticles basally on anterior surface and posteriorly on dorsal surface. Mandibular hairs (8-10) + 12, laterally barbed; hairs of anterior group apically frayed, those of posterior group apically tufted. *Maxilla* (1 dissected specimen). Cardo rather broadly fused mesobasally with cranium, the fusion not strengthened by a striplike thickening of the cuticle along the anterior margin of cranium; 1-Mx single or double. Mesostipes 1.35 times as long as wide, peach-shaped; parartis at confluence of lacinial suture and strongly sclerotized dorsobasal margin; lateral surface smooth; stipital sensoria equal, at basal 0.4; 4-Mx lightly pigmented; 2, 5, 6-Mx unpigmented; $4 \leq 5 > 6 > 2$-Mx in length; 5-Mx between stipital sensoria and base. Palpostipes short, apically narrowed, excluding lateral artis about 0.33 as long as mesostipes; S_1 broadest, $S_3 > S_5 > S_1 = S_2 = S_4$ in length. *Mentum plate* broadly triangular, with 19-23 teeth, median tooth larger than immediate flanking teeth, flanking teeth progressively larger laterally. Aulaeum with a sclerotized triangular median tooth. *Thorax*. Barbing of strong thoracic setae usually rather weak and sparse except for 7, 8-P, 8, 9-M and 7, 9-T; 9, 12-P longer than 10-P; usually, 14-P double, 4-M

triple and 5-T single. *Abdomen.* Setae 4-I, 13-II, 13-VI and 6-VII with many apical secondary branches; 6-I shorter but more strongly pigmented and barbed than 6-III-VI; 7-I and 6-II rather short but pigmented and strongly barbed; 13-III-V each consisting of a large main branch and 2 short branches; 1-IV-VII and 3-VII rather well developed; 1-IV-VI and 10-VII smooth to distinctly but sparsely barbed; 14-IV, VI, VII and 3, 12-V usually single; 13-I, 7-VI and 3, 4, 7-VII usually double; 11-I and 8-IV usually triple. Comb scales about 60 to 100 in a patch; individual scales elongate, broad-based, laterally and apically fringed with spicules, the apical spicules slightly longer. *Siphon* long and slender, light brown, very dark on basal margin except for attaching point of acus, broadest at base, apex 0.58-0.63 as wide as base; length 2.04-2.40 mm, index 5.73-6.45 (3); microsculpture of short rows of minute denticles; pecten reaching only basal 0.11-0.23, of 7-12 teeth, a few teeth basad of siphon, 1-4 apical teeth detached; each tooth with several long denticles, detached teeth with fewer denticles; 1-S at base subventrally on somewhat prominent base, longer than siphon diameter; 2-S at apex, very short. *Saddle* 0.50-0.55 mm long, with weakly sclerotized acus; microsculpture similar to siphon laterally and ventrally, but the rows shortened and the denticles dorsally developed into short acute spicules; 1-X as long as or shorter than saddle; 3-X with 3 unequal branches; 4-X of 11-13 cratal and 6-7 precratal tufts (18-19 in total), the latter placed on saddle, most proximal tuft fairly close to base of saddle, each tuft with 5 to about 10 branches. Anal gills tapering to pointed apex, 0.9-1.9 (5) length of saddle, ventral gill usually slightly longer than, occasionally equal to dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 2♂, 6♀, 11 L, 4 l: Hokkaido (A-0038, A-0043, A-1662, A-1681, A-2077, A-2078, A-2125, A-2126, A-2127).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). KOREA.

BIONOMICS. Not common in Hokkaido, apparently rare in Honshu. Larvae were obtained in ground pools in Hokkaido. The species may emerge twice a year or more; the larvae are found frequently associated with *Anopheles sinensis* (? = Engaru race) and *Culex orientalis* (Sato and Iwase 1959). While disease relationships of this species are not known, several members of the genus have been found naturally infected with arboviruses (Dobrotworsky 1971), and therefore should be considered of potential medical importance.

SUBGENUS *CULISETA* FELT

Culiseta Felt, 1904: 391c. Type-species: *Cs. absobrinus* Felt.

FEMALE. Spiracular bristles usually many. Wing membrane often with dark spots; bristles on underside of base of subcosta numerous; vein m-cu close to r-m or well proximad of it. Femora and tibiae without marks other than apical fringe spots; tarsi all dark or pale banded. Abdominal terga usually with pale basal bands.

MALE. Palpus as long as or longer than proboscis; segments 4, 5 and apex of 3 hairy. Tergum IX without protrudent lobes. Basistyle often with subapical lobe or subapical patch of hairs.

LARVA. *Head* moderately broad; antenna about half as long as head; seta 1-A moderately developed, at or proximad of middle; 2, 3-A close to apex, moderately long. Mouth brush of moderate size. *Mandible:* mandibular comb of stout setiform teeth. *Maxilla* of browsing type, mesostipes about as long as

wide, with some spine-like stout spicules on mesal margin; hairs of maxillary brush rather short, some hairs stiff. Lacinia also with some hairs stiff. Palpostipes rather short, a little more than half as long as mesostipes. Aulaeum without median tooth. *Abdomen.* Comb scales many in a patch. Siphon short or moderately long; pecten followed by a row of simple hairs distally; 1-S at or near base of siphon, no accessory setae. Seta 3-X branched; 4-X with or without precratal hairs.

DISTRIBUTION. Holarctic region.

Only one species occurs in this region.

17. *CULISETA (CULISETA) KANAYAMENSIS* (YAMADA)*
(Figs. 26, 27, 174; Table 54)

Theobaldia kanayamensis Yamada, 1932: 218 (♀). Type-locality: Kanayama, Hokkaido, Japan.

Culiseta (Culiseta) kanayamensis: LaCasse and Yamaguti, 1950: 80 (♂, ♀, L); Stone, 1961: 44, Korea.

Culiseta (Culiseta) impatiens: Suzuki, 1975: 299, Oze, Honshu, Japan; Kamimura, 1976b: 241 (misidentification of Suzuki).

FEMALE (Fig. 174). Wing length 6.3-6.8 mm. *Head.* Eyes narrowly separated above and below. Vertex covered with pale yellowish narrow curved scales, eye margin more densely scaled; numerous dark brown erect forked scales over vertex excepting anterior area; tempus heavily covered with pale yellowish, rather broad scales; more than 10 vertical bristles and 4-5 temporal bristles on each side, bristles on or near interocular space yellowish brown, others dark. Clypeus dark brown. Antennal pedicel brown, mesal side darker, with pale small scales and fine bristles; flagellum 0.75-0.79 (3) of proboscis; flagellomere 1 1.06-1.18 (3) of Flm 2, with pale small scales on mesal side; Flm 3 longer than Flm 1. Palpus 0.19-0.21 (3) of proboscis, dark scaled, with fairly many pale scales basally; segment 3 2.15-2.84 (3) of 2, 4 very small, papilliform. Proboscis 1.22-1.24 (2) of forefemur, dark scaled, with several ventrobasal bristles. *Thorax.* Pronotal integument very dark brown; anterior lobe covered with pale yellowish narrow curved and whitish crescent-shaped scales, rather narrow, flat truncate scales anterolaterally, many pale to dark brown bristles of various sizes over entire surface; posterior lobe covered anterodorsally with yellowish narrow curved scales and posteroventrally with white, rather broad scales, bearing more than 10 yellowish to dark brown bristles of various sizes near posterior margin. Scutum with integument dark brown, with a pair of light brown integumental submedian stripes from anterior promontory to prescutellar space, covered with dark brown and yellow narrow curved scales except for unscaled apices of submedian integumental stripes, scutal angle, prescutellar space and narrow lateral parts of posterior margin; the yellow scales predominant on anterior

*After the completion of the manuscript, Danilov (1976: 185) synonymized *kanayamensis* with *bergrothi* (Edwards 1921c: 50. Type-locality: Sweden).

margin, supraalar area and margin of prescutellar space, forming a rather obscure median line and a pair of distinct sublateral stripes just laterad of series of posterior dorsocentral bristles, the scales near posterior margin whitish; scutal bristles dark brown, rather short except for most posterior bristles. Scutellum covered with white narrow curved scales on median lobe, yellow narrow curved scales on lateral lobes, each lobe bearing about 10 or more dark brown long bristles and several short yellowish ones. Paratergite with rather broad white scales. Pleural integument brown to dark brown; patches of rather broad white scales on propleuron, postspiracular area, subspiracular area, lower flank of prealar knob, posterior sternopleuron and upper 0.67 of mesepimeron; metameron with several white scales; pleural bristles whitish yellow to yellowish brown, many on propleuron, prealar knob, upper to posterior sternopleuron and upper mesepimeron, 7 to more than 10 spiraculars, 3-5 anterolower mesepimerals; a few pale fine bristles on postspiracular area close to paratergite. *Wing*. Veins dark scaled. Membrane slightly darkened and veins more densely scaled at bases of rs and r_{4+5}, thus forming 2 rather obscure dark spots. Cell R_2 1.96-3.18 (6) of vein r_{2+3}. Halter knob dark, pale scaled. *Legs*. Forecoxa mainly pale scaled, dark scales mixed on anterior surface; mid- and hindcoxae pale scaled. Femora with distinct pale apical spot; forefemur with a narrow pale streak on anterior surface, pale on posterior half of underside; midfemur with a narrow pale streak on anterior surface, pale on posterior surface excepting subapical area; hindfemur pale in lower half of anterior surface, the pale area basally broadened and apically narrowed, posterior surface pale except subapical area. Tibiae with pale apical fringe; fore- and midtibiae with pale streak on posterior surface. Femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 as long as or slightly longer than 4; hindtarsomere 1 0.83-0.93 (6) of tibia. *Abdomen*. Tergum I with median patch of pale scales; II-VII dark scaled, each with a basal band of pale scales, the band apparently extending distally on lateral aspect. Sterna pale scaled, with rather obscure dark apical bands or lateroapical spots.

MALE (Figs. 26, 174). Wing length 5.9-6.3 mm. Antennal pedicel dark brown, glabrous; flagellum 0.58 (1) of proboscis; flagellomere 12 1.13 (1) of Flm 13, both 1.17 of Flm 1-11. Palpus 1.10 (1) of proboscis, dark scaled, apical 0.75 of ventral side of segment 3 with numerous long bristles, 4 and 5 also bristled; length ratio of 2-5 : 0.67 : 1.27 : 0.88 : 1.00 (1). Proboscis 1.32 (1) length of forefemur. Cell R_2 1.23-1.48 (2) of vein r_{2+3}. Tarsomere 4 of fore- and midtarsi about twice as long as broad; foretarsomere 5 1.77-1.94 (3) length of 4; midtarsomere 5 1.47-1.56 (3) length of 4. Anterior claw of foretarsus somewhat sinuate, anterior claw of midtarsus more evenly arcuate. *Genitalia*. Tergum VIII with a short narrow medioapical lobe bearing 10-17 short stout setae densely arranged on the apical margin; IX well sclerotized, lobes broad, convex, moderately separated, each bearing 18-25 bristles. Sternum IX short, moderately sclerotized in basal half, membranous in apical half, with 0-2 apical bristles at middle. Basistyle subcylindrical, broadest at sternal base, about 3 times as long as wide, sternobasally scaled, bristled over entire surface, the bristles long laterally and apically, sparse sternally; claspette rather weakly protrudent, bearing 2 or 3 apical setae; apical lobe absent. Dististyle lightly pigmented, 0.63-0.71 (2) length of basistyle, slender, arcuate, with a number of minute apical setae, 1 or 2 stouter setae about at basal 0.33 on concave side; claw short, apical. Cercal tergal surface weakly sclerotized; 4 cercal setae on each side; paraproct laterally well sclerotized and apically strongly sclerotized, apex 3-toothed. Aedeagus well sclerotized, broadest near base, strongly constricted at basal 0.25, expanded at middle and

apically narrowed, 1.85-2.02 (2) times as long as wide, 2.17-2.38 (2) times as long as median width, broadly open tergobasally, the tergal opening apically narrowed, the lateral walls almost overlapping each other in middle; sternal side open in a narrow median slit, the slit interrupted in basal 0.33 by a weakly sclerotized broad bridge.

LARVA (Fig. 27). *Head.* Width 1.30-1.43 mm; light brown, 1.22-1.36 (7) times as wide as long; apical margin of labrum concave; seta 1-C pigmented, rather slender; 4-6-C a little posterior to 7-C; 4-C slightly anteriad of 6-C; 5-C with 2-5 more branches than 6-C; 6-C nearly on or slightly anteriad of a line between 5,7-C; 10-C usually 2-4 forked, rarely single; 11-C moderately developed; usually, 9-C double and 14-C single; 18,19-C present, single or double. *Antenna* 0.48-0.58 mm long, becoming apically brownish, finely spiculate, usually somewhat swollen at insertion of 1-A; 1-A inserted at basal 0.35-0.42, with 11 to about 20 barbed branches, barely reaching apex of shaft. *Mandible* with a number of, occasionally only a few, simple microspines dorsolaterally near base; $MdS_{1,3,4}$ long, arcuate, progressively shorter; MdS_2 about half as long as MdS_1; MdS_5 nearly straight, more than half as long as MdS_1. Mandibular comb with teeth setiform, stout, as well developed as in *Aedes (Ochlerotatus)* spp. Cutting organ with a single strong dorsal spine nearly attaining tip of VT-4; lateral dorsal tooth smaller, 2 or 3 cuspid or with 1 or 2 mesobasal denticles; mesal dorsal tooth smaller than VT_0, with several mesobasal denticles and a few accessory denticles; ventral tooth with 2 or 3 lateral (VT-1,2,4) and 3 mesal denticles (VT_{1-3}), VT-1,2 small, VT-4 as long as mesal dorsal tooth but more slender, VT_2 longer than VT_1 and VT_3; ventral blade single, strong, with well developed mesal pectination in a single row in basal half, in a double row in apical half; pectinate brush of 9,10 mesally pectinate hairs. Piliferous process with the 5 usual hair groups. Mandibular hairs (7-9) + (11-14), hairs of anterior group barbed, hairs of posterior group apically tufted. *Maxilla.* Cardo very narrowly fused mesobasally with cranium, 1-Mx usually 2-4 branched, rarely single or 5 branched. Mesostipes slightly broader than long; confluent point of well sclerotized lacinial suture and strongly sclerotized dorsobasal margin expanded into a poorly sclerotized flap which forms parartis; lateral surface smooth; stipital sensoria equal or subequal, at apical 0.25; 6-Mx simple, slightly shorter than 4-Mx, longer than 2-Mx; 5-Mx at about middle, distinctly proximad of stipital sensoria; hairs of lacinia very dense. Palpostipes short and broad, apically narrowed, excluding lateral artis slightly more than half as long as mesostipes; S_1 broadest of all, length of sensoria somewhat variable but S_1 and S_3 always longer than others. *Mentum plate* rather narrowly triangular, with 27-32 teeth, lateral teeth larger and more widely spaced than median teeth. *Thorax.* Setae 2,5-P usually single; 9,12-P longer than 10-P; 14-P smooth to distinctly barbed; 13-T rather well developed. *Abdomen.* Setae 4-I, 13-II, VI, 7-III-V and 6-VII with many secondary apical branches; 6-I, II and 7-I slightly shorter than 6-III-VI, but more strongly barbed; 7-II and 4-V with rather few long barbs; 1-III rather strong; 1-V often with a small secondary branch; 5-I, 4-II and 5,8-VII often dendritic; 10-VII smooth to distinctly barbed; 10-I, II, 9, 14-III, 2,9,14-IV, 12,14-V, 14-VI, 12,14-VII and 4-VIII usually single; 12-I, 1,3,12-II, 3,10-IV, 4-VII and 2-VIII usually double; 1-IV and 13-V usually triple; 6,9-I usually 4 branched. Comb scales 63-95 in a patch; individual scales parallel-sided or paddle-shaped, evenly fringed laterally and apically with spicules. *Siphon* light brown, dark in basal margin, with acus, slightly broadened from base to basal 0.25, 3.08-3.53 as long as wide, apex 0.57-0.68 as wide as greatest diameter; length 1.34-1.63 mm, index 3.38-3.97;

microsculpture consisting of distinct short ridges bearing extremely minute denticles; pecten reaching basal 0.18-0.26, with 14-26 dark brown, evenly spaced teeth including 0-3 basal abortive teeth, the teeth progressively larger apically, each with a few rather long ventral denticles; a row of 11-19 evenly spaced simple hairs immediately distad of pecten, the apical hair at apical 0.22-0.40 of siphon, occasionally one or 2 basal hairs within pecten; 1-S fairly long, at basal 0.11-0.17 on a somewhat prominent base. *Saddle* 0.41-0.50 mm long; microsculpture similar to that of siphon but weaker; 1-X shorter than saddle, usually triple; 3-X with unequal branches; 4-X of 16-17 cratal and 3-4 precratal tufts (19-21 in total), each 6-16 branched. Anal gills variable in length and shape, 1.5-3.1 length of saddle, apically tapering with pointed apex (usually when short) or parallel-sided with blunt apex (usually when long); ventral gill usually slightly longer than, occasionally equal to or slightly shorter than dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 3♂, 9♀, 17 L: Hokkaido (A-0031, A-0200, A-0201, A-0217, A-0224). 4♂, 3♀, with associated skins (3 l, 3 p); 49 L, 13 l: Honshu (C-1190, C-1191, C-1192, C-1193, C-2334).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). KOREA.

BIONOMICS. Rather common in Hokkaido, restricted to high mountains in central Honshu. The larvae have been found in natural ground pools, irrigation ditches and artificial containers such as barrels, water tanks usually with decayed leaves on the bottom. Adult females bite man. As several species of *Culiseta* are known to be involved in arbovirus transmission (Dobrotworsky 1971), this species may be of potential medical importance.

4. GENUS *ORTHOPODOMYIA* THEOBALD

Orthopodomyia Theobald, 1904b: 236. Type-species: *Or. albipes* Leicester, 1904; Malaya.

Medium-sized conspicuously ornamented mosquitoes; larvae reddish or purplish brown in color, mature 4th stage larvae with large sclerotized plates on abdominal segments VII and VIII.

FEMALE. *Head.* Eyes separated above. Vertex including interocular space with narrow decumbent scales; erect scales numerous, over entire vertex. Antenna longer than proboscis; flagellomere 1 1.2-1.3 *(anopheloides)* of Flm 2. Palpus rather long, 0.33-0.60 of proboscis, pale banded; segment 4 frequently present, scaled. Proboscis shorter than forefemur, pale banded and spotted. *Thorax.* Anterior pronotal lobes widely separated, bristled; posterior pronotal lobe with few bristles along posterior margin; both lobes scaled. Scutum with pale and dark narrow scales; all scutal bristles well developed. Scutellar scales narrow, rather long, pale. Postnotum bare. Paratergite moderately broad, bare. Prosternum scaled. Pleura with scale patches except on postspiracular area; spiracular, postspiracular, upper sternopleural and lower mesepimeral bristles absent; prealar bristles absent or one; propleural, lower sternopleural and upper mesepimeral bristles present. Base of mesomeron well above that of hindcoxa. *Wing.* Squama fringed with hair-like scales; alula fringed with scales. Dorsal remigial bristles absent. Veins spotted with pale scales, scales rather broad. Cell R_2 longer than vein r_{2+3}. *Legs.* Ornamented. Fore- and midtarsomere 1 longer than 2-5; foretarsomere 5 longer than 4; midtarsomere 5 as long as or longer than 4; hindtarsomere 1 slightly longer than tibia. Claws equal and

simple. *Abdomen.* Terga ornamented; I hirsute; laterotergite scaled. Segment VIII not retractile. Seminal capsules 3, one slightly larger than the other 2.

MALE. Antennal flagellum distinctly plumose, shorter than or as long as proboscis; 4-5 basal flagellomeres with scales; Flm 12 and Flm 13 elongate. Palpus straight, 0.7-0.9 length of proboscis, apex not hairy. Proboscis shorter or nearly as long as forefemur. Fore- and midtarsomere 4; greatly shortened, much shorter than 5, foretarsomere 5 strongly modified, with conspicuous ventrobasal swelling, bearing several pairs of short stiff setae; midtarsomere 5 weakly modified. Anterior claw of fore- and midtarsi enlarged, with blunt-tipped median tooth; posterior claw simple; both claws of hindtarsus equal and simple. Genitalia. Tergum VIII with medioapical lobe; IX weakly sclerotized, with bristles on each side but without lobes. Basistyle rather long, without mesal membrane, extensively scaled; claspette (basal mesal lobe) short, rounded, bearing several thick setae and many fine bristles; basal and apical tergal lobes absent. Dististyle simple, with a number of fine setae and a terminal claw. Cercal setae present; paraproct with strongly sclerotized apical teeth. Aedeagus simple, open sternally, with large tergobasal orifice.

LARVA. Reddish or purplish brown. *Head* slightly to distinctly broader than long; setae 4-7-C posteriad of antennal base; 4-C branched and barbed; 11-C often dendritic. *Antenna* smooth; 1-A branched, barbed, inserted at basal 0.3-0.5 of shaft; 2-6-A apical. Mouth brush of fine numerous hairs. Mandible with 3 mandibular spurs, MdS_1 longest, curved, strongly pigmented, MdS_3 similar, but shorter and paler, MdS_5 shortest, attenuated in apical half, mesally pectinate. Mandibular brush well developed; mandibular comb of flexuous teeth. Cutting organ with 2 dorsal teeth, lateroventral one multicuspid, mesodorsal one 1-3 cuspid; ventral tooth with 3 acute mesal denticles and various basal denticles; 2 ventral blades, VB_1 extending well beyond apex of VT_0; pectinate brush well developed. Piliferous process well protrudent, with 5 hair groups; labula extending beyond apex of anterior part. Mandibular hairs divided into 2 groups. *Maxilla.* Cardo free from cranium, apparently directly articulating with mesostipes anteriorly by a dorso-anterior process, apparently ventrolaterobasally fused with laterostipes. Mesostipes longer than wide, without strong spine-like spicules; parartis at termination of lacinal suture, articulating with a well developed rod of paracoila; pseudoartis undeveloped, stipital sensorium single, small, about at middle, without basal ring; ventral stipital seta 4-Mx pale, only slightly longer than dorsal stipital seta 2-Mx. Lacinia with 3 hair groups distinct, mesal group confluent with median group at about anterior 0.33. Proximal lacinial seta 5-Mx slightly proximad of level of stipital sensorium; distal lacinial seta 6-Mx at apex. Palpostipes rather long and narrow, shorter than mesostipes, apically cylindrical, without lateral stipital seta 2-Mx; apex with ampulla and at least 4 palpal sensoria ($S_{1,4}$); $S_{1,2,4}$ with basal ring. *Mentum plate* with median tooth much larger than submedian teeth, lateral flanking teeth larger than mesal flanking teeth and more widely spaced; aulaeum without median tooth. *Thorax.* Setae 1, 5-P, 5, 6, 10-M and 10-T very long; 0-P 13, 14-M and 8-T with many fine secondary apical branches. *Abdomen.* Segments VII and VIII in mature larvae with large sclerotized plates; 0, 14-I, 14-II absent; 6-I, II rather strong, multiple and branched, 6-III, V, VI very long, single; 6-IV shorter, single or double; 4, 12-I, 4, 13-II, 7-III-V, 1, 4, 7, 13-VI with many fine secondary apical branches. Comb scales in 2 regular rows, scales of posterior row much larger. *Siphon* moderately to very long, without pecten,

with 1 pair of 1-S at basal 0.3-0.5. *Saddle* complete; 2-X branched, 3-X single, 4-X of usually 14 multibranched cratal hairs.

DISTRIBUTION. Palaearctic, Oriental, Nearctic and Neotropical regions; Madagascar.

This genus is represented by only one species in this region.

18. *ORTHOPODOMYIA ANOPHELOIDES* (GILES)
(Figs. 28, 29, 175; Table 55)

Mansonia anopheloides Giles, 1903: 315 (♂, ♀, L). Type-locality: Dehra Dun, India.

Orthopodomyia (Orthopodomyia) nipponica LaCasse and Yamaguti, Mar. 1948: 264 (♂, ♀, L). Type-locality: Kyoto, Japan.

Orthopodomyia (Orthopodomyia) anopheloides: Sasa and Asanuma, Nov. 1948: 72.

Orthopodomyia anopheloides nipponica: LaCasse and Yamaguti, 1950: 58 (♂, ♀, L).

Orthopodomyia anopheloides: Gentry, 1957: 82; Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 175). Wing length 2.9-4.3 mm. *Head.* Eyes contiguous beneath. Vertex roughly covered with pale yellowish narrow curved scales, interocular space and eye margin covered more densely with such scales; erect forked scales yellowish brown, pale yellowish apically; tempus with a spot of dark broad scales, covered with pale yellowish narrow curved scales above the spot and with pale broad scales below the spot; 3 or 4 dark vertical and 1-3 (usually 2) temporal bristles on each side. Clypeus dark brown. Antennal pedicel brown, mesal surface dark, covered with small pale yellowish scales and bearing a few short bristles; flagellum 1.11-1.17 (5) of proboscis; flagellomere 1 1.21-1.28 (5) of Flm 2, dark in basal half and at apex, with rather long, pale scales above and short pale scales mesally; Flm 2-7 (often up to Flm 10) dark at apex and base, pale in-between; remaining flagellomeres dark. Palpus 0.42-0.48 (5) length of proboscis, dark scaled, with a small pale dorsoapical spot on segment 1 and a pale articular band at joint 2-3, apex (very short segment 4) pale scaled; 3 1.27-1.56 (5) of 2. Proboscis 0.86-0.94 (5) of forefemur, bearing 2 ventrobasal bristles, dark scaled, with a pale band at apical third (occasionally extending distad ventrally), and a pale dorsosubapical patch (sometimes reduced) distad of the band. *Thorax.* Pronotal integument dark brown; anterior lobe covered with white or pale yellowish broad scales except midposterior portion, dorsal scales occasionally more yellowish and narrower, about 10 bristles of various sizes, usually 3-4 bristles long and stout; posterior lobe with pale yellowish (occasionally golden yellow), rather narrow, curved scales anterodorsally and whitish broad scales posteriorly, bearing 2-3 long bristles and often 1-2 additional short ones. Scutum with integument grayish brown to dark brown, with prescutellar space appearing darker, covered with pale yellowish and dark brown, narrow curved scales except for unscaled narrow anterosubmedian lines, rather broad posterior dorsocentral lines, a small area behind scutal angle and posterior prescutellar space; paired patches of outstanding dark erect slender scales at anterior ends of posterior dorsocentral lines; scales on margins broader, those

on humeral margins more whitish; dark brown narrow decumbent scales forming ill-defined patches: 2 on median line, 2 on dorsocentral line, one on fossal area, the fossal patch fused with 2nd dorsocentral patch; occasionally most of anterior median and dorsocentral areas occupied by dark brown scales, thus forming a single large rhomboidal patch; sometimes scales at posterior end of median line, posterior part of anterior dorsocentral lines, anterior and posterior fossal area, supraalar area and on margins of prescutellar space golden yellow; scutal bristles dark brown; usually one or 2 humeral bristles and one or 2 angulars rather distant from humeral margin and scutal angle respectively; 1-3 posterior fossals. Scutellum rather pale brown, each lobe covered with pale long slender scales and bearing 4-8 long bristles together with several short ones. Prosternum densely covered with broad white scales. Pleural integument dark brown; propleuron densely covered with broad white scales; patches of white or pale yellowish broad scales on subspiracular area, lower flank of prealar knob, sternopleuron and lower mesepimeron; upper mesepimeron with a patch of pale yellowish crescent-shaped scales; 4-9 propleural bristles, 1 (rarely 2) long and 2-5 fine lower sternopleurals, 7-11 pale upper mesepimerals, no prealars.
Wing. Alula fringed with dark narrow scales. Veins dark scaled, with following clear spots of white scales: vein c with 8 spots - basal, subbasal, humeral, posthumeral, sector (proximad of rs), subcostal, preapical and apical; humeral spot extending onto r and cu (long), and often onto 1a; sector spot onto sc and r; subcostal spot onto sc, r_1, fork of rs and m; preapical spot onto r_1 and bases of r_2 and r_3; apical spot onto r_{1-3} and longest on r_3; r with accessory sector spot including base of rs; tips of r_{1-3} dark; r_{4+5} with pale apical spot, usually with a few dark scales at tip; m with a spot at m-cu; m_{1+2} and m_{3+4} with basal and apical spots; cu_1 with spots at m-cu and apex; cu_2 with apical spot, occasionally reduced. Cell R_2 1.17-1.48 (5) length of vein r_{2+3}. Halter with pale scaled knob, often some dark scales also present.
Legs. Forecoxa covered with broad white or pale yellowish scales; midcoxa basally pale scaled, anteroapically dark scaled; hindcoxa basally and apical pale scaled, dark scaled in-between. Trochanters mainly pale scaled. Forefemur speckled with dark and pale scales, with ill-defined pale basal and subapical bands and distinct pale apical fringe; midfemur with distinct pale apical fringe, anterior surface speckled with dark and pale scales, with ill-defined pale basal and subapical bands, posterior surface mainly pale scaled, with a rather broad dark apical band; hindfemur similarly scaled to midfemur but basally darker on both sides. Anterior surface of tibiae speckled with dark and pale scales, with ill-defined dark subbasal and subapical bands, and distinct pale apical fringe; anterior surface of hindtibia often with more pale scales; posterior surface of tibiae mainly pale scaled except for dark bands corresponding to those on anterior surface. Tarsomeres 1 speckled with dark and pale scales; foretarsomere 1 with white, ventrally incomplete, basal band and often also apical band, 2 and 3 usually with only indication of dorsobasal pale spot, occasionally proximal 2 white articular bands distinct; midtarsus with white basal band on 1, and 3 white articular bands, 3rd band (on joint 3-4) usually incomplete, occasionally reduced; 4 sometimes entirely pale scaled; hindtarsus with white dorsobasal spot on 1, and 3 white articular bands (basal band or dorsobasal spot absent on 2), basal bands on 3 and 4 well developed, frequently more than half or at least about half of the segment length (specimens from Palaearctic Japan, Amami and Okinawa), or with 4 articular bands (basal band or dorsobasal spot present on 2) and basal bands on 3 and 4 less developed, usually less than half of the seg-

ment length (23 of 24 specimens from Yaeyama Guntô); hindtarsomere 5 entirely white scaled. Midfemur slightly thickened basally; midtarsomere 5 as long as 4; hindtarsomere 1 1.09-1.17 (5) of tibia. Hindtarsal claw about 0.7 length of foretarsal claw. *Abdomen.* Tergum I with a patch of medial dark scales and scattered laterobasal pale scales; laterotergite heavily covered with pale scales; II-VII dark scaled, with basal band, a pair of median spots, and laterobasal and lateroapical patches of pale scales; the basal band and median spot often reduced in anterior segments, more developed in posterior segments, occasionally confluent on VII; the basal band frequently confluent with laterobasal patches in posterior segments; the laterobasal and lateroapical patches more developed in anterior segments, the latter extending anteriorly along lateral margin and often fused with laterobasal patch; VIII with pale basal band, sometimes entirely pale scaled. Sterna dark scaled, with pale narrow basal band.

MALE (Figs. 29, 175). Wing length 2.8-4.2 mm. Antennal flagellum 0.85-1.01 (3) length of proboscis, with long slender white scales on basal 5 flagellomeres; Flm 12 and Flm 13 together 0.76-0.93 (3) of Flm 1-11; Flm 12 1.21-1.27 (4) of Flm 13. Palpus 0.76-0.83 (4) of proboscis, dark scaled, with pale spot (occasionally reduced) on segment 1 and pale articular band at joint 2-3; apices of 3 and 4, and entire 5 pale scaled; 4 with 2 rather long apical bristles; length ratio of 2-5 : 5.00-6.66 : 6.00-7.78 : 2.00-2.66 : 1.00 (4). Proboscis 0.90-0.95 (3) of forefemur, the pale band median in position. Cell R_2 0.97-1.27 (5) length of vein r_{2+3}. Hindtarsomere 1 1.07-1.23 (5) of tibia. *Genitalia.* Tergum VIII with a prominent narrow posteromedian lobe; IX bearing 2-4 fine bristles on each side. Sternum IX medioapically emarginate, without bristles. Basistyle subcylindrical, 3.3-3.7 times as long as wide, bristled except laterobasally, scaled except for mesal surface and apex of tergal surface; claspette only slightly protrudent, bearing 3-6 (usually 4 or 5) lightly pigmented, thick setae; interbasal fold mediobasally interrupted. Dististyle slightly less than half as long as basistyle, about 7 times as long as wide, somewhat swollen basally and apically, with 8-13 fine setae on apical 0.6; claw 0.2 as long as dististyle, pigmented, simple. Paraproct strongly sclerotized apically, with 3 (rarely 2) finger-like apical teeth; 2-5 (usually 2 or 3) cercal setae. Aedeagus oval and slightly constricted at middle in tergal view, fairly large, slightly more than 0.33 as long as basistyle, 1.48-1.67 (4) times as long as wide, weakly sclerotized except for the sternally strongly protrudent base, with a round tergobasal orifice and rather narrow sternal opening.

LARVA (Fig. 28). *Head.* Width 0.94-1.07 (x = 1.00) mm; usually brownish 0.99-1.07 (x = 1.03) times as wide as long; no evident microsculpture; labrum concave; seta 1-C moderately slender, curved ventromesad, separated by about 1.25-1.50 times length; 4-C posteriad of level of 7-C; 5-C larger than 6, 7-C, caudad of a point between 4- and 6-C; 6-C slightly anteriad of 4-C; 8-10-C relatively long and slender; 9-C usually double, 11-C usually with 5-6 main branches, each finely subdivided apically; 14-C relatively small and pale. *Antenna* 0.33-0.45 mm long, slightly more than 0.33 length of head, fairly uniform brown, slightly paler at apex, slightly arcuate, tapering beyond basal 0.33, lacking spicules or microsculpture except for a few short plicae at insertion of 1-A; 1-A usually 5-6 branched, well barbed, inserted at basal 0.19-0.26 of shaft, not attaining apex. *Mandible* with a few small needle-like microspines on middorsolateral aspect. Mandibular comb of 22-27 flexuous setiform teeth, arising from spiculate prominences, the lateralmost 5-7 somewhat reduced. Cutting organ complex, with 2 strong dark dorsal teeth,

mesodorsal one 1-3 cuspid, lateroventral one multicuspid, all cusps acute; accessory denticles appear as 1-3 weakly sclerotized elongate structures mesad of dorsal teeth, sometimes accompanied by additional smaller setiform structures; VT_0 often slightly concave apicomesally, VT_{1-3} usually acutely triangular, frequently with asymmetrical bases, VT_2 larger than the others; a triangular accessory denticle ventrad of and between VT_2 and VT_3; VT-4 indistinct; VB_1 slightly sinuate, mesal pectinations relatively long and fine; VB_2 much shorter, nearly transparent, with relatively long, coarse, bilateral pectinations; pectinate brush of 11-12 bilaterally pectinate hairs. Piliferous process with PPH_4 appearing to be completely divided. Mandibular hairs 5-8 in 2 widely separated groups, the 3-5 proximal hairs slightly tufted apically, the 2-3 distal hairs usually strongly frayed in apical 0.25. *Maxilla* with 1-Mx weak, pale and single. Mesostipes about 1.4 times as long as broad; stipital sensorium at about apical 0.4; 2, 4-Mx subapical. Lacinia with 6-Mx simple. Palpostipes elongate, slender, slightly expanded basally, concave in mesal aspect of basal 0.33, about attaining level of 2-Mx; $S_4 > S_3 > S_2 > S_1$ in length; S_5 apparently absent. *Mentum plate* with 19-23 teeth, the median tooth much larger than any of the flanking teeth, the flanking teeth becoming progressively larger laterad. *Thorax*. Integument usually with some degree of purplish-brown mottling; setae 0-P and 13-M usually with 9-11, 14-M and 8-T usually with 7-9 strong main branches, each apically subdivided into numerous fine branches; 3-T usually 4 branched, one or more of the branches usually apically frayed; 13-T quite variable in length. *Abdomen*. Integument usually mottled with some purplish-brown pigment; sclerotized plates of varying development dorsally on VII and VIII; 1-III, V usually long and single; 3-I, IV, 4-IV, 6-IV, VI, 7-I, VI, 8, 9-II, and 13-III usually double; 1-I, 5-III and 8-V frequently (61-72%) double; 5-II and 7-VI usually with 2-3 apically frayed main branches; 4, 12-I usually with 5-7, 4-II with 4-5, 13-II and 8-VII with 6-8, 7-IV with 8-10, 7-V with 7-8, 1-VI with 4-6, 13-VI with 14-18 and 6-VII with 6-9 strong main branches, each finely subdivided apically; 1-VIII fine, nearly always inserted on edge of sclerotized plate; 5-VIII sometimes inserted on edge of plate (see discussion). Comb scales 31-44 (x = 35.5), usually in 2 distinct rows, the anterior row with 22-32 (x = 25.7) relatively small, roughly paddle-shaped scales, each with numerous subequal apical spicules, the posterior row with 7-12 (x = 9.8) larger scales, each with 1-5 strong apical, and numerous weaker lateral spicules. *Siphon* brownish yellow to brownish, darker brown in basal ring, indistinctly darker distad of 1-S, with apical 0.1 distinctly paler, distinctly narrowed from level of 1-S at basal 0.38-0.44; length 0.92-1.31 (x = 1.08) mm, index 3.55-4.95 (x = 4.26); acus may or may not be evident (see discussion); no distinct microsculpture; 1-S not attaining apex of siphon; 2-S apical. *Saddle* lacking distinct microsculpture, ventrally shortened, 0.39-0.46 mm long dorsally, 0.17-0.21 mm long ventrally, usually with a narrow lateral accessory plate anteriad of it; 1-X relatively weak, apically frayed, 0.25-0.51 (x = 0.34) length of saddle; 2-X with one branch much longer than others; 4-X of 12-14 (usually 14), 4-20 branched cratal tufts, the basalmost tufts usually short and 4-6 branched, the main tufts usually 15-18 branched. Anal gills somewhat fusiform, dorsal gill 0.70-1.12 length of saddle, ventral gill 0.50-0.67 length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♀, with associated skins (1 l, 1 p): Mikura Is., Izu Shichitô (C-0099). 8 L: Shikoku (G-1270). 23♂, 36♀, with associated skins (12 l, 12 p); 10 L, 6 l: Kyushu (H-0081, H-0315, H-0316, H-0317, H-0318). 9 L: Yakushima (H-0809). RYUKYU ARCHIPELAGO: 1♂, 2♀: Amami Guntô (I-0301, I-1858). 4♂, 7♀, with

associated skins (4 l, 4 p); 20 L, 3 l: Okinawa Guntô (J-0413, J-0414, J-0459, J-0460, J-0468, J-0491, J-0496, J-0497, J-0505). 50♂, 34♀, with associated skins (19 l, 19 p); 63 L: Yaeyama Guntô (K-0146, K-0151, K-0179, K-0561, K-0563, K-0570, K-0571, K-0574, K-0577, K-0578, K-0579, K-0605, K-0614, K-0626, K-0639, K-0684, K-0698, K-0768, K-0791, K-0917, K-0923, K-0970, K-1245, K-1283, K-1341, K-1345, K-1359, K-1416, K-1445, K-1462, K-1589, K-1602, K-1610, K-1613, K-1737, K-1757, K-1773, K-2036, K-2058).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Izu Shichito, Shikoku, Kyushu, Yakushima, Tsushima). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). ORIENTAL REGION (excluding Celebes).

DISCUSSION. As pointed out by Zavortink (1968, 1971) *Orthopodomyia anopheloides* is an extremely variable species. In the larva, much of this variability in physical appearance is apparently age related, particularly in the development of the sclerotized plates on VII, VIII and X, and in the base of the siphon. In young 4th stage specimens, the plates are scarcely visible, and the siphon appears to have a small detached acus. As more mature specimens are examined, the plates are seen to become larger and more distinct, and the acus becomes embedded in the basal ring, finally appearing as a small, indistinctly paler spot. In fully mature 4th stage larvae, the plate on VII usually extends ventrad to the level of seta 6-VII, 3-VII usually inserted just caudad of the plate, but occasional specimens are seen with 3-VII on the plate. The plate on VIII is usually incomplete ventrally, but sometimes complete; insertion of 5-VIII on the ring is apparently independent of the completeness of the ring in mature specimens. Variability was also noticed in the development of the large comb scales, there being from 1 to 5 or more strong apical spicules. This appeared somewhat locality related; specimens from Okinawa and Kyushu usually having the main apical spicule at least twice as long as the immediate flanking spicules, specimens from Yaeyama usually with 3 or more subequal strong apical spicules, or having a central strong spicule less than twice as long as the immediate flanking spicules. Zavortink (ibid.) also mentioned the presence of a "hairy" form of *Or. anopheloides*, in which some larval and pupal setae were much more strongly developed than normal. One of our specimens was judged "hairy."

BIONOMICS. Common in southern Palaearctic Japan and the Ryukyu Archipelago. The larvae are tree hole breeders, occasionally found in shaded artificial containers (with fallen leaves) such as gravestones or small cement tanks. LaCasse and Yamaguti (1950) found larvae in stone bowls and flower holders of cut bamboo at cemeteries in Kyoto. The 4th stage larva may overwinter in Amami Ôshima (Wada et al. 1976). *Toxorhynchites manicatus* apparently does not feed on the larvae of *Or. anopheloides*, although often they are found together. Zavortink (1968) stated that *Orthopodomyia* larvae are apparently filter feeders, ingesting microorganisms and small particles strained from water. Adult habits are poorly known; apparently they do not bite man. Miyagi (1972b) found that the adults attacked chicks but not mice, reptiles and amphibians in the laboratory.

5. GENUS *MANSONIA* BLANCHARD

Mansonia Blanchard, 1901: 1046. Type-species: *Culex titillans* Walker, 1848; Brazil.

Medium-sized mosquitoes; larvae with siphon valves strongly modified for piercing plant tissues.

FEMALE. Eyes contiguous or narrowly separated above and below. Vertex with decumbent scales narrow, sometimes with broad scales laterally; erect scales numerous; 5-8 vertical and 4-5 temporal bristles on each side, often continuous. Antennal flagellum about as long as proboscis; flagellomere 1 1.2-1.6 of Flm 2. Palpus not more than 0.35 length of proboscis, very small segment 4 usually present. *Thorax*. Anterior pronotal lobes widely separated, bristled; posterior pronotal lobe with bristles near posterior margin. Scutum moderately arched, with narrow scales only; acrostichal bristles occasionally absent or reduced to a few anterior pairs, other scutal bristles developed. Scutellum with narrow scales. Postnotum bare. Paratergite narrow, bare. Pleura with scale patches small, often also reduced in number; spiracular bristles absent; postspiracular bristles present or absent; propleural, prealar, sternopleural and upper mesepimeral bristles present; lower mesepimeral bristles present, often in middle near anterior margin. Base of mesomeron above that of hindcoxa. *Wing*. Squama fringed with hairlike scales; alula fringed with lanceolate scales. Cell R_2 longer than vein r_{2+3}. Vein scales variable. Dorsal remigial bristles present or absent. *Legs*. Foretarsomere 5 longer than 4; midtarsomere 5 shorter to slightly longer than 4; hindtarsomere 1 distinctly shorter than tibia. Empodium occasionally modified. Pulvilli not developed. Claws equal and simple; those of hindtarsus at least 0.7 as long as those of fore- or midtarsus. *Abdomen*. Tip truncate. Tergum I hirsute; laterotergite unscaled.

MALE. Antenna strongly plumose, shorter or as long as proboscis; flagellomeres 12 and 13 elongate. Palpus as long as or longer than proboscis, segment 5 occasionally very short. Foretarsomeres 4 and 5 slightly to strongly modified, 5 longer than 4; midtarsomeres 4 and 5 simple or slightly modified, 5 longer than 4. Empodium of hind tarsus occasionally modified. Anterior claw of fore- and midtarsi enlarged, toothed; posterior claw simple; both claws of hindtarsus equal and simple. *Genitalia*. Tergum IX with or without bristle-bearing lobes. Sternum IX without bristles. Basistyle variable in shape, usually broad, with scales at least laterally; claspette present, with filament variable in shape. Dististyle irregular and variable in shape; claws small or absent. Cercal setae present; paraproct with strongly sclerotized apical teeth. Aedeagus rather simple, tergally closed, with tergobasal orifice, sternally widely open.

LARVA. (Extracted mainly from Belkin 1962). *Head* distinctly wider than long. Seta 1-C dorsal and removed from anterior border; 2-C rarely developed. *Antenna* always longer than cranium; 2,3-A removed a considerable distance from apex, distal part (distad of 2,3-A) narrow, smooth, variable in length, articulated or ankylosed at base; proximal part (proximad of 2,3-A) spiculate; 1-A long and densely branched. Mouth brush of numerous slender hairs. Mentum plate small; aulaeum with median tooth. *Thorax*. Setae 1-3-P close together near meson on a poorly defined common basal callus; 8-P short; 12-P strong; 13-P absent. *Abdomen*. Setae 6-I-VI and 7-I strong, usually single. Comb scales few in a single row. *Siphon* short, triangular, with a narrow complete ring at base (acus), separated from the rest of siphon by a deep suture; pecten absent; ventrolateral valve greatly developed, at least as long as body of siphon, with recurved spines near and at apex; median dorsal valve with a sawlike long process; 1-S near apex or distad of siphon body; 2-S on a tubercle distad of siphon body, strongly

developed; 6-S variable; 8-S usually large. *Saddle* complete, long, sometimes longer than entire siphon; 1-X removed from apical margin of saddle; 2,3-X long and multiple; 4-X of 8-10 cratal hairs, precratal hairs often present. Anal gills shorter than saddle.

DISTRIBUTION. Worldwide.

KEYS TO SUBGENERA OF *MANSONIA*

FEMALE ADULT

Postspiracular bristles absent; wing scales narrow; abdominal tergum VIII without spiniform setae. . . . *Coquillettidia* (p. 118)
Postspiracular bristles present; all or most wing scales very broad, often asymmetrical: abdominal tergum VIII with spiniform setae. *Mansonioides* (p. 115)

MALE GENITALIA

Dististyle with terminal claw. . . . . *Coquillettidia* (p. 118)
Dististyle without claw . . . . . *Mansonioides* (p. 115)

LARVA

Distal part of antenna flexible, as long as proximal part; comb scales 5-10, with apex pointed. . . . . *Coquillettidia* (p. 118)
Distal part of antenna rigid, less than half as long as proximal part; comb scales 1-3, with apex rounded. . . . *Mansonioides* (p. 115)

SUBGENUS *MANSONIOIDES* THEOBALD

Mansonioides Theobald, 1907: 498. Type-species: *Mansonioides septemguttata* Theobald, 1907; Borneo.

FEMALE. Proboscis shorter than forefemur. Pronotal lobes scaled. Acrostichal bristles weak or reduced to some anterior ones. Postspiracular bristles present. Wing speckled with pale and dark broad scales, most scales asymmetrical. Abdominal tergum VIII with a number of strong short spiniform setae along apical margin. Seminal capsules 3, 2 large and one rudimentary.

MALE. Palpus longer than proboscis; segment 5 minute. *Genitalia.* Tergum IX neither lobed nor bristled. Basistyle excavated and membranous on mesal surface; tergomesal margin rather produced, with a row of strong setae; claspette long, nearly reaching apex of basistyle, with one or more apical filaments. Dististyle lacking terminal claw, with many fine bristles.

LARVA. (Extracted mainly from Belkin 1962). Antenna with distal part less than 0.5 of proximal part, rigid, ankylosed at base; setae 2,3-A longer than distal part. *Abdomen.* Setae 4 mesad of 3 on III and IV; 4,5-VIII removed from 3-VIII. Comb scales reduced to 2-3, apically rounded, without fringe of spicules. Siphon with 1-S near apex of siphon body.

DISTRIBUTION. Manchurian subregion, Oriental region, Northern Australian region, Solomon Is., Ethiopian region.

Subgenus *Mansonioides* in this region is represented by a single widely dis-

tributed species.

19. *MANSONIA (MANSONIOIDES) UNIFORMIS* (THEOBALD) (Figs. 29, 30, 176)

Panoplites uniformis Theobald, 1901e: 180 (♀). Type-locality: Quilon, Travancore, S. India, Taiping, Perak.
Mansonia uniformis: Mochizuki, 1913: 32; Fukuoka, Japan; Okinawa Is., Ryukyu Archipelago.
Mansonia (Mansonioides) uniformis: LaCasse and Yamaguti, 1950: 66 (♂, ♀, L); Chu, 1956: 42, Korea.

FEMALE (Fig. 176). Wing length 3.5-4.6 mm. *Head.* Eyes contiguous above and below. Vertex covered with pale narrow curved scales and pale brown erect forked scales; tempus covered with white broad scales; 6-8 pairs of brown vertical bristles, bristles of median pair close together, fairly long; 4 brown temporals on each side. Clypeus yellowish brown. Antenna: pedicel yellowish brown, with several dark short bristles on ventromesal side; flagellum 0.95-0.99 (6) of proboscis; flagellomere 1 1.45-1.57 (5) of Flm 2, with some dark broad scales. Palpus 0.33-0.35 (6) of proboscis, covered with mixed white, yellow and dark scales; segment 3 1.80-2.25 (6) of 2; 4 0.10-0.18 (5) of 3. Proboscis rather short, 0.87-0.92 (6) of fore-femur, with broad yellow median band, base covered with mixed dark and yellow scales, apex with dark scales mixed with increasing numbers of apical pale scales, tip white scaled; ventral side with more pale scales. *Thorax.* Pronotal integument brown, lower half of posterior pronotal lobe rather dark; both lobes with white narrow curved scales, occasionally posterior lobe with a few broad scales on lower posterior area; anterior lobe bearing more than 10 brown bristles of various sizes, posterior lobe bearing 7 to more than 10 bristles in a single row, and a few fine ones out of the row. Scutum with integument brown, covered with brown and white narrow curved scales; brown scales covering anteromedian area delimited by anterior dorsocentral series, narrow areas along posterior dorsocentral series and lower half of supraalar area; white scales covering anterior margin, fossal area, upper half of supraalar area and margin of prescutellar space; a few pale scales scattered in anteromedian area; prescutellar space bare; acrostichal bristles reduced to anterior 3-5 pairs; 6 to more than 10 bristles in fossal area: a few on humeral margin and near scutal angle, 3-6 in a row close to posterior part of anterior dorsocentral series; bristles rare in middle of fossal area. Scutellum brown, each lobe with pale narrow curved scales and bearing 5-8 long brown bristles, each lateral lobe with 1-4 additional short bristles. Paratergite rather dark brown. Pleura rather dark brown on postspiracular and upper subspiracular areas, the dark area continuous to concolorous lower posterior pronotal lobe forming an ill-defined broad band; propleuron and anterior corner of sternopleuron also rather dark brown, pleura otherwise rather pale brown; propleuron, upper and lower posterior sternopleuron and upper mesepimeron each with a patch of white broad scales; pleural bristles pale yellowish brown, more than 10 on each of propleuron, postspiracular area, sternopleuron along upper and posterior margins and upper mesepimeron, a row of 2-5 bristles along anterior margin in middle of mesepimeron, no bristle on lower 0.33 of mesepimeron. *Wing.* Veins mottled with dark and yellow scales, almost all these scales except those on distal half of costa

very broad and asymmetrical; posterior margin of wing mottled with dark and yellow, moderately broad scales; slender fringe scales all dark. Dorsal remigial bristles absent; cell R_2 2.08-3.21 (6) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Fore- and midcoxae with both dark and pale scales; hindcoxa unscaled or with only a few pale scales at apex. Posterior half of underside of forefemur and posterior surface of foretibia mainly pale scaled; basal half or a little more of posterior surface of mid- and hindfemora pale scaled; femora and tibiae otherwise dark scaled, each with several pale patches, occasionally some of these pale patches fused; tarsomere 1 with pale broad basal and median bands, basal band of hindtarsomere 1 usually with a small dark spot; fore- and midtarsomeres 2-3 and hindtarsomeres 2-5 with pale broad basal bands. Midtarsomere 5 as long as or only slightly longer than 4; hindtarsomere 1 0.65-0.72 (6) as long as tibia. Claw of hindtarsus 71-79% (3) length of fore- or midtarsus. *Abdomen*. Tergum I with a median patch of yellow scales, occasionally intermixed with a few dark scales, sides unscaled; II-VI dark scaled, with mediobasal patch of yellow scales on anterior 1-3 segments, posterior margin largely yellow scaled; II-III with lateroapical patch of white scales and often with laterobasal yellow scales; IV usually with only a few pale lateral scales; sides of V and VI basally yellow scaled and apically white scaled; VII yellow and white scaled, often intermixed with dark scales; apical margin slightly emarginate; VIII with dark teeth arranged as 4-7: 1·8-9·1 : 1·5-8. Sterna II-VI pale scaled, frequently basally yellow and apically white; IV occasionally dark scaled lateroapically; VIII unscaled, bilobed.

MALE (Figs. 29, 176). Wing length 2.8-3.4 mm. Antenna: pedicel glabrous; flagellum 1.04 (1) of proboscis; flagellomeres 12 and 13 together 0.63 of 1-11, Flm 12 and Flm 13 subequal. Palpus 1.28 of proboscis, mainly dark scaled; segments 2 and 3 with median pale band, 4 with 2 outstanding apical bristles, 5 very short, pale scaled; length ratio of 2-5 : 5.78 : 10.22 : 8.44 : 1.00. Pleura often with less than 10 postspiraculars and upper mesepimerals, 2 or 3 midanterior mesepimerals. Cell R_2 1.70-2.00 (4) length of vein r_{2+3}. Hindtarsomere 1 0.68 (1) of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped subbasal tooth. *Genitalia*. Tergum IX very short, weakly sclerotized, with 3 constrictions in middle. Sternum IX small, oblong. Basistyle elongate-conical with pointed apex in dorsoventral view, 2.8 times as long as wide, with a deep tergomesal emargination subbasally, with a row of strong striated setae along tergomesal margin, bristled on tergal surface; lateral and sternal surfaces apically bristled and basally scaled; claspette very long, nearly reaching apex of basistyle with stem glabrous, filament pigmented, 0.2 as long as stem, apically bifurcate into a wrench-like shape. Dististyle compressed, somewhat sigmoid, broad in lateral view, 0.75 as long as basistyle, pubescent on entire surface, with many fine bristles on apical 0.33 of sternal surface; apex strongly sclerotized, bluntly pointed. Paraproct with apex strongly sclerotized and 5-6 toothed; 3 cercal setae. Aedeagus elongate ovoid, large, more than half as long as basistyle, 2.67-2.80 (2) times as long as wide, sternally open, tergally closed, with oblong tergobasal orifice; apex with a pair of groups of several tubercles.

LARVA (Fig. 30). (After LaCasse and Yamaguti 1950). *Head*. Cranium with a large incurved conical protuberance ventrad of antennal base; ocular area covered with anteriorly directed denticles; seta 1-C comparatively long, rather blunt; 3-C very small; 4-C minute; 5-C small; 6, 7-C barbed; ranges of branching (in parentheses) of head setae as follows: 4(2-4), 5(2-5), 6(4-9), 7(5-10), 8(1-5), 9(2-5), 10(1-3), 11(2-7), 12(2-5), 13(2-3), 14(3-6), 15(2-5). *Antenna*. Seta 1-A at basal 0.33 of shaft, with 10-18 barbed branches; 2, 3-A

at apical 0.29. *Mandible*. Cutting organ with 2 unicuspid dorsal teeth; pectinate brush of 9-12 slender plumose hairs. Piliferous process cleft apically. *Maxilla*. Cardo with 1-Mx 2-4 branched. Mesostipes with microsculpture of pentagonal or hexagonal meshes on ventral surface; twin equal stipital sensoria. *Mentum plate* with 9 teeth; aulaeum with median tooth bearing 6 apical denticles. *Thorax*. Ranges of branching (in parentheses) of thoracic setae as follows: 0-P(2-5), 4,5,7-P(2-3), 4-M(3-7), 8-M(3-6), 9-M(2-3), 7-T(2-4), 9-T(2-3), 13-T(3-5); 1,14-P and 6-M double; 2,3,6,9,10,12-P,5,7,10,12-M and 10-T single. *Abdomen*. Setae 6-I-VI and 7-I single; 1-VIII 1-2 branched; 3,4-VIII double. Comb scales 2 (occasionally 1), simple and blunt-tipped. *Siphon*. Seta 1-S with 2 unequal branches; 2-S slightly curved, on a raised chitinous base; 6-S very fine; 8-S stout; median dorsal valve with about a dozen teeth along its concave mid-dorsal ridge; ventrolateral valve with a number of oblique ridges, bearing 4 apical hooks in 2 groups; dorsolateral valve with an apical stout complex hook; median caudal filament transversely striate. *Saddle* 0.5-0.6 mm long; 1-X 3-6 branched; 2,3-X each 7-14 branched; 4-X of 10-11 cratal, 2-7 branched hairs, and 2-4 precratal, 1-3 branched hairs. Anal gills 0.30-0.55 mm long.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 5♂, 4♀: Okinawa Guntô (J-1624, J-1625, J-2154, J-2155, J-2156, J-2157). 65♀: Yaeyama Guntô (K-0181, K-0584, K-0721, K-0722, K-0786, K-0913, K-1005, K-1068, K-1069, K-1302, K-1325, K-1444, K-1473, K-1538, K-1596, K-1706, K-2153). TAIWAN. 3♂, 6 L (3♂: Neihu, Taipei Hsien, 1 XII 1973, net, Lien & Mizusawa; 5 L: Lab. Col. originated in Nankang, Taipei Hsien; 1 L: Taiwan mainland).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Shikoku, Kyushu). KOREA (Korean Pen.). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). ORIENTAL, AUSTRALASIAN AND ETHIOPEAN REGIONS.

BIONOMICS. Rare in temperate Japan, more common in the Ryukyu Archipelago. The larvae were found in large natural ponds and slowly moving streams at Yodo, Kyoto Pref., Honshu; they attached to the underground portions of the stems and roots of *Zuzania latifolia* for air; adult females are vicious blood suckers (LaCasse and Yamaguti 1950). In Yaeyama, we found adults in shrubbery and obtained them from human bait.

RELATION TO DISEASES. In the tropical region, the larvae of *Wuchereria bancrofti* and *Brugia malayi* have been found in wild-caught females of *Mansonia uniformis* (Horsfall 1955). This species apparently plays almost no significant role in the transmission of these diseases in Japan, but because of its avidity for human blood, perhaps warrants more study.

SUBGENUS *COQUILLETTIDIA* DYAR

Coquillettidia Dyar, 1905: 47. Type-species: *Culex perturbans* Walker, 1856, North America.

FEMALE. Proboscis as long as forefemur. Pronotal lobes unscaled. Acrostichal bristles present. Postspiracular bristles absent. Wing scales usually narrow, unicolorous. Abdominal tergum VIII without strong spiniform setae. Seminal capsules 3.

MALE. Palpal segment 5 well developed. *Genitalia*. Tergum IX with lobes bristled. Basistyle without modified setae; claspette short, with one or more elongate filaments or setae. Dististyle with terminal or subterminal

claw.

LARVA. (Extracted mainly from Belkin 1962). Antenna with distal part usually as long as proximal part, flexible, annulated, and movable at base along a diagonal ventral connection to proximal part; setae 2, 3-A much shorter than distal part of antenna. *Abdomen.* Seta 4 laterad of 3 on III and IV. Comb scales at least 5, apex sharply pointed or with a few moderately strong spines, fine laterobasal denticles or spicules sometimes present; 3-5-VIII in a compact group. Siphon with 1-S distad of siphon body.

DISTRIBUTION. Holarctic, Oriental, Australian and Ethiopian regions, some Pacific islands.

KEYS TO SPECIES OF *MANSONIA (COQUILLETTIDIA)*

FEMALE ADULT

Scales of wing, legs and abdomen mostly yellow; empodium modified, palmate, with 5-7 short, stout and acute branches. *ochracea* (p. 119)

Scales of wing, legs and abdomen dark, purplish; empodium simple. *crassipes* (p. 122)

MALE GENITALIA

Dististyle narrowed apically from the expanded and strongly curved median portion, without spine. . . . . *ochracea* (p. 119)

Dististyle slightly broadened apically, with a short slender spine proximad of middle. . . . . *crassipes* (p. 122)

Larval specimens not available to us.

20. *MANSONIA (COQUILLETTIDIA) OCHRACEA* (THEOBALD) (Figs. 31, 32, 177)

Taeniorhynchus ochraceus Theobald, 1903: 263 (♀). Type-locality: Kuala Lumpur, Malaya.

Culex shakujiiensis Ogasawara, 1939a: 238 (♀). Type-locality: Shakujii, Tokyo, Japan.

Mansonia (Coquillettidia) ochracea: LaCasse and Yamaguti, 1950: 72 (♂, ♀, L); Lee, Hong, Shin and Hak, 1971: 23, Pusan, Kyong-sangnam Do., Korea.

Mansonia ochracea: Gentry, 1957: 82, Oyama, Okinawa Is., Ryukyu Archipelago.

Rather large, entirely bright yellowish mosquito.

FEMALE (Fig. 177). Wing length 4.8-5.6 mm. *Head.* Eyes contiguous above, very narrowly separated or nearly contiguous below. Vertex covered with pale yellow narrow curved scales, and with basally yellowish brown, apically brown, erect forked scales on posterior 0.67, tempus covered with pale yellow broad scales; 5-8 pairs of brown vertical bristles, median pair close together and close to eye, others a little distant from eye; 4-5 brown temporal bristles on each side close to eye. Clypeus yellowish brown.

Antenna: pedicel yellowish brown, with several mesal brown bristles; flagellum 1.01-1.08 (4) of proboscis; flagellomere 1 yellowish brown, 1.35-1.53 (4) of Flm 2, with some broad scales; remaining flagellomeres brown. Palpus 0.33-0.36 (4) of proboscis, yellow scaled, tip with dark brown scales; segment 3 2.70-3.00 (4) of 2, 4 very small, conical. Proboscis as long as forefemur, yellow scaled, base with brown scales, tip with dark brown scales. *Thorax*. Pronotal lobes with integument yellowish or light brown; anterior lobe bearing more than 10 brown bristles of various sizes; posterior lobe with a posterior row of 4-8 brown bristles, usually with a few fine additional bristles out of the row. Scutal integument light brown, covered with golden yellow narrow curved scales; scutal bristles brown, usually 3-6 along humeral margin to scutal angle, one posterior fossal. Scutellum with integument and scales similar to those of scutum; median lobe with 4-6, each lateral lobe with 5-9 long brown bristles, and occasionally with one or 2 additional medium-sized ones; each lobe usually with several additional hair-like fine bristles. Pleural integument light brown, sternopleuron with pale yellow broad scales posteriorly; pleural bristles yellowish brown, more than 10 on each of propleuron, prealar knob and sternopleuron along its upper to posterior margin; 7 to more than 10 upper mesepimerals; 1-4 bristles in middle of mesepimeron near anterior margin, these bristles rarely absent; no bristle on lower 0.33 of mesepimeron. *Wing*. Veins covered with yellowish, moderately broad scales; 2 dorsal remigial bristles present; cell R_2 1.82-2.50 (6) length of vein r_{2+3}. Halter with knob yellow scaled. *Legs*. Mainly yellow scaled. Femora and tibiae with varying amounts of mixed brown scales on anterior surface, the brown scales tending to form a small apical patch, the patch always distinct and often forming a complete ring in hindfemur, and forming an ill-defined basal ring and apical fringe in hindtibia; fore- and hindtarsomere 1 narrowly brown scaled apically; fore- and hindtarsomeres 2-5 with apical brown scaling variable; midtarsomeres 2-5 or 3-5 with some brown scales apically or incomplete apical ring of brown scales, 5 occasionally mainly brown scaled. Midtarsomere 5 nearly as long as 4; hindtarsomere 1 0.71-0.75 (5) of tibia. Claw of hindtarsus about 78-83% that of fore- or midtarsus in length. Empodium dark, palmate with 5-7 short, stout and acute branches, usually with one or 2 additional lateral spicules; some of smaller dorsal and ventral branches apically filamentous; a few ordinary ventral hairs also basally present. *Abdomen*. Yellow scaled above and below; tergum I with medial scales only; II-IV usually with scattered dark brown medial scales; II-VI with dark brown laterobasal integumental patches gradually decreasing in size posteriorly.

MALE (Figs. 32, 177). Wing length 3.8-4.6 mm. Antenna: pedicel glabrous; flagellum 0.80-0.87 (2) of proboscis; flagellomeres 12 and 13 together 0.85-0.89 (2) as long as 1-11,12 1.33-1.39 (2) of Flm 13. Palpus 1.19-1.27 (2) of proboscis, yellow scaled, tip of segment 3, apical 0.33 to half of 4 and entire 5 covered with brown scales; 4, 5 and apex of 3 with numerous long bristles; length ratio of 2-5 : 1.09-1.10 : 1.61-1.67 : 0.97-1.01 : 1.00 (2). Cell R_2 1.24-1.55 (4) length of vein r_{2+3}. Foretarsomere 4 very short, only 1.4 times as long as broad and 0.4 as long as 5; 5 nearly as long as 3, with a ventrobasal protuberance bearing 3 pairs of stout setae; midtarsomere 5 distinctly longer than 4, shorter than 3, simple; hindtarsomere 1 0.76-0.81 (3) of tibia. Anterior claw of fore- and midtarsi with blunt-tipped submedian and laterobasal teeth. Empodium simple in fore- and midtarsi, slightly broadened apically and with 2 or 3 rather stout acute branches in hindtarsus. *Genitalia*. Tergum IX with lobes rather small, widely separated, weakly sclerotized, each bearing 3-6 (4) medium-sized bristles. Sternum IX trape-

zoidal, fairly narrow apically, apical margin slightly emarginate. Basistyle subcylindrical, 2.6-2.9 times as long as wide, bristled except for a narrow space of mesal surface, with long tergolateral and lateroapical bristles, and a short row of 3-4 closely arranged, tergomesal medium-sized bristles at apex, laterally scaled, with a few tergobasal scales; claspette short, stem with a fine median and a stout apical seta, filament pigmented, rod-shaped, with apex rounded, subequal to apical seta in length. Dististyle in lateral view slightly broadened at base, strongly expanded and tergally curved nearly 90° about at middle, then apically attenuate, pigmented and with minute setae in apical half, 7-11 on convex side and 3-4 on concave side; claw short, emarginate at apex. Paraproct with apex strongly sclerotized, 4-6 toothed; 5-6 cercal setae. Aedeagus ellipsoidal, slightly constricted in middle, with widest part proximal to middle, 1.8 times as long as wide, sternally open, with large basal and small apical orifices on tergal side; sclerotized lateral wall expanded tergally in middle; apical half of tergal surface closed with very weakly sclerotized wall; apex with 4-5 teeth on each side; sternal lateral edge serrate.

LARVA (Fig. 31). (After LaCasse and Yamaguti 1950). *Head.* Much broader than long; integument with microsculpture of transverse rows of minute denticles; seta 1-C comparatively long, with blunt tip; 3-C very small; 5-C small; 6, 7-C barbed; ranges of branching (in parentheses) of head setae as follows: 4(2-6), 5(7-9), 6(4-7), 7(6-15), 8(2-5), 9(3-7), 10(1-5), 11(7-16), 12(4-7), 13(3-5), 14(1-3), 15(3-5). *Antenna* with proximal part spiculate; distal part very long, slightly more than twice the length of proximal part, annulated, slender, whip-like, articulated with proximal part dorsally at a little proximad of its apex; 1-A with 25-30 sparsely barbed branches; 2, 3-A located slightly distad of 1-A. Mandible with microspines on posterior dorsolateral aspect; cutting organ with 2 bicuspid dorsal teeth; ventral tooth with 2 pointed denticles (? $VT_{1,2}$) and an anterodorsal spine (? VT-4) at base and a bifid tooth (? VT_3) posteroventrally; ventral blade sinuate; pectinate brush of 9-11 bilaterally pectinate hairs. Piliferous process apically cleft. *Maxilla.* Cardo with 1-Mx single. Mesostipes with microsculpture of pentagonal or hexagonal meshes on ventral surface; twin stipital sensoria on a common base. Palpostipes somewhat constricted at middle. *Mentum plate* triangular, with 11-14 teeth, median tooth larger; aulaeum with bifid or trifid median tooth, and 2 pairs of dorsal submarginal denticles. *Thorax.* Ranges of branching (in parentheses) of thoracic setae as follows: 4-P(3-5), 7-P(2-3), 8-P(3-4), 11-P(5-8), 14-P(2-3), 8-M(5-7), 9-M(4-6), 7-T(6-9), 9-T(4-6), 11-T(1-3), 13-T(4-5); 1, 2, 5, 6, 10, 12-P, 5, 7, 10, 12-M, 10, 12-T single; 3, 9-P double. *Abdomen.* Setae 6-I-VI and 7-I single; 6-I smaller than 7-I; 1-VIII single, comparatively large; 2-VIII 4-5 branched; 3-VIII very large, single, barbed. Comb scales 7-9 in an arcuate row; individual scales with several slender spines apically. *Siphon* 0.38-0.60 mm long including respiratory valves, 1-S triple, inserted on a conical prominence; 2-S narrowly flanged from the curved apex to near base; 6-S fine; 8-S reaching beyond tip of respiratory valves; median dorsal valve more coarsely serrate than in *Ma. uniformis;* dorsolateral valve with strong hooks at apex; ventrolateral valve with axial stripe, and with 6 apical hooks in 2 groups; median caudal filament finely granulate. *Saddle* obliquely truncate, 0.5-0.55 mm long dorsally, 0.35-0.38 mm long ventrally; 1-3-X 3-7, 9-17 and 6-11 branched respectively; 4-X of 8-10 cratal, 2-10 branched hairs, and 2 precratal, 2-5 branched hairs. Anal gills 0.3-0.45 mm long, bluntly pointed.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 4♂, 11♀: Honshu (C-2158, E-2159, E-2161, E-2162, E-2163). RYUKYU ARCHIPELAGO. 2♂,

9♀: Okinawa Guntô (J-1623, J-2154, J-2155, J-2160, J-2164, J-2165, J-2166, J-2167).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu). KOREA (Korean Peninsula). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). SOUTH CHINA. INDOCHINA. MALAYA. INDONESIA. PHILIPPINES. THAILAND. INDIA. NEW GUINEA.

TAXONOMIC NOTES. *Culex shakujiiensis* was synonymized with *Mansonia ochracea* by Kano and Hayashi (1949).

BIONOMICS. Rare in temperate Japan. Larvae were collected from the underwater portions of the stems and roots of *Zuzania latifolia* in stagnant natural ponds at Yodo, Kyoto Pref., Honshu, in association with *Ma. uniformis;* adult females bite man (LaCasse and Yamaguti 1950). Kano and Hayashi (1950) also reported the larvae on the roots of *Zuzania latifolia* in Tokyo. Adults are attracted by light. Savage and McDonald (1972) found the seasonal abundance profile of *Ma. ochracea* on Okinawa very similar to that of *Ma. uniformis*, although it was much scarcer.

21. *MANSONIA (COQUILLETTIDIA) CRASSIPES* (VAN DER WULP) (Figs. 32, 178)

Culex crassipes Van der Wulp, 1881: 9 (♀). Type-locality: Soeroelangoen, Sumatra.
Mansonia crassipes: Bohart, 1959: 196, Iriomote Is., Ryukyu Archipelago.

FEMALE (Fig. 178). Wing length 3.7-4.3 mm. *Head.* Eyes contiguous above, very narrowly separated or almost contiguous below. Vertex with integument yellow to brown, covered roughly with pale yellowish narrow curved scales, with dark long erect forked scales numerous posteriorly, few anteriorly; tempus covered with pale yellowish broad scales; vertical and temporal bristles brown, continuous, usually 7 verticals somewhat removed from eye, 4, 5 temporals close to eye. Clypeus brown, yellowish at basal middle. Antenna: pedicel testaceous, somewhat infuscate and bearing several dark small hairs on mesal surface; flagellum 1.00-1.05 (5) of proboscis; flagellomere 1 1.19-1.33 (5) of Flm 2, with a few dark small scales mesoventrally. Palpus 0.27-0.31 (5) of proboscis; segments 3 2.55-3.08 (5) of 2; 4 very small, nipple-shaped; 2 and 3 laterally covered with violet-tinged dark scales; 1-3 laterally bristled, mesally glabrous except for the bristled apical half of 3. Proboscis rather stout, 0.99-1.07 (5) of forefemur, clothed with violet-tinged dark scales. *Thorax.* Anterior pronotal lobe yellow, bearing 6 brown stout bristles together with a number of fine ones; posterior pronotal lobe brown, bearing 6-7 brown bristles along posterior margin, the bristles decreasing in size dorsally. Scutum with integument testaceous, infuscate on humeral area and often behind scutal suture, becoming posteriorly yellowish, covered roughly with yellow and brown narrow scales; scutal bristles brown. Scutellum pale yellow, with brown hair-like scales, bearing 5-6 bristles on each lateral lobe and 3-5 bristles on median lobe; some fine additional bristles often present. Postnotum yellow. Pleural integument brown to yellow, post- and subspiracular areas, upper sternopleuron and mesepimeron more or less darker, forming a vague diagonal broad band continuous to posterior pronotal lobe; patches of white broad scales on caudal angle of sternopleuron and upper mesepimeron, a number of white broad scales placed loosely on upper sternopleuron; pleural bristles yellow, about 10 on propleuron, sternopleuron and upper mesepimeron,

more than 10 on prealar knob, one lower mesepimeral at about lower 0.33. *Wing*. Vein scales dark with purple reflection, somewhat lighter on posterior part; one dorsal remigial bristles present. Cell R_2 1.42-1.56 (5) length of vein r_{2+3}; membrane strongly iridescent. Halter with knob yellowish brown, covered with dark and pale rather narrow scales. *Legs*. Coxae with patches of white moderately broad scales. Basal 0.33-0.50 of femora clothed with yellowish scales; hindfemur with a narrow patch of silvery white scales in middle of anterior surface; femora, tibiae and tarsi otherwise covered with purple-tinged dark scales. Midtarsomere 5 shorter than or nearly as long as 4; hindtarsomere 1 0.70-0.74 (5) of tibia. Claw of hindtarsus 80-84% of that of fore- or midtarsus in length. *Abdomen*. Tergum I with a median patch of purple scales, sides unscaled; terga II-VII covered with purple scales, with ill-defined laterobasal spots of yellowish brown scales usually progressively larger and extending onto dorsal aspect posteriorly. Sterna with pale basal bands. Seminal capsules 3, one larger than the other 2.

MALE (Figs. 32, 178). Wing length 3.1-3.6 mm. Antennal flagellum 0.92-0.96 (5) of proboscis; flagellomeres 12 and 13 together 0.80-0.94 (5) of Flm 1-11, Flm 12 1.18-1.25 (5) of Flm 13. Palpus 1.00-1.05 (5) of proboscis, clothed with violet-tinged dark scales; segment 5 turned downwards, 4, 5 and apex of 3 bearing many bristles, length ratio of 2-5 : 1.95-2.30 : 3.04-3.50 : 1.52-1.70 : 1.00 (5). Proboscis 1.05-1.09 (5) of forefemur. Pleural diagonal dark band usually more distinct than in female. Cell R2 1.06-1.14 (5) length of vein r_{2+3}. Foretarsomere 4 very short, about half as long again as broad, only slightly more than half as long as 5; 5 with ventrobasal protuberance bearing several short stout setae; midtarsomere 5 simple. Anterior claw of foretarsus with blunt-tipped median and acute laterobasal teeth; anterior claw of midtarsus with blunt-tipped median and laterobasal teeth. Abdominal tergum VIII triangular at apex, mainly covered with yellowish brown scales, dark purple scales at apex only. *Genitalia*. Tergum IX with lobes well protrudent and widely separated, each bearing 2-5 setae. Basistyle subcylindrical, 2.0-2.5 times as long as wide, heavily bristled tergally, bearing long sternal bristles at apex, small mediotergal and mesosternal bristles, a dense group of small hairs on mesodistal portion; claspette narrow, with a rod-like pigmented filament and a slender seta at apex, the seta dorsal to and about as long as the filament. Dististyle 0.8 as long as basistyle, stout, with large basal condyle, slightly widened and with 4 minute setae at apex, bearing a sharp spine-like process on concave side slightly nearer to base than to apex; claw very short and blunt. Paraproct heavily sclerotized at apex and bearing 3 large recurved teeth together with several small ones; cercal setae 4-7. Aedeagus well sclerotized, 1.47-1.73 (5) as long as wide, widely open sternally, edge of tergobasal orifice laterally expanded, laterosternal edge serrate on basal half; apex notched, with 3-4 denticles.

LARVA. Specimens not available.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 1♀: Amami Guntô (I-0312). 8♂, 12♀: Okinawa Guntô (J-0100, J-1623, J-2168, J-2169). 46♂, 31♀: Yaeyama Guntô (K-0181, K-0582, K-0584, K-0719, K-0722, K-0726, K-0730, K-0731, K-0739, K-1401, K-1472, K-1474, K-1539, K-1596, K-1598, K-2030, K-2062, K-2106).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). TAIWAN. SOUTH CHINA. PHILIPPINES. MALAYA. INDONESIA. THAILAND. BURMA. INDIA. SRI LANKA. AUSTRALASIAN REGION.

BIONOMICS. The larvae have not been found in this region. Adults are found commonly in shrubbery on Iriomote Is., rather rare elsewhere, also

collected in light traps. As in other *Mansonia*, the larvae of *crassipes* will probably be found in permanent or semi-permanent bodies of water obtaining their air supply by tapping underwater roots and stems of aquatic vegetation with modified siphons. This species is not known to be of medical importance.

6. GENUS *CULEX* LINNAEUS

Culex Linnaeus, 1758: 602. Type-species: *Cx. pipiens* Linnaeus, 1758; Europe.

Small to large mosquitoes.

FEMALE. *Head.* Eyes contiguous or separated both above and below. Vertex always with narrow decumbent scales; broad decumbent scales present or absent; erect forked scales usually numerous, almost covering vertex, rarely restricted to posterior half of vertex; 2-3 temporal bristles. Antennal flagellum usually as long as or longer than proboscis, sometimes slightly shorter; flagellomere 1 1.0-1.7 of Flm 2. Palpus less than 0.33 of proboscis; segment 4 infrequently developed. Proboscis usually as long as or longer than forefemur, occasionally shorter than it, with 4 or more ventrobasal bristles. *Thorax.* Anterior pronotal lobes widely separated, bristled; posterior pronotal lobe with bristles along posterior margin or dorsal to posterior margin. Scutum moderately to strongly arched, with scales all or mostly narrow; acrostichal bristles present or absent, other scutal bristles developed. Scutellum bristled, with narrow scales. Postnotum bare. Paratergite narrow, bare. Pleura with or without scale patches, never densely covered with scales; propleuron, prealar knob, sternopleuron and upper mesepimeron bristled, spiracular and postspiracular bristles absent (a few South Pacific species with postspiracular bristles, after Belkin 1962) lower mesepimeral bristles absent or present. Base of mesomeron distinctly above that of hindcoxa. *Wing.* Squama fringed with hairlike scales; alula fringed with lanceolate scales. Dorsal remigial bristles present. Cell R_2 longer than vein r_{2+3}. *Legs.* Foretarsomere 5 shorter to slightly longer than 4; hindtarsomere 1 shorter to slightly longer than tibia; claws equal and simple; pulvilli usually well developed. *Abdomen.* Tergum I hirsute, scaling usually restricted to middle; laterotergite usually unscaled, very few scales sometimes present in species of subgenus *Lutzia*.

MALE. Antennal flagellum plumose, shorter than to as long as proboscis; flagellomeres 12 and 13 elongate. Palpus variable. Proboscis usually longer than forefemur, shorter than it in subgenus *Barraudius;* false joint usually present with the position variable, occasionally indistinct, long bristles immediately proximad of the joint present or absent. Foretarsomere 4 shortened, 5 slightly longer to more than twice as long as 4, with some stout setae on ventrobasal swelling and midventral surface. Midtarsomere 5 usually not modified, shorter than 4, slightly modified and longer than 4 in subgenus *Neoculex*. Anterior claw of fore- and midtarsi enlarged, both anterior and posterior claws usually toothed; claws of hindtarsus equal and simple. *Genitalia.* Tergum IX always narrow, often strip-like, poorly sclerotized; lobes usually poorly developed, broad, widely separated, bristled, sometimes well differentiated (Subgenus *Neoculex*). Sternum IX membranous, usually without bristles. Basistyle usually unscaled (scaled in subgenus *Barraudius*), without basal lobe or claspette, subapical lobe usually well developed, bearing

variously developed modified setae, typically these setae are 3 rods (α, β, γ; α being most mesoproximal) usually located proximally, one broad seta (δ) mesodistally, one broadly foliate seta (ϵ) laterodistally, one long curved bristle (χ) laterad of ϵ, and one or more smaller setae (μ) between δ and the 3 rods; μ occasionally similar to δ in shape and size and may be interpreted as multiple δ. Dististyle articulating in vertical plane, falciform, occasionally modified, sometimes with an apical crest of spines or annulations on convex side; claw usually pale, apical, short, somewhat apically broadened. Cercal setae present. Paraproct with apical crest consisting of a clump of numerous or a row of fewer spines. Aedeagus paired, composed of sternobasal and tergoapical divisions; the sternobasal division (true aedeagus, after Belkin 1962) usually broad, lamellate, often weakly sclerotized, with surface usually smooth, occasionally spiculate, with the lateral pieces connected by a sternal basal bridge, having much less taxonomical value than in tergoapical division; tergoapical division usually well sclerotized, lateral pieces connected by a tergal subbasal (occasionally median or subapical) bridge, with subbasal knob articulating laterally with mesobasal knob (subbasal process of Sirivanakarn 1976) of paraproct, apex variously developed from a single pair of simple processes to several pairs of processes or large teeth; aedeagus of subgenus *Neoculex* rather simple.

LARVA. (Excluding predatory *Lutzia*.) *Head*. Usually distinctly broader than long, collar narrow; rudimentary or minute seta 2-C often present; 5, 6-C usually posteriad of 7-C; 6-C lateroanteriad or directly anteriad of 5-C; 8-C posteriad of 5-C; 12-C usually posteriad of 13-C; 16, 17-C present or absent. *Antenna* usually long and divided into distal and proximal parts at the insertion of 1-A, the distal part usually distinctly narrower than the usually spinulate proximal part; 1-A usually inserted distad of middle, occasionally at about middle, with usually well developed strongly barbed branches, occasionally with smooth branches; 2, 3-A most often subapical, sometimes almost apical; 4-6-A apical, 5-A (antennal sensorium) shorter than 6-A, with an accessory minute sensorium on proximal division. Mouth brush of fine numerous hairs. *Mandible* with a rather weakly developed group of simple microspines laterally near base; 1-Md absent. Usually 5 mandibular spurs; MdS_1 longest, curved, pigmented; MdS_2 multiple, short and hair-like; MdS3, 4 similar to MdS_1 in shape but smaller and paler; MdS_5 shortest, basally broadened; occasionally MdS_2 reduced and $MdS_{1, 3-5}$ all stout and pigmented (*bitaeniorhynchus*). Mandibular brush usually well developed, of numerous stiff hairs, occasionally reduced to a number of fine hairs (*bitaeniorhynchus*). Mandibular comb of about 10 or more spiculate prominences (teeth), diminishing laterally in size, each prominence with 1 or 2 long filamentous spicules in addition to many short ones, occasionally mandibular comb reduced to a ventrolateral row of only a few prominences (*bitaeniorhynchus*). Cutting organ without dorsal spine; 2 dorsal teeth, lateral tooth smaller, unicuspid, mesal tooth variable; ventral tooth small to moderate, with one lateral denticle (VT-4) and 3 mesal denticles (VT_{1-3}); ventral blade 1 or 2, VB_1 extending beyond apex of VT_0, usually apically slender, mesally pectinate, occasionally modified; pectinate brush well developed, of usually about 10 hairs, the hairs usually laterally pectinate toward base, bilaterally toward apex. Piliferous process not sclerotized, usually well protrudent, with 5 hair groups; labula usually extending at most only a little beyond apex of anterior part, greatly developed in *brevipalpis* (Giles); occasionally piliferous process very wide, only slightly protrudent, and more densely haired (*bitaeniorhynchus*). Mandibular hairs divided into 2 groups or in a single row (*bitaeniorhynchus*), hairs of distal group laterally

barbed and often basally spiculate, those of proximal group apically frayed. *Maxilla*. Cardo narrow, usually narrowly to somewhat broadly fused mesobasally with cranium, occasionally fused with cranium along its entire basal margin (*bitaeniorhynchus* group); cardinal seta 1-Mx weak, single or double. Mesostipes longer than wide, without spine-like strong spicules; stipital sensoria twinned, with basal ring short or reduced; dorsal stipital seta 2-Mx always fine, pale, shortest of all the ring-based maxillary setae; ventral stipital seta 4-Mx variable. Hairs of maxillary brush usually long and slender, rather short in *bitaeniorhynchus*. Parartis without sclerotized protrusion, having a membranous connection with a sclerotized curved rod of paracoila. Pseudoartis at most moderately developed, never fused with cranium. Lacinia occupying mesal half of dorsal surface of mesostipes, without spine-like strong spicules; proximal lacinial seta 5-Mx usually at about level of stipital sensoria, occasionally distad of it (*bitaeniorhynchus*); distal lacinial seta at apex, a simple short seta. Palpostipes usually less than half as long as mesostipes (more than half in *bitaeniorhynchus* group), basally broadened, usually separated from mesostipes (fused with it basally in *bitaeniorhynchus*), without lateral stipital seta 3-Mx; apex with ampulla and 5 palpal sensoria (3 or 4 in *bitaeniorhynchus*), $S_{1,2,4}$ ring-based, S_3 usually longest, S_5 shortest, $S_{1,2}$ dorsolateral and S_{3-5} ventromesal in position. *Mentum plate* pentagonal or triangular, teeth usually moderate in size, modified in *bitaeniorhynchus*. Aulaeum fringed with hair-like spicules, with median tooth, or without it *(Culiciomyia)*. *Thorax*. Prothoracic setae 1-8-P are usually fairly constant in branching; they are especially useful for sorting living larvae, and shown as "prothoracic setal formula" in the descriptions of species. Setae 1, 2-P single and strong, 1-3-P on a common well developed basal callus, often fairly close to meson; 3, 4, 8-P variable, 5-7, 12-P strong, 9, 10-P of medium-size, 11-P weak, 13-P absent, 14-P 1-4 branched; 1-4-M weak, 5-10, 12-M strong; 1-6, 12-T weak, 7, 9 10-T strong, 13-T occasionally rather well developed; 0-P, 13, 14-M and 8-T usually dendritic; 11-M-T minute. *Abdomen*. Setae 6-I-VI and 7-I strong; 12-I present; 13-II, VI and often 6-VII dendritic; 1-III-VI and 13-III-V occasionally rather well developed; 1, 2-VIII dorsolateral, 3-VIII lateral and 4, 5-VIII ventrolateral in position. Comb scales variable. *Siphon* usually long, with large rhomboidal acus; pecten usually moderately developed, in basal half of siphon, with teeth usually pale; 1-S of at least 3 pairs of setae, most frequently subventral in position, sometimes almost ventral, often accessory lateral or subdorsal setae present subapically. *Saddle* complete; 1-X on saddle, usually weak; 2-X with unequal branches; 3-X single; 4-X usually 8 or more cratal hairs, rarely one or a few most proximal hairs off grid; grid usually complete. Larvae of *Lutzia* are quite different (*vide* the subgeneric description).

DISTRIBUTION. Worldwide.

KEYS TO SUBGENERA OF *CULEX*

FEMALE ADULT

1. Lower mesepimeral bristles 4 or more, arranged in a row parallel to the anterior margin of mesepimeron; acrostichal bristles present. *Lutzia* (p. 237)

   Lower mesepimeral bristles 0-3. 3

2(1). Acrostichal bristles present. 3
Acrostichal bristles absent. 6

3(2). Hindtarsomere 1 at most 0.80 length of tibia. . . . *Barraudius* (p. 233)
Hindtarsomere 1 at least 0.85 length of tibia. 4

4(3). Pleura without distinct scale patches; abdominal terga entirely dark.
Eumelanomyia (Mochthogenes) (p. 185)
Pleura with distinct scale patches; abdominal terga banded or with latero-basal patches. 5

5(4). Proboscis unbanded; abdominal tergal bands apical. . *Neoculex* (p. 179)
Proboscis banded or/and abdominal tergal bands basal, or both proboscis and abdominal terga unbanded. . . . . *Culex* (p. 129)

6(2). Vein 1a reaching level from m-cu to r-m; vertex with broad scales at least on eye margin. . . . . *Culiciomyia* (p. 214)
Vein 1a reaching level between cubital fork and m-cu. 7

7(6). Posterior pronotal bristles along posterior margin; vertex with broad scales anterolaterally to eye margin. . . . . *Lophoceraomyia* (p. 196)
Posterior pronotal bristles along dorsal margin to posterior margin; vertex with scales all narrow.
Eumelanomyia (Protomelanoconion) (p. 185)

MALE ADULT

1. Basistyle scaled, subapical lobe divided into proximal and distal sections, bearing short weakly modified setae; tergoapical division of aedeagus composed of 2 pairs of processes. . . . . *Barraudius* (p. 233)
Basistyle unscaled, subapical lobe not divided, and/or bearing long well developed modified setae. 2

2(1). Aedeagus with tergal bridge subapical; subapical lobe with 2 rods (α, β); midtarsomere 5 longer than 4. . . . . *Neoculex* (p. 179)
Aedeagus with tergal bridge subbasal or median; subapical lobe with 3 rods (α, β, γ); midtarsomere 5 longer than 4. 3

3(2). Tergoapical division of aedeagus composed of a pair of oval (in tergal view) processes; palpus shorter than proboscis.
Eumelanomyia (p. 185)
Tergoapical division of aedeagus composed of one or more pairs of horn-shaped processes or large teeth; palpus as long as or longer than proboscis. 4

4(3). Subapical lobe with only simple setae or bristles in addition to 3 rods; tergoapical division of aedeagus composed of one pair of processes.
Lutzia (p. 237)
Subapical lobe with modified setae in addition to 3 rods. 5

5(4). Tergoapical division of aedeagus complex, of 3 or more pairs of processes or large teeth, or of one pair of finely spiculate processes. . . . . *Culex* (p. 129)
Tergoapical division of aedeagus rather simple, of 2 pairs of processes, or one pair of non-spiculate processes. 6

6(5). Paraproct with basal sternolateral process well developed; antenna without modified setae; palpal segment 3 with a row of lanceolate setae. . . . . *Culiciomyia* (p. 214)
Paraproct without basal sternolateral process; antenna with modified setae; palpus without a row of lanceolate setae.
Lophoceraomyia (p. 196)

LARVA

1. Labrum produced anteriorly; mandible with very strong ventral tooth; maxilla with cardo, mesostipes and palpostipes almost fused together; seta 7-II as strong as 7-I; siphon as long as or shorter than saddle. . . . . *Lutzia* (p. 237)
Labrum not produced anteriorly; mandible with small to moderately developed ventral tooth; maxilla with cardo, mesostipes and palpostipes usually separated; seta 7-II much shorter and weaker than 7-I; siphon longer than saddle. 2

2(1). Seta 3-P as long and strong as 1, 2-P or nearly so, single. 3
Seta 3-P distinctly shorter and weaker than 1, 2-P, single or branched. 4

3(2). Siphon with seta 1-S arranged in a zigzag ventral row, without lateral or subdorsal setae other than 2-S. . . . . *Barraudius* (p. 233)
Siphon with seta 1-S subventral and/or with lateral or subdorsal seta in addition to 2-S. . . . . *Culex* (p. 129)

4(2). Mentum plate with more than 25 narrow teeth; aulaeum without median tooth; saddle with markedly strong apical spicules; seta 4-X of usually 8 hairs. . . . . *Culiciomyia* (p. 214)
Mentum plate with at most 21 rather broad teeth; aulaeum with median tooth; saddle without markedly strong apical spicules; seta 4-X of usually 10 or more hairs. 5

5(4). Seta 4-P weak, shorter than 3-P; 5-C shorter than 7-C.
Eumelanomyia (Mochthogenes) (p. 185)
Seta 4-P strong, longer than 3-P; 5-C as long as to longer than 7-C. 6

6(5). Individual pecten teeth with at most 3, usually one or 2, ventral denticles. . . . . *Neoculex* (p. 179)
Individual pecten teeth with at least 4, often about 10, ventral denticles. 7

7(6). Setae 2, 3-A apical; labula of mandible very strongly developed, extending far beyond apex of anterior part, with apex subacute. *Eumelanomyia (Protomelanoconion)* (p. 185)

Setae 2, 3-A subapical; labula of mandible extending only slightly beyond apex of anterior part, with apex rounded. . *Lophoceraomyia* (p. 196)

SUBGENUS *CULEX* LINNAEUS*

Culex Linnaeus, 1758: 602. Type-species: *Cx. pipiens* Linnaeus, 1758; Europe.

Medium-sized to rather large mosquitoes.

FEMALE. *Head.* Eyes contiguous or narrowly separated above. Vertex including eye margin usually with narrow scales only, occasionally with broad lateral scales; erect forked scales over almost entire vertex; 5-10 vertical and usually 2 (occasionally 3) temporal bristles on each side. Antennal flagellum 0.9-1.3 of proboscis; flagellomere 1 1.1-1.7 of Flm 2. Palpus 0.17-0.25 of proboscis; segment 4 lacking or minute. Proboscis 0.9-1.3 of forefemur, with several ventrobasal bristles; pale median band present or absent. *Thorax.* Pronotal lobes with narrow scales; anterior lobe with more than 10 bristles of various sizes; posterior lobe with 4 to more than 10 bristles along posterodorsal to dorsoposterior margin or posterior margin, many bristles in a posterodorsal group in *bitaeniorhynchus*. Scutum covered with narrow scales; all scutal bristles developed. Scutellar median lobe with 5-12, each lateral lobe with 3-9 long bristles. Pleura with small but distinct scale patches on upper sternopleuron, lower posterior sternopleuron and midanterior mesepimeron, propleuron and upper mesepimeron also often with scales; 0-3 lower mesepimeral bristles. *Wing.* Veins dark scaled, or speckled or spotted by pale scales. Cell R_2 at least twice as long as vein r_{2+3}. *Legs.* Tarsi banded or unbanded. Foretarsomere 5 shorter to slightly longer than 4; hindtarsomere 1 0.85-1.09 of tibia. *Abdomen.* Laterotergite unscaled; scaling of terga variable. Seminal capsules 3.

MALE. Antennal flagellum 0.77-0.95 of proboscis; flagellomere 12 0.78-1.32 of Flm 13, both 0.66-0.99 of Flm 1-11 (0.65-0.76 and 0.94-1.25 respectively in *boninensis*). Palpus 1.2-1.5 of proboscis (0.99-1.08 in *boninensis*); segment 3 without specialized setae or with a row of apically broadened setae (*sitiens* and *pseudovishnui*); 4 usually shorter than, rarely as long as 5; 4 and 5 upturned; 4, 5 and apex of 3 with numerous rather long bristles except in *boninensis*. Proboscis 1.1-1.4 of forefemur, with false joint at middle to apical 0.4. Cell R_2 longer than vein r_{2+3}, relatively shorter than in female, 1a usually slightly shorter than in female. Foretarsomere 4 shortened; 5 moderately modified, 1.5-2.3 of 4, ventrobasal swelling with 2 pairs of short curved apical setae and one pair of rather long lateral setae; also a pair of midventral short curved setae present, the base of them occasionally developed as a short process. Midtarsomere 5 not modified, shorter than 4. Anterior claw of fore- and midtarsi with a blunt-tipped median tooth; posterior claw with a sharp laterobasal tooth. *Genitalia.* Tergum IX

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*After the completion of the manuscript, Sirivanakarn (1976: 115) recorded *Culex (Culex) vishnui* from Chizuka, Okinawa Is., Ryukyu Archipelago. This species, closely allied to *pseudovishnui*, was not treated by us in this publication.

reduced to a narrow transverse band, lobes poorly differentiated, widely separated, bristled. Sternum IX without bristles. Basistyle unscaled; subapical lobe usually at apical 0.3, usually bearing 3 rods (α, β and γ), one more or less broad seta (δ), one broadly foliate seta (ϵ), one lateral accessory bristle (χ) and a few short specialized setae (μ) near δ: δ sometimes indistinguishable from μ; μ occasionally absent. Dististyle 0.33-0.60 length of basistyle, usually evenly arcuate and apically tapering, occasionally modified, with a short seta on concave side near apex and one or more short setae more proximally on convex side, often with annulations on convex side near apex; claw short, apically broadened, usually pale. Paraproct with apical crest of numerous pigmented spines, lateral spines stout, blunt-tipped; laterobasal process variable. Aedeagus usually complex; tergoapical division with 3 or more processes or teeth, greatly simplified in *sinensis*.

LARVA. Representatives of this region are divided into 2 groups by the larval characters. One (*bitaeniorhynchus* group) includes *bitaeniorhynchus* and *sinensis*, and another (*pipiens* group) all the others. (1) *pipiens* group. *Head*. Distinctly broader than long; overall size, oral cavity, mandible and maxilla relatively large, ventral aspect of cranium relatively short; seta 1-C variable, usually shorter than distance between bases; rudimentary 2-C often present; 4-C slender, not reaching apex of cranium, posteriad of level of 7-C; 5, 6-C well developed, usually posteriad of level of 7-C; 11-C weaker than 13-C; 17-C rudimentary or absent. *Antenna* distinctly spinulate; 1-A inserted distad of middle, with well developed barbed branches; 2, 3-A subapical. Mouth brush of numerous fine hairs. *Mandible* with a group of simple dorsolateral microspines near base; mandibular ring distinct, on basal aspect; 5 mandibular spurs, MdS_1 longest, pigmented, curved; MdS_2 of several slender spurs, some apically refurcate; $MdS_{3,4}$ similar to MdS_1 in shape, but smaller and paler; MdS_5 shortest, straight, basally broadened. Mandibular brush well developed, consisting of numerous stiff hairs. Mandibular comb of about 10 or more spiculate prominences, progressively smaller laterally, each with 2 unequal long filamentous spicules in addition to many short ones. Cutting organ with 2 heavily pigmented dorsal teeth, mesal tooth with mesal denticle(s); ventral tooth with lateral denticle (VT-4) spiniform, not reaching apex of VT_0, and with 3 triangular mesal denticles; ventral blade 1 or 2, VB_1 apically slender, extending beyond apex of VT_0, with mesal pectination; VB_2 much smaller, pectinate mesally and also laterally toward base; pectinate brush well developed, the hairs laterally pectinate basally and bilaterally apically. Piliferous process well protrudent, with labula extending beyond apex of anterior part, bearing the usual 5 hair groups. Mandibular hairs divided into 2 groups, hairs of distal group laterally barbed, those of proximal group apically frayed. *Maxilla*. Cardo usually narrowly connected with cranium mesobasally (somewhat broadly in *fuscocephala* Theobald), cardinal seta 1-Mx usually single, occasionally double. Mesostipes with some unilaterally pectinate rather thick curved spicules on basal mesal margin; stipital sensoria at about middle of mesostipes or slightly proximad of it, each with a basal ring; ventral stipital seta 4-Mx variable. Pseudoartis poorly to moderately developed. Hairs of maxillary brush long and slender. Lacinia with spicules all slender; proximal lacinial seta 5-Mx at about level of stipital sensoria. Palpostipes excluding lateral artis at most 0.4 as long as mesostipes, basally broadened; apex with ampulla and 5 palpal sensoria; S_3 always longest. *Mentum plate* pentagonal or triangular, with teeth 25 or less, aulaeum with pale median tooth. *Thorax*. Setae 0-P, 13, 14-M and 8-T usually dendritic; 3-P single, as long as 1, 2-P; 4-P long; 12-P strong,

definitely longer and stouter than 9, 10-P. *Abdomen.* Comb scales variable, but never in a single row. *Siphon* with pecten reaching at least basal 0.2 of siphon, teeth pale, with ventral denticles; 1-S of 3 or more pairs (excepting a few aberrant *pipiens*), subventral or almost ventral, often one or a few additional lateral or subdorsal setae near apex. *Saddle* usually pale yellow; 1-X shorter than saddle; 2-X usually with dorsal branch(es) shorter than ventral branch; 4-X of 11-14, most frequently 12, cratal hairs, each hair usually branched; grid fused with saddle proximally. (2) *bitaeniorhynchus* group. Differing from *pipiens* group in the following characteristics. Body setae, in general, relatively short. *Head* with overall size, oral cavity, mandible and maxilla relatively small; ventral aspect of cranium long; seta 4-C sometimes extending beyond apex of cranium; 11-C occasionally stronger than 13-C. *Antenna* sometimes poorly spinulate; 1-A inserted at about middle, sometimes smooth. *Mandible* with microspines on ventral surface; 4 mandibular spurs (MdS_2 reduced), all broad and pigmented. Mandibular brush reduced to a short dorsolateral row of a number of hairs. Mandibular comb reduced to a ventrolateral row of only a few spiculate prominences. Cutting organ with dorsal teeth and VT-4 more strongly developed, VT_3 sometimes modified; VB_1 sometimes modified, VB_2 apparently absent; pectinate brush more weakly developed. Piliferous process only slightly protrudent, very broad, more densely haired. Mandibular hairs in a single row, closely spaced. *Maxilla* with cardo fused with cranium along its entire basal margin. Mesostipes with stipital sensoria distad of middle. Hairs of maxillar brush short. Lacinia more densely covered with basally thickened spicules; 5-Mx at or distad of level of stipital sensoria. Palpostipes about 0.6 as long as mesostipes, mesobasally fused with mesostipes, apex with 3 or 4 palpal sensoria. $S_{1,2}$ well developed, other(s) small and pale. Mentum plate sometimes modified. *Thorax.* Seta 4-P sometimes short. *Abdomen.* Comb scales less than 10. Pecten poorly developed, reaching at most basal 0.1 of siphon, of less than 10 teeth.

DISTRIBUTION. Worldwide.

KEYS TO SPECIES OF *CULEX (CULEX)**

FEMALE ADULT

1. Lower mesepimeral bristle present; proboscis and tarsi not banded. 2
   Lower mesepimeral bristle absent. 4

2(1). Side of thorax with 2 conspicuous dark transverse integumental stripes; abdominal terga with usually poorly developed dull-pale mediobasal patches. . . . . *fuscocephala* (p. 135)
   Side of thorax without conspicuous dark integumental stripes; abdominal terga with pale basal bands. 3

*Cx. *vishnui* not included; see Sirivanakarn 1976.

3(2). Midfemur with a distinct pale streak on anterior surface. *vagans* (p. 138)
Midfemur without a pale streak on anterior surface. . *pipiens* (p. 141)

4(1). Proboscis and tarsi not banded. . . . . *boninensis* (p. 171)
Proboscis and tarsi pale banded. 5

5(4). Wing not spotted. 6
Wing spotted. 11

6(5). Abdominal terga with pale basal bands or patches. 7
Abdominal terga with pale apical bands, or both apical and basal bands. 10

7(6). Scutum largely white scaled; abdominal terga with triangular mediobasal patches. . . . . *whitmorei* (p. 158)
Scutum mainly brown scaled; abdominal terga with basal bands. . . . 8

8(7). Vertex with erect forked scales all dark[1]; proboscis usually with scattered pale scales in basal dark area; midfemur not speckled with pale scales. . . . . *tritaeniorhynchus* (p. 148)
Vertex with some median erect forked scales pale; proboscis without scattered pale scales in basal dark area[2]. 9

9(8). Midfemur not speckled with pale scales. . . . . *pseudovishnui* (p. 152)
Midfemur speckled with pale scales on anterior surface. *sitiens* (p. 155)

10(6). Wing veins speckled with pale and dark scales. *bitaeniorhynchus* (p. 173)
Wing veins dark scaled. . . . . *sinensis* (p. 177)

11(5). Wing with basal pale mark on veins c and r; sector pale mark including c, sc and r-r_1; foretarsomere 1 as long as 2-5 together. *orientalis* (p. 167)
Wing without basal pale mark; sector pale mark not extending onto vein r-r_1; foretarsomere 1 longer than 2-5 together. 12

12(11). Abdominal terga III-VI frequently with distal spots; VII with pale apical band usually broad. . . . . *jacksoni* (p. 161)
Abdominal terga without distal spots; VII with pale apical band narrow or reduced. . . . . *mimeticus* (p. 164)

[1]Some of these dark scales may have pale tips (Matsuo and Iwaki 1972).

[2]Some *pseudovishnui* females have scattered pale scales on ventrobasal aspect of proboscis (Matsuo and Iwaki 1972).

MALE ADULT

1. Palpus as long as or only slightly longer than proboscis (at most, longer than proboscis by less than half length of segment 5), with apex not hairy; subapical lobe of basistyle with ϵ narrow. *boninensis* (p. 171)
Palpus distinctly longer than proboscis (at least, longer than proboscis by nearly the length of segment 5), with apex distinctly hairy; subapical lobe of basistyle with ϵ broadly foliate. 2

2(1). Subapical lobe of basistyle divided, lateroproximal division bearing α, β, γ, ϵ and χ; mesodistal division bearing δ; μ absent. *fuscocephala* (p. 135)
Subapical lobe of basistyle not divided, or ϵ and χ indistinctly separated; μ present. 3

3(2). Sternomesal subdivision of aedeagus with apex not spiculate; aedeagus composed of 3 pairs of processes. 4
Sternomesal subdivision of aedeagus with apex finely spiculate. . . . 5

4(3). Paraproct with laterobasal process strongly developed, curved sternally, deeply pigmented. . . . . *vagans* (p. 138)
Paraproct with laterobasal process short, straight, pale. *pipiens* (p. 141)

5(3). Tergoapical division of aedeagus simple, composed of a pair of horn-shaped spiculose processes (sternomesal subdivision), with a small protuberance at base of each; paraproct with laterobasal process strongly developed. . . . . *sinensis* (p. 177)
Tergoapical division of aedeagus complex, with 3 or more large tergal teeth on each side. 6

6(5). Dististyle short, less than 0.4 as long as basistyle; paraproct with laterobasal process short. . . . . *bitaeniorhynchus* (p. 173)
Dististyle long, about 0.5 as long as basistyle or longer. 7

7(6). Dististyle very broad, 2.8-3.8 times as long as wide, abruptly narrowed in apical 0.33; laterobasal process strongly developed, sternally curved, deeply pigmented. . . . . *orientalis* (p. 167)
Dististyle narrow, at least 4 times as long as wide, apically tapering. 8

8(7). Subapical lobe of basistyle with δ distinctly larger than μ. 9
Subapical lobe of basistyle with δ subequal to μ in shape and size . . 12

9(8). Paraproct with laterobasal process, if at all developed, pale, straight, at most moderately long; dististyle without annulations. *jacksoni* (p. 161)
Paraproct with laterobasal process strongly developed, sternally curved, deeply pigmented. 10

10(9). Dististyle without annulations. . . . . *mimeticus* (p. 164)
Dististyle with annulations on apical convex side. 11

11(10). Apex of sternomesal subdivision of aedeagus, in tergal view, mesally angulate, acutely produced laterally; subbasal knob small.
tritaeniorhynchus (p. 148)
Apex of sternomesal subdivision of aedeagus, in tergal view, mesally rounded, not acutely produced laterally; subbasal knob large.
pseudovishnui (p. 152)

12(8). Dististyle with apical annulations on convex side; paraproct with laterobasal process strongly developed; aedeagus without very broad triangular lateral process; subbasal knob very large.
sitiens (p. 155)
Dististyle without annulations; paraproct with laterobasal process moderately developed; aedeagus with very broad triangular lateral process; subbasal knob poorly developed. . . . . *whitmorei* (p. 158)

LARVA

1. Comb scales paddle-shaped evenly fringed, laterally to apically, with fine spicules. 2
Comb scales thorn-shaped, apical spine stronger than lateral spicules. 7

2(1). Seta 1-C pale, slender; apically filamentous. 3
Seta 1-C dark, stout. 5

3(2). Setae 5, 6-C 2-3 branched; mesostipes with lateral surface smooth; 1-S very weak, shorter than siphon diameter; siphon index more than 5. . . . . *fuscocephala* (p. 135)
Setae 5, 6-C 4-7 branched; mesostipes with lateral surface spinulate; 1-S well developed, longer than siphon diameter or siphon index less than 5. 4

4(3). Siphon index more than 5; seta 1-S usually 5 paired; mentum teeth 16-20 ($\bar{x}$ = 18.5). . . . . *vagans* (p. 138)
Siphon index usually less than 5; seta 1-S usually 4 paired; mentum teeth 20-25 ($\bar{x}$ = 22.3). . . . . *pipiens* (p. 141)

5(2). Seta 4-P single; 1-S almost ventral, basalmost 1-S 6-13 branched.
boninensis (p. 171)
Seta 4-P usually double; 1-S subventral, 2-5 branched. 6

6(5). Seta 5-C 3, 4 branched, 6-C and 7-I double; ventral blade with mesal pectination of numerous fine teeth; siphon index 7.0-9.0.
tritaeniorhynchus (p. 148)
Seta 5-C 5-7 branched, 6-C 4-6 branched, 7-I single; ventral blade with mesal pectination of about 10 strong teeth; siphon index 5.2-6.2.
sitiens (p. 155)

7(1). Comb scales less than 20; seta 1-S subventral. 8
Comb scales more than 20; seta 1-S almost ventral. 11

8(7). Pecten reaching at least basal 0.2 of siphon. 9
Pecten reaching at most basal 0.1 of siphon. 10

9(8). Seta 1-S moderate, not more than twice as long as siphon diameter at insertion, smooth, 3-6 branched; 2-S short, simple; 5-C 3, 4 branched; 9-P and 1-T single; 2-X 3, 4 branched.
pseudovishnui (p. 152)
Seta 1-S strong, more than twice as long as siphon diameter, barbed, double; 2-S longer than apical diameter of siphon, with spicules basally; 5-C double; 9-P and 1-T 2, 3 branched; 2-X single.
whitmorei (p. 158)

10(8). Mentum plate with 19-27 distinct teeth; seta 4-C extending beyond apex of cranium; 4-P short, smooth. . . . . *sinensis* (p. 177)
Mentum plate with numerous indistinct closely appressed teeth; seta 4-C not reaching apex of cranium; 4-P long, barbed.
bitaeniorhynchus (p. 173)

11(7). Siphon with 1-4 simple strong subventral spines on each side; seta 1-S of 6-8 setae; seta 4-C 3-6 branched. . . . . *jacksoni* (p. 161)
Siphon without simple strong spines; seta 1-S of 9-14 setae. 12

12(11). Seta 4-C 3-5 branched; mentum plate triangular, with flanking teeth equal; 13-T 1-3 branched; 2-S curved, more than half as long as siphon diameter at apex, longer than apical pecten tooth.
mimeticus (p. 164)
Seta 4-C 1, 2 branched; mentum plate pentagonal, with flanking teeth unequal; 13-T with at least 8, usually more than 10 branches; 2-S straight, 0.33 as long as siphon diameter at apex, shorter than apical pecten tooth. . . . . *orientalis* (p. 167)

22. *CULEX (CULEX) FUSCOCEPHALA* THEOBALD
(Figs. 33, 34, 179: Table 56)

Culex fuscocephala Theobald, 1907: 420 (♀). Type-locality: Peradeniya, Ceylon.
Culex fuscocephalus: Miyagi and Omori, 1968: 5, Yaeyama Gunto, Ryukyu Archipelago.

FEMALE (Fig. 179). Wing length 2.7-3.5 mm. *Head.* Vertex medially covered with white narrow curved scales and laterally with white rather broad scales; numerous dark gray erect forked scales over vertex, a few median ones pale yellow; tempus densely covered with pale broad scales; 5 to about 10 vertical bristles on each side, a median pair long, golden brown, others dark; 2 dark temporal bristles on each side. Clypeus dark brown. Antenna: pedicel yellowish brown, mesal surface infuscate, with a few small hairs and scales; flagellum 0.91-1.15 (4) of proboscis; flagellomere 1 1.29-1.70 (4) of Flm 2. Palpus 0.16-0.17 (4) of proboscis, dark scaled, with a few dull pale scales; segment 3 ovoid, slightly more than twice as long as wide,

1.44-1.71 (4) length of 2. Proboscis 1.06-1.30 (4) of forefemur, covered with dark scales dorsally and dull pale scales laterally and ventrally. *Thorax*. Pronotal integument dark brown; anterior lobe covered with white crescent-shaped scales; posterior lobe with bronze-brown narrow curved scales dorsally and 5-9 bristles dorsoposteriorly. Scutum with integument blackish brown, covered with bronzy dark narrow curved scales on disk, with pale narrow curved scales along margins and on prescutellar space; scutal bristles mostly dark, a number of bristles along antealar margin yellow; humerals, angulars and posterior fossals 1-3 each. Scutellum covered with pale narrow curved scales on median lobe, bearing 5-6 long dark bristles on each lateral lobe and 7-12 on median lobe, together with several small bristles on each lobe. Pleural integument dark brown on postspiracular area, upper subspiracular area, prealar knob and upper mesepimeron, the dark area forming a transverse band continuous from posterior pronotal lobe; middle sternopleuron and lower mesepimeron also dark brown and forming another transverse band; a distinct pale band present between these 2 dark bands from lower posterior pronotal lobe to metapleuron; lower sternopleuron brown; patches of white rather broad scales on propleuron, pale upper sternopleuron, lower caudal sternopleuron and pale median mesepimeron; propleural, prealar and sternopleural bristles about 10 or more; 5-10 upper mesepimerals; 2 or 3 (rarely one) lower mesepimerals, one of them always stout. *Wing*. Veins mostly dark scaled, a few pale scales at base of c, base of r pale scaled; cell R_2 2.32-3.30 (4) length of vein r_{2+3}; 1a ending at level between cubital fork and m-cu or nearly reaching level of m-cu. Halter with dark scaled knob. *Legs*. Forecoxa covered with scales on anterior surface, basally and apically pale, dark in-between; mid- and hindcoxae with pale scales. Posterior half of both dorsal and ventral surfaces of forefemur, posterior surface of midfemur, hindfemur excepting dorsal surface, posterior surface of foretibia, dorsal and posterior surfaces of midtibia, and hindtibia excepting dorsal surface pale scaled; basal segments of tarsi with some pale scales; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than or equal to 4; hindtarsomere 1 0.93-0.96 (4) of tibia. *Abdomen*. Tergum I with dark gray and dull pale scales at middle; II-VII dark gray scaled, each with a mediobasal transverse patch of dull pale scales, the patch sometimes indistinct; lateral margin covered with dull pale scales, the pale area narrowed toward anterior segments; VIII dark gray scaled at middle, dull pale scaled on both sides. Sterna dull pale scaled.

MALE (Figs. 34, 179). Wing length 2.3-3.2 mm. Antenna: flagellum 0.77-0.86 (4) length of proboscis; flagellomere 12 1.13-1.45 (4) of Flm 13, both 0.66-0.78 (4) of Flm 1-11. Palpus 1.30-1.39 (4) of proboscis (longer than proboscis by about length of segment 5), with pale scales on underside of 3 and 4; 4, 5 and apex of 3 hairy; length ratio of 2-5: 0.74-0.82 : 1.45-1.61 : 0.74-0.82 : 1.00 (4). Proboscis 1.24-1.29 (4) of forefemur, with false joint at apical 0.40-0.41, with long ventral bristles immediately proximad of the joint. Scutellar lateral lobes with 4, 5 long bristles. Lower mesepimeral bristle always one. Cell R_2 1.85-2.13 (4) length of vein r_{2+3}. *Genitalia*. Tergum IX with each lobe bearing 10-17 medium-sized bristles. Basistyle subparallel-sided in basal half and conical in apical half in tergal view, bristled except for basal and mesoapical areas, with a row of 7-10 curved bristles on tergal surface in middle, the row often basally double; subapical lobe at about apical 0.25 of basistyle, well protrudent, divided into lateroproximal and mesodistal sections; the lateroproximal section bearing 3 rods (α, β and γ) on the top, and a very wide and finely striated leaflet (ϵ) together

with a long curved bristle (χ?) on membranous distal flank of the section, proximal rod (α) shorter and more slender than other 2, with rounded apex, middle rod (β) and distal rod (γ) subequal in length, curved at apex, β thicker than γ; the mesodistal section small, bearing a single rod-shaped long seta (δ). Dististyle 0.5-0.6 length of basistyle, curved at about apical 0.33, with minute annulations on convex side at apex, bearing 2 small setae near apex, proximal one on convex side and distal one on concave side. Cercal tergal surface broadly sclerotized, 2, 3 cercal setae; paraproct weakly sclerotized, laterobasal process very long, stout, sternally curved and markedly pigmented. Tergoapical division of aedeagus 1.00-1.08 (5) times as wide as long; mesal subdivision slightly longer than lateral subdivision, rod-shaped, simple, unpigmented, apically divergent, with sharp apex, the surface without fine spiculation; lateral subdivision moderately sclerotized, consisting of a cluster of 6, 7 tergally or laterotergally directed teeth including laterobasal most broad tooth; subbasal knob moderately developed; sternally directed teeth or processes absent.

LARVA (Fig. 33). *Head.* Width 0.95-1.07 mm; pale yellow-brown to brown, 1.35-1.47 (x = 1.43) times as wide as long; labrum not concave; seta 1-C long, fairly slender, apically filamentous, pale, separated by 0.75-1.15 times their length; 4-C quite slender, usually single; 5, 6-C subequal, 0.67-0.75 length of head; 6, 11, 13-C usually double. *Antenna* 0.46-0.51 mm long, nearly straight, pale in proximal part except for dark basal ring, rather dark in distal part, with numerous rather long spinules dorsally, laterally and ventrobasally on proximal part, several short spinules laterally on distal part; 1-A inserted at about apical 0.33, with 20-25 strongly barbed branches, each about 0.6 of antenna length; 2-4-A subequal, each about 0.50-0.55 of antenna length; 5-A 0.67-0.80 of 6-A. *Mandible* (a single dissected specimen) with a number of needle-like dorsolateral microspines. Cutting organ with mesal dorsal tooth bearing a very small distal denticle and a very strong proximal denticle; VT_0 subacute, somewhat elongate, distance from base to apex of VT_0 about 1.2 times distance from proximal base of VT_3 to distal base of VT_1; VT_3 slightly larger than $VT_{1,2}$; VB_2 much smaller than VB_1; pectinate brush about 10 haired. Piliferous process strongly protrudent, labula nearly as large as the portion anterior to the cleft. Mandibular hairs 7 + 8. *Maxilla* (a single dissected specimen). Cardo rather broadly fused mesobasally with cranium; 1-Mx usually single, rarely double. Mesostipes 1.33 as long as wide, with lateral surface smooth; stipital sensoria somewhat proximad of middle, distal sensorium slightly shorter; 4-Mx pale, slender; pseudoartis moderately developed. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis less than 0.33 length of mesostipes; S_1 slightly and S_4 strongly curved, $S_3 > S_1 = S_4 > S_2 > S_5$ in length. *Mentum plate* with 15-17 (usually 17) subacute teeth, the flanking teeth becoming more acute laterad. Aulaeum with simple median tooth. *Thorax.* Prothoracic setal formula: 1·1·1(2)·2(1)·1·1·2-5·2-4; 12-P usually longer than 6-P and 3 times length of 9-P; 1-M small, subequal to 2-M; 7-M usually slightly shorter than, but more strongly barbed than 6-M. *Abdomen.* Seta 5-I often dendritic; when single, 1-III about 0.63 length of 6-III and 1-IV slightly longer than 6-IV; when double or triple, 1-III, IV much shorter than the respective setae 6; 8-III and 12-IV usually double; 1-VI smaller than 6-VI; 7-VI at least twice as long as 9-VI, nearly as long as 4-VI; 5-VIII usually lightly barbed. Comb scales 24-44 (x = 36.3) in a roughly triangular patch, the individual scales broadly paddle-shaped, lateroapically fringed with long strong spicules, laterobasally with smaller spicules. *Siphon* yellow brown except for narrow dark brown basal

ring, smooth or nearly so, very slightly sinuate, tapering gradually distad; length 1.27-1.43 mm, index 5.3-6.3 (x = 5.7); pecten reaching basal 0.25-0.34 (x = 0.32), of 9-14 teeth, becoming larger and more separated distad, each tooth with 2-5 ventral denticles; 1-S of 3 or 4 pairs of subventral setae, located as follows: most proximal seta just distad of pecten at basal 0.34-0.50 (x = 0.42), next seta (sometimes absent) at basal 0.51-0.58 (x = 0.54), subapical seta at basal 0.63-0.75 (x = 0.71), and apical seta at basal 0.79-0.86 (x = 0.82), the subapical seta more lateral in position than the others, each usually 2, 3 branched, shorter than siphon diameter at insertion; 2-S stiff, subapical, usually less than half the length of the apical pecten tooth. *Saddle* 0.31-0.39 mm long, with some small needle-like spicules becoming more prominent dorsocaudad; 1-X usually less than 0.5 saddle length; 2-X with longest branch usually at least 3 times saddle length; 4-X of 11 or 12 cratal hairs, each with 4-9 branches, the most proximal hair sometimes much reduced. Anal gills slender, fusiform, dorsal gill 0.9-1.6 (x = 1.4) length of saddle, ventral gill usually 0.67-0.75 length of dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO: 39♂, 94♀, with associated skins (1 l, 1 p); 27 L, 1 l: Yaeyama Guntô (K-0112, K-0942, K-0987, K-0999, K-1019, K-1036, K-1105, K-1106, K-1107, K-1108, K-1109, K-1110, K-1113, K-2119).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô). TAIWAN. PHILIPPINES. BORNEO. JAVA. SUMATRA. SOUTH CHINA. HONG KONG. HAINAN ISLAND. INDOCHINA. MALAYA. SINGAPORE. THAILAND. BURMA. ANDAMAN ISLANDS. INDIA. NEPAL. SRI LANKA.

BIONOMICS. Not rare in Yaeyama Guntô, but not found in other parts of this region. A record of this species from Osan, Korea by Reisen et al. (1971) needs restudy. The larvae are found in ground pools, ponds, rice fields and other semipermanent bodies of water, usually with emergent vegetation (Bram 1967). Sirivanakarn (1976) reported their occurrence in containers such as earthenware jars and coconut shells. Dowell et al. (1965) collected *fuscocephala* larvae in banana axils and fire barrels in Luzon. Adult females have been reported feeding on man and buffalo (Bram 1967), as well as cows and pigs (Sirivanakarn 1976).

RELATION TO DISEASES. Japanese encephalitis virus (JEV) was isolated from wild caught females of this species in Taiwan (Wang et al. 1962) and Thailand (Sirivanakarn 1976). Gould et al. (1974) found *fuscocephala* infected with JEV in Thailand, but apparently a lower percentage than other implicated vector species studied (*gelidus* and *tritaeniorhynchus*). Sirivanakarn (1976) also cited references indicating natural infections of *fuscocephala* with Malayan and Bancroftian filariasis, but its role in their transmission is undetermined.

23. *CULEX (CULEX) VAGANS* WIEDEMANN
(Figs. 34, 35, 180; Table 57)

Culex vagans Wiedemann, 1828: 545 (♂, ♀). Type-locality: Foochow, China; Hsiao, 1946: 41; Seoul, Korea; Intermill, 1967: 2, Okinawa Is., Ryukyu Archipelago.
Culex tipuliformis: Yamada, 1927: 583; Hokkaido and Honshu, Japan.
Culex (Culex) vagans: LaCasse and Yamaguti, 1950: 216 (M, F, L).

FEMALE (Fig. 180). Wing length 3.9-4.6 mm. *Head.* Eyes contiguous above and below. Vertex covered with pale yellowish brown narrow curved

scales and numerous rather dark brown erect forked scales, a few anteromedian erect scales occasionally pale; side of vertex and eye margin more densely covered with more whitish scales; tempus covered with pale broad scales; 6-8 (3) vertical and 2 (4) temporal bristles on each side, most mesal vertical bristle long, yellowish brown, others dark. Antenna: pedicel yellowish brown, mesal surface dark brown, with several minute bristles and small white scales; flagellum 0.96-0.98 (2) of proboscis; flagellomere 1 1.16-1.21 (2) of Flm 2, with several white scales ventromesally. Palpus 0.18 (2) of proboscis, dark scaled; segment 3 2.20-2.94 (2) of 2; 4 lacking in 2 dissected specimens. Proboscis 1.06-1.09 (2) of forefemur, dark scaled dorsally, apically and basally, with pale ochreous scales broadly in middle ventrally. *Thorax*. Pronotal integument brown, with yellowish brown narrow curved scales, lateral scales of anterior lobe and posteroventral scales of posterior lobe whitish; posterior lobe with 4-10 (6) rather dark brown bristles along posterodorsal to dorsoposterior margin. Scutum with integument brown, covered with yellowish brown narrow curved scales, scales on anterior and supraalar margins and prescutellar space whitish; scutal bristles rather dark brown, 3-5 (4) bristles on margins of fossal area. Scutellum with whitish narrow curved scales; each lateral lobe with 5-6, median lobe with 6-10 long rather dark brown bristles, each lobe with several additional yellowish fine bristles. Pleural integument light brown, posteriorly paler; small patches of white broad scales on propleuron, upper and midposterior sternopleuron, and upper and midmesepimeron; pleural bristles yellowish brown to quite pale, 6 to more than 10 propleurals, 7-12 prealars, more than 10 sternopleurals, 6 to more than 10 upper mesepimerals and one (occasionally 2) lower mesepimeral (8). *Wing*. Veins dark scaled. Cell R_2 3.35-3.45 (4) length of vein r_{2+3}; base of R_2 slightly proximad of that of M_{1+2}; 1a ending at level between cubital fork and m-cu. Halter knob pale scaled. *Legs*. Forecoxa pale scaled basally, dark scaled otherwise, pale scales often also present at apex; mid- and hindcoxae with pale scales. Femora with posteroapical pale fringe; forefemur with pale streak on anterior surface, pale on posterior half of ventral surface to posterior surface, posterior half of dorsal surface also appearing pale under some light; midfemur with a sharply defined pale streak on anterior surface, closer to dark ventral margin than to dorsal margin, and extending from base to anteroapical dark fringe, posterior surface to dorsobasal surface pale; hindfemur largely pale excepting dorsal surface, the dorsal dark area not quite reaching base, expanding apically onto anterior surface and covering tip of anterior surface. Foretibia appearing to be pale on anterior, ventral to posterior surface; midtibia with a narrow pale streak on anterior surface, posterior surface appearing pale, this pale area often expanding apically onto dorsal surface; hindtibia appearing pale on both anterior and posterior surface, with apical pale fringe. Basal tarsomeres appearing posteroventrally pale, and also anteroventrally pale in hindtarsus. Femora, tibiae and tarsi otherwise dark. Foretarsomere 5 equal to or slightly longer than 4; hindtarsomere 1 0.89-0.96 (4) of tibia. *Abdomen*. Tergum I with a median spot of dark and pale scales; II-VII with basal bands and sublateral narrow patches of pale yellowish scales, and laterobasal patches of white scales, the basal bands somewhat laterally narrowed, usually not confluent with laterobasal patches on anterior segments, usually confluent with them in posterior segments; VIII pale scaled. Sterna pale scaled.

MALE (Figs. 34, 180). Wing length 3.4-3.9 mm. Antenna: flagellum 0.77-0.84 (4) as long as proboscis; flagellomere 12 0.78-0.86 (4) of Flm 13, both 0.89-0.99 (4) of Flm 1-11. Palpus 1.34-1.36 (5) of proboscis; segment 1

without bristles; 4, 5 and apical half of 3 with numerous medium to rather long bristles; 3 lateroventrally pale scaled excepting apex and base, with scattered pale scales mesally; 4 with ventral pale streak and 5 with ventrobasal pale spot; length ratio of 2-5 : 0.75-0.87 : 1.72-1.81 : 0.94-1.00 : 1.00 (5). Proboscis 1.25-1.28 (5) of forefemur, with false joint at apical 0.38-0.41, (5) without long bristles proximad of the joint. Cell R_2 1.82-2.09 (5) length of vein r_{2+3}; base of R_2 at level of base of M_{1+2} or slightly apical. Foretarsomere 5 1.59-1.80 (5) of 4, with bases of midventral short curved setae slightly protrudent; hindtarsomere 1 0.96-1.02 (5) of tibia. *Genitalia*. Tergum IX with each lobe bearing 6-13 (6) bristles of medium length. Basistyle with very fine tergal bristles except basally and apically, medium bristles tergolaterally, long bristles laterobasally to sternoapically, and short to medium bristles sternally; subapical lobe at apical 0.3, moderately protrudent, 3 rods (α, β and γ) proximal, closely spaced, subequal in length, γ more slender than other 2; δ and $\mu_{1,2}$ mesodistal, close together, δ moderately broad; ϵ laterodistal, strongly foliate, longer than δ; χ rather thick basally, curved apically. Dististyle rather strongly curved, 0.55 (1) length of basistyle, with a short seta on convex side at about apical 0.33, another on concave side at about apical 0.17. Cercal tergal surface rather well sclerotized, 1-4 cercal setae on each side; paraproct with laterobasal process very long, curved sternally, well pigmented. Tergoapical division of aedeagus with 3 processes: tergomesal, tergolateral and sternal, ratio of distance between apices: 0.57-0.77 : 1.27-1.71 : 1.00 (3).

LARVA (Fig. 35). *Head*. Width 0.95-1.25 mm; 1.26-1.58 times as wide as long; labrum straight between setae 1-C; 1-C slender, apically filamentous, pale, 0.68-0.87 as long as distance between bases; rudimentary 2-C sometimes present; 4-C longer than distance between bases; 13-C usually triple; 14-C slightly distant from anterior margin of cranium. *Antenna* 0.46-0.60 mm long, about 0.67 length of head, gently curved, spinulate dorsally, laterally and ventrobasally in proximal part, with only a few spinules on distal part, pigmented, occasionally proximal part broadly pale; 1-A inserted at apical 0.28-0.37 (x = 0.33), with 23 to 29 barbed branches, extending well beyond apex of shaft; 2-4-A subequal in length, 2-4, 6-A pigmented. *Mandible* with a number of needle-like dorsolateral microspines. Cutting organ with mesal dorsal tooth with a bicuspid large mesobasal denticle; ventral tooth with VT-4 stout, VT_{1-3} dark, subequal; VB_2 distinct; 7-10 haired pectinate brush. Mandibular hairs (6-7) + (8-12), hairs of distal group spiculate basally. *Maxilla*. Cardo mesobasally connected with cranium by a narrow sclerotized strip; 1-Mx single. Mesostipes 1.2-1.4 times as long as wide, with lateral surface spinulate; stipital sensoria at about middle, subequal; 4-Mx short, pale; pseudartis moderately developed. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis not more than 0.33 as long as mesostipes, $S_3 > S_1 \geq S_4 \geq S_2 > S_5$ in length. *Mentum plate* pentagonal, with 16-20 (x = 18.5) teeth, median tooth slightly larger than submedian teeth. Aulaeum with median tooth simple or bicuspid. *Thorax*. Prothoracic setal formula: 1·1·1·2·1·1·2(3)· 2(3). *Abdomen*. Integument ventrally very finely spiculate, VIII laterally and ventrally distinctly spiculate. Setae 1-III-VII well developed, 1-III-VI with branches unequal, 13-III-V weaker than respective setae 1; 3-II, IV, 14-III, VI-VIII, 12-IV and 10-VII usually single; 7-I, 11-III, V, VII, 5-IV, 1, 11-V, 1, 4-VI usually double; 1-VII most frequently and 13-VII usually 4 branched. Comb scales 32-40 in a patch, individual scales paddle-shaped, apically and laterally fringed with spicules, the spicules progressively stronger apically. *Siphon* nearly straight, dark at basal margin,

10.4-12.0 times as long as apical width; length 1.25-1.78 mm, index 5.33-6.17; microsculpture of transverse rows of extremely fine denticles; pecten reaching basal 0.23-0.30 of siphon, of 12 to 15 pale teeth including 0-5 basal abortive teeth, each with some ventral denticles; 1-S of 5 (rarely 4) pairs of setae, first (basalmost), 2nd and apicalmost setae subventral, 3rd seta more frequently subventral but often lateral in position; subapical setae lateral in position; each 2-6 branched, occasionally barbed; proximal 3 pairs distinctly longer than siphon diameter at insertion, distalmost seta usually shorter than it; basalmost seta located at basal 0.28-0.41, usually beyond pecten, occasionally within it; 2-S upright, subequal to apical pecten tooth. *Saddle* 0.29-0.43 mm long; microsculpture of spiculiferous short transverse ridges, the spicules progressively more distinct apically, numerous free stronger spicules scattered apically from dorsal to lateroventral surface; 2-X usually with 1 short dorsal branch in addition to a long ventral branch; 4-X of 11, 12 (usually 12) cratal hairs, each 4-9 branched. Anal gills tapering apically, 1.3-4.1 length of saddle, ventral gill 0.7-1.0 as long as dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 21♂, 26♀, with associated skins (18 l, 18 p); 28 L, 81: Hokkaido (A-0043, A-1640, A-1663, A-1910, A-1917, A-1918, A-1925, A-1926, A-1927, A-1928, A-1930, A-1948). 14♂, 9♀, with associated skins (13 l, 13 p); 17 L: Honshu (B-0378). RYUKYU ARCHIPELAGO. 2♀: Okinawa Guntô (J-2117, J-2118).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Kyushu). KOREA (Korean Pen., Cheju Do). RYUKYU ARCHIPELAGO (Amami and Okinawa Guntô). EAST SIBERIA. SAKHALIN. MANCHURIA. NORTH AND SOUTH CHINA. HONG KONG. NORTH INDIA.

BIONOMICS. Apparently common in northern Japan, less so in southern Japan including the Ryukyus. Larvae occur usually in natural fresh water ground pools, occasionally invading turbid water pools associated with human dwelling areas. Adults are known to attack man at night (Hsiao and Bohart 1946).

RELATION TO DISEASES. *Culex vagans* is very suitable as an intermediate host of *Wuchereria bancrofti* (Yamada 1927, as *tipuliformis* Theobald), however this species is a doubtful man biter.

24. *CULEX (CULEX) PIPIENS* LINNAEUS*

Culex pipiens Linnaeus, 1758: 602 (A). Type-locality: Europe; Lapponia; America.

DISTRIBUTION. WORLDWIDE.

24A. *CULEX (CULEX) PIPIENS QUINQUEFASCIATUS* SAY
(Figs. 36, 38, 181; Table 58)

Culex quinquefasciatus Say, 1823: 10 (A). Type-locality: Mississippi River, United States; Yamada, 1932: 215, Kyushu, Japan; U. S. War Dept., 1945: 11, Korea.

Culex fatigans Wiedemann, 1828: 10 (♂, ♀). Type-locality: East Indies (Indonesia); Hatori, 1919: 1057, Ishigaki Is., Ryukyu Archipelago.

Culex (Culex) quinquefasciatus: LaCasse and Yamaguti, 1950: 220 (♂, ♀, L); Bohart, 1956(1957): 77, Chichijima and Mukojima, Ogasawara Isls.; Volcano Isls.

FEMALE (Fig. 181). Wing length 3.0-4.3 mm. *Head.* Eyes barely contiguous above, definitely below. Vertex covered with pale narrow curved

*The nominal subspecies, *Culex pipiens pipiens* Linnaeus, and one or more other subspecies do not occur in this region.

scales and numerous erect forked scales, eye margin more densely covered with pale narrow scales, the median erect forked scales pale yellowish brown, the lateral ones dark; tempus covered with pale broad scales; 6-8 vertical and 2 temporal dark brown bristles on each side. Clypeus dark brown. Antenna: pedicel yellowish brown, mesal surface dark brown, with minute bristles and scales; flagellum 0.96-1.07 (9) of proboscis; flagellomere 1 1.15-1.40 of Flm 2, often with some scales. Palpus 0.18-0.21 of proboscis, dark scaled, with pale scales at tip dorsally; segment 3 2.16-3.10 of 2; 4 lacking in 10 slide mounted specimens. Proboscis 1.00-1.07 (9) of forefemur, dark scaled dorsally, basally and apically, broadly pale scaled ventrally in middle. *Thorax.* Pronotum with integument brown or rather light brown, covered rather roughly with yellowish pale narrow curved scales, often scales on ventroposterior part of posterior lobe whitish; posterior lobe with 6-9 mostly dark brown bristles of various sizes along posterodorsal to dorsoposterior margin. Scutum with integument brown, covered with yellowish brown narrow curved scales, scales on margins and prescutellar space whitish; scutal bristles brown to rather dark brown, fossal area with 4-7 bristles mostly along humeral margin and scutal suture, occasionally a few bristles in middle of the area. Scutellum with scales similar to those of prescutellar space; each lateral lobe with 5, 6, midlobe with 6-10 long yellowish to dark brown bristles, each lobe with several additional fine yellowish bristles. Pleural integument light brown, somewhat darker on posterior sternopleuron between scale patches and anterior mesepimeron below scale patch, posterior mesepimeron, mesomeron and metapleuron pale; small patches of broad white scales on upper sternopleuron, midposterior sternopleuron, upper mesepimeron and midanterior mesepimeron; somewhat yellowish and narrower scales on propleuron; pleural bristles yellowish brown to quite pale, 4-12 propleurals, about 10 or more prealars, more than 10 sternopleurals, 4-15 upper mesepimerals, one (very rarely 2) lower mesepimeral. *Wing.* Veins dark scaled. Cell R_2 2.74-3.56 (x = 3.13) length of vein r_{2+3}; 1a ending at level between cubital fork and m-cu to level of m-cu. Halter with pale scaled knob. *Legs.* Forecoxa pale scaled at base, dark scaled otherwise; midcoxa dark scaled at apex, pale scaled otherwide; hindcoxa with pale scales. Femora with narrow pale basal band, and rather indistinct incomplete pale apical fringe; fore- and midfemora pale posteroventrally, hindfemur pale on lower anterior surface to posterior surface excepting apical area, the anterior pale area basally broadened, apically narrowed. Hindtibia with some pale scales at apex anteriorly. Femora, tibiae and tarsi otherwise dark. Foretarsomere 5 equal to or slightly longer than 4; hindtarsomere 1 0.87-0.95 of tibia. *Abdomen.* Tergum I with median spot of dark scales; II-VIII dark scaled, with laterobasal patches and basal bands (usually short on II) of pale scales, the basal bands medially broadened, usually not connected with laterobasal patches on anterior segments, confluent with laterobasal patches on one or a few posterior segments. Sterna mainly pale scaled, usually with dark scales or spot of dark scales present medially and lateroapically, occasionally median line entirely dark, excepting II. Seminal capsules 3, one slightly larger than other 2.

MALE (Fig. 38). Wing length 2.5-3.2 mm. Antennal flagellum 0.79-0.95 of proboscis; flagellomere 12 1.06-1.19 of Flm 13, both 0.71-0.82 of Flm 1-11. Palpus 1.21-1.31 of proboscis, with numerous rather long bristles from apical 0.33 to apex; segment 3 with occasionally indistinct dorsolateral mark of pale scales; pale scales also ventrally present on 4 and ventrobasally on 5; length ratio of 2-5: 0.77-0.95 : 1.72-2.05 : 0.88-0.97. Proboscis 1.12-1.24

of forefemur, with false joint at apical 0.39-0.44 (9), without long bristles proximad of the joint. Cell R_2 1.59-2.26 (x = 1.95) times length of vein r_{2+3}; 1a usually not reaching level of m-cu. Foretarsomere 5 1.95-2.11 of 4, with a pair of short setiferous ventromedian processes; hindtarsomere 1 0.91-1.01 of tibia. *Genitalia*. (Yaeyama population). Tergum IX with each lobe bearing 5-14 (14; x = 9.6) bristles of medium length. Basistyle with fine bristles tergally, medium to long bristles laterally and sternoapically, short bristles sternally otherwise; subapical lobe at apical 0.3, moderately protrudent; 3 rods (α, β and γ) almost tandem, subequal in length, α and β close together, γ more slender than other 2 and occasionally a little removed distally; δ at mesodistal corner of the lobe, moderately broad, apically hooked; 2 or 3, rarely 4 (14; x = 2.3) apically hooked slender setae (μ) just laterad of δ; ϵ at laterodistal corner of the lobe, foliate, striated; χ rather thick basally. Dististyle about half as long as basistyle, simple, rather strongly arcuate, with a short seta on mesal side at about apical 0.33, and another more distally on concave side. Cercal tergal surface rather weakly sclerotized, 3-6 (13; x = 4.2) cercal setae on each side; paraproct well sclerotized, laterobasal process short, horizontal. Tergoapical division of aedeagus with subbasal knob well developed, 1.15-1.36 (x = 1.28) times as wide as long at the knobs, with 3 processes: tergal, sternomesal and sternolateral; the tergal processes (dorsal arms) narrow, tapering to a bluntly pointed apex, only a little divergent apically or nearly parallel; the sternomesal processes (ventral arms) well developed, laterally curved in a right angle, extending far more laterally than tergal process; the sternolateral process also directed laterally, smaller than sternomesal process; ratio of distances between apices of these 3 processes in above order: 0.22-0.35 (x = 0.29) (D/V) : 1.00 : 0.75-0.90 (x = 0.81).

LARVA (Fig. 36). *Head*. Width 1.07-1.15 mm; 1.32-1.43 times as wide as long; anterior margin of labrum between setae 1-C almost straight; 1-C pale, slender, apically filamentous, 0.49-0.78 (x = 0.58) as long as distance between bases; rudimentary 2-C often present; 4-C longer than distance between bases; usually, 5-C 5-6 branched, 6-C 4-5 branched and 10-C double; 14-C well caudad of anterior margin of cranium. *Antenna* 0.40-0.46 mm long, slightly more than half as long as head, slightly curved, pigmented, dorsally, laterally and ventrobasally spinulate on proximal part, with only several spinules laterally on distal part; 1-A inserted at apical 0.29-0.36 (x = 0.32) of shaft, with 23-30 barbed branches, extending well beyond apex of shaft; 2-4-A subequal in length, 2-4, 6-A pigmented. *Mandible* with a number of simple needle-like dorsolateral microspines. Mesal dorsal tooth of cutting organ with a large bicuspid mesobasal denticle; ventral tooth with VT-4 stout; VT_{1-3} dark, VT_2 usually a little more slender than VT_3 in the Yaeyama population (contrarily, a little stronger in the Ogasawara population); VB_1 more slender than in *vagans;* VB2 distinct; pectinate brush 8-11 haired. Mandibular hairs (6-7) + (7-11), hairs of distal group basally spiculate. *Maxilla*. Cardo narrowly connected with cranium mesobasally; 1-Mx single. Mesostipes 1.25-1.33 times as long as wide, with lateral surface spinulate, stipital sensoria at about middle, equal; 4-Mx short, pale. Pseudoartis moderately developed. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis about 0.3 as long as mesostipes, basally broadened; $S_3 > S_1 = S_4 \geqq S_2 > S_5$ in length. *Mentum plate* pentagonal, with 20-25 (x = 22.3) teeth, median tooth larger than submedian teeth; aulaeum with median tooth simple. *Thorax*. Prothoracic setal formula: 1·1·1·2·1·1·2(1,3)·2(1); usually 7, 8-P and 4-M double. *Abdomen*. Integument very finely

spiculate ventrally excepting segment I, VIII distinctly spiculate laterally and ventrally. Setae 1-III-VII rather well developed, often with branches unequal; 13-III-V weaker than respective setae 1; 8-III-V and 3-VII usually single; 12-I, 11-III, IV, 1-V, 1, 4-VI and 11-VII usually double; 5-VIII usually 4 branched. Comb scales 31-48 in a patch, individual scales paddle-shaped, evenly fringed laterally to apically with spicules. Siphon dark at basal margin, usually somewhat swollen proximad of middle, 3.08-4.00 times as long as wide, apex 0.40-0.52 as wide as widest part; length 0.96-1.30 mm, index 3.27-4.16; microsculpture of transverse rows of very fine denticles; pecten reaching basal 0.31-0.38 of siphon, of 8-15 pale teeth including 0-2 basal abortive teeth, each with several ventral denticles; 1-S of 4 pairs of setae; first (basalmost) and 4th setae always, and 2nd seta usually subventral; 3rd seta always and 2nd seta occasionally lateral in position, each 2-10 branched, smooth to distinctly barbed, usually lightly barbed, slightly shorter than siphon diameter at insertion; basalmost 1-S inserted at basal 0.27-0.44, usually beyond pecten, occasionally within it; 2-S upright, shorter than apical pecten tooth. *Saddle* 0.35-0.43 mm long; microsculpture of spiculiferous short transverse ridges, the spicules progressively more distinct apically, many free stronger spicules scattered apically from dorsal side to around 1-X; 2-X with one or 2 short dorsal and one long ventral branches; 4-X of 11-12 (14 in one specimen from Amami Ôshima) cratal hairs, each 4-8 branched. Anal gills apically tapering, 0.9-1.7 length of saddle; ventral gill 0.71-1.12 length of dorsal gill, usually shorter than dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 5♂, 6♀: Yakushima (H-0083, H-0084). RYUKYU ARCHIPELAGO. 5♀, 1 L: Amami Guntô (I-0264, I-0307, I-0308, I-0313, I-2225). 1♂, 5♀, 1 L, 1 l: Okinawa Guntô (J-0471, J-0524, J-0526, J-0585). 47♂, 65♀, with associated skins (3 l, 3 p); 46 L, 1 l: Yaeyama Guntô (K-0111, K-0117, K-0118, K-0131, K-0132, K-0142, K-0143, K-0175, K-0176, K-0177, K-0178, K-0181a, K-0705, K-0707, K-0928, K-1032, K-1033, K-1072, K-1073, K-1074, K-1589). OGASAWARA ISLS. 16♂, 16♀, with associated skins (6 l, 6 p); 10 L, 20 l: (N-1722, N-1726, N-1728, N-1729, N-1730).

DISTRIBUTION. PALAEARCTIC JAPAN (Shikoku, Kyushu, Yakushima). ?KOREA. RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). OGASAWARA ISLANDS. VOLCANO ISLANDS. COSMOTROPICAL.

24B. *CULEX (CULEX) PIPIENS PALLENS* COQUILLETT
(Figs. 37, 38, 181; Table 59)

Culex pallens Coquillett, 1898: 303 (♂, ♀). Type-locality: Japan.
Culex osakaensis Theobald, 1907: 439 (♂, ♀). Type-locality: Osaka, Honshu, Japan.
Culex pipiens var. *pallens:* Yamada, 1927: 584, Korea.
Culex (Culex) pipiens: LaCasse and Yamaguti, 1950: 225 (♂, ♀, L).

FEMALE (Fig. 181). Wing length 3.0-5.3 mm. *Head.* Pale yellowish erect forked scales, in general, rather fewer especially in the northern population; 6-10 vertical bristles. Antenna: flagellum 0.92-1.05 (9) of proboscis; flagellomere 1 1.11-1.38 (11) of Flm 2. Palpus 0.17-0.19 (8) of proboscis; segment 3 2.18-3.14 (9) of 2. Proboscis 0.98-1.15 (8) of forefemur. *Thorax.* Posterior-pronotal bristles 4-8. Scutum with 5-8 bristles on fossal area mostly along humeral margin and scutal suture; 5-9 bristles on scutellar

lateral lobe and 6-11 on median lobe; 6-13 propleurals, 7 to more than 10 upper mesepimerals, one (very rarely 2) lower mesepimeral. *Wing*. Cell R_2 3.68-5.57 (x = 4.26) length of vein r_{2+3}. *Leg*. Hindtarsomere 1 0.91-1.00 of tibia. *Abdomen*. Tergal basal bands on III-VII often even in width, occasionally medially broadened; sterna usually entirely pale in the northern population, usually with some dark scales in the southern population.

MALE (Figs. 38, 181). Wing length 2.8-4.2 mm. Antenna: flagellum 0.79-0.87 length of proboscis; flagellomere 12 0.93-1.18 (12) of Flm 13, both 0.75-0.91 of Flm 1-11. Palpus 1.23-1.40 (11) of proboscis; length ratio of segments 2-5: 0.61-0.77 : 1.55-1.72 : 0.83-0.93 : 1.00 (11). Proboscis 1.12-1.38 (11) of forefemur, with false joint at apical 0.41-0.44. Cell R_2 1.97-3.84 (11; x = 2.82) length of vein r_{2+3}. Foretarsomere 5 1.68-2.00 of 4; hindtarsomere 1 0.97-1.08 (11) tibia. *Genitalia*. Differing from *pipiens quinquefasciatus* in the following points. Tergal processes of aedeagus broader, of even width, broad and subtruncate at apex, and more strongly divergent apically; ratio of distances between apices of tergal processes (dorsal arms), sternomesal processes (ventral arms) and sternolateral processes: 0.48-0.75 (x = 0.63) (D/V) : 1.00 : 0.79-0.96 (12; x = 0.90).

LARVA (Fig. 37). *Head*. Width 1.10-1.20 mm; 1.32-1.52 times as wide as long; seta 1-C 0.54-0.81 length of distance between bases; rudimentary 2-C usually present, occasionally developed to a distinct, though very short, seta; 11, 12-C usually triple; 14-C usually single. *Antenna* 0.41-0.52 mm long, about 0.6 as long as head, 1-A inserted at apical 0.26-0.33 (x = 0.30) of shaft, with 23 to 29 barbed branches. *Mandible*. Cutting organ with VT_2 usually more slender than VT_3; pectinate brush 7-10 haired. Mandibular hairs (6-7) + (8-12). *Maxilla*. Mesostipes 1.33-1.40 times as long as wide. *Mentum plate* with 20-25 (x = 22.3) teeth. *Thorax*. Prothoracic setal formula: 1·1·1·2·1·1·2(3)·2(3); usually, 7, 8-P and 4-M double, 14-P and 1-M single. *Abdomen*. Setae 10-I, 14-III, 3, 12-IV, 8, 14-V, 9, 14-VI, and 14-VII usually single; 13-I, 5, 12-II, 5, 11-III and 1-IV-VI usually double; 13-III and 1-VII usually triple. Comb scales 32-52. *Siphon* with ventral side in lateral view slightly sinuate, dark at basal margin, 7.2-10.0 times as long as apical width; length 1.13-1.44 mm, index 4.00-5.21, usually less than 5; pecten reaching basal 0.28-0.34 of siphon, of 13-17 teeth including 0-2 basal abortive teeth, each with several ventral denticles; 1-S of 4-5 (usually 4, rarely 3) pairs of setae, first (basalmost) and apicalmost setae subventral, 2nd seta usually subventral, sometimes lateral in position, subapical seta lateral in position; each 2-5 branched, usually lightly barbed; first seta located beyond pecten at basal 0.32-0.47, basal 3 setae longer, apicalmost setae slightly shorter than siphon diameter at insertion. *Saddle* 0.32-0.43 mm long, many free spicules dorsoapically scattered, these free spicules usually not in an area ventrad of 1-X; 2-X usually with 1 short dorsal and 1 long ventral branch; 4-X of 11, 12 (usually 12) cratal hairs, each 4-8 branched. Anal gills apically tapering, 1.0-2.4 times as long as wide, ventral gill 0.6-0.9 as long as dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 61♂, 49♀, with associated skins (8 l, 8 p); 19 L, 2 l: Hokkaido (A-0032, A-0034, A-0043, A-0044, A-0045, A-1656, A-1677, A-1912, A-1914, A-1921, A-1922, A-1923, A-1926, A-1927, A-1930, A-1935, A-1938, A-1941, A-1943, A-1948). 49♂, 35♀, with associated skins (7 l, 7 p); 82 L, 34 l: Honshu (5♂ genitalia slides: #1-#5 of Coquillett's type-series, Gifu, USNM. 1♂ genitalia slide: Sendai, 29 VIII 1901, Marlatt; 1♂ genitalia slide: Okayama, 5 V 1901, Marlatt, USNM. C-0109, C-0406, C-1194, C-1815, C-1819, C-1826, C-1901, C-2217, C-2223, C-2228, C-2229, C-2230, C-2231, C-2232, C-2233, C-2234, C-2235, C-2241,

C-2242, C-2243, C-2244, C-2318, C-2327, D-0009, D-0057, E-2224, E-2245, F-0229, F-0232). KOREA. 34♂, 28♀ with associated skins (5 l, 5 p); 10 L: Korean Peninsula (L-0880, L-1959, L-1973, L-2246). 16♂, 8♀: Cheju Do (M-0843, M-0846, M-0852, M-0853).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Izu Shichito, Shikoku, Kyushu). KOREA (Korean Peninsula, Cheju Do). NORTH CHINA.

24C. *CULEX (CULEX) PIPIENS* FORM *MOLESTUS* FORSKAL
(Fig. 38; Table 60)

Culex molestus Forskal, 1775: 85 (A). Type-locality: Rossetta, Kahira and Alexandria, Egypt.

Culex pipiens autogenicus: Kawase, June 1943: 294, Tokyo, Japan.

Culex pipiens var. *pallens* (autogenous strain): Toshioka and Kawase, Aug. 1943: 88.

Culex pipiens molestus: Omori, Bekku, Kamura, Ôri and Shimogama, 1955: 1572, Nagasaki, Kyushu, Japan.

Description based on specimens from laboratory colonies of Yokohama and Kawasaki strains.

FEMALE. Wing length 2.9-3.7 mm. Vertical bristles 6, 7. Antenna: flagellum 0.95-1.06 (7) of proboscis; flagellomere 1 1.08-1.34 of Flm 2. Palpus 0.19-0.25 (7) of proboscis; segment 3 1.88-2.82 of 2. Proboscis 1.04-1.10 (7) of forefemur. Posterior pronotal bristles 6-9. Scutum with 6-12 bristles on fossal area, frequently some bristles present in middle of this area; 4, 5 lateral scutellars, 5-8 median scutellars; 9-12 propleurals, 4 to more than 10 upper mesepimerals, one lower mesepimeral. Cell R_2 4.23-5.73 (x = 4.94), length of vein r_{2+3}. Hindtarsomere 1 0.85-0.94 of tibia. Abdominal sterna usually entirely pale.

MALE (Fig. 38). Wing length 2.8-3.2 mm. Antenna: flagellum 0.78-0.85 (8) of proboscis; flagellomere 12 1.00-1.20 (8) of Flm 13, together both 0.71-0.80 of Flm 1-11. Palpus 1.22-1.27 (7) of proboscis; length ratio of segments 2-5: 0.71-0.88 : 1.62-2.12 : 0.84-0.98 : 1.00 (7). Proboscis 1.21-1.37 (8) of forefemur, with false joint at apical 0.42-0.46 (8). Cell R_2 2.52-3.25 (x = 2.97) length of vein r_{2+3}. Foretarsomere 5 2.05-2.19 of 4; hindtarsomere 1 0.89-1.01 of tibia. *Genitalia.* (Kawasaki strain). Differing from *pipiens quinquefasciatus* and *p. pallens* in the following points. Subbasal knob of aedeagus poorly developed, usually indistinct, tergal division of aedeagus thus narrower, 1.04-1.23 (9; x = 1.12) times as wide as long at level of tergal subbasal bridge. Sternomesal processes of aedeagus smaller, usually not markedly extending laterad of tergal processes; tergal processes as in *p. pallens* with broad subtruncate apex; ratio of distances between apices of tergal processes (dorsal arms), sternomesal processes (ventral arms) and sternolateral processes: 0.79-1.00 (x = 0.89) (D/V) : 1.00 : 0.96-1.13 (9; x = 1.05).

LARVA. Not different from *pipiens pallens*.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 34♂, 33♀, 10 l: (C-2210, C-2211). Laboratory colony, 406th Medical Laboratory, originated in Yokohama and Kawasaki, Kanagawa Pref.

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu). HOLARCTIC REGION. AUSTRALIA. EASTERN AND SOUTHERN

AFRICA. SOUTHERN SOUTH AMERICA.

TAXONOMIC DISCUSSION. There are numerous works on the *Culex pipiens* complex. Some of the papers dealing with the populations of this region include Bekku (1956), Kamura and Bekku (1957), Kamura (1958, 1959a, b), Hori (1960a, b, c), Ishii (1961-71), Sasa and coworkers (1963-71), Morikawa (1964), etc. The majority of Japanese authors appear to treat *pallens* as a subspecies of *pipiens*, while some western authors consider it a "hybrid population" between *pipiens* (s. s.) and *quinquefasciatus*, and do not give it subspecific rank. In Japan, however, true *pipiens* does not exist (Sasa 1971). Our specimens from Hokkaido were *pallens*. Thus, at present, it appears that natural hybridization between *pipiens* (s. s.) and *quinquefasciatus*, and between *pipiens* (s. s.) and *pallens* does not occur in Japan. It is known that some important morphological characters show clinal variations from north to south, the northern population appearing to be closer to *pipiens* (s. s.) and the southern populations to *quinquefasciatus*. However, even northernmost specimens can be discriminated from European *pipiens* by the broader median process (ventral arm) as well as an average D/V (or DV/D) ratio. Subspecies *quinquefasciatus* is easily discriminated from *pallens* by the pointed tergal process (dorsal arm) of the male genitalia and the shorter inflated siphon of the larva. It occurs only in Kyushu and Shikoku in Palaearctic Japan, and intermediate forms between it and *pallens* have been reported. However, *pallens* still appears to be dominant there. The coexistence of *pallens* and *quinquefasciatus* has not been recorded with certainty in other parts of Palaearctic Japan. At least in Japan, *pallens* is thought to be a morphologically and geographically well defined population. It spreads over a wider latitudinal zone (30^{o} - 46^{o} N in Japan) than the North American hybrid population (36^{o} - 39^{o} N, coexisting with *pipiens* (s. s.) and *quinquefasciatus*). There may be an intrinsic difference between *pallens* and the North American hybrid population. Here, *pallens* is treated as a subspecies peculiar to this region. Problems may occur due to lack of sufficient knowledge about this species in eastern continental Asia. Lee (1971) recognized *pallens* in Korea, but not *pipiens* (s. s.) and doubted the occurrence of *quinquefasciatus*. Our collections of this species from southern Korea were *pallens*. Mong (1955) showed that *pallens* was distributed in north China, and *quinquefasciatus* in south China, but did not mention *pipiens* (s. s.). Gutsevich et al. (1970) stated, "*pipiens* is rare east of Lake Baikal," but did not refer to *pallens* in the USSR. The continental *pipiens* complex should be studied as intensively as was done in Japan, and the ranges of *pallens* and *pipiens* (s. s.) delineated on this continent.

Recently, Wada, Oda and Mori (1976) presented a brief but interesting report that *pallens* reared under short-day photoperiod conditions for several generations had come to possess the character of *quinquefasciatus*. This may be a basis for considering *pallens* as being derived from *quinquefasciatus*.

A physiological race, *molestus*, characterized by autogeny, stenogamy and holodynamism, has been known in Japan since 1943. The males of *molestus* have been believed to be discriminated from *pallens* by D/V ratio. Noguchi and Asahina (1966) indicated the difference in the number of ommatidia at the 4th or 5th row from the meson in the eyes of the adults, viz, 7 (male) or 8 (female) in *molestus*, 8 (male) or 9 (female) in *pallens*. Makiya (1972) claimed that the above traits were not always sufficient, as the range of variation overlapped, he then proposed a "discriminant function." Such an attempt may be helpful when 2 or more races of *pipiens* exist together. There is a closer affinity in the male genitalia between Japanese *molestus* and European *pipiens* or *molestus* than between *molestus* and *pallens*. This infers that Japanese

molestus may have been introduced from Europe (Wada 1976). However, Uchida and Hosoi (1977) stated that they produced an autogenous strain from *pallens* by giving meals containing amino acids instead of blood; this strain possessed the male genitalia similar to those of *molestus*. Further investigations are necessary to resolve this intriguing problem.

BIONOMICS. *Culex pipiens* is the most common mosquito in human-dwelling areas in Japan. The larvae occur in a very wide variety of artificial containers (usually large) or other types of stagnant water such as ditches, gutters, ground pools, etc. They prefer polluted water containing abundant organic matter. Associated species are *Culex tritaeniorhynchus, Cx. pallidothorax, Cx. halifaxii* and *Aedes togoi* (LaCasse and Yamaguti 1950). The form *molestus* breeds most frequently in water in underground situations, such as basements of building, subways, etc., also occasionally in open water. This species is known to exhibit unautogeny, stenogamy and homodynamism in *quinquefasciatus*, unautogeny, eurygamy and heterodynamism in *pallens* and *pipiens*, and autogeny, stenogamy and homodynamism in *molestus*. The females are primarily avian feeders, but also vicious biters of man and other mammals [especially *quinquefasciatus* (Sirivanakarn 1976)]; Miyagi (1972b) reported that *pipiens pallens* took blood readily from reptiles, and thus could maintain colonies in the laboratory. Bram (1967) cited studies finding *pipiens* (probably *pipiens quinquefasciatus*) capable of flying over 0.8 km 36 hrs after release, later ranging up to 5.5 km.

RELATION TO DISEASES. *Culex pipiens* is the most important vector of Bancroftian filariasis in this region, especially *quinquefasciatus* in the Ryukyu Archipelago, where more favorable climatic conditions exist as compared to temperate Japan. Recent investigations on filariasis in Japan were summarized by Sasa (ed.) 1970. Japanese encephalitis virus has been isolated from wild caught specimens of this species, but its role during epidemics of this disease is not certain (Yamamoto 1971). Involvement of *quinquefasciatus* with other viruses such as Chickungunya has been reported by several authors (Bram 1967, Sirivanakarn 1976), but its importance as a vector is in doubt.

25. *CULEX (CULEX) TRITAENIORHYNCHUS* GILES
(Figs. 38, 39, 182; Table 61)

Culex tritaeniorhynchus Giles, 1901: 606 (A). Type-locality: Travancore, India; Yamada, 1932: 213, Korea.

Culex biroi: Mochizuki, 1913: 8; Fukuoka, Kyushu, Japan.

Culex summorosus Dyar, 1920: 180. Type-locality: Los Banos, Luzon, Philippines; Bram, 1967: 225 (synonomy).

Culex (Culex) tritaeniorhynchus: Bohart and Ingram, 1946b: 81, Okinawa Is., Kerama Isls., Takabanare Is. and Iheya Is., Ryukyu Archipelago; LaCasse and Yamaguti, 1950: 230 (♂, ♀, L); Bohart, 1956 (1957): 83, Chichijima, Ogasawara Isls.

FEMALE (Fig. 182). Wing length 2.2-4.0 mm. *Head.* Eyes contiguous above. Vertex covered with pale narrow curved scales and numerous dark brown erect forked scales; tempus heavily covered with broad white scales; 6-8 vertical and 2 temporal dark brown bristles on each side. Antenna: pedicel yellowish brown, darker mesally, with a number of minute bristles and a few small scales; flagellum 0.97-1.08 (5) of proboscis; flagellomere 1 1.30-1.45 (5) of Flm 2. Palpus 0.18-0.20 (5) of proboscis, dark scaled;

segment 3 2.00-2.57 of 2; 4 absent in 5 dissected specimens. Proboscis 1.12-1.20 (5) of forefemur, dark scaled, with moderately long median band of pale scales; basal dark area longer than apical dark area, with scattered pale scales. Cibarial teeth 30 (1 specimen examined) (30-34 in Taiwan, after Chen 1972), slender. *Thorax*. Pronotal integument yellowish brown to rather dark brown, posterior lobe often darker, both lobes with bronzy yellowish brown narrow curved scales; posterior lobe with 6-14 dark brown bristles of various sizes along posterodorsal to dorsoposterior margin, not arranged in a row. Scutum with integument rather dark brown, covered with bronze-brown narrow curved scales, scales on supraalar area and prescutellar space somewhat paler; scutal bristles dark brown, fossal area with 6-13 bristles, 5-9 anterior ones often forming a row subparallel to dorsocentral series. Scutellum with scales similar to those of prescutellar space; each lateral lobe with 4-6, median lobe with 6-10 long dark brown bristles, each lobe with several additional yellowish fine bristles. Pleural integument brown, rather dark on lower subspiracular area to anterior sternopleuron above cephalic corner, postspiracular area, prealar knob, anterior sternopleuron below cephalic corner, upper posterior sternopleuron above lower scale patch to anterior mesepimeron, lower posterior sternopleuron below lower scale patch, pale in remainder of mesepimeron, metapleuron and mesomeron; a few yellowish narrow curved scales on propleuron, small patches of broad white scales on upper sternopleuron, mid-posterior sternopleuron and anterior mesepimeron; pleural bristles mostly yellowish brown to pale, 8-11 propleurals, more than 10 prealars and sternopleurals, 5-11 upper mesepimerals, no lower mesepimerals. *Wing*. Veins dark scaled. Cell R_2 2.84-4.00 (5) length of vein r_{2+3}; base of R_2 usually slightly proximad of that M_{1+2}; 1a reaching about level of m-cu. Halter knob pale scaled. *Legs*. Forecoxa dark scaled, with a small basal spot of pale scales; midcoxa basally pale scaled, apically dark scaled; hindcoxa with pale scales. Forefemur pale on posterior 0.33 of ventral surface to posterior surface; mid- and hindfemora pale on posterior surface excepting apex. Tibiae and tarsi appearing pale on posteroventral surface. Foretarsomeres 2-4, midtarsomeres 1-4 and hindtarsomeres 1-3 with narrow pale basal bands, apices of fore- and midtarsomeres 1-3 and those of hindtarsomeres 1-2 with dorsal pale scales, development of these pale bands or scales somewhat variable, some of them occasionally lost or also appearing on other joints. Foretarsomere 5 about as long as 4. *Abdomen*. Tergum IX with median spot of pale scales; II-VII with basal bands and laterobasal patches of pale scales, the bands and patches connected with each other, the patches extending nearly to the apical margin; VIII pale scaled, with subapical dark scales. Sterna mainly pale scaled, with lateroapical patches of dark scales, the patches progressively smaller toward posterior segments, often fading away in a few posterior segments. Seminal capsules 3, one slightly larger than other 2.

MALE (Figs. 38, 182). Wing length 2.6-3.5 mm. Antenna: flagellum 0.81-0.91 (5) of proboscis; flagellomere 12 1.09-1.27 (5) of Flm 13, both 0.87-0.96 of Flm 1-11. Palpus 1.32-1.45 (6) of proboscis, apically upturned, with pale basal bands on segment 4 and 5; 1 without bristles; 4, 5 and apical half of 3 with numerous rather long to medium bristles; length ratio of 2-5: 0.61-0.71 : 1.26-1.49 : 0.74-0.85 : 1.00 (6). Proboscis 1.22-1.37 (5) of forefemur, with false joint at apical 0.44-0.46 (6), with many slender moderately long bristles proximad of the joint, the pale median band over the joint. Cell R_2 2.06-2.60 (6) length of vein r_{2+3}; 1a reaching level between cubital fork and m-cu. Foretarsomere 5 1.81-2.00 (5) of 4; hindtarsomere 1 1.07-1.15 (6) of tibia. *Genitalia*. Tergum IX with each lobe bearing 4-9

(13; x = 6.9) bristles of medium length. Basistyle with fine tergoapical bristles, medium tergolateral and sternal bristles, and long lateral bristles; subapical lobe at apical 0.3, moderately protrudent; 3 rods (α, β and γ) closely spaced, α slightly shorter than other 2, α as thick as β, γ as long as β but more slender; δ and μ_{1-3} on mesodistal corner of the lobe, δ not very broadened, μ_{1-3} just lateroproximad of δ, each with 1-3 apical retrose hooks; ϵ very strongly foliate, apparently basally striated, χ characteristically apically curved. Dististyle 0.48-0.56 length of basistyle, about 5 times as long as wide, arcuate, narrowed from apical 0.25, with weak annulations on convex side near apex, with a short seta on convex side at apical 0.33, another on concave side distal to it. Cercal tergal surface well sclerotized, 2-3 cercal setae on each side; paraproct with laterobasal process thick, very long, sternally curved, pigmented. Tergoapical division of aedeagus 1.09-1.29 (8) times as wide as long, with 4-5 (rarely 3) large pigmented tergoapical teeth, one broad falciform tergomedian tooth, and one unpigmented sternolateral tooth; mesosternal part acutely produced laterally and mesally angulate at apex, minutely spiculate; subbasal knob moderately developed.

LARVA (Fig. 39). *Head.* Width 0.94-1.12 mm; 1.32-1.47 times as wide as long; labrum straight or only slightly concave between setae 1-C; 1-C deeply pigmented, 0.45-0.57 (6) as long as distance between bases, usually thick up to apex, blunt-tipped, occasionally tapering to sharp apex; 4-C not reaching apex of cranium, shorter than distance between bases; 14-C usually single. *Antenna* 0.53-0.59 mm long, 0.7-0.8 length of head, pigmented at base and in distal part, dorsally and laterally spinulate in proximal part, few laterobasal spinules in distal part; 1-A inserted at apical 0.26-0.35, with 26-40 strongly barbed branches; 2,3-A pigmented, equal in length; 4-A pigmented, slightly shorter than 2,3-A. *Mandible* with several simple dorsolateral microspines; MdS_5 less than half as long as MdS_1. Cutting organ with mesal dorsal tooth bearing a strong basal and a tiny median denticle on mesal side; ventral tooth with VT-4 stout; VT_3 larger than $VT_{1,2}$; VB_1 with mesal pectination distinct in basal 0.67; VB_2 apparently undeveloped; pectinate brush 8-9 haired. Mandibular hairs (5-6) + (9-10), distalmost hair apparently multiple. *Maxilla.* Cardo narrowly connected mesobasally with cranium; 1-Mx single. Mesostipes 1.4-1.5 times as long as wide, with lateral surface smooth; stipital sensoria equal, proximad of middle; 4-Mx short but stiff, lightly pigmented. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis about 0.25 as long as mesostipes; $S_3 > S_1 > S_2 = S_4 > S_5$ in length; ampulla protrudent. *Mentum plate* with 13-17 teeth, often with a laterobasal abortive tooth; aulaeum with median tooth notched at tip. *Thorax.* Prothoracic setal formula: 1·1·1·2(1)·1·1·3(4)·2; usually, 4-P and 2,12-T double, 7-P triple, 9-M 4 branched and 7-T 6 branched. *Abdomen.* Setae 1-VI, VII often with a small sclerotized ring-like callus at base; 2-I, 1-II and 10-III usually single; 5,11-III, 3,12-IV and 7,10-VII usually double; 6-I, II and 4-VI usually triple; 1-IV usually 4 branched. Segment VIII laterally spiculate; comb scales 28-43 in a patch, individual scales elongate paddle-shaped, fringed evenly with apical and lateral spicules. *Siphon* brownish, straight, 13-18 times as long as apical width; length 1.62-1.94 mm, index 7.00-9.00; microsculpture of transverse rows of minute blunt denticles; pecten reaching basal 0.22-0.27 of siphon, of 12-16 teeth, more broadly spaced apically, each with several ventral denticles; 1-S of 4-5 (rarely 6) pairs of subventral setae, each 2-4 branched, equal to or slightly longer than siphon diameter at insertion, an additional dorsolateral pair usually proximad of the apical 1-S, each 2-4 branched; most proximal 1-S located beyond pecten at basal 0.30-0.40; 2-S

apical, upright, shorter than apical pecten tooth. *Saddle* 0.31-0.38 mm long, with microsculpture of short spiculiferous ridges, becoming ventrally and basally faint, the spicules slightly stronger and scattered singly 1-X weak; 2-X with 1-4 short dorsal and 1 long ventral branches; 4-X of 11-12 cratal tufts, each 5-11 branched. Anal gills pointed, 0.8-2.3 length of saddle; ventral gill usually slightly shorter than dorsal one.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 2♂: Hokkaido (A-0043). 37♂, 42♀, with associated skins (5 l, 5 p); 17 L: Honshu (C-0046, C-1815, C-1956, C-2217, C-2236, C-2237, C-2238, C-2239, C-2240, C-2316, D-0047, D-0057, D-0062, D-0064, F-0229). 1♀, with associated skins (1 l, 1 p): Kyushu (H-1977). KOREA. 4♂, 4♀, with associated skins (5 l, 5 p): Korean Peninsula (L-0834, L-1973, L-1974, L-1976, L-2315). 5♂, 7♀: Cheju Do (M-0850, M-0852, M-0853, M-0877). RYUKYU ARCHIPELAGO. 2♂, 6♀: Amami Guntô (I-0292, I-0310, I-0313, I-0314). 28♀, 7 L, 1 l: Okinawa Guntô (J-0498, J-0528, J-0529, J-0532, J-0533, J-0536, J-2282, J-2283). 37♂, 40♀, with associated skins (2 l, 2 p); 31 L: Yaeyama Guntô (K-0113, K-0131, K-0144, K-0145, K-0175, K-0177, K-0181a, K-0925, K-0951, K-0956, K-0961, K-0984, K-0986, K-0988, K-0992, K-0996, K-0998, K-1001, K-1009, K-1021, K-1036, K-1111, K-1113, K-1116, K-1398, K-1436, K-1437, K-1438, K-1439, K-1440, K-1441, K-1442, K-1443). OGASAWARA ISLS. 1♂ (N-1722).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). OGASAWARA ISLANDS. SOUTH PRYMORYE. MANCHURIA. NORTH AND SOUTH CHINA. HONG KONG. TAIWAN. PHILIPPINES. INDONESIA. INDOCHINA. MALAYA. SINGAPORE. THAILAND. BURMA. INDIA. SRI LANKA. MALDIVE ISLANDS. UZBEKISTAN. TURKOMEN. SOUTH AZERBAIJAN. SOUTHWEST ASIA. AFRICA.

BIONOMICS. Very common south of central Honshu, rather rare in Hokkaido. Larvae are found most frequently in rice fields and various types of impounded water; other habitats include ditches, rock holes, buffalo hoof-prints, sluggish stream, etc.; they are most often found associated with *Anopheles sinensis* in rice fields. Bram (1967) reported *tritaeniorhynchus* as having been collected from low salinity tidal marshes, one of us (E.S.S.) has seen larvae collected from containers in a graveyard in Vietnam, and Moriya (1974) found small numbers of *tritaeniorhynchus* in Kamakura City, Japan. McDonald and Savage (1972) reported a remarkable decline in populations of this species as well as those of *An. sinensis* due to changes in agriculture on Okinawa. The peak of the adult population occurs from the middle of July to the beginning of August; the population drops remarkably during September. Adults overwinter in Amami Ôshima (Wada et al. 1976). Females are severe biters of man and livestock including birds. Less than 20% of tested females took blood from reptiles (Miyagi 1972b). Overseas dispersal was observed in this species; 3 females being captured on a weathership located on the Pacific Ocean at 29° N, 135° E, 560 km east of Amami Ôshima, or 780 km from Okinawa Is. (Asahina and Turuoka 1969, 1970; Asahina 1970). Perhaps a more realistic flight range is about 2 km (after feeding), as found by Bailey and Gould (1975). Miller et al. (1977) found activity of *tritaeniorhynchus* to peak in early evening (1830-2030 hr), decline slowly through the night, dropping abruptly in the predawn hours.

RELATION TO DISEASES. Japanese encephalitis virus has been isolated from wild caught females of 5 mosquito species in this region, but of these,

Culex tritaeniorhynchus is considered to be a primary vector of this disease (Yamamoto 1971). Overwintering of Japanese encephalitis virus in the pig-mosquito cycle has long been one of the more important epidemiological problems associated with this disease. All the efforts to detect the virus during the winter in Palaearctic Japan appear to have been unsuccessful. Hayashi et al. (1975) isolated the virus from wild caught females of *tritaeniorhynchus* in the winter of 1973 in Amami-Ôshima, but failed in the succeeding year. Wada et al. (1976) concluded that the success of the isolation of 1973 had occurred due to the unusual high temperature of that year. Thus, overwintering sources of JEV should be sought further south.

Culex tritaeniorhynchus has a low suitability as an intermediate host of *Wuchereria bancrofti* (Yamada 1927).

26. *CULEX (CULEX) PSEUDOVISHNUI* COLLESS
(Figs. 40, 41, 183; Table 62)

Culex vishnui: Edwards, 1921b: 339, Osaka, Japan.
Culex annulus: Yamada, 1927: 574, Korea.
Culex (Culex) vishnui: Bohart and Ingram, 1946b: 83, Okinawa Is. and Iheya Is., Ryukyu Archipelago; LaCasse and Yamaguti, 1950: 236 (♂, ♀, L).
Culex pseudovishnui Colless, 1957: 88 (♂, ♀, L). Type-locality: Singapore.
Culex (Culex) neovishnui Lien, 1968c: 230 (♂, ♀, P, L). Type-locality: Peiyuan, Taitung Hsien, Taiwan, Sirivanakarn, 1975: 71 (synonomy).

FEMALE (Fig. 183). Wing length 2.8-3.9 mm. *Head.* Eyes contiguous above and below. Vertex covered with pale narrow curved scales and numerous erect forked scales, the latter white to yellowish medially, dark brown laterally (at least a few pale ones always present in middle); tempus covered with pale broad scales; 6-7 vertical and 2 temporal dark brown bristles on each side. Clypeus rather dark brown. Antenna: pedicel yellowish brown, mesal surface dark brown, with several dark minute bristles and small pale scales; flagellum 1.06-1.12 (4) of proboscis; flagellomere 1 1.28-1.46 (4) of Flm 2. Palpus 0.21-0.25 (4) of proboscis, dark scaled, tip laterodorsally pale scaled; segment 3 1.86-2.50 of 2, 4 absent or occasionally developed to 0.2 of 3. Proboscis 1.06-1.09 (4) of forefemur, dark scaled, with median band of pale scales, basal dark area entirely dark (without scattered pale scales), longer than apical dark area. *Thorax.* Pronotal integument rather dark brown; both lobes with yellowish narrow curved scales; posterior lobe with 5-8 yellowish to dark brown bristles along posterodorsal to dorsoposterior margin. Scutum with integument rather dark brown, covered with concolorous narrow curved scales and also pale ones, the latter on margins and prescutellar space; scutal bristles dark brown, some supraalars and prescutellars yellowish. Scutellum with scales similar to those of prescutellar space; each lateral lobe with 3-5, median lobe with 6-8 long dark brown bristles, each lobe with several additional fine yellowish bristles. Paratergite rather dark brown. Pleural integument rather dark brown on lower subspiracular area, postspiracular area, concave portion between prealar knob and sternopleuron, anterior sternopleuron excepting anterior corner, posterior sternopleuron between scale patches and anteromedian mesepimeron; propleuron with pale yellowish rather broad scales, some scales pointed; small patches of white broad scales on upper sternopleuron, lower-posterior sternopleuron and

anterior mesepimeron; several white broad scales also on upper mesepimeron; pleural bristles yellowish pale to brown, 5-9 propleurals, about 10 or more prealars, more than 10 sternopleurals, 4-7 upper mesepimerals, no lower mesepimerals. *Wing*. Veins dark scaled; cell R_2 2.01-2.85 (9) length of vein r_{2+3}; 1a ending at level between r-m and m-cu. Halter knob pale scaled. *Legs*. Forecoxa basally and anteromesally pale scaled, dark scaled in-between; midcoxa pale scaled, with some anteroapical dark scales; hindcoxa with pale scales. Femora with narrow pale basal bands; forefemur pale on posterior half of ventral surface; posterior surface of midfemur and both anterior and posterior surfaces of hindfemur pale excepting apical area. Tibiae with scattered pale scales or irregular pale streak. Foretarsomeres 1-3, mid- and hindtarsomeres 1-4 with pale basal bands or spots. Femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 as long as or shorter than 4; hindtarsomere 1 0.99-1.04 (4) of tibia. *Abdomen*. Tergum I with median patch of dark scales; II-VIII dark scaled, with laterobasal patches and basal bands of pale scales, the basal band connected with the lateral patches. Sternum II usually entirely pale scaled; III-VIII pale scaled, with apical bands of dark scales, the bands often interrupted at middle in anterior segments.

MALE (Fig. 41). Wing length 3.0-3.7 mm. Antenna: flagellum 0.88 (1) of proboscis; flagellomere 12 1.09 of Flm 13, both 0.84 of Flm 1-11. Palpus 1.34 (1) of proboscis, with pale bands at apex of segment, in middle of 3, at bases of 4 and 5, pale scales also present at apex of 5; 1 without bristles; 3 with a row of short modified setae, each seta somewhat broadened, blunt-tipped, with midrib; 4, 5 and apex of 3 with numerous rather long bristles; length ratio of 2-5; 0.73 : 1.46 : 0.79 : 1.00 (1). Proboscis 1.30 (1) of fore-femur, with false joint at middle, and several rather long bristles proximad of the joint. Cell R_2 1.48-1.82 (5) length of vein r_{2+3}. Foretarsomere 5 1.89-2.00 (5) times as long as 4; hindtarsomere 1 1.06-1.12 (5) of tibia. *Genitalia*. Tergum IX with each lobe bearing 4-6 (5) bristles of medium length. Basistyle with a number of fine tergoapical bristles, medium and long bristles tergolaterally to sternally; subapical lobe at apical 0.3, moderately or rather weakly protrudent; 3 rods (α, β and γ) closely spaced, α slightly shorter than other 2, γ a little more slender than β; δ and μ close together at mesodistal corner; μ 3 in number, a little shorter and more slender than δ, with one or a few apical retrorse hooks; ϵ strongly foliate, striation faint; χ rather short. Dististyle 0.52-0.60 (2) length of basistyle, arcuate, apically tapering, with very fine annulations on convex side near apex, with a short seta on convex side slightly distal to middle, and another on concave side at apical 0.33. Cercal tergal surface well sclerotized, 2-3 (5) cercal setae on each side; paraproct well sclerotized, laterobasal process thick, long, curved sternally, deeply pigmented. Tergoapical division of aedeagus with 4-5 (2) large pig-mented tergoapical teeth, one tergomedian tooth, and one lateroproximally directed sternolateral tooth; mesosternal part more or less produced laterally and mesally rounded at apex in tergal view, not keeled in lateral view, minutely spiculate; subbasal knob large.

LARVA (Fig. 40). *Head*. Width 1.01-1.10 mm; 1.37-1.48 (5) times as wide as long; labrum slightly concave between setae 1-C; 1-C stout, thick up to near apex, occasionally tapering from basal 0.33, deeply pigmented, 0.49-0.66 (5) as long as distance between bases; 4-C short, very weak, shorter than distance between bases; usually, 5-C triple, 13-C double and 14-C single. *Antenna* 0.60-0.74 mm long, 0.84-1.01 (5) length of head, dark brown at base and in distal part, dorsally and laterally spiculate excepting apical area; 1-A

inserted at apical 0.31-0.39, with 28-39 barbed branches; 2,3-A at apical 0.06-0.11, equal in length, pigmented; 4-A slightly shorter than 2,3-A, pigmented; 6-A twice as long as 5-A, pigmented. *Mandible* with several needle-like laterodorsal microspines. Cutting organ with mesal dorsal tooth bearing a small median and a large basal denticle on mesal side; ventral tooth with VT-4 stout; $VT_{1,2}$ equal, VT_3 larger than $VT_{1,2}$; ventral blade with mesal pectination distinct in basal half; VB_2 apparently undeveloped; pectinate brush 9-10 haired. Mandibular hairs (5-7) + (8-11), 14-17 in total, hairs of distal group basally spiculate. *Maxilla*. Cardo mesobasally connected with cranium by a narrow sclerotized strip; 1-Mx very weak, single. Mesostipes 1.4 times as long as wide, with lateral surface smooth, bearing a row of slender spicules on mesal margin; stipital sensoria proximad of middle, distal sensorium usually slightly shorter; 4-Mx short but stout, lightly pigmented. Pseudoartis almost undeveloped. Lacinia with 5-Mx at or slightly proximad of level of stipital sensoria. Palpostipes excluding lateral artis 0.2 as long as mesostipes; $S_3 > S_1 > S_2 = S_4 > S_5$ in length; ampulla scarcely protrudent. *Mentum plate* with 11-13 teeth, usually with an additional tiny abortive tooth on each side at base. Aulaeum with a 2-5 (usually 3) cuspid median tooth. *Thorax*. Prothoracic setal formula: 1·1·1·2(3)·1·1·3(2,4)·2(1,3); usually, 4-P and 12-T double, and 7-P triple; 13-T occasionally lightly barbed. *Abdomen*. Integument very finely spiculate ventrally excepting a few anterior segments, VIII also laterally spiculate. Setae 1-III, IV sometimes, and 1-V-VII usually with small sclerotized ring-like calli at bases; 8-II, III, 12-V, 3-VI and 10-VII usually single; 12-I, III and 8-IV usually double; 6-I-III, V, VI usually triple. Comb scales 5-14 arranged in an often irregular, single or double row, proximal scales sometimes distinctly smaller, individual scales thorn-shaped, with a strong apical spine, laterobasally fringed with fine spicules. *Siphon* brownish, tapering a little apically, just curved dorsally near apex, 10-12 times as long as apical width; length 1.32-1.51 mm, index 5.95-6.88 (8); microsculpture of rather faint short transverse ridges bearing extremely fine denticles, often indistinct; pecten reaching basal 0.25-0.33 of siphon, of 9-11 teeth, progressively larger apically, each tooth with slender ventral denticles up to middle to near apex; 1-S 5-7 paired, basalmost 1-S located beyond pecten at basal 0.33-0.51, each seta 3-6 branched, mostly longer than siphon diameter at insertion; usually one, occasionally 2 pairs of additional subdorsal setae near apex, each 2-4 branched; 2-S straight, shorter than apical pecten tooth. *Saddle* 0.34-0.37 mm long; microsculpture of spiculiferous short transverse ridges, a group of mostly single longer spicules subdorsally at apex; 1-X fine; 2-X with dorsal branches distinctly shorter than the ventral branch; 4-X of 11-13 cratal hairs, each 3-11 branched, basalmost hair occasionally single and thick. Anal gills pointed, 0.8-2.6 length of saddle; ventral gill 0.8-1.0 as long as dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 16♀: Honshu (F-0233). KOREA. 1♀: Cheju Do (M-0849). RYUKYU ARCHIPELAGO. 7♂, 16♀, with associated skins (6 l, 6 p); 15 l: Amami Guntô (I-0309, I-0310, I-1863, I-1874, I-1876, I-1883, I-1892). 3♂, 1♀: Okinawa Guntô (J-0533, J-1292, J-2122, J-2227). 17♂, 10♀, with associated skins (3 l, 3 p); 32 L, 1 l: Yaeyama Guntô (K-0582, K-0584, K-0924, K-0946, K-0951, K-1065, K-1078, K-1089, K-1294, K-1396, K-1398, K-1436, K-1437, K-1438, K-1439, K-1441, K-1442, K-1443).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Shikoku, Kyushu, Yakushima). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). ORIENTAL REGION.

BIONOMICS. Not very common in temperate Japan, common in the Ryukyus. Larvae were found in ground pools and rice-fields. Other larval habitats are natural ponds, irrigation ditches, burrow pits, roadside ditches and gutters containing clean water (LaCasse and Yamaguti 1950). Adult females are night biters.

RELATION TO DISEASES. Japanese encephalitis virus has been isolated from wild caught females, but the capability of transmitting the virus is not certain (Yamamoto 1971). This uncertainty is due in part to past confusion with other closely related species of the *vishnui* subgroup (Sirivanakarn 1976).

27. *CULEX (CULEX) SITIENS* WIEDEMANN
(Figs. 41, 42, 184; Table 63)

Culex sitiens Wiedemann, 1828: 542 (♀). Type-locality: Sumatra.
Culex (Culex) sitiens: Bohart and Ingram, 1946b: 81: Okinawa Is. and Ie Is., Ryukyu Archipelago; Chu, 1956: 42, Korea.

FEMALE (Fig. 184). Wing length 3.0-3.6 mm. *Head.* Vertex covered with pale narrow curved or crescent-shaped scales and numerous dark erect forked scales intermixed with several yellow ones at middle; tempus densely covered with broad white scales; 5-7 vertical and 2 temporal dark bristles on each side, median vertical bristles golden brown, others dark. Clypeus dark brown. Antenna: pedicel yellowish brown, mesal surface infuscate, with scattered small hairs and a few small scales; flagellum 1.07-1.12 (3) of proboscis; flagellomere 1 1.33-1.43 (3) of Flm 2. Palpus 0.20-0.22 (3) of proboscis, dark scaled; segment 3 1.83-2.05 (3) length of 2. Proboscis 1.01-1.05 (3) forefemur, dark scaled, with a broad median band of pale scales. *Thorax.* Pronotal integument dark brown; anterior and posterior lobes covered with pale yellow narrow curved scales; posterior lobe also with several bronze-brown narrow curved scales, the pale scales wider and paler posteriorly, 5-13 yellow and dark bristles along posterior margin. Scutum with integument very dark brown, covered with bronze-brown and pale narrow curved scales, the pale scales forming indistinct patches on margins, humeral area, around scutal suture and on prescutellar space. Scutellum covered roughly with pale yellow narrow curved scales, bearing 4-6 long dark bristles on each lateral lobe and 6-9 on median lobe, together with a few short bristles on each lobe. Pleural integument dark brown, rather pale in posterior lower mesepimeron, metapleuron and posterior upper mesomeron; patches of broad white scales on propleuron, upper sternopleuron, caudal middle sternopleuron and upper mesepimeron; about 10 propleural and prealar bristles, more than 10 sternopleurals, 5-13 upper mesepimerals, no lower mesepimerals. *Wing.* Veins dark scaled; cell R_2 2.08-2.57 (4) length of vein r_{2+3}; 1a reaching near level of r-m. Halter knob pale scaled. *Legs.* Forecoxa with anterior surface covered with mixture of pale and dark scales; mid- and hindcoxae each with a patch of pale scales, a few dark scales at apex of the patch of midcoxa. Posterior surface of fore- and midfemora, both sides of hindfemur pale scaled, pale scaled area apically narrowed; midfemur speckled with pale scales on anterior surface; tibiae with pale streak and pale apical fringe; tarsomere 1 often with a pale streak on posterior surface, 1 and 2 with both basal and apical bands of pale scales, 3-5 with basal bands, the apical bands usually incomplete, basal bands of apical one or 2 segments sometimes reduced; femora, tibiae and

tarsi otherwise dark scaled but often with pale scales intermixed. *Abdomen.* Tergum I with a median spot of dark scales; II-VIII dark scaled, each with a distinct basal band of white scales, the band laterally broadened. Sterna pale scaled, with narrow dark apical bands.

MALE (Figs. 41, 184). Wing length 2.8-3.5 mm. Antenna: flagellum 0.81-0.87 (7) length of proboscis; flagellomere 12 1.11-1.32 (7) of Flm 13, both 0.86-0.97 (7) of Flm 1-11. Palpus 1.30-1.39 (7) of proboscis (longer than proboscis by length of segment 5 or slightly more), with patches of pale scales at apex of 2, middle of 3, base of 4 and base and apex of 5; 3 bearing a row of 25-31 apically curved and broadened setae on mesoventral side, each seta with a median stria; length ratio of 2-5; 0.64-0.75 : 1.47-1.67 : 0.81-0.88 : 1.00 (7). Proboscis 1.15-1.22 (6) of forefemur, with false joint at apical 0.48-0.51 (7), with long bristles proximad of the joint. Cell R_2 1.28-1.68 (4) length of vein r_{2+3}; 1a ending just before level of m-cu. Foretarsomere 5 1.90-2.05 (3) times as long as 4; hindtarsomere 1 0.99-1.12 (6) of tibia. *Genitalia.* Tergum IX with each lobe bearing 2-7 medium-sized bristles. Basistyle parallel-sided in basal 0.67, then apically narrowed in tergal view, 2.2-2.6 times as long as wide, bristled except mesal surface distal to subapical lobe, and basal area; subapical lobe at apical 0.33, well protrudent, bearing 3 rods (α, β, γ), 3 subequal apically hooked setae (δ, $\mu 1, 2$) and a broadly foliate seta (ϵ), together with a laterobasal accessory bristle (χ); $\alpha < \beta = \gamma$ in length, $\alpha = \beta > \gamma$ in thickness, β and γ just curved at apex; ϵ with a few distinct striae. Dististyle wide in basal 0.67, then apically narrowed, 5 times as long as wide, 0.5-0.6 as long as basistyle, pigmented, with one or 2 small setae on convex side at apical 0.33 and another on concave side between apex and the seta of convex side. Cercal tergal surface well sclerotized, cercal setae 2-5; paraproct with laterobasal process long, sternally curved, pigmented. Tergoapical division of aedeagus 1.28-1.40 (5) times as wide as long; each lateral piece divided into tergolateral and sternomesal subdivisions in apical half; tergolateral subdivision sclerotized, consisting of 4-5 strong teeth; sternomesal subdivision unpigmented, sternally expanded, keeled in lateral view, finely spinulate on apical surface, mesal side hairy in basal half; a large laterobasally directed sternal tooth present; subbasal knob very large and noticeably protrudent laterally.

LARVA (Fig. 42). *Head.* Width 1.15-1.27 mm; 1.43-1.58 (x = 1.48) times as wide as long, dark yellowish-brown; labrum shallowly concave; seta 1-C very stout, subacute, pigmented, 0.17-0.25 as thick as long, separated by 1.2-1.8 times their length, occasionally with one or 2 very small denticles beyond middle; 4-C slender, caudad of level of 7-C; 6-C just slightly cephalad of a line between 5, 7-C; 7-C only slightly shorter than 5-C, reaching beyond insertion of 1-A; 14-C usually single. *Antenna* 0.53-0.58 mm long, slightly bowed, pale in proximal part except for dark brown basal ring, light brown in distal part, dorsally, laterally and ventrobasally spinulate on proximal part, several lateral spinules on distal part; 1-A inserted at apical 0.34-0.42 (x = 0.38), with approximately 20-30 strongly barbed branches, each about 0.8 antenna length; 2,3-A long, about 0.5-0.6 antenna length; 4-A similar but slightly shorter. *Mandible* with a few small needle-like dorsolateral microspines. Cutting organ with mesal dorsal tooth bearing one or 2 large mesobasal denticles; VT_{1-3} becoming larger proximad; VB_1 very strongly and coarsely pectinate on mesal margin (the number of teeth about 10), the individual teeth quite stout; VB_2 apparently undeveloped; pectinate brush 8-10 haired. Mandibular hairs (6-9) + (12-13), 18-21 in total. *Maxilla.* Cardo narrowly connected mesobasally with cranium; 1-Mx single. Mesostipes about

1.2 times as long as wide, with lateral surface smooth, with a row of somewhat stiff spicules along mesal margin; stipital sensoria at about middle, subequal; 4-Mx slender, only slightly pigmented; pseudoartis undeveloped. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis about 0.3 as long as mesostipes; $S_3 > S_1 > S_4 \fallingdotseq S_2 > S_5$ in length. *Mentum plate* triangular, with 15-17 (usually 15) blunt to subacute teeth, the median tooth not noticeably larger than the flanking teeth. *Thorax*. Prothoracic setal formula: 1(2)·1(2)·1·2(3)·1·1·3·2(3); 1,2-P almost always single; 4,8-P usually double; 12-P as long or longer than 5-P, moderately barbed. *Abdomen*. Seta 4-I fan-shaped, usually with 7-10 main branches, sometimes with a few branches apically split; 6-I usually triple; 4-IV usually single; 12-IV usually double; 7-V longer than 7-IV, usually 5,6 branched; 1-VI usually triple, subequal to 1-V, sometimes stronger than 1-IV; 13-VII usually triple. Comb scales 32-48 (x = 38.2), in a roughly triangular patch, individual scales broadly paddle-shaped, fringed apically with long subequal spicules, laterally with shorter spicules. *Siphon* pale yellow-brown, darker at base and apex, nearly straight, slender, length 1.49-1.63 mm, index 5.2-6.2 (x = 5.6); pecten confined to basal 0.28-0.35 (x = 0.32), of 9-18 (x = 12.4) teeth, each with 6 to 10 or more ventrobasal denticles; 1-S of 6 or 7 pairs, 4 or 5 proximal subventral pairs at least twice as long as siphon diameter at insertion, sparsely but strongly barbed; 1 lateral pair at apical 0.27-0.37 (x = 0.33) of siphon, slightly longer than siphon diameter at insertion, sometimes sparsely barbed; an apicosubventral pair at apical 0.11-0.17 (x = 0.14) of siphon, smooth, subequal to siphon diameter at insertion; 2-S apical, stiff, dark brown, 0.67-0.75 length of apical pecten tooth. *Saddle* 0.35-0.40 mm long; spicules inconspicuous except for those on laterocaudal aspect between 1,2-X; 1-X usually single, weakly barbed, 1.0-1.5 times saddle length; 2-X with ventralmost branch much longer than others, nearly as long as 3-X; 3-X about 5 times saddle length; 4-X of 11 or 12 cratal hairs, each 6 to 11 branched, the most proximal 2 or 3 hairs sometimes much reduced. Anal gills very short, the dorsal gill 0.6-0.7 length of saddle; ventral gill 0.8-1.0 length of dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 3♂, 3♀, 10 L: Okinawa Guntô (J-2120, J-2121, J-2312). 20♂, 24♀ with associated skins (5 l, 5 p); 95 L, 4 l: Yaeyama Guntô (K-0929, K-0934, K-0946, K-0956, K-0984, K-1000, K-1123, K-1124, K-1125).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa, Miyako and Yaeyama Guntô). KOREA. COASTAL REGIONS THROUGHOUT THE ORIENTAL REGION, AND OF EAST AFRICA, MADAGASCAR, NORTHERN AUSTRALIA AND PACIFIC ISLANDS.

BIONOMICS. Common in Yaeyama Guntô, apparently rare in Okinawa Is. Biery and Burns (1973c) found *sitiens* to comprise less than 0.15% of *Culex* mosquitoes collected on Okinawa from 1970 to 1972. Larvae usually occur in brackish ground pools, largely restricted to seacoast locales (Sirivanakarn 1976). They are found also in ponds and artificial containers (Kamimura 1976b). Females are night feeders, apparently primarily on birds and pigs, less so on cows, dogs and humans (Bram 1967).

RELATION TO DISEASES. Japanese encephalitis virus was transmitted experimentally by this species (as *jepsoni* Theobald) (Hodes 1946), but the role of this species during epidemics of this disease is not certain. Iyengar (1953) found *sitiens* naturally infected with *Brugia malayi* in Thailand, however he did not consider *sitiens* as an important vector of this pathogen.

28. *CULEX (CULEX) WHITMOREI* (GILES)
(Figs. 43, 44, 185; Table 64)

Taeniorhynchus whitmorei Giles, 1904: 367 (♀). Type-locality: Camp Stotsenburg, Angeles and Panpanga, Luzon, Philippines.
Leucomyia plegepennis Theobald, 1907: 375 (♀). Type-locality: Kobe, Honshu, Japan.
Culex whitmorei: Yamada, 1927: 582, Korea.
Culex (Culex) whitmorei: LaCasse and Yamaguti, 1950: 211 (♂, ♀, L); Bohart, 1959: 197, Sonai, Iriomote Is., Ryukyu Archipelago.

FEMALE (Fig. 185). Wing length 3.1-3.5 mm. *Head.* Eyes narrowly separated above. Vertex including interocular space covered with white narrow curved scales; erect scales white medially, brown laterally; tempus covered with broad white scales, a small patch of broad dark scales within the pale scaled area; 5-6 vertical bristles on each side, mesal ones yellowish, lateral ones dark; 2 dark temporal bristles on each side. Clypeus brown. Antenna: pedicel dorsolaterally testaceous, mesoventrally dark brown, with small broad white scales and very fine mesal bristles; flagellum 1.06 (1) of proboscis; flagellomere 1 1.31 of Flm 2, without scales. Palpus 0.2 of proboscis, dark scaled, with pale apical scales; segment 3 1.76-1.85 of 2. Proboscis 1.08 of forefemur, dark scaled, with a broad median band of pale scales. *Thorax.* Anterior pronotal lobe with integument brown, covered with white and yellowish brown narrow curved scales; posterior pronotal lobe with integument dark brown posterodorsally, rather light brown anteroventrally, covered with narrow curved white scales on dorsal and posterior margins, yellowish brown ones in middle, bearing 4-6, mostly brown, some yellowish, bristles along posterior margin. Scutum with integument rather dark brown, covered with white narrow curved scales, with an anteromedian small patch and paired anterosubmedian short stripes of yellowish brown narrow curved scales, and paired posterior dorsocentral broad stripes of dark brown narrow curved scales, the anteromedian patch extending a little posteriorly in a specimen from Amami Ôshima, reaching middle of scutum forming a longitudinal median band in 2 specimens from Ishigaki Is., Yaeyama Guntô; scutal bristles brownish, fossal area with 2 or 3 bristles anterolaterally, one on level of scutal angle and one or 2 posteriorly. Scutellum with integument concolorous with scutum; median lobe covered with white narrow curved scales, bearing 5-6 long bristles; each lateral lobe covered with dark brown narrow curved scales, bearing 4 (rarely 5) long bristles; all lobes with some additional short bristles. Pleural integument brown, darker on post- and subspiracular areas, paler on mesepimeron, mesomeron and metapleuron; patches of broad white scales on propleuron, upper sternopleuron, lower posterior sternopleuron, upper mesepimeron and anteromedian mesepimeron, the lattermost and upper sternopleural patches nearly confluent; 5-7 yellowish brown to brown propleural bristles, 6-8 pale prealars, about 10 or more mostly dark sternopleurals, 4-8 pale upper mesepimerals, no lower mesepimerals. *Wing.* Veins mostly dark scaled; c with pale scales basally on posterior side; 1a almost reaching level of m-cu. Cell R_2 3.12-3.44 length of vein r_{2+3} in 2 specimens from Osaka Pref., 2.22-2.43 in 3 specimens from the Ryukyu islands. Halter with pale scaled knob. *Legs.* Coxae basally pale scaled, dark scaled apically. Femora with apical fringe pale dorsally and dark laterally; forefemur dark scaled and speckled with pale scales on dorsal surface and anterior half of

ventral surface, remainder pale scaled; midfemur dark scaled with scattered pale scales on anterior surface, mainly pale scaled on posterior surface; hindfemur pale scaled, anterior surface mottled with dark scales. Foretibia dorsally and laterally dark scaled, ventrally pale scaled; midtibia pale scaled except base, apex and ventral surface; hindtibia mostly dark scaled, with medial pale scales and dorsobasal and anteroapical pale spots. Tarsi mainly dark scaled; tarsomeres 1 with some pale scales laterally; foretarsomeres 2-4 and mid- and hindtarsomeres 1-4 with pale basal bands, 5 occasionally with indication of a pale basal band. Foretarsomere 5 as long as 4; hindtarsomere 1 0.90-0.97 of tibia. *Abdomen*. Tergum I with median patch of dark scales, occasionally pale scales mixed; II-VII each with median, laterobasal and sublateroapical patches of pale scales; the median patch usually triangular, diminishing in size toward posterior segments, often lacking on VII, occasionally extending posteriorly and forming a continuous longitudinal median band; the laterobasal and sublateroapical patches almost midsublaterally confluent; VIII with laterobasal patches of pale scales. Sterna pale scaled, with lateroapical patches of dark scales, the patches increasing in size toward anterior segments.

MALE (Figs. 44, 185). Wing length 2.9-3.1 mm. Antenna slightly shorter than proboscis, flagellomere 12 longer than Flm 13, both shorter than Flm 1-11. Palpus longer than proboscis by a little less than apical 2 segments, dark scaled, with pale articular band at segments 2-3, broad median band on 3, and basal bands on 4 and 5; rather long bristles on 4 and 5, and 3 ventroapically. Proboscis longer than forefemur. Propleural bristles not separated from prosternal bristles. Cell R_2 2.38 length of vein r_{2+3} (one specimen from Osaka Pref.). Hindtarsomere 1 as long as tibia. Foretarsomere 4 only slightly longer than wide; 5 longer than 4, with a few stout setae ventrobasally. *Genitalia*. Tergum IX with each lobe bearing 3-6 (2) bristles. Basistyle 3 times as long as wide in sternal view, laterally and sternally bristled, with only a few very fine tergal bristles near subapical lobe; subapical lobe well protrudent, rod α strongest; β and γ laterodistad of α, close together; β slightly longer but narrower than α; γ a little smaller than β; δ and μ_{1-3} apically hooked, δ similar to μ in shape, only slightly larger than them; ϵ leaflike, unstriated, round-tipped; χ rather stout. Dististyle 0.52 (1) length of basistyle, 5.2 times as long as wide, lightly pigmented basally, with 2 fine setae, one on convex side at about apical 0.33 another a little more distad on concave side. Cercal setae 3-4 (2); paraproct with laterobasal process moderately developed. Tergoapical division of aedeagus 1.51-1.54 (1) times as wide as long; each lateral plate with 2-4 (2) tergal teeth and a laterally extended, very large, triangular median tooth, apex apparently sternally expanded, with fine spiculation.

LARVA (Fig. 43). *Head*. Seta 1-C stout, strongly pigmented, acuminate at tip, shorter than distance between bases; 4-C short, very slender, about as long as or shorter than distance between bases. *Antenna* 0.74-0.78 mm long, curved, dark at base and in distal part, spiculate dorsally except for apex; 1-A at apical 0.35-0.40 of shaft, with about 20-30 barbed branches, extending beyond apex of shaft; 2, 3-A about 0.67 as long as shaft, at apical 0.06-0.12; 4-A slightly shorter than 2-A, 2-4-A pigmented. *Mandible**. Mesal dorsal tooth of cutting organ with 2 mesal denticles; VT_3 larger than

*No specimen of dissected mouthparts available for precise description.

$VT_{1, 2}$. *Maxilla** with very stout pigmented 4-Mx; stipital sensoria and 5-Mx at about basal 0.33. *Mentum plate* with 11-13 teeth of subequal size. *Thorax.* Prothoracic setal formula: 1·1·1·2(1)·1·1·3(2)·2; 13-T well developed. *Abdomen.* Comb scales 6-8, arranged in an irregular double row; individual scales slender, with a single strong apical spine, laterobasally fringed with very fine spicules. *Siphon* slender, tapering and dorsally curved toward apex, with apex 0.42 (1) as wide as base; length 1.02-1.10 mm, index 5.2; microsculpture of transverse rows of minute denticles; pecten reaching basal 0.18-0.23 of siphon, 7-11 teeth, a few basal teeth definitely smaller or abortive, each tooth with about 10-20 rather long, ventral denticles; 1-S of 5-7 subventral pairs; each seta very long, double, strongly barbed; basalmost one longest, at basal 0.25-0.31 of siphon, apicalmost one 0.60-0.75 of basalmost, at apical 0.25-0.28; 2 pairs of accessory unbarbed double setae slightly dorsad of level of 1-S, basal one at basal 0.42-0.55, apical one at apical 0.17-0.31, each much weaker than 1-S, but distinctly longer than siphon diameter; 2-S stout, longer than apical siphon diameter, directed somewhat anteriorly, with one or more accessory short multiple spicules basally; ventrobasal valve relatively large, rounded in lateral view; 9-S rather stout, curved. *Saddle* finely spiculate, 0.32-0.34 mm long; 1-X weak, shorter than saddle; 4-X of 12 cratal hairs, each 3-10 branched. Anal gills 2.7-3.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 4♀, 1 L: Honshu (1♂, 4♀: Sukuno, Osaka Pref., 1 VIII 1965, Kamimura, KKCOL; 1 L: Okayama, Okayama Pref., 24 VIII, Kamimura, KKCOL). 1♂: Kyushu (Kamiitagawa, Kagoshima Pref., 6 VI 1965, rice field, Kamimura, KKCOL). KOREA. 1♀: Korean Pen. (L-2143). RYUKYU ARCHIPELAGO. 1♂, 2♀: Amami Guntô (1♂, 1♀: Gusuku, Amami Ôshima, 14 IV 1964, rice field, Kamimura, KKCOL; 1♀: Nishinakama, Amami Ôshima, 21 V 1965, rice field, Kamimura, KKCOL). 2♀, 3 L: Yaeyama Guntô (1 L: Ishigaki, Ishigaki Is., 1 XI 1961, rice field, Sasa, KKCOL; 2 L: Ishigaki, Ishigaki Is., rice field, Sasa, KKCOL. 2♀: K-2065).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Shikoku, Kyushu). KOREA (Korean Peninsula). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). PRYMORYE. ORIENTAL REGION. NEW GUINEA.

BIONOMICS. Usually rare in temperate Japan and the Ryukyus. Larvae are found in fresh water ground pools, rice paddies, and the margins of slowly moving streams (LaCasse and Yamaguti 1950). Females are night biters and, apparently zoophilic, much greater numbers being collected from buffalo bait in comparison to human bait (Self et al. 1976).

RELATION TO DISEASES. *Culex whitmorei* is one of the species most suitable as an intermediate host of Bancroftian filariasis (Yamada 1927). Sirivanakarn (1976) stated that one author reported isolation of JEV from *whitmorei* in India, but that the importance of *whitmorei* as a vector had not been confirmed.

*No specimen of dissected mouthparts available for precise description.

29. *CULEX (CULEX) JACKSONI* EDWARDS
(Figs. 44, 45, 186; Table 65)

Culex (Culex) jacksoni Edwards, 1934: 452 (♂, ♀, L). Type-locality: Shonson Hill, Hong Kong; Stone, Knight and Starcke, 1959: 250, Korea.
Culex (Culex) kangi Lien, 1968c: 235 (♂, ♀, P, L). Type-locality: Chienchi, Hsinchu, Hsinchu Hsien, Taiwan; Lee and Lee, 1975: 59, Korea; Sirivanakarn, 1976: 150 (synonomy).

FEMALE (Fig. 186). Wing length 3.5-4.3 mm. *Head.* Vertex covered with pale yellowish brown, narrow curved or paler crescent-shaped scales and numerous long erect forked scales, median erect forked scales yellowish brown, lateral ones dark; tempus covered with broad white scales, a few broad dark scales within the white scaled area; 6-8 dark brown vertical and 2-3 dark temporal bristles on each side. Clypeus dark brown. Antennal pedicel tawny yellow, mesal side infuscate, with a few pale small scales and dark short hairs; flagellum 0.99-1.18 (6) of proboscis; flagellomere 1 1.19-1.33 of Flm 2. Palpus dark scaled, with tip pale scaled, 0.20-0.21 of proboscis; segment 3 2.46-3.38 of 2. Proboscis 0.96-1.05 of forefemur, dark scaled, with a distinct median band of white scales. *Thorax.* Pronotal lobes with integument rather dark brown, pale brown on lower posterior lobe, covered roughly with yellowish brown narrow curved scales, bearing 7-13 (9) dark brown or pale yellowish brown bristles along posterior upper corner of posterior lobe. Scutum with integument brown, covered with brownish and pale narrow curved scales, the pale scales forming ill-defined patterns on anterior promontory, along humeral margin and scutal suture, at posterior end of anterior dorsocentral line, on supraalar area and along margin of prescutellar bare space; scutal bristles rather dark brown, a few on anterior promontory yellowish, 7-10 (9) fossal bristles located slightly interiad of humeral margin and scutal suture. Scutellum roughly covered with pale narrow curved scales, bearing dark brown long bristles, 3-6 (9) on each lateral lobe and 6-8 (9) on median lobe, several additional short bristles on each lobe. Paratergite rather dark brown. Pleural integument pale brown, infuscate on subspiracular area, prealar knob and often posterior sternopleuron between 2 scale patches; small patches of broad white scales on propleuron, upper and middle posterior sternopleuron, upper and middle mesepimeron; pleural bristles brown in most of 7-12 (9) propleurals, others pale, about 10 prealars, more than 10 sternopleurals, 5-13 (9) upper mesepimerals, no lower mesepimerals. *Wing.* Anterior veins with 3 marks of pale scales: sector on c and sc, subcostal over c to r_1 and apical on c and r_1; sector mark on c sometimes intermixed with dark scales or shortened basally; r_2 and r_3 with a common pale spot at base; r_{4+5} pale except at base and apex; cu_1 pale in middle 0.33; 1a dark at base, pale to middle, dark in apical half; a pale fringe spot at apex of cu_2; veins otherwise dark scaled. Cell R_2 2.26-3.21 (9) length of vein r_{2+3}. Halter knob pale scaled. *Legs.* Forecoxa scaled on anterior surface, white in basal 0.33, dark otherwise; midcoxa with integument dark at base; mid- and hindcoxae each with a patch of white scales. Femora with narrow apical fringe of pale yellowish scales; forefemur pale scaled on posterior half of ventral surface, with several pale scales subapically; midfemur pale scaled at base of anterior surface, on basal 0.67 of posterior surface and entire ventral surface, with subapical pale spot on posterior side; hindfemur pale scaled on basal 0.60-0.67 of anterior surface, otherwise similar to midfemur. Tibiae with narrow yellowish apical

fringe; foretibia with a pale streak on posterior side; mid- and hindtibiae with pale streaks on both sides. Tarsomere 1 pale scaled on posterior side, with a small basal pale spot and apical pale fringe; 2 and 3 with pale basal ring and pale apical fringe; 4 with pale basal ring. Femora, tibiae and tarsi otherwise dark scaled. Foretarsomeres 2-5 together slightly shorter than 1, 5 as long as or slightly shorter than 4; hindtarsomere 1 0.97-1.09 of tibia. *Abdomen.* Tergum I with median patch of dark scales; II-VI dark scaled, with basal bands and laterobasal patches of pale scales, the laterobasal patches extending posteromesally but not reaching apical margin, the basal bands not connected with laterobasal patch on II, barely connected on III-VI; V and VI with narrow apical bands of pale scales; VII with basal band, broad apical band and lateral patches usually connected with each other leaving a mediosubbasal patch of dark scales; V frequently with a pair of discal spots, IV and VI often with smaller spots or a faint indication of the spot; VIII pale scaled. Sterna pale scaled, IV-VII with lateroapical oblique patches of dark scales, VIII dark at middle of apex.

MALE (Figs. 44, 186). Wing length 3.2-3.6 mm. Antennal pedicel glabrous; flagellum 0.81-0.91 (5) of proboscis; flagellomere 12 0.95-1.07 of Flm 13, both 0.90-1.00 of Flm 1-11. Palpus 1.34-1.42 of proboscis (longer than proboscis by slightly more than length of segment 5), markedly bristled from apical 0.4 of 3 to apex, with a pale spot of unscaled integument at fused joint of 2 and 3, with a patch of pale scales intermixed with a few dark scales in middle of 3 on same level as median band of proboscis; base of 4 and 5 with pale scales; apex of 5 with pale scales and a pigmented seta; length ratio of 2-5 : 0.54-0.69 : 1.26-1.38 : 0.70-0.77 : 1.00. Proboscis 1.19-1.23 (3) of forefemur, with several rather long ventral bristles at false joint. Cell R_2 1.58-2.17 length of vein r_{2+3}. Foretarsomere 5 1.82-2.10 (8) length of 4. *Genitalia.* Almost identical with those of *mimeticus,* differing only in that the laterobasal process of paraproct is usually weakly developed, occasionally lacking or moderately developed; even in the most developed case, it is not deeply pigmented and never curved sternally. Lobe of tergum IX with 3-9 bristles.

LARVA (Fig. 45). *Head.* Width 1.10-1.21 mm;* pale yellowish; 1.33-1.50* times as wide as long; microsculpture consisting of short rows of minute spicules, visible only under oil immersion; labrum slightly concave; seta 1-C stout, brown, slightly thickened in middle, separated by 1.2-1.7 times length; 3-C relatively weak; 4-C very short, about on level with 6-C; 5, 6-C 0.67 or less length of cranium, 5-C frequently (70%) 5 branched; 6-C usually (84%) triple; 7-C almost on line with 5, 6-C; 13-C usually double, reaching beyond base of antenna. *Antenna* 0.50-0.53 mm long, pale in proximal part, fairly dark in distal part, dorsally and laterally spiculate in proximal part, very few laterobasal spicules in distal part; 1-A slightly more than 0.6 length of shaft, inserted at apical 0.40-0.46 (x = 0.43), with 20 or more strongly barbed branches; 2, 3-A equal, 0.60-0.66 length of shaft; distance between 2-A and apex 0.29-0.40 (x = 0.34) as long as distance between 1, 2-A; 4-A 0.76-0.92 length of 2-A; 2-4-A dark brown; 6-A 0.35-0.42 length of 4-A. *Mandible* almost identical with that of *mimeticus,* differing only in having fewer microspines on laterodorsal surface, and equal mesal denticles on ventral tooth. *Maxilla.* Cardo very narrow, almost entirely well sclerotized, narrowly connected mesobasally with cranium; 1-Mx single.

*Taiwan specimens.

Mesostipes 1.17-1.25 times as long as broad, with lateral surface smooth, and mesobasal margin strongly sclerotized; stipital sensoria subequal, slightly distal to middle; a band of short hairs along lacinial suture from apex to just laterad of stipital sensoria; 4-Mx longest of all maxillary setae, stiff and pigmented; pseudoartis poorly developed. Lacinia with 5-Mx at level of or slightly distad of stipital sensoria. Palpostipes excluding lateral artis 0.6 length of mesostipes; S_{1-3} subequal but apparently $S_3 > S_1 > S_2$ in length, S_4 definitely shorter, S_5 very short. *Mentum plate* triangular, with 11-15 teeth, the median tooth about 1.5 times the size of its flanking teeth. Aulaeum with median tooth apparently bicuspid. *Thorax*. Prothoracic setal formula: 1·1·1·1·1·1·3(2, 4)·2(3); 14-P, 1-M-T usually single; 12-T usually double; 13-T weak. *Abdomen*. Setae 1-I, IV, 3-I-III, 4-III, 6-V, VI, 7-VI, 8-IV, V, 11-II, IV-VI, 12-I, II, 13-I, IV usually double; 1-II, III, 2-VIII, 3-V, X, 4-IV, VII, VIII, 7-I, 8-II, III, and 12-IV-VII usually single; 6-I usually 3-4 branched; 6-III, IV usually triple; 6-VII not dendritic; barbing on 1, 13-IV varying from inconspicuous to quite strong; 13-III usually smooth, sometimes with a few small barbs; 5-VIII usually 4 branched, not quite as strongly barbed as 1, 3-VIII; 1, 5-VIII subequal in length, about 0.67-0.75 length of 3-VIII. Comb scales 26-37 (x = 31.0) in a roughly triangular patch, individual scales thorn-shaped, with a strong apical spine, fringed with a few laterobasal spicules. *Siphon* nearly straight, tapering gradually from base, with apex about 0.5 as wide as base, pale yellowish-brown, becoming somewhat darker in apical 0.2, with basal ring very dark; length 1.38-1.73 (x = 1.56) mm, index* 5.2-6.3 (x = 5.7); microsculpture indistinct, consisting of short transverse rows of minute spicules; pecten in an often irregular row, reaching basal 0.34-0.53 (x = 0.42), of 12-19 (x = 15.8) teeth, each usually with 4-6 ventrobasal denticles, progressively larger distad; 1-4 yellowish brown, simple thorn-like strong subventral spines present on each side from apical 0.10-0.59, usually those on median area much smaller than those of apical area; 1-S of 6-8 usually paired, subventral setae, each 3-8 branched, subequal to siphon diameter at insertion; proximalmost 1-S inserted usually beyond, occasionally within pecten at basal 0.39-0.58; distalmost 1-S at apical 0.14-0.23; usually 2 pairs of laterosubapical accessory setae present, 1-2 (usually 2) branched, inserted at apical 0.14-0.22 and 0.06-0.15 respectively; 2-S straight, less than 0.5 as long as siphon diameter at apex, at least 0.67 length of apical pecten tooth, sometimes longer than it. *Saddle* 0.40-0.45 mm long; microsculpture consisting of short transverse rows of needle-like microspines; 1-X 0.30-0.43 length of saddle; 4-X of 12 cratal hairs, each 2-7 branched. Anal gills slender, gradually tapering from base, dorsal gill 1.2-1.6 times saddle length, ventral gill subequal to slightly shorter than dorsal gill.

SPECIMENS EXAMINED. KOREA. 22♂, 20♀, with associated skins (14 l, 14 p); 3 L: Korean Peninsula. (L-0816, L-0868, L-1483, L-2067, L-2068). TAIWAN. 10♂, 10♀ with associated skins (10 l, 10 p); 49 L (5♂, 5♀, with associated skins (10 1, 10 p): Shinlin, Taipei Hsien, 24 III 1974, ground pool, Lien & Matsuki; 5♂, 5♀, 49 L: Shinlin, Taipei Hsien, 14 IV 1974, ground pool, Matsuki).

DISTRIBUTION. KOREA (Korean Peninsula). PRYMORYE. TAIWAN. NORTH CHINA. HONG KONG. NEPAL. INDIA. SRI LANKA.

*Taiwan specimens.

TAXONOMIC DISCUSSION. Edwards (1934) stated, in his original description, "*Hypopygium:* closely resembling that of *C. mimeticus;* no obvious differences discoverable in the single specimen available." We examined the holotype male preserved in BMNH. No differences were detected in the subapical lobe and aedeagus, but the paraproct was found to have a small pale laterobasal process (arm), but never with a long, deeply pigmented and sternally curved process as in *mimeticus*. In the Korean population, the laterobasal process of the paraproct varies from totally reduced to moderately long; the most frequently encountered case was that of the holotype. There are intermediate forms between non-existant and moderately long, and all these types emerged from larvae having strong spines on the siphon. The larval exuviae of the holotype "has no distinct spines, but some thickenings of the chitin" (Edwards 1934). This may be an abnormal individual of this species.

BIONOMICS. Apparently common in Korea. Larvae were found in ricefields and ground pools, usually at higher elevations (Sirivanakarn 1976).

30. *CULEX (CULEX) MIMETICUS* NOÉ
(Figs. 46, 47, 187; Table 66)

Culex mimeticus Noé, 1899: 240 (♀). Type-locality: Grassano in Basilicata, Italy; Kobayashi, 1929: 41, Korea.

Culex (Culex) mimeticus: Bohart and Ingram, 1946b: 80, Okinawa Is., Ryukyu Archipelago; Hsiao and Bohart, 1946: 27, Nagasaki, Kyushu, Yumoto (Kanagawa), Honshu, Japan; LaCasse and Yamaguti, 1950: 241 (♂, ♀, L).

FEMALE (Fig. 187). Wing length 4.4-5.0 mm. *Head.* Eyes very narrowly separated above. Vertex including interocular space covered with pale yellowish narrow curved scales; median erect forked scales yellowish brown, lateral ones dark brown; tempus covered with broad white scales; 5-7 vertical and 2-3 (usually 2) temporal bristles on each side. Clypeus dark brown. Antennal pedicel yellowish brown, mesal surface dark brown, with pale small scales and fine bristles. Palpus dark scaled, with tip pale scaled. Proboscis dark scaled, with a distinct pale median band; basal dark area longer than apical dark area. *Thorax.* Pronotal integument brown to rather dark brown; anterior lobe with rather pale, yellowish brown narrow curved scales, scales of lower part paler; posterior lobe with scales similar to those of anterior lobe, those on posteroventral area paler and broader, 10-15 brown bristles along posterodorsal to posterior margin in an irregular double or triple row. Scutum with integument brown to rather dark brown, covered with rather pale, yellowish brown and white narrow curved scales, the white scales, variable in amount, along humeral margin to scutal suture, on supraalar area and margins of prescutellar space; middle of prescutellar space light brown, bare; scutal bristles dark brown; fossal area with 2-5 bristles along humeral margin and 3-6 near scutal angle to posterior margin. Scutellum light brown, covered with pale narrow curved scales, bearing 4-8 long, dark brown bristles on each lateral lobe and 7-12 on median lobe, each lobe with a number of additional fine yellowish brown bristles. Pleural integument light brown to brown, lower anterior margin and midposterior part of sternopleuron, and upper and lower anterior parts of mesepimeron darker; patches of broad white scales on propleuron, upper and midposterior sternopleuron, and midanterior mesepimeron, upper mesepimeron with several broad white scales; pleural bristles light brown, 7-14 propleurals, about 10 or more prealars, more than 10 sterno-

pleurals, 7 to more than 10 upper mesepimerals, no lower mesepimerals. *Wing*. Remigium usually with 3 dark bristles. Vein c with sector, subcostal and subapical pale marks; sector pale mark including sc, subcostal pale mark extending onto sc and r_1, preapical pale mark covering r_1 and usually also r_2, occasionally lacking on c; often these pale marks on sc, r_1 and r_2 smaller than those on c; r_{2+3} with a pale mark at fork; r_{4+5} with a long pale median mark; m with a pale mark at fork; cu_1 with a long pale median mark; cu_2 occasionally pale at tip; 1a with a long pale subbasal mark, or pale in entire basal half; a pale mark of long fringe scales at termination of cu_2; wing scales otherwise dark. Cell R_2 3.14-3.39 (2) length of vein r_{2+3}. Halter with pale scaled knob. *Legs*. Forecoxa scaled on anterior surface, basally and mesoapically pale, dark in-between; mid- and hindcoxae each with a patch of pale scales, with dark scales at apex of midcoxa. Forefemur pale at base and on posterior surface to posterior part of ventral surface, with pale apical fringe and subapical spot, the spot fused with or separated from apical fringe, frequently developed to an incomplete ring; midfemur pale at base and on posterior surface excepting upper half of apical area or short dark apical streak, with pale subapical spot usually fused with pale apical fringe; hindfemur pale excepting apical 0.25-0.33 and dorsal surface to dorsoanterior surface, with incomplete pale apical band; fore- and midtibiae pale on posterior surface, with pale basal spot on anteroventral surface and pale apical band, with a pale streak on anterior surface, usually indistinct on foretibia, more distinct on midtibia; hindtibia broadly pale with scattered dark scales in middle excepting dorsal surface, with pale basal spot on anteroventral surface and pale apical band; tarsomeres with both pale basal and apical bands on 1-3, pale basal band 4, 4 occasionally with some pale scales at apex; femora, tibiae and tarsi otherwise dark. Foretarsomeres 2-5 together slightly shorter than 1, 5 shorter than or nearly as long as 4; hindtarsomere 1 0.98-1.02 (3) of tibia. *Abdomen*. Tergum I with median patch of dark scales; II-VII dark scaled, with pale basal bands becoming narrower on posterior segments; VII and occasionally VI with pale scales on apical margin, sometimes forming a distinct apical band; laterobasal patch of pale scales on each tergum, usually not fused with basal band. Sternum II pale scaled, III-VII basally and medioapically pale scaled, dark scaled otherwise.

MALE (Figs. 47, 187). Wing length 3.6-4.0 mm. Antennal flagellum 0.88-0.90 (2) of proboscis; flagellomere 12 0.91-1.04 of Flm 13, both 1.13-1.18 of Flm 1-11. Palpus 1.43-1.48 (1) of proboscis (longer than proboscis by more than length of segment 5); 3 with pale median band, 4 with pale basal band, 5 with pale basal and apical bands; 4, 5 and apex of 3 bristly; length ratio of 2-5 : 0.62-0.67 : 1.33-1.35 : 0.80-0.84 : 1.00. Proboscis 1.13-1.15 (2) of forefemur, with several rather long ventral bristles at false joint; pale median band usually narrower than in female; apical dark area with a few scattered pale scales. Cell R_2 1.47-1.72 (3) length of vein r_{2+3}. Foretarsomere 5 1.67-2.04 (3) of 4; hindtarsomere 1 1.03-1.08 (5) times as long as tibia. *Genitalia*. Tergum IX with each lobe bearing 5-11 (5) bristles. Basistyle laterally and sternally bristled, only several fine tergal bristles near subapical lobe, long lateral and sternoapical bristles; subapical lobe moderately protrudent; rods α-γ proximalmost and close together, β slightly longer than α and γ, a broad seta (δ) mesodistally, shorter than α, apically rounded; 3 setae (μ_{1-3}) close to δ, each with one or 2 retrorse apical hooks; a broad leaf-like, but not striated seta (ϵ) laterally; a rather long bristle (χ) laterad of ϵ. Dististyle fairly broad, lightly pigmented, 0.47-0.53 (5) length of basistyle, with a few setae on convex side, and 1 on concave side distally. Cercal tergal surface

moderately sclerotized, 2-4 cercal setae; paraproct with laterobasal process strongly developed, deeply pigmented and sternally curved. Aedeagus with tergoapical division as long as wide or slightly shorter; each lateral piece with apex rounded or bluntly pointed and finely spiculate, bearing rather slender laterally directed teeth, 4-6 tergally and one sternally, often 1-3 denticles present on tergal surface.

LARVA (Fig. 46). *Head.* Front margin of labrum slightly concave; seta 1-C dark brown, stout, pointed, 0.65-0.78 as long as distance between bases: 4-C very short, slightly anteriad of 6-C; 6-C usually double, slightly anteriad of a line between 5, 7-C; 14-C stiff and pigmented. *Antenna* 0.67-0.70 mm long, dark brown at base and in distal part, spiculate except ventrally and apically, spiculation sparser and spicules stouter than in *orientalis;* 1-A inserted at apical 0.39-0.46 of shaft, with 22-24 strongly barbed branches, extending beyond apex of shaft; 2, 3-A equal, 0.54-0.61 length of shaft, slightly proximal to apex, distance between 2-A and apex 0.41-0.66 (20; $x = 0.49$) as long as distance between 1, 2-A; 4-A 0.79-0.87 length of 2-A, 2-4-A dark brown; 6-A 0.38-0.50 length of 4-A, and twice as long as 5-A. *Mandible* with a number of simple laterodorsal microspines. Cutting organ with mesal dorsal tooth bicuspid or bearing mesobasal denticle almost as large as the tooth; VT_3 larger than $VT_{1,2}$; VB_1 with mesal pectination fine apically, becoming stronger basally; VB_2 apparently undeveloped; pectinate brush about 10 haired. Piliferous process with labula as wide as anterior part and much more protrudent than it. Mandibular hairs (9-10) + (10-12), but not distinctly divided. *Maxilla.* Cardo fairly narrow, broader than in *jacksoni,* narrowly connected mesobasally with cranium; 1-Mx single. Mesostipes 1.2 times as long as broad, with lateral surface smooth, and mesobasal margin strongly sclerotized; stipital sensoria at apical 0.4, anterior sensorium slightly shorter than other; a narrow band of hairs along lacinial suture from apex to just laterad of stipital sensoria; 4-Mx pigmented, stiff, shorter than 5-Mx; pseudoartis poorly developed. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis 0.33 as long as mesostipes or a little longer; palpal sensoria rather long, slender, $S_1 > S_2 > S_3 > S_4 > S_5$ in length. *Mentum plate* triangular, with 15-17 teeth, all flanking teeth equal. Aulaeum with median tooth bicuspid. *Thorax.* Prothoracic setal formula: 1·1·1·1·1·1·3(2)·2(3); 5-M weaker than 6-M; usually, 7-P triple, 8-P double, 14-P, 1, 12-M single. *Abdomen.* Seta 7-II smooth or barbed; 3-VI anteromesad of 1-VI; 1-VII stronger than 1-VI, on a small round sclerotized basal plate; 2-I, 1-III, 5-III-VI and 2-VIII usually single; 12-I, 4-III, 1, 4, 11-IV, 11, 13-V, 4-VI and 11-VII usually double. Comb scales 25-34 in a patch, individual scales thorn-shaped, with a strong apical spine and fine laterobasal spicules. *Siphon* with dark basal ring, somewhat infuscate at apex, apically tapering; length 1.86-2.33 mm, index 6.83-8.08; microsculpture of transverse rows of very minute, blunt denticles; pecten reaching basal 0.20-0.35 of siphon, of 11-17 teeth, the teeth increasing in size and more widely spaced apically, each tooth with several ventral denticles within basal half of the tooth; 1-S of 9-12 ventral setae, in a zigzag row basally, more distinctly paired apically, longer than siphon diameter at insertion excepting most apical ones; basalmost 1-S at basal 0.31-0.47, usually beyond pecten, occasionally within it, 3-5 branched; apicalmost 1-S at apical 0.04-0.11, 1-3 (usually 2) branched; median 1-S with 2-7 branches; one or 2 pairs of laterosubapical accessory setae present, of about same size as apicalmost 1-S, each 2-3 branched; 2-S very dark brown, curved, more than half as long as apical siphon diameter, longer than apical pecten tooth. *Saddle* 0.41-0.53 mm long; microsculpture of short transverse

rows of minute pointed denticles, basally and ventrally weaker, but not markedly more dorsoapically distinct; 1-X shorter than saddle; 2-X with short dorsal and long ventral branches; 4-X of 11-13 cratal hairs, each 3-4 branched. Anal gills tapering to pointed apex, 1.5-2.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 3♀, 1 l: Hokkaido (A-1950). 4♂, 1♀, 9 L, 5 l: Honshu (8 L: Yuzawa, Iwate Pref., 13 X, ditch, Kamimura; l L: Misumi, Shimane Pref., 4 VIII 1966, ground pool, Kamimura, KKCOL. B-1284, C-2320, D-1185, D-1626). KOREA. 2♂, 2♀: Korean Peninsula. (L-0885, L-0886). RYUKYU ARCHIPELAGO. 5♀, 26 L, 2 l: Yaeyama Guntô (K-0588, K-0662, K-0956).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku Kyushu). KOREA (Korean Peninsula). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). SOUTHERN PALAEARCTIC REGION. ORIENTAL REGION.

BIONOMICS. Not rare in southern Japan including Ryukyu Archipelago, rather rare in northern Japan. Larvae were found in ponds, ditches, blocked streams and ground pools of fresh water, often associated with *Cx. orientalis*. Also recorded from rice fields, river bed, springs, etc. (Kamimura 1976b); and rock pools (Sirivanakarn 1976).

31. *CULEX (CULEX) ORIENTALIS* EDWARDS
(Figs. 47, 48, 188; Table 67)

Culex orientalis Edwards, 1921b: 338 (♂, ♀).
Type-locality: Tokio, Japan; Yamada, 1932: 212, Korea.
Culex (Culex) orientalis: LaCasse and Yamaguti, 1950: 246 (♂, ♀, L).

FEMALE (Fig. 188). Wing length 3.7-4.9 mm. *Head.* Eyes very narrowly separated above. Vertex including interocular space covered with pale narrow curved scales; median erect forked scales yellowish brown and lateral ones dark brown; tempus covered with broad white scales, occasionally with a spot of dark scales or a few scattered dark scales; 5-6 vertical and 2 temporal bristles on each side. Clypeus yellowish brown to dark brown. Antennal pedicel yellowish brown, mesal surface dark brown, with pale small scales and fine bristles; flagellum 1.05-1.17 (4) of proboscis; flagellomere 1 1.29-1.41 of Flm 2, without scales. Palpus 0.16-0.22 (4) of proboscis, apex of segment 3 pale scaled, remainder dark scaled; 3 1.89-2.61 of 2: 4 rudimentary. Proboscis 0.95-1.02 (4) of forefemur, dark scaled, with a distinct pale median band; basal dark area longer than apical dark area; tip often with some pale scales. *Thorax.* Pronotal integument brown to dark brown; anterior lobe with pale yellowish narrow curved scales; posterior lobe with yellowish brown narrow curved scales, those on lower posterior area paler, 7-13 yellowish brown bristles in an irregular double row along posterodorsal margin to posterior margin. Scutum with integument brown to dark brown, covered with yellowish brown and white narrow curved scales, the white scales along humeral margin to scutal suture, on supraalar area and margins of prescutellar space, and occasionally forming an anteromedian and a pair of median dorsocentral spots; middle of prescutellar space light brown, bare; scutal bristles very dark brown, fossal area with 4, 5 bristles along humeral margin and 3-6 near scutal angle to posterior margin. Scutellum light brown, covered with white narrow curved scales, bearing 4-7 long dark brown bristles on each lateral lobe and 7-11 on median lobe, each lobe with a number of additional fine

yellowish brown bristles. Pleural integument yellowish brown to brown, usually with greenish tinge in teneral specimens; postspiracular area, lower subspiracular area, concave area between prealar knob and sternopleuron, midanterior and midposterior sternopleuron, and upper and lower anterior mesepimeron darker; patches of broad white scales on propleuron, upper and midposterior sternopleuron and midanterior mesepimeron; upper mesepimeron with several broad white scales; pleural bristles yellowish to pale brown, 7-12 propleurals, about 10 or more prealars, more than 10 sternopleurals, 5-12 upper mesepimerals, no lower mesepimerals. *Wing.* Remigium with 2-4 dark bristles. Vein c with basal, sector, subcostal and subapical pale marks; basal pale mark extending from posterior margin of c onto r, occasionally reduced; sector pale mark including sc and r-r_1; subcostal pale mark extending onto sc and r_1, subapical pale mark covering r_1 and r_2, reduced rarely on c or r_1, occasionally on r_2; remigium pale, with dark spot or a few scattered dark scales; r_{2+3} with pale mark at fork; r_{4+5} with very long pale median mark; m with pale marks at sector level and at fork, one of them or both occasionally reduced; cu usually with a few pale scales or a pale spot at base, and often with a pale mark at presector level; cu_1 with a long pale median mark; cu_2 with pale apical mark or spot; 1a pale in basal half or up to level of cubital fork; long fringe scales pale in basal area, and forming a pale mark at termination of cu_2; wing scales otherwise dark. Cell R_2 2.35-3.19 (4) length of vein r_{2+3}. Halter with pale scaled knob. *Legs.* Forecoxa scaled on anterior surface, basally and apically pale, dark in-between, occasionally dark scales reduced; mid- and hindcoxae each with a patch of pale scales. Forefemur pale at base and on posterior surface to posteroventral surface, with an incomplete pale subapical band which is completely or incompletely separated from pale apical fringe; midfemur pale at base and on posterior and ventral surfaces, with apical part of posterior surface more or less dark, with subapical band and apical fringe similar to those of forefemur; hindfemur pale except for apex and a narrow dorsal stripe, with anterior surface often mottled with dark scales, with pale apical fringe. Fore- and midtibiae pale on posterior surface, with a pale basal spot on anteroventral surface and pale apical fringe, occasionally with a row of pale scales on anterior surface; hindtibia pale in middle excepting dorsal surface, with the pale area occasionally mottled with dark scales, with a pale basal spot on anteroventral surface and pale apical fringe; femora, tibiae and tarsi otherwise dark scaled. Tarsomeres 1-3 with pale basal and apical bands, 4 with pale basal band and occasionally a few pale scales at apex; 1 usually with scattered lateral and ventral pale scales. Foretarsomere 1 as long as 2-5 together, 5 slightly shorter than 4, hindtarsomere 1 0.90-1.00 (4) of tibia. *Abdomen.* Tergum I with a median patch of dark scales; II-VII dark scaled, with basal bands and long laterobasal patches of pale scales, both usually narrowly fused at base; VI and VII often with pale scales at apex. Sternum II pale scaled; III-VII pale scaled basally and medially up to apical margin, dark scaled lateroapically, the dark scaled area tending to be confluent mesally on posterior segments.

MALE (Figs. 47, 188). Wing length 2.7-3.9 mm. Antennal pedicel neither bristled nor scaled; flagellum 0.92-1.00 (4) of proboscis; flagellomere 12 0.98-1.09 of Flm 13, both 0.73-0.81 of Flm 1-11. Palpus 1.22-1.29 (4) of proboscis (longer than proboscis by length of segment 5 or less); 3 with pale median band, 4 with pale basal band, 5 with pale basal and apical bands; 4, 5 and apex of 3 bristly but less so than in *mimeticus;* length ratio of 2-5 : 0.82-0.87 : 1.47-1.72 : 0.71-0.81 : 1.00. Proboscis 1.05-1.13 (4) of forefemur, with pale median band at false joint, several rather long ventral bristles at false joint; area distad of pale median band with variable number of pale scales. Pale

marks of wing variable, in general less developed than in female, occasionally almost all pale marks reduced. Cell R_2 2.42-3.12 (4) length of vein r_{2+3}. Foretarsomere 4 very short; 5 2.00-2.30 (4) of 4; hindtarsomere 1 0.98-1.04 (4) of tibia. *Genitalia*. Tergum IX with each lobe bearing 3-6 (x = 4.3) bristles. Basistyle 2.5 times as long as wide in sternal view, densely bristled tergally in middle, rather sparsely sternally, long bristles laterally and sternoapically; subapical lobe moderately protrudent; rods α-γ proximalmost, close together, α shorter than other 2, β apically curved, an additional smaller rod often present proximad of α; δ rod-like, apically rounded, as long as γ; μ_{3-4}, short each with a few apical retrorse hooks, occasionally apparently simple; ϵ very broad, leaf-like, but not striated, apically rounded, χ long, apically curved. Dististyle very broad, abruptly narrowed from apical 0.33, 2.8-3.8 times as long as wide, 0.52-0.54 (2) length of basistyle, lightly pigmented, with annulations on convex side of apical half, a fine seta on convex side at about apical 0.33, and another a little more distally on concave side. Cercal tergal surface well sclerotized, 2-3 cercal setae; paraproct with laterobasal process strongly developed, sternally curved, deeply pigmented. Tergoapical division of aedeagus 1.32-1.54 (4) times as wide as long; each lateral piece with finely spiculate and often denticulate apex, and laterally directed strong teeth, 4-6 (usually 5) tergal and one sternal.

LARVA (Fig. 48). *Head*. Width 1.18-1.31 mm; yellowish brown; 1.34-1.45 times as wide as long; front margin of labrum very slightly concave; seta 1-C very dark brown, straight, stout, pointed, about half as long as distance between bases; 4-C short, slightly anteriad of 6-C, usually single; 6-C slightly anteriad of a line between 5, 7-C; 11, 13-C usually double; 14-C slender, unpigmented, usually single. *Antenna* 0.67-0.85 mm long, very dark brown at base and in distal part, densely spiculate except ventrally and apically; 1-A inserted at apical 0.31-0.39 of shaft, with 27-38 strongly barbed branches, extending well beyond apex of shaft; 2, 3-A equal, 0.62-0.69 length of shaft, close to apex, distance between 2-A and apex 0.18-0.33 (x = 0.27) as long as distance between 1, 2-A; 4-A 0.83-0.92 as long as 2-A, 2-4-A dark brown; 6-A 0.20-0.31 length of 4-A. *Mandible* with a number of simple laterodorsal microspines. Cutting organ with mesal dorsal tooth bearing a large basal denticle and one (88.7%) or 2 (1.9%) small median denticles, the small denticles rarely rudimentary (5.7%) or lacking (3.8%); VT_3 larger than $VT_{1,2}$; VB_2 apparently undeveloped; pectinate brush 11-12 haired. Piliferous process with labula much narrower than anterior part and only slightly more protrudent than it. Mandibular hairs (7-9) + (10-13), hairs of anterior group often with a group of prominent barbs subbasally. *Maxilla*. Cardo well sclerotized, narrowly connected mesobasally with cranium; 1-Mx single or double. Mesostipes 1.4 times as long as broad, with lateral surface smooth; stipital sensoria at about basal 0.4 of mesostipes, anterior sensorium slightly shorter than other; a band of 2 or 3 rows of hairs dorsally from apex to just laterad of stipital sensoria along lacinial suture, the hairs diminishing in size basally; 4-Mx pigmented, about as long as 5-Mx, apically filamentous; pseudoartis poorly developed. Lacinia with 5-Mx at level of or slightly proximad of stipital sensoria. Palpostipes very short, excluding lateral artis only 0.25 as long as mesostipes; $S_3 > S_1 > S_2 \doteqdot S_4 > S_5$ in length. *Mentum plate* somewhat pentagonal, with 11-13 teeth, often with an additional small basal tooth on each side; median tooth and one or 2 most lateral teeth larger than others. Aulaeum with median tooth apparently 2 or 3 cuspid. *Thorax*. Prothoracic setal formula: 1·1·1·1·1·1·3(2-4)·2(3); usually, 5-P triple and 9-P single; 14-P occasionally barbed; 5-M weaker than 6-M; 13-T substellate, stronger than in *mimeticus*. *Abdomen*. Seta 4-I often with a

few rather strong barbs or secondary branches; 7-II short and simple in 5 specimens from central Honshu, rather long and fairly strongly barbed in specimens from Hokkaido; 1-III-VII progressively stronger, 1-IV-VII each on a small round sclerotized basal plate; 3-VI anteromesad of 1-VI; 2,8-II, 2,14-III, V, VII usually single; 8-III and 7-VI usually double; 6-I, II, 3-II and 5-III usually triple; 9-I usually 4 branched; barbs of 1,3-VIII much stronger than 5-VIII. Comb scales 24-36 in a patch; individual scales with a moderate-sized apical spine, and rather stiff laterobasal spicules. *Siphon* with dark basal ring, somewhat infuscate at apex, apically tapering, with apex about half as wide as base; length 1.57-2.24 mm, index 5.36-7.72; microsculpture of transverse rows of blunt-tipped minute denticles; pecten reaching basal 0.21-0.31 of siphon, of 11-17 teeth, the teeth increasing in size and more widely spaced apically, each tooth with nearly 20 ventral denticles, the denticles progressively larger apically and reaching apical 0.33 of the tooth; 1-S of 10-14 ventral setae, in a zigzag row basally, more distinctly paired apically, longer than siphon diameter at insertion excepting apical 2-4 setae; basalmost 1-S beyond pecten at basal 0.29-0.41, 3-6 (usually 4) branched; apicalmost 1-S at apical 0.09-0.14, 2-4 branched; median 1-S with 2-6 branches; one or 2 pairs of laterosubapical accessory setae present, of about same size as apicalmost 1-S, each 2-4 branched; 2-S dark brown, straight, 0.33-0.40 as long as apical diameter of siphon, shorter than apical pecten tooth. *Saddle* 0.36-0.48 mm long; microsculpture of short transverse rows of minute pointed denticles, ventrally obsolete, more distinct dorsoapically; 1-X short and fine; 2-X with usually 2,3, short dorsal and 1 long ventral branches; 4-X of 10-12 cratal hairs, each 5-9 branched. Anal gills tapering to pointed apex, 1.2-1.8 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 168♂, 111♀, with associated skins (20 l, 20 p); 67 L, 24 l: Hokkaido (A-0043, A-1285, A-1638, A-1639, A-1640, A-1642, A-1652, A-1655, A-1670, A-1673, A-1678, A-1712, A-1713, A-1911, A-1912, A-1913, A-1914, A-1919, A-1920, A-1928, A-1929, A-1931, A-1933, A-1937, A-1938, A-1939, A-1940, A-1947, A-1949, A-1950). 17♂, 12♀, with associated skins (3 l, 3 p); 24 L, 1 l: Honshu (C-1905, C-1956, C-2285, C-2286, C-2321, C-2322, C-2323, C-2324, C-2325, C-2326, D-0055, D-0057, D-0063, D-0065, D-0066, D-0089, D-0393, D-0394, D-0404). 1♀, with associated skins (1 l, 1 p): Kyushu (H-1995). KOREA. 8♂, 9♀: Korean Peninsula. (L-0829, L-0832, L-0865, L-0874, L-1974, L-1976).

DISTRIBUTION. PALAEARCTIC JAPAN. (Hokkaido, Honshu, Shikoku, Kyushu). KOREA (Korean Peninsula, Cheju Do). SIBERIA. NORTH AND SOUTH CHINA. TAIWAN.

BIONOMICS. Common throughout Palaearctic Japan. Larvae were found in rice fields, ponds, ground pools of fresh water and sluggish streams with adequate cover of marginal vegetation and containing duckweed, algae, etc. Associated species include *Anopheles sinensis, Cx. tritaeniorhynchus, Cx. pseudovishnui, Cx. bitaeniorhynchus, Cx. hayashii, Cx. infantulus* and *Aedes dorsalis* (Meigen) (LaCasse and Yamaguti 1950). Light trap collections at U. S. airbases during 1970-72 found *Cx. orientalis* to comprise less than 6% of all *Culex* collected in Japan, less than 3% collected in Korea (Biery and Burns 1973a,b). This species apparently does not feed on man.

32. *CULEX (CULEX) BONINENSIS* BOHART
(Figs. 49, 50, 189; Table 68)

Culex (Culex) boninensis Bohart 1956 (1957): 75 (♂, ♀, P, L). Type-locality: Chichijima, Ogasawara Isls.

FEMALE (Fig. 189). Wing length 3.1-3.8 mm. *Head.* Vertex covered with dark brown narrow curved scales and dark erect forked scales, occasionally pale yellowish narrow curved or crescent-shaped scales forming a rather vague median line, sometimes a few erect forked scales at middle of vertex pale yellow; eye margin with pale narrow curved scales which also cover interocular space; tempus covered with broad pale scales; 6-7 vertical and 2 temporal bristles on each side. Clypeus dark brown. Antenna: pedicel testaceous, mesal surface infuscate, with minute bristles; flagellum 1.06-1.18 (3) of proboscis; flagellomere 1 with a few small scales, 1.29-1.50 (4) of Flm 2. Palpus dark scaled, 0.18-0.21 (4) of proboscis; segment 3 1.80-2.33 of 2. Proboscis dark scaled, 0.96-0.99 (4) of forefemur. *Thorax.* Pronotal integument mostly dark brown, pale brown on lower posterior lobe; anterior lobe with dark narrow curved scales, bristles dark brown; posterior lobe with a number of dark narrow curved scales dorsally and a row of 7-13 dark brown bristles of varying lengths along dorsal margin to posterodorsal corner. Scutum with integument brown or light brown, covered with narrow dark scales, with a pair of submedian stripes formed by unscaled integument; fossal area with about 10 bristles along humeral margin to scutal suture. Scutellum covered with scales similar to scutum but showing brighter golden sheen, bearing 4-7 long dark bristles on each lateral lobe and 6-8 on median lobe, several short bristles on each lobe. Pleural integument brown to pale brown, often greenish in teneral specimens, lower subspiracular area dark brown, postspiracular area, prealar knob and upper mesepimeron rather dark, a rather dark small integumental patch across upper posterior sternopleuron and anterior mesepimeron; small patches of broad white scales on upper sternopleuron, lower posterior sternopleuron and middle mesepimeron; 4-6 propleural bristles, 2 or 3 of them long and dark; 7-11 rather dark prealars; about 10 to 16 sternopleurals, some stout and dark, others pale yellowish brown; 5-10 pale yellow upper mesepimerals; no lower mesepimerals. *Wing.* Veins dark scaled. Cell R_2 2.69-3.08 (4) length of vein r_{2+3}. Halter knob dark scaled. *Legs.* Forecoxa scaled on anterior surface, narrowly pale basally, dark otherwise; mid- and hindcoxae each with a patch of pale scales. Fore- and midfemora pale scaled on posterior and ventral surfaces; hindfemur pale scaled on basal 0.60-0.67 of posterior surface and of lower half of anterior surface, dorsal surface dark up to base; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 shorter than 4; hindtarsomere 1 1.04-1.09 (4) of tibia. *Abdomen.* Tergum I dark scaled in middle; II-VII dark scaled, each with laterobasal patches of white scales usually not visible in dorsal aspect. Sterna II-VII basally pale scaled and apically dark scaled, sometimes II-IV entirely pale scaled. Segment VIII dark scaled.

MALE (Figs. 50, 189). Wing length 1.7-3.1 mm (reared examples). Antenna: flagellum 0.77-0.83 (4) of proboscis; flagellomere 12 0.65-0.76 of Flm 13, both 0.94-1.25 of Flm 1-11. Palpus dark scaled, 0.99-1.08 (4) of proboscis; segments 4, 5 and apex of 3 not hairy; length ratio of 2-5 : 1.19-1.31 : 2.22-2.34 : 0.88-0.96 : 1.00. Proboscis 1.09-1.17 (4) of forefemur, with false joint at apical 0.47-0.50 (2), without long bristles proximad of the

joint. Cell R_2 2.54-2.94 (4) length of vein r_{2+3}. Foretarsomere 5 1.74-1.83 (4) length of 4; hindtarsomere 1 0.99-1.00 (3) of tibia. *Genitalia*. Tergum IX with each lobe bearing 6-9 medium-sized bristles. Basistyle swollen in basal 0.75 and about twice as long as wide in tergal view, bristled except mesal surface at apex distal to subapical lobe and a small area at base; subapical lobe well protrudent, rod α stouter but shorter than β, γ longer than β, all hooked at apex; δ broad, subequal to α in length; μ single, narrow, shortest; ϵ narrow, subequal to α in length; χ longest. Dististyle about 0.67 length of basistyle, 4 times as long as wide, gently curved, moderately pigmented, with annulations at apex on convex side. Cercal tergal surface moderately sclerotized, 2-6 cercal setae; paraproct with laterobasal process moderately developed, pigmented, sternally curved at apex; a bristled sclerite between paraproct and basal plate. Tergoapical division of aedeagus well sclerotized, 1.11-1.30 (4) times as wide as long, sternomesal subdivision with 5, 6 stout tergoapical teeth, the surface without fine spiculation; tergolateral subdivision much shorter than sternomesal subdivision, of a simple conical form in tergal view; subbasal knob fairly large; sternal process or tooth absent.

LARVA (Fig. 49). *Head*. Width 1.06-1.19 mm; usually straw yellow to pale brown, 1.3-1.5 times as wide as long; labrum at most very slightly concave between setae 1-C; 1-C stout, deep brown, subacute, separated by 1.9-2.5 times their length; 4-C slender, well cephalomesad of 5, 6-C, separated by about 0.6 times their length; 6-C nearly always double, very slightly cephalad of a line between 5, 7-C; 5-C usually 4 branched; 11-C nearly always double; 14-C nearly always single, dark. Antenna 0.60-0.67 mm long, 0.75-0.80 length of head, slender, slightly arcuate, pale on proximal part except for apex and base, dark in distal part; with numerous rather long spinules on proximal part dorsally, laterally and ventrobasally; a few short spinules on distal part laterally; 1-A inserted at apical 0.31-0.34 of shaft, 25-30 branched, well barbed, about 0.6 times length of antenna; 2 3-A inserted at about apical 0.07-0.10; 2-4-A long and dark, each about 0.5-0.6 length of antenna. *Mandible* with a dorsolateral group of about 15 pale needle-like microspines. Cutting organ with mesal dorsal tooth having 2 denticles, the distal denticle much smaller than proximal denticle; ventral tooth with VT_{1-3} progressively larger proximad; VB_2 apparently hair-like, short, usually difficult to see; pectinate brush 6-8 haired. Mandibular hairs (5-6) + (9-10), 15-16 in total. *Maxilla*. Cardo narrowly connected mesobasally with cranium, 1-Mx single. Mesostipes 1.4 as long as wide, with lateral surface smooth; stipital sensoria slightly proximad of middle; 4-Mx short, rather stiff, lightly pigmented; pseudoartis poorly developed. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis less than 0.33 length of mesostipes, about half as broad as long, apicomesally rugose; $S_3 > S_1 > S_2 = S_4 > S_5$ in length. *Mentum plate* with 18-23 teeth, the lateralmost 2-4 teeth acute, the remainder subacute to blunt, median tooth much broader than flanking teeth. Aulaeum with median tooth bifid. *Thorax*. Prothoracic setal formula: 1·1·1·1·1·1·3(2)·2(3). *Abdomen*. Setae 6-I, II nearly always triple and strongly barbed; 6-III-VI less strongly barbed; 5-VIII nearly always 5 branched, lightly barbed. Comb scales 30-55 (x = 42.4) in a patch, individual scales paddle shaped, fringed on broad apical portion with strong subequal spicules, laterally with much shorter finer spicules. *Siphon* straw yellow to pale brown, often distally darker, straight; length 1.33-1.65 mm, index 5.3-6.2; microsculpture of transverse rows of minute denticles; pecten reaching basal 0.29-0.38, of 9-14 long pale brown teeth, becoming progressively smaller proximad, apical tooth often somewhat detached, each tooth usually with 6-10 distinct ventral denticles; 1-3 small

abortive teeth often found at base of pecten; 1-S of 2.5-4 (usually 3) large and 1,2 (usually one) small pairs of ventral setae; proximalmost 1-S inserted just distad of pecten, usually 8-10 branched, length 1.2-1.4 times width of siphon at insertion; 1,2 (usually 2) pairs of small dorsolateral setae also present; 2-S subapical, dark brown, stiff, 0.6-0.8 length of apical pecten tooth. *Saddle* with microsculpture of spiculiferous transverse short ridges, many stronger free spicules apically scattered dorsad of 1-X; 1-X usually double, 0.5-0.7 length of saddle; 2-X usually double, with dorsal branch shorter; 4-X of 11-13 (usually 12) cratal hairs, each with 6-15 branches. Anal gills subequal, about half to nearly as long as saddle, somewhat apically pointed.

SPECIMENS EXAMINED. OGASAWARA ISLS. 67♂, 61♀, with associated skins (23 l, 23 p); 84 L, 33 l (N-1169, N-1170, N-1171, N-1172, N-1173, N-1174, N-1180, N-1504, N-1505, N-1507, N-1508, N-1517, N-1545, N-1549, N-1556, N-1557, N-1558, N-1560, N-1561, N-1562, N-1563, N-1564, N-1565, N-1566, N-1567, N-1714, N-1720, N-1721, N-1722, N-1723, N-1724, N-1725).

DISTRIBUTION. OGASAWARA ISLANDS.

TAXONOMIC DISCUSSION. Due to the character of the male palpus and genitalia, *boninensis* appears to have an isolated taxonomic position in the subgenus *Culex*. Sirivanakarn (1976) stated that *boninensis* may represent a distinct subgenus. However, the larvae do not exhibit any peculiar characters. The ventrally located 1-S is rather distinctive, but such is seen also in species of the *mimeticus* group.

BIONOMICS. Common in Ogasawara Isls. Larvae were found in ground pools, rock holes and slowly moving streams. Takahashi (1973) collected larvae in artificial containers. Females are apparently night feeders; biting man and mouse in the laboratory (Kamimura 1976b).

33. *CULEX (CULEX) BITAENIORHYNCHUS* GILES
(Figs. 50, 51, 190; Table 69)

Culex bitaeniorhynchus Giles, 1901: 607 (A). Type-locality: Travancore, India.

Culex karatsuensis Mochizuki, 1913: 28 (♂, ♀, E). Type-locality: Fukuoka and Karatsu, Kyushu, Japan.

Culex bitaeniorhynchus var. *karatsuensis:* Yamada, 1927: 578, Korea.

Culex (Culex) bitaeniorhynchus: Bohart and Ingram, 1946b: 77, Okinawa Is. and Takabanare Is., Ryukyu Archipelago; LaCasse and Yamaguti, 1950: 201 (♂, ♀, L).

FEMALE (Fig. 190). Wing length 4.3-4.8 mm. *Head.* Eyes contiguous above and below. Vertex covered with pale narrow curved scales; median erect forked scales yellowish brown, lateral ones dark; tempus covered with pale yellowish broad scales, some dark scales mixed posteriorly; 6-7 vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel brown, darker mesally, with several minute bristles and a few small scales; flagellum 1.17-1.20 (5) of proboscis; flagellomere 1 1.30-1.50 of Flm 2. Palpus 0.21-0.24 (5) of proboscis, mainly dark scaled, with pale scales at tip and scattered elsewhere; segment 3 2.38-2.59 (5) of 2, 4 absent or papilliform. Proboscis 0.88-0.94 (5) of forefemur, dark scaled, with a broad median band of pale scales, pale scales also present at tip and scattered in apical dark area, pale ochreous scales scattered in basal dark area. *Thorax.* Pronotal integument rather dark brown; anterior lobe with ochreous brown nar-

row curved scales; posterior lobe with scales similar to or somewhat lighter than those of anterior lobe, bearing more than 10 fine pale to stiff dark bristles in a group dorsoposteriorly. Scutum with integument brown, darker anteriorly and paler posteriorly, covered with narrow curved scales; ill-defined varying-sized patches of dark scales behind anterior promontory, and on fossal area, supraalar area and prescutellar space; pale scales before prescutellar space and on posterior margin; rather large dark erect pointed scales above wing root; other scutal scales brownish; scutal bristles dark brown, more than 10 bristles in and around fossal area. Scutellum with pale narrow curved scales and 6-9 long dark brown bristles on each lateral lobe; median lobe with dark narrow curved scales anteriorly and pale ones posteriorly, bearing 8-12 long dark brown bristles; each lobe with several additional fine pale bristles. Paratergite rather dark. Pleural integument brown, darker anteriorly, paler posteriorly; propleuron with a small clump of pale crescent-shaped scales below bristles; small patches of broad white scales on upper sternopleuron, midposterior sternopleuron and upper mesepimeron; propleural, prealar and sternopleural bristles more than 10, a few long propleurals and sternopleurals dark, others yellowish brown, prealars pale; 8-14 pale upper mesepimerals, no lower mesepimerals. *Wing*. Veins speckled with dark and pale ochreous scales; long marginal fringe scales dark. Cell R_2 2.82-3.29 (5) length of vein r_{2+3}; 1a ending at level between m-cu and r-m, to r-m. Halter knob pale scaled. *Legs*. Forecoxa narrowly pale scaled basally, otherwise speckled with dark and pale ochreous scales; mid- and hindcoxae with pale basal scales and dark apical scales. Femora with narrow pale basal bands; forefemur pale on posterior 0.33 of ventral surface, mid- and hindfemora pale on posterior surface excepting apical area; femora otherwise speckled with dark and pale ochreous scales. Tibiae speckled with dark and pale ochreous scales, pale ones posteroventrally dominant. Tarsomere 1 speckled with dark and pale ochreous scales; foretarsomeres 2-4, and mid- and hindtarsomeres 1-5 with pale basal bands, foretarsomere 5 often with an indication of pale basal band; 1-4 with dorsoapical pale spots. Foretarsomere 5 a little shorter to nearly as long as 4; hindtarsomere 1 0.95-1.02 (5) of tibia. *Abdomen*. Tergum I with median spot of pale ochreous scales; II-VII with apical bands of pale ochreous scales and laterobasal patches of whitish scales, otherwise dark scaled and often with scattered pale ochreous scales, occasionally many pale ochreous scales on basal margin forming rather indistinct basal bands; VIII mostly pale scaled, with some dark scales near apex. Sterna II-VII largely pale scaled, with laterosubapical patches of dark scales. Seminal capsules 3, one slightly larger than the other 2.

MALE (Fig. 50). Wing length 3.8-4.3 mm. Antenna: flagellum 0.91-0.96 (5) of proboscis; flagellomere 12 1.21-1.30 of Flm 13, both together 0.84-0.95 of Flm 1-11. Palpus 1.42-1.53 (5) of proboscis, apically upturned, with pale bands at apex of segment 2, middle of 3, and bases of 4 and 5, apical half of 5 also pale scaled; 1 without bristles from base; 4, 5 and apical half of 3 with numerous rather long bristles; length ratio of 2-5 : 0.48-0.59 : 1.21-1.45 : 0.73-0.82 : 1.00. Proboscis 1.06-1.12 (5) of forefemur, with false joint just distad of middle, many slender bristles of medium length just proximad of false joint and rather narrow pale band just distad of it. Cell R_2 1.53-1.77 (5) length of vein r_{2+3}; 1a ending at about level of m-cu. Foretarsomere 5 1.67-1.91 (5) of 4; hindtarsomere 1 1.05-1.14 of tibia. Tergum VIII basally pale and apically dark. *Genitalia*. Tergum IX with each lobe bearing 4-11 bristles of medium size. Basistyle evenly covered tergally and sternally with medium-sized bristles excepting tergomesal margin and sternobasal area, with long

bristles laterally; subapical lobe at apical 0.3, moderately protrudent, 3 rods (α, β and γ) equal in length, α and β thick, on apex of the lobe, γ slender, at distal base of the lobe; δ apparently setiform; ϵ foliate; 3, 4 slightly thickened setae (μ) immediately laterad of δ; χ rather short. Dististyle short, 0.34-0.39 (5) length of basistyle, rather strongly arcuate, about 4 times as long as wide, lightly pigmented, with a short seta on convex side slightly distad of middle, and another on concave side at about apical 0.25. Cercal tergal surface weakly sclerotized; 2-4 cercal setae on each side; paraproct with laterobasal process short. Tergoapical division of aedeagus with 2, 3 furcate, digitiform, rather large tergomesal teeth, sternally directed, densely and finely spiculate mesal process, and laterosternally directed glabrous lateral process; sternobasal division rather well sclerotized, fairly large.

LARVA (Fig. 51). *Head.* Width 0.89-1.10 mm; relatively small, 1.30-1.49 times as wide as long, pale yellowish brown; ventral aspect of cranium long, oral cavity rather narrow; labrum with front margin concave; seta 1-C located mesad of the most anteriorly produced point of labrum and slightly behind the apical margin, unpigmented, thick, slightly broadened in middle or evenly thick, acuminate at tip, 0.84-0.94 (5) as long as distance between bases; 4-C usually double, short, about as long as distance between bases; 5-C usually triple; 11-C usually single, longer than 13-C; 14-C near anterior margin. *Antenna* 0.36-0.48 mm long, about 0.50-0.67 length of head, straight, dorsally, mesally and laterally spinulate in proximal part, with only a few spinules basally in distal part, rather dark at base and in distal part; 1-A inserted at basal 0.44-0.53, with 21-27 barbed branches reaching about apex of shaft; 2, 3-A close to apex, 2-A more distal than 3-A, 2-4-A subequal in length, lightly pigmented, 5-A shorter than 6-A; 6-A lightly pigmented. *Mandible* relatively small, rounded, with a number of simple microspines on ventral surface near base; mandibular ring distinct, on dorsal surface somewhat distant from basal margin; 4 mandibular spurs, all lightly pigmented and stout; MdS_1 longest, apically curved, without serration; MdS_2 lacking; MdS_3 shortest, less than half as long as MdS_1, straight; MdS_4 slightly shorter than MdS_1, slightly curved apically, MdS_5 subequal to MdS_4, straight, MdS_{3-5} serrate on mesal margin. Mandibular brush reduced to a short dorsolateral row of a number of hairs, the dorsal hairs stout; mandibular comb reduced to a ventrolateral row of 2 or 3 prominences (teeth), each bearing several rather long spicules. Cutting organ without dorsal spine; 2 large dorsal teeth, the lateral one unicuspid, the mesal one very broad, bicuspid; ventral tooth with VT_0 equal to lateral dorsal tooth in size, with spiniform VT-4 reaching apex of VT_0; $VT_{1,2}$ ventromesal in position, dark; VT_3 apparently represented by a large rather pale and flat expansion of mesobasal part of ventral tooth; VB_1 very wide, strongly broadened at base, strongly curved apically, with acute apex, far extending beyond apex of VT_0, serrate on mesal margin, the serration apically faint; VB_2 apparently undeveloped; pectinate brush of 5-6 laterally pectinate hairs. Piliferous process broad, only slightly protrudent, notched between labula and anterior part, with 5 hair groups, hairs short, numerous and dense. Mandibular hairs about 20 in a single row, distalmost hair apparently multiple, distal hairs simple, proximal hairs apically frayed. *Maxilla.* Cardo transverse, narrow, fused with cranium having a distinct suture along its entire basal margin; 1-Mx single, weak. Mesostipes 1.25-1.33 times as long as wide, with lateral surface smooth, with stiff, but apically filamentous spicules on mesal margin; stipital sensoria distad of middle, equal, each with a basal ring; 2-Mx very short, near apex; 4-Mx stiff, lightly pigmented. Hairs of maxillary brush short, many of them basally thick. Parartis not

produced; pseudoartis represented by a somewhat produced ventral laterobasal corner of mesostipes, attached to an internal sclerotized ridge close to apical margin of cranium. Lacinia with suture sigmoid and well sclerotized along its entire length, numerous simple basally thickened spicules mesally and lateromedially, and apically frayed rather thick spicules laterobasally; 5-Mx at level between stipital sensoria and apex; 6-Mx apparently a moderately long simple seta. Palpostipes about 0.6 length of mesostipes, fairly broad, apparently mesobasally fused with mesostipes; apex with usually 3 palpal sensoria, S_1 and S_2 pigmented, $S_1 > S_2 > S_3$ in length; S_4 absent; S_5 apparently usually absent; ampulla well developed. *Mentum plate* acutely triangular, with numerous closely appressed minute teeth. Aulaeum with median tooth rather short, bearing 2 acute denticles. *Thorax*. Setae in general relatively short; prothoracic setal formula: 1·1·1·2(1)·1·1(2)·3·2; 1-3-P rather close together on a prominent basal callus; usually, 4-M triple and 6-T single; 13-T weak. *Abdomen*. Integument very finely and sparsely spiculate laterally on VIII. Setae in general relatively short; 1-III-VI weak, shorter than respective setae 3; 10-VII stronger than 13-VII; 2-I usually single; 3, 10-I, 4, 10-12-III, 4, 5, 8, 12, 13-IV, 5, 7, 10, 12-VI, 1, 12-VII usually double; 6-III, IV and 3-VII usually triple. Comb scales 3-8, individual scales thorn-shaped, with strong apical spine, fringe of spicules very fine, restricted to base. *Siphon* pale yellowish brown, darker at base and apex, with large acus, 15-20 times as long as apical width; length 2.03-2.45 mm, index 6.62-8.00; microsculpture of irregular transverse rows of extremely fine denticles; pecten restricted to basal 0.06-0.10 of siphon, of 5-8 short pale teeth, basal teeth often abortive, each tooth with several ventrobasal denticles; 1-S of 4 pairs of subventral setae, each 2, 3 branched; proximalmost 1-S located at basal 0.35-0.50; 2-S dark, shorter than apical diameter of siphon, longer than apical pecten tooth, proximally inclined. *Saddle* 0.40-0.47 mm long, without microsculpture; 1-X weak; 2-X with long ventral and 2-5 short dorsal branches; 4-X of 10-13 cratal hairs, each 4-8 branched. Anal gills tapering to narrowly rounded tip, 1.5-2.2 length of saddle, dorsal gill equal to or a little shorter than ventral gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 20♂, 37♀, with associated skins (16 l, 16 p); 28 L, 5 l: Honshu (C-1956, C-2319, D-0057, D-0065, F-0228). 1♀: Shikoku (G-1277). 2♂, 1♀, 3 l: Kyushu (H-1992, H-1994). KOREA. 1♀: Korean Peninsula. (L-0829). RYUKYU ARCHIPELAGO. 13♂, 7♀, 6 L: Amami Gunto (I-0234, I-0235, I-1877, I-1878). 1♂, 1♀: Okinawa Gunto (J-0528). 167♂, 40♀, 7 L: Yaeyama Gunto (K-0175, K-0180, K-0183, K-0184, K-0582, K-0584, K-0588, K-0600, K-0662, K-0670, K-0701, K-0719, K-0720, K-0722, K-0724, K-0726, K-0730, K-0731, K-0733, K-0924, K-0925, K-0946, K-0951, K-0976, K-0985, K-0986, K-0988, K-1006, K-1021, K-1070, K-1439).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Gunto). SOUTH PRYMORYE. ORIENTAL, AUSTRALIAN AND ETHIOPEAN REGIONS.

TAXONOMIC DISCUSSION. In many portions of its range, this species appears quite variable in several characters (Bram 1967, Sirivanakarn 1976). Japanese and Ryukyuan populations appear to essentially belong to "*bitaeniorhynchus* (typical form)" of Sirivanakarn (1973). The male genitalia are identical. However, dark scaling of the anterior 0.67 of scutum seems to appear more frequently, and the abdominal terga occasionally have an indication of basal pale bands.

As mentioned in the foregoing generic and subgeneric descriptions, *bitaeni-*

orhynchus has many exceptional characteristics for a species of the subgenus *Culex*, especially in the larval mouthparts. However, the 12 species assigned to the *bitaeniorhynchus* series by Edwards (1932) should be studied at least to the level of the present work before considering a change in their taxonomic status.

BIONOMICS. Very common throughout Japan, including Ryukyu Archipelago. Larvae occur in rice fields, ground pools of fresh water, rock pools and sluggish streams containing green algae, *Spirogyra* spp. Associated species include *Anopheles sinensis, Cx. tritaeniorhynchus, Cx. pseudovishnui, Cx. orientalis, Cx. hayashii* and *Cx. rubithoracis* (LaCasse and Yamaguti 1950).

RELATION TO DISEASES. Specimens of *Culex bitaeniorhynchus* have been infected with the virus of Japanese encephalitis (Petrishcheva and Shubladze 1940, after Gutsevich et al. 1970).

34. *CULEX (CULEX) SINENSIS* THEOBALD
(Figs. 52, 191; Table 70)

Culex gelidus var. *sinensis* Theobald, 1903: 180 (♀). Type-locality: Shaohyling, China.

Culex tripunctatus Mochizuki, 1913: 24 (♂, ♀, E). Type-locality: Fukuoka and Karatsu, Kyushu, Japan.

Culex sinensis: Yamada, 1927: 582, Korea.

Culex (Culex) sinensis: Bohart and Ingram, 1946b: 79, Nago, Chizuka and Hentona, Okinawa Is., Ryukyu Archipelago; LaCasse and Yamaguti, 1950: 206 (♂, ♀, L).

FEMALE (Fig. 191). (After LaCasse and Yamaguti 1950). Wing length 3.8-5.9 mm. *Head.* Vertex covered with yellowish pale narrow curved scales and erect forked scales, lateral erect forked scales dark. Clypeus dark. Antenna: pedicel mesally pale scaled. Palpus 0.20-0.25 as long as proboscis, dark scaled, pale scaled at tip, with few scattered pale scales. Proboscis dark scaled, with median band of yellowish pale scales, located slightly closer to apex than base; a few pale scales subapically. *Thorax.* Pronotal lobes with yellowish pale to brown narrow curved scales. Scutum with integument dark brownish gray, covered with pale to ochreous brown scales in anterior 0.67, with one anteromedian and one pair of median spots of dark brown scales in anterior 0.33, covered with black narrow curved scales in posterior 0.33 excepting prescutellar space which bears pale to golden narrow curved scales with some dark ones intermixed. Scutellum with black and pale to golden narrow curved scales; bristles dark. Pleural integument brown, paler on mesepimeron and metapleuron, spiracular and post- and subspiracular areas somewhat darker; a patch of pale scales on propleuron and mesepimeron, 2 on sternopleuron. *Wing.* Veins dark scaled, with dull pale to brownish scales intermixed along posterodorsal margin of costa. Halter knob fringed with yellowish pale scales. *Legs.* Coxae pale scaled. Fore- and midfemora distinctly speckled; hindfemur with yellowish pale scales predominating. Tibiae with narrow pale basal and apical bands, with some scattered pale scales dorsally, pale striped ventrally. Tarsomere 1 pale striped ventrally; 1-3 with basal and apical creamy bands, 4 and 5 with creamy basal bands. Femora, tibiae and tarsi otherwise dark. *Abdomen.* Tergum I with a medioapical patch of dark scales; II-VIII with laterobasal patches, and apical and basal bands of yellowish pale scales; the basal patches confluent with apical bands on posterior

segments excepting VIII; the basal bands narrower than apical bands on II-VII, of smaller scales, sometimes obsolete on VII; VIII with basal band more conspicuous than apical band. Sterna covered with yellowish pale and brownish scales, with a pair of dark submedian patches on II-VII, apically dark on VIII.

MALE (Fig. 191). (After LaCasse and Yamaguti 1950). Palpus longer than proboscis by more than length of segment 5; 2 and 3 with pale bands, 4 and 5 with pale basal bands, 5 with apical 0.4-0.5 pale. *Genitalia*. Tergum IX with lobes not protrudent, each with 4-6 bristles. Basistyle with long lateral bristles; subapical lobe (after Bram 1967) with 3 hooked rods (α, β and γ), 3 fine (μ_{1-3}) and one strong (δ) accessory setae, a well developed leaf (ϵ), and gently curved seta (χ). Dististyle with a fine seta each on convex and concave sides. Cercal setae 2, 3; paraproct with laterobasal process well developed, sternally curved. Tergoapical division of aedeagus simple, consisting of paired horn-shaped, heavily sclerotized, finely spiculate processes.

LARVA (Fig. 52). (Description based on a single whole mounted specimen, supplemented by LaCasse and Yamaguti 1950). *Head*. Relatively small, ventral aspect of cranium long, oral cavity rather narrow; labrum with front margin apparently somewhat convex between setae 1-C; 1-C pigmented, stiff, of even width nearly up to acuminate tip, 0.46 (1) as long as distance between bases; 4-C well developed, far extending beyond apex of cranium, more than twice as long as distance between bases; 14-C near anterior margin. *Antenna* 0.40 mm long, straight, dark at base and distal 0.67 of distal part, with only several dorsal spinules in proximal part; 1-A inserted at apical 0.46, with over 20 smooth branches, extending slightly beyond apex of shaft; 2, 3-A at apical 0.25 (1); 4-A shorter than 2, 3-A; 5-A slightly shorter than 6-A. *Mandible* with 4 mandibular spurs; cutting organ with 2 dorsal teeth, lateral one smaller, unicuspid, mesal one very broad, bicuspid; ventral tooth apparently with very wide and dark VT-4 resembling lateral dorsal tooth; VT_{1-3} triangular, apparently similar to each other in shape and size; ventral blade slender and apically tapering. *Maxilla* apparently almost identical with that of *bitaeniorhynchus;* 1-Mx single, weak; 4-Mx weaker than *bitaeniorhynchus;* 5-Mx apparently closer to level of stipital sensoria than to apex. Palpostipes about 0.75 length of mesostipes, at least 3 palpal sensoria distinct. *Mentum plate* triangular, with 19-27 teeth progressively smaller basally, most basal teeth very small. Aulaeum with median tooth bearing 2 acute denticles at apex. *Thorax*. Setae in general relatively short; prothoracic setal formula: 1·1·1·3(2)·1·1·3·1; 4-P very short, weak and smooth; 13-T weak. *Abdomen*. Setae in general relatively short; 1-III-VI shorter than respective setae 3. Comb scales 3-6 in a row, individual scales thorn-shaped with a strong apical spine, lateral fringe of spicules extremely fine, restricted to base. *Siphon* apically tapering; length 1.7-2.0 mm, index 6-8; microsculpture indistinct; pecten restricted to base, of 1-4 pale teeth, each with 1-4 ventral denticles; 1-S of 4-7 pairs of subventral setae, each 2-3 branched, apparently equal to or shorter than siphon diameter at insertion; 2-S well developed, longer than siphon diameter at apex, hooked at apex, proximally inclined, lightly pigmented. *Saddle* 0.37-0.43 mm long; microsculpture indistinct; 1-X weak; 4-X of 10-12 cratal hairs, each 3-7 branched. Anal gills apically tapering, twice as long as saddle, dorsal gill equal to or slightly shorter than ventral gill.

SPECIMEN EXAMINED. RYUKYU ARCHIPELAGO: 1 L: Amami Guntô (I-2189).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Shikoku, Kyushu). KOREA (Korean Peninsula). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). SOUTH PRYMORYE. SOUTH CHINA. HONG KONG.

TAIWAN. PHILIPPINES. INDONESIA. INDOCHINA. MALAYA. THAILAND. BURMA. INDIA. SRI LANKA.

BIONOMICS. Apparently rare throughout Japan including the Ryukyu Archipelago. In their 3-year study, Biery and Burns (1973a) found *sinensis* to comprise less than 0.14% of all *Culex* collected in light traps. Larvae occur in rice fields, ditches, stream and ground pools containing green algae, *Spirogyra* spp. (Kamimura 1976b, Sirivanakarn 1976).

RELATION TO DISEASES. A comparatively small number of the larvae of *Wuchereria bancrofti* complete their development in *Cx. sinensis*; thus, it has a low suitability as an intermediate host (Yamada 1927). It is known to bite man, but its relative scarcity would appear to minimize its importance as a pest or disease vector (Sirivanakarn 1976).

SUBGENUS *NEOCULEX* DYAR

Neoculex Dyar, 1905: 45. Type-species: *Culex territans* Walker, 1856; United States.

FEMALE. *Head.* Eyes contiguous above. Vertex including eye margin with narrow scales; erect forked scales over almost entire vertex. Antenna about as long as proboscis; flagellomere 1 only slightly longer than Flm 2. Proboscis without pale band, with several ventrobasal setae. *Thorax.* Both pronotal lobes with scales; posterior lobe with bristles along dorsal to posterior margin. Acrostichal bristles present. Pleura often with distinct scale patches on propleuron, upper sternopleuron, lower-posterior sternopleuron and upper mesepimeron; lower mesepimeral bristles present or absent. *Wing.* Membrane strongly iridescent. Cross vein m-cu well proximad of r-m; 1a ending at level between cubital fork and m-cu; cell R_2 distinctly longer than M_{1+2}. *Legs.* Tarsi entirely dark or with basal bands. Tarsomere 5 shorter than 4; hindtarsomere 1 slightly shorter than tibia. *Abdomen.* Laterotergite unscaled; 3 seminal capsules.

MALE. Antennal flagellum slightly shorter than or as long as proboscis, strongly plumose; flagellomere 12 subequal to Flm 13, both shorter than Flm 1-11. Palpus as long as or longer than proboscis, apex with long bristles scanty to dense. Proboscis longer than forefemur, with false joint distal to middle, without long ventral bristles proximad of the joint. Foretarsomere 4 shortened; 5 about twice as long as 4, modified, with 4 pairs of stout ventrobasal setae and a pair of setiferous midventral processes. Midtarsomere 4 a little shortened; 5 slightly longer than 4, not strongly modified. Anterior claw of fore- and midtarsi with a blunt-tipped submedian tooth; posterior claw with a sharp laterobasal tooth. Abdominal tergum VIII bilobed. *Genitalia.* Tergum IX variable. Sternum IX without bristles. Basistyle without scales; subapical lobe with 2 rods (α, β), 2-5 modified setae (δ), usually not leaf-like (ϵ) and usually short but stout and pigmented lateral accessory bristle (χ). Paraproct without basal sternolateral process, all or most spines of apical crest blunt or truncate. Aedeagus simple for the genus, composed of a pair of lateral pieces basally connected and also by a tergal bridge usually located distad of middle, rarely at middle.

LARVA. *Head.* Seta 1-C stiff and pigmented; 5, 6-C well developed, caudad of 7-C. Antenna long, spinulate; 1-A strongly developed, distad of middle; 2, 3-A subapical. Mouth brush of fine numerous hairs. *Mandible* with a group of dorsolateral microspines; mandibular ring distinct, on basal aspect,

slightly closer to dorsal artis than to lateral margin; 5 mandibular spurs, MdS_1 longest, curved, pigmented; MdS_2 short, slender, multiple; $MdS_{3,4}$ similar to but paler and a little shorter than MdS_1; MdS_5 shortest, abruptly narrowed apically. Mandibular brush well developed, a single row of simple hairs. Mandibular comb of spiculate prominences (teeth), each with a long filamentous spicule. Cutting organ rather small, with 2 unicuspid dorsal teeth; ventral tooth with one lateral (VT-4) and 3 mesal denticles (VT_{1-3}), $VT_{1,2}$ narrow, rod-like, VT_3 stout; a fairly large accessory denticle ventromesad of mesal dorsal tooth; 2 mesally pectinate ventral blades, VB_2 much smaller than VB_1; pectinate brush of laterally pectinate hairs well developed. Piliferous process strongly protrudent, with 5 hair groups; labula not exceeding tip of anterior part. Mandibular hairs divided into 2 groups. *Maxilla.* Cardo rather broadly fused mesobasally with cranium. Mesostipes with pseudoartis undeveloped; hairs of maxillary brush long and slender; twin stipital sensoria basal to middle, without distinct basal ring; dorsal stipital seta 2-Mx subapical. Lacinia with proximal lacinial seta 5-Mx slender, at level slightly proximad of stipital sensoria. Palpostipes short, basally broadened, not fused mesobasally with mesostipes on ventral surface, lateral artis well developed; apex with ampulla and 5 palpal sensoria. *Mentum plate* roughly pentagonal, median tooth larger than a few bluntly pointed mesal teeth, one or 2 lateral teeth nearly as large as median tooth; aulaeum with median triangular tooth. *Thorax.* Integument spiculate; 3-P shorter than 1, 2-P, branched; 4-P strong, longer than 3-P; 12-P longer than 9, 10-P. *Abdomen.* Integument spiculate on VIII only. Setae 6-I-VI and 7-I strong. Comb scales numerous in a patch, each evenly fringed laterally to apically with fine spicules. Siphon long; pecten basally restricted, each tooth with ventrobasal denticles. Saddle apex without conspicuous spicules; 2-X with several unequal branches; 4-X of 10 or more tufts, usually on grid, occasionally a few off grid.

DISTRIBUTION. Palaearctic, Nearctic and Australian regions.

35. *CULEX (NEOCULEX) RUBENSIS* SASA AND TAKAHASI
(Figs. 53, 54, 192; Table 71)

Culex (Neoculex) rubensis Sasa and Takahasi, 1948b: 51 (♂, ♀, L). Type-locality: Rubeshibe, Akan and Kamiohoro, Hokkaido, Japan; LaCasse and Yamaguti, 1950: 261 (♂, ♀, L); Chu, 1956: 42, Korea.

FEMALE (Fig. 192). Wing length 3.3-4.3 mm. *Head.* Vertex including eye margin with rather long white narrow curved scales and dark erect forked scales, the narrow curved scales not quite decumbent, giving a shaggy appearance to vertex; tempus covered with broad white scales; 5-6 vertical and 3 temporal dark bristles on each side. Clypeus brown to dark brown. Antenna: pedicel brown to dark brown, with a few minute bristles and small white scales; flagellum 0.95-1.05 (5) of proboscis; flagellomere 1 1.03-1.15 (5) of Flm 2, with small white scales. Palpus 0.18-0.22 (5) of proboscis, dark scaled; segment 3 1.59-2.17 (5) of 2; 4 lacking in 5 dissected specimens. Proboscis 1.03-1.06 (5) of forefemur, dark scaled. *Thorax.* Pronotal integument brown to dark brown; anterior lobe with white scales, narrow ones mesally and broad ones laterally, bearing many bristles, only 3-4 of them dark and stout, others pale and fine; posterior lobe with narrow white curved scales dorsally to posteriorly, bearing 8-12 mostly dark bristles along dorsal to posterior margin in an irregular row, several posterior ones stout, others fine. Scutum with

integument brown to dark brown, covered with grayish brown narrow curved scales, scales on margins and prescutellar space pale; all scutal bristles dark, present except at middle of fossal area. Scutellum with pale narrow curved scales; median lobe with 6-8 and each lateral lobe with 4-6 long dark bristles together with several short ones. Pleural integument brown to dark brown; moderately developed patches of broad white scales on propleuron, upper sternopleuron, lower-posterior sternopleuron and upper mesepimeron; pleural bristles pale, 6-10 propleurals, about 10 or more prealars, sternopleurals and upper mesepimerals, one lower mesepimeral. *Wing*. Veins dark scaled, c with basal spot of pale scales; r-m, m-cu and base of r_{4+5} unscaled; m around m-cu and r-m, and often r_s at base of r_{4+5} without dorsal plume scales, these unscaled portions combined forming a median interruption in anterior dark area of wing in macroscopic view. Cell R_2 2.85-4.56 length of vein r_{2+3}. Halter knob pale scaled. *Legs*. Coxae with patches of pale scales. Femora with pale apical fringe; forefemur with pale anterobasal streak, pale at base and in posterior half of ventral surface including posterior surface; midfemur narrowly pale basally, posterior surface pale excepting dorsoapical area; hindfemur largely pale excepting apex, dorsoapical dark area extending to middle to basal 0.33 on dorsal surface. Fore- and midtibiae pale on posterior surface, with pale apical fringe spots; hindtibia with pale apical fringe. Hindtarsomere 1 usually with rather ill-defined pale basal band; midtarsomere 1 and hindtarsomere 2 often with pale basal scales, occasionally pale scales encircling the base. Femora, tibiae and tarsi otherwise dark. Hindtarsomere 1 0.85-0.92 (7) of tibia. *Abdomen*. Tergum I with a median patch of dark scales; II-VII dark scaled, with apical bands of pale scales, the bands broadened at lateral margin; VIII dark scaled. Sterna mostly pale scaled, with narrow basal band of dark scales on posterior segments.

MALE (Fig. 54). Wing length 2.4-3.8 mm. Antenna: pedicel apparently lacking bristles but with white scales; flagellum 0.90-0.99 (5) length of proboscis; flagellomere 12 0.96-1.12 (5) of Flm 13, both 0.86-0.94 of Flm 1-11. Palpus 1.34-1.48 (4) of proboscis; segment 4 and apex of 3 slightly thickened; 4, 5 and apex of 3 with many long and medium-sized bristles; length ratio of 2-5 : 1.06-1.19 : 1.61-2.00 : 1.07-1.21 : 1.00 (5). Proboscis 1.13-1.20 (5) of forefemur, with false joint at apical 0.39-0.42 (4). Cell R_2 2.15-2.86 (7) times as long as vein r_{2+3}. Foretarsomere 5 2.00-2.23 (3) of 4; midtarsomere 5 1.19-1.49 (3) of 4, hindtarsomere 1 0.89-0.95 (7) of tibia. Sternum VIII dark scaled, with narrow apical band of pale scales. *Genitalia*. Tergum IX well sclerotized medially; lobes moderately protrudent, rounded, widely separated, each with 2-9 bristles of moderate length. Basistyle strongly narrowed apically, with long and medium-sized bristles ventrally and laterobasally, short bristles lateroapically, with a group of about 20 short bristles tergomedially proximad of subapical lobe, area between the group and lateral aspect and tergal surface distad of subapical lobe and mesal surface without bristles. Subapical lobe at apical 0.33, moderately protrudent, with 2 rods (α and β) proximally, 3-5 (most frequently 4) specialized setae (δ_{1-5}) distally, 2 short simple setae ($\mu_{1,2}$) in-between, and a rather long simple slender seta (ϵ) on a small knob of the lateral aspect: α and β subequal, with recurved apex; δ_{1-5} subequal, with several fine retrorse teeth in apical half; an accessory pigmented rather stout bristle (χ) laterad of subapical lobe. Dististyle 0.52-0.61 length of basistyle, apically tapering; concave side basally pilose, with 2 short setae in apical half and 2 or 3 small transparent lobe-like structures near apex; claw lightly pigmented, 0.14-0.17 (8) length of dististyle. Cercal tergal surface with a pair of moderately sclerotized plates, 3-6 cercal setae; paraproct with apical crest of

about 10 pale truncate spines and a few tergomesal pointed ones. Aedeagus well sclerotized, H-shaped in tergal view, 1.48-1.69 (3) times as long as wide; each lateral piece connected by tergosubapical bridge at apical 0.23-0.30 and by a basal bridge; apex rounded, with a number of denticles.

LARVA (Fig. 53). *Head.* Width 1.10-1.27 mm; pale yellowish-brown, 1.37-1.54 (x = 1.47) as wide as long; seta 1-C dark, stiff, acute, setal bases separated by 1.8-2.5 times their length; 2-C absent; 4-C slender, well mesad and slightly cephalad of 6-C; 5-C nearly always and 6-C always double, 6-C slightly shorter than cranium; 5-C about 0.83 length of, caudad and slightly mesad of 6-C; 7-C definitely shorter than 5-C; 11-C fairly slender; 13-C occasionally with one or more branches apically split or with a few fine barbs; 14-C more frequently (67%) double; 16, 17-C absent. *Antenna* slightly curved, 0.83-0.95 (x = 0.86) length of head; pale except at extreme base and distad of seta 1-A; strongly spiculate dorsolaterally, spicules needle-like basally, becoming stouter distad, strongest opposite insertion of 1-A; 1-A inserted at apical 0.25-0.32 (x = 0.28), of about 30-35 strongly barbed branches, about 0.83 length of antenna; 2, 3-A slightly shorter, subequal. *Mandible* with a small patch of long needle-like microspines at about midpoint of dorsolateral aspect; MdS_4 somewhat darker and wider than MdS_3; MdS_5 finely pectinate on mesal margin. Mandibular comb of 14-17 spiculate prominences, all but the lateralmost few also bearing a long filamentous spicule. Cutting organ with mesal dorsal tooth larger than lateral one, with a uni- or bicuspid fairly large accessory denticle ventromesad of it; VT-4 acute, nearly reaching tip of VT_0; $VT_{1,2}$ subequal; VT_3 strong, bluntly rounded to subacute; VB_1 slightly sinuate, well exceeding tip of VT_0, broadest in basal 0.4, then tapering gradually to a slender tip, finely pectinate on mesal margin; VB_2 pale, more coarsely pectinate on mesal margin; pectinate brush of 12-14 laterally pectinate hairs. Piliferous process deeply cleft apically, PPH_5 a transverse row of long hairs across the cephalic aspect of the process near its base. Mandibular hairs consisting of 6, 7 thicker, more widely spaced, basally barbed, acutely tipped distal hairs and 8-11 more slender and closely spaced, smooth based proximal hairs (15-18 in total); tips of the hairs in the proximal group brushier than those of the distal group. *Maxilla* with 1-Mx single, slender. Mesostipes about 1.5 times as long as wide, with lateral sclerotized surface smooth; stipital sensoria subequal, arising from an inconspicuous divided base at about basal 0.38 of mesostipes; 2-Mx subapical; 4-Mx directly dorsad and a bit proximad of 2-Mx, pigmented, rather strong, but not nearly as strong as in *Cx. (Eumelanomyia) hayashii* or *okinawae*. Palpostipes 0.25 or less length of mesostipes, unsclerotized on mesal aspect, $S_{1,2,4}$ pigmented; S_2 as long as but more slender than S_1; S_3 much larger than S_1; S_4 shorter than S_1; S_5 slightly shorter than S_4. *Mentum plate* with 13-18 strong teeth; the median tooth nearly twice as broad as the immediate flanking teeth, the more lateral teeth becoming larger and more acute. *Thorax.* Integument finely and rather sparsely spiculate; prothoracic setal formula 1·1·2-4(5, 6)·2(1)·1·1·3(2-4)·2(1); setae 1, 2, 5-P and 6-M 1.75 to over 2.0 cranium length; 3-P about 0.5 cranium length; 14-P and 1-T usually double; 2-T usually triple, the distance from 3-T to 2-T at least 4 times distance from 2-T to 1-T; 12-T usually with a few long slender barbs, not apically split. *Abdomen.* Distinct spiculation present on VIII only, otherwise smooth, or extremely fine spiculation present on 1-3 posterior segments and occasionally also on anterior segments ventrally. Setae 1-I, II, 3-V, VI, 4-IV, 5-II-VI, 7, 9-VII, 8-II, III, 11-III, VII, and 12-IV-VIII usually single; 1-I usually mesocaudad of, occasionally nearly tandem with 2-I; 3-II-IV, 6-III-VI, 7-I, 8-IV, V, 11-II and 12, 13-I usually double; 6-I, II usually triple;

1-V somewhat larger than 1-IV; 4-I sometimes with a few weak to fairly strong barbs; 7-II usually barbed when 3 or fewer branched, otherwise smooth; 10-VII nearly smooth to strongly barbed; 5-VIII more frequently (69%) triple. Comb scales 40-55 (x = 46.6) in a roughly triangular patch, individual scales broadly paddle-shaped, fringed with spicules, the apical and subapical spicules stronger than the lateral spicules. *Siphon* nearly straight, pale yellowish-brown except for a darker area at apex, and a dark brown basal ring; length 1.60-1.87 (x = 1.70) mm, index 7.06-7.98 (x = 7.57); microsculpture of indistinct transverse rows of minute spicules, becoming more prominent apically; pecten reaching basal 0.23-0.29 (x = 0.26), of 10-15 (x = 12.4) teeth, each usually with a single strong, occasionally 2 or 3, ventrobasal denticles; usually 6 pairs of 1-S, inserted from basal 0.27-0.36 (x = 0.31) to 0.89-0.92 (x = 0.90), each usually 2,3 branched, 1.0-1.5 times siphon diameter at insertion; 2-S single, apical, stiff, brownish, about 0.50-0.67 length of apical pecten tooth. *Saddle* 0.33-0.39 mm long; microsculpture of groups of 1-3 needle-like spicules, the spicules becoming a little more prominent dorsoapically; seta 1-X usually 0.33-0.50 saddle length; 2-X about 3 times saddle length, usually with ventralmost branch shorter than subventral branch; 3-X usually over 5 times saddle length; 4-X of 11-13 cratal and 0-2 precratal tufts (12-14 in total), the cratal tufts usually 6-8 branched, the precratal tufts 2,3 branched, reduced. Anal gills elongate, tapering, 6 to 8 times as long as wide, dorsal gill 1.3-1.5 of saddle length, ventral gill slightly shorter.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 61♂, 88♀ with associated skins (10 l, 10 p); 18 L, 22 l: Hokkaido (A-0043, A-1642, A-1643, A-1652, A-1653, A-1654, A-1662, A-1670, A-1708, A-1709, A-1710, A-1711, A-1909, A-1914, A-1916, A-1920, A-1926, A-1928, A-1940, A-1944, A-1948, A-1949, A-1970). KOREA. 7♂, 7♀, with associated skins (10 l, 10 p); 5 L: Korean Peninsula. (L-0890, L-0891, L-0892, L-0893, L-1490, L-2144).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). KOREA (Korean Peninsula).

TAXONOMIC DISCUSSION. Gutsevich et al. (1970) stated, "*C. rubensis* is probably a Far Eastern subspecies of *C. territans*," and also "*C. rubensis* is probably a synonym of *C. territans*." We studied many specimens of North American *territans* in the collection of the USNM. Many differences were detected as shown in Table 5. These differences compelled us to treat them as distinct species, notwithstanding the identity in the structure of the aedeagus and the subapical lobe of the basistyle. The pale (translucent) interruption at the middle of the dark scaled anterior portion of the wing in *rubensis* is especially remarkable, easily seen with the naked eye. Korean examples we examined were identical with Japanese *rubensis*. We also examined the following European specimens of *territans:* 2 males, 3 females and larvae from England, 4 males, 2 male genitalia slides and 1 female from France, 1 female from Spain, 1 4th stage larva from each of Germany, Czechoslovakia and Italy, in the collection of the BMNH, and 1 male with the male genitalia slide from France in the collection of the USNM. They are definitely closer to North American *territans* than to Japanese *rubensis*. However, some differences were found between North American and European specimens. In the European female specimens, cell R_2 of the wing is only about twice as long as vein r_{2+3}; dark scales, though very few, often present among the yellowish brown vertical erect forked scales; hindtarsomere 1 always entirely dark. In the European male specimens, the dististyle lacked cilia on the concave side in the apical half in 2 specimens, a few cilia present in one specimen; the claw of the dististyle is shorter, 0.09-0.11 (3; x = 0.10) length of dististyle, while it is 0.11-0.24 (12; x = 0.16) in

TABLE 5. Morphological differences between *Culex (Neoculex) rubensis* from Japan and *Cx. (Ncx.) territans* from North America.

	rubensis	*territans*
Female adult		
Vertical erect scales	Dark	Yellowish brown to brown
Wing	With anteromedian pale interruption	Without anteromedian pale interruption
Costal pale basal spot	Present	Absent
Pale apical fringe of hindtibia	Distinct	Indistinct
Pale basal band of:		
midtarsomere 1	Present or absent	Absent
hindtarsomere 1	Present	Absent or indistinct
hindtarsomere 2	Present or absent	Absent
Male adult		
Lobes of tergum IX	Widely separated	Moderately separated
Apical half of concave side of dististyle	Glabrous	Ciliate
Larva		
Seta 5-C	Slightly shorter than 6-C, as long as 7-C	Distinctly shorter than 6-C, shorter than 7-C
Seta 6-C	Double	Usually (90.5% of 13 specimens) single
Seta 1-M	Very short, subequal to 2-M	Moderately long, much longer than 2-M
Spiculation of thorax	Rather sparse and fine	Dense and usually strong

North American *territans*, and 0.14-0.17 (8; $x = 0.15$) in Japanese *rubensis*. In the 4th stage larvae, the spiculation of abdominal segments I-VII appears to be more distinct. Further study will be necessary to evaluate the significance of these differences.

BIONOMICS. Common in Hokkaido, apparently rare in Honshu. No records from west of Kyoto in Honshu. Larvae were obtained from ground pools, rice fields, ponds and ditches, occasionally found in artificial containers such as tin cans. Little is known on the bionomics of the adults. They apparently do not bite man.

SUBGENUS *EUMELANOMYIA* THEOBALD

Eumelanomyia Theobald, 1909: 10; Theobald 1910b: 240. Type-species: *Culex albiventris* Edwards, 1922c (*nom. nov.* for *inconspicuosa* Theobald, 1909, Gold Coast; Sirivanakarn, 1971: 72 (resurrection); Sirivanakarn 1972: 1-86 (revision of Southeast Asian species).

Small to medium-sized unornamented mosquitoes.

FEMALE. *Head*. Eyes almost contiguous above. Vertex with narrow to broad scales (only narrow scales in the species of this region); erect forked scales numerous, over almost entire vertex, color variable; 4-6 vertical and 2 temporal bristles on each side. Antenna as long as or longer than proboscis; flagellomere 1 1.2-1.4 of Flm 2. Palpus at most 0.2 of proboscis, dark scaled; segment 5 very small or absent. Proboscis as long as or slightly longer than forefemur, without pale band, with several ventrobasal bristles. *Thorax*. Both pronotal lobes unscaled or with a few narrow scales; posterior lobe with bristles along dorsal to dorsoposterior margin. Scutum and scutellum with narrow scales; usually all scutal bristles present excepting middle of fossal area, sometimes acrostichal bristles absent except for a few anterior pairs. Pleural scales absent, or very few present on sternopleuron; lower mesepimeral bristles present or absent. *Wing*. Vein scales dark; m-cu well proximad of r-m; 1a ending usually at level between cubital fork and m-cu, or at most reaching m-cu; cell R_2 distinctly longer than r_{2+3} and M_{1+2}. *Legs*. Tarsi without pale band; fore- and midtarsomere 5 shorter than 4; hindtarsomere 1 about as long as or a little longer than tibia. *Abdomen*. Laterotergite unscaled; terga II-VIII entirely dark in the species of this region. Seminal capsules 3.

MALE. Antennal flagellum shorter than or as long as proboscis; flagellomere 12 longer to shorter than Flm 13, together shorter (0.65-0.90) than Flm 1-11. Palpus 0.5-0.8 of proboscis and 5 segmented in the species of this region, apically tapering, or somewhat swollen and modified (*brevipalpis*), without conspicuous tufted bristles apically. Proboscis as long as or longer than forefemur. Foretarsomere 4 shortened, 5 modified, longer than 4, with usually 3 pairs of stout setae on ventrobasal swelling, and a pair of short setiferous ventrosubbasal processes; midtarsomeres 4 and 5 not modified. Anterior claw of foretarsus slightly to distinctly longer than posterior claw, with blunt-tipped median tooth, posterior claw with sharp laterobasal tooth; anterior claw of midtarsus slightly to distinctly longer than posterior claw, simple or toothed, posterior claw with sharp laterobasal tooth. *Genitalia*. Tergum IX with a lobe or lobes weakly to moderately developed, bristled. Sternum IX without bristles. Basistyle without scales; subapical lobe moderately to strongly protrudent, with 3 rods (α, β and γ), several modified setae (δ), one leaflet (ϵ) often not very

broad, and an accessory bristle (χ). Proctiger with cercal setae; paraproct with basal sternolateral process undeveloped, mesal spines of apical crest pointed, lateral ones truncate. Aedeagus consisting of paired, usually oval, denticulate processes; tergal bridge median or submedian; lamellate sternobasal division relatively small.

LARVA. *Head.* Seta 1-C stout and pigmented; 5, 6-C short and weak (*Mochthogenes*), or as usual for the genus (*Protomelanoconion*), variable in position. *Antenna* spinulate; seta 1-A well developed, distad of middle; 2, 3-A subapical (*Mochothogenes*) or apical (*Protomelanoconion*). Mouth brush of numerous fine hairs. *Mandible* with a group of dorsolateral microspines near base; 5 mandibular spurs; mandibular brush well developed; mandibular comb of spiculate prominences (teeth), each with usually one long filamentous spicule. Cutting organ small to moderate; 2 unicuspid dorsal teeth; ventral tooth with one lateral denticle (VT-4) and 3 mesal denticles (VT_{1-3}), $VT_{1,2}$ very narrow, rod-like, blunt-tipped, unpigmented, VT_3 triangular, stout, acute and dark; ventral blade 1 or 2; pectinate brush of laterally pectinate hairs. Piliferous process strongly protrudent, with 5 hair-groups. Mandibular hairs divided into 2 groups. *Maxilla.* Cardo rather broadly fused mesobasally with cranium. Mesostipes longer than wide, hairs of maxillary brush long and slender; twin stipital sensoria at middle or proximad of it, basal ring weakly developed or absent; dorsal stipital seta 2-Mx subapical; ventral stipital seta 4-Mx variously developed; pseudoartis undeveloped. Lacinia with proximal lacinial seta 5-Mx slender at level slightly proximad of stipital sensoria. Palpostipes short, basally broadened, not fused ventrobasally with mesostipes, lateral artis well developed; apex with 5 palpal sensoria; ampulla present or absent. *Mentum plate* roughly pentagonal, with median tooth distinctly larger than others, mesal flanking teeth moderately broad, equal, subacute or truncate, contiguous with each other nearly up to apex, 1 or 2 lateral teeth slightly larger and more or less apically separated. Aulaeum with triangular medioapical tooth. *Thorax.* Integument smooth; seta 3-P shorter than 1, 2-P; 4-P variously developed; 12-P longer than 9, 10-P. *Abdomen.* Integument smooth; setae 6-I-VI and 7-I strong. Comb scales numerous in a patch, evenly fringed laterally to apically with fine spicules. Siphon moderately to very long; pecten basally restricted, shape of teeth variable; 1-S of 4-6 pairs, subventral or almost ventral. Saddle apex without conspicuous spicules; 2-X with 1-5 unequal branches; 4-X of 9-15 usually cratal tufts.

DISTRIBUTION. Manchurian subregion, Ethiopian and Oriental regions, and Papuan subregion.

KEYS TO SPECIES OF *CULEX (EUMELANOMYIA)*

FEMALE ADULT

Acrostichal bristles and lower mesepimeral bristle absent.
brevipalpis (p. 193)

Acrostichal bristles present; usually one lower mesepimeral bristle present. . . . . *hayashii hayashii* (p. 187)
hayashii ryukyuanus (p. 190)
okinawae (p. 191)

MALE ADULT

1. Tergum IX with a single median lobe; subapical lobe of basistyle with δ_1 comb-like; dististyle broadened and apically complex. *okinawae* (p. 191)
Tergum IX with a pair of well separated lobes; δ_1 not comb-like; dististyle tapering and apically simple. 2

2(1). Palpus straight or only slightly upturned and apically tapering; segment 4 less than 0.33 length of 3, with rather long apical bristles; δ_1 long, reaching near apex of α-γ, straight. . . *hayashii hayashii* (p. 187)
hayashii ryukyuanus (p. 190)
Palpus irregularly curved; segment 4 broadened, only slightly shorter than 3, with a few short spine-like stout setae at apex; δ_1 short, curved. . . . . *brevipalpis* (p. 193)

LARVA

1. Antenna at most 0.67 length of head; setae 2,3-A apical; mandible with labula extending far beyond apex of anterior part of piliferous process; siphon index more than 10; 1-S shorter than siphon diameter at insertion. . . . . *brevipalpis* (p. 193)
Antenna at least 0.8 length of head; setae 2,3-A subapical; mandible with labula not extending beyond apex of piliferous process; siphon index less than 8; 1-S longer than siphon diameter at insertion. 2

2(1). Antenna pale; seta 2-X 2-5 (most frequently 3-4) branched.
hayashii hayashii (p. 187)
hayashii ryukyuanus (p. 190)
Antenna dark; seta 2-X usually single (1-3 branched in Taiwan population). . . . . *okinawae* (p. 191)

36A. *CULEX (EUMELANOMYIA) HAYASHII HAYASHII* YAMADA*
(Figs. 54, 55, 193; Table 72)

Culex hayashii Yamada, 1917: 67 (♂, ♀, P, L, E). Type-locality: Tokyo, Koyama, Nagaoka, Fukui, Kyoto, Kobe, Hiroshima and Ogori, Honshu; Fukuoka, Kyushu, Japan. Yokoo, 1944: 50, Suwon, Kyongki Do, Korea.
Culex (Neoculex) hayashii: LaCasse and Yamaguti, 1950: 257 (♂, ♀, L).

FEMALE (Fig. 193). Wing length 2.9-3.7 mm. *Head.* Vertex including eye margin roughly covered with pale narrow curved scales and pale yellowish erect forked scales; tempus with broad pale scales; usually 5 mostly dark vertical and 2 dark temporal bristles on each side, an additional short yellowish bristle just beneath the longest mesalmost vertical bristle. Clypeus dark brown. Antenna: pedicel dark brown, with several fine bristles; flagellum 0.99-1.08 of proboscis; flagellomere 1 pale in basal half, 1.25-1.43 of Flm 2, with a few pale small scales (these as well as the bristles of pedicel are usually difficult to see in pinned specimens). Palpus 0.13-0.16 of proboscis, dark scaled; segment 3 1.63-2.29 of 2; 4 reduced. Proboscis 1.13-1.22 of forefemur, dark

*The 2 subspecies of *Cx. h. hayashii* occur in this region, however, extralimital material of the nominal subspecies has not been studied.

scaled. *Thorax*. Pronotal integument light to moderately dark brown; anterior lobe without scales, bearing more than 10 bristles, a few mesal ones dark and stout, others pale and fine; posterior lobe with several narrow curved pale scales anterodorsally, bearing 5-11 bristles along middorsal to dorsoposterior margin, anterior bristles pale and fine, posterior ones dark and stout. Scutum with integument brown, covered with concolorous narrow curved scales, scales on margins more or less paler; all scutal bristles present, mostly dark brown, fine supraalar bristles pale brown. Scutellum with pale brown narrow curved scales, median lobe with 5-8, each lateral lobe with 3-5 (usually 4) long dark bristles, each lobe with several additional short bristles. Pleural integument brown, pale in lower sternopleuron and mesomeron; a few pale rather narrow scales on lower sternopleuron, otherwise scaleless; pleural bristles pale to yellowish brown; 7 to about 10 propleurals, less than 10 prealars, more than 10 sternopleurals, 5-12 upper mesepimerals, one lower mesepimeral. *Wing*. Cell R_2 3.50-6.57 (20; x = 4.49) length of vein r_{2+3}. Halter knob dark scaled. *Legs*. Coxae with pale scales. Forefemur more or less pale basally; midfemur pale basally and ventrally; hindfemur largely pale excepting apical area, dorsoapical dark area narrowly extending to about middle. Femora otherwise, tibiae and tarsi dark. Hindtarsomere 1 0.95-1.03 (20) of tibia. Claw of hindtarsus 0.75 length of fore- or midtarsus claw. *Abdomen*. Tergum I with a median spot of dark scales; II-VIII dark scaled. Sterna pale scaled.

MALE (Fig. 54). Wing length 2.4-3.2 mm. Antennal flagellum 0.90-1.01 of proboscis; flagellomere 12 1.04-1.38 of Flm 13, both 0.65-0.73 of Flm 1-11. Palpus 0.71-0.85 (9; x = 0.78) of proboscis; apex of segment 3 with a few, 4 and 5 with several moderately long bristles; length ratio of 2-5: 4.00-6.33 : 5.05-7.05 : 1.56-2.08 : 1.00. Proboscis 1.20-1.30 (7) of forefemur. Long bristles of scutellum usually 6 on median lobe and 3 on each lateral lobe. Propleural bristles many, 4-8 upper mesepimerals. Cell R_2 3.15-4.86 (20; x = 3.85) length of vein r_{2+3}. Hindtarsomere 1 0.97-1.03 (20; x = 1.00) of tibia. Anterior claw of midtarsus simple, much longer than posterior claw, strongly curved. *Genitalia*. Tergum IX with lobes moderately wide, moderately sclerotized and slightly protrudent, each bearing 3-8 rather short bristles. Basistyle apically tapering, 2.5 as long as wide, covered tergally and sternally with short bristles; laterally with large bristles; subapical lobe wide, moderately protrudent, placed near apex, bearing 3 rods (α, β and γ) proximally, and 4 mesal modified setae (δ_{1-4}), one lateral leaflet (ϵ) and 3 distal setae (μ_{1-3}); γ a little shorter and narrower than other 2, slightly sinuate, with pointed apex; δ_{1-4} of assorted lengths, narrow, rounded at apex, with fine serrations on distal margin; ϵ with pointed apex, slightly wider than δ; μ_1 thickened, curved; μ_2 curved; χ long, curved, laterad of and apart from subapical lobe. Dististyle gently curved, slightly narrowed apically, 0.5-0.6 length of basistyle, 7 times as long as wide, with a small seta at about apical 0.33 on concave side; claw 0.14 length of dististyle. Cercal tergal surface distinctly sclerotized; 2-3 cercal setae; paraproct moderately sclerotized, with a crest of stout spines at apex, a few outer spines blunt-tipped. Tergoapical division of aedeagus slightly shorter than wide, consisting of paired oval (in tergal view) rather widely separated processes, the lateral aspect forming a vertical wall; about 20 denticles on the mesal aspect and at apex; subbasal knob indistinct; tergal bridge submedian, narrow in tergal view; basal condyles moderately produced, convergent.

LARVA (Fig. 55). *Head*. Width 0.86-0.96 mm; pale yellowish-brown, 1.57-1.68 (x = 1.62) times as wide as long; labrum concave; seta 1-C thickest in basal 0.33, separated by 2.2-2.6 times length; 2-C absent; 4-C well caudad

of 7-C; 6-C little more than 0.33 length of cranium, usually with a few fine but relatively long barbs, inserted about midway between 4, 5-C, 5-C much finer than, 0.50-0.67 length of, and nearly tandem with 6-C, 4, 5, 13-C usually double; 14-C usually branched from the base; 15-C occasionally appearing dendritic; 16, 17-C apparently absent. *Antenna* 0.51-0.60 mm, subequal to head length, slightly to moderately arcuate, pale except for dark brown base and a light brown apical 0.25-0.33, moderately spiculate, especially on dorsal and lateral aspects, spicules becoming sparser distad of seta 1-A; 1-A inserted at apical 0.24-0.33 (x = 0.30), with about 25-30 strongly barbed branches; 2, 3-A subapical, subequal. *Mandible* with microspines long, needle-like. Mandibular comb of 13-17 spiculate prominences, each with a long filamentous spicule (occasionally double), lateral prominences becoming weaker, lacking a well-differentiated filament. Cutting organ rather small; mesal dorsal tooth much larger than lateral dorsal tooth; accessory denticle strong, bifurcate (occasionally trifurcate), subequal in length to lateral dorsal tooth; VT_0 slightly recurved; VT-4 acute, reaching near tip of VT_0; $VT_{1,2}$ subequal; VB_1 somewhat sinuate, exceeding tip of VT_0, mesal pectination very short and fine; VB_2 much smaller, unpigmented, pectination coarser; pectinate brush of 11-14 laterally pectinate hairs. Piliferous process apically cleft; labula not extending beyond apex of broader anterior portion; PPH_5 a nearly straight transverse row of long hairs across cephalic aspect of the process basad of the cleft. Mandibular hairs consisting of 5-7 thick, widely spaced, basally barbed, acutely tipped distal hairs and 8-11 slender, closely spaced, smooth based, brushy tipped proximal hairs (14-18 in total), the proximalmost 1-3 often reduced. *Maxilla* with 1-Mx single, slender, weakly pigmented. Mesostipes about 0.67 as broad as long, with sclerotized lateral surface smooth; 4-Mx very strong, dark, a little proximad of level of 2-Mx. Lacinia with 6-Mx pale, slender, apparently slightly longer than 4-Mx. Palpostipes about 0.2 length of mesostipes; ampulla present; S_2 more slender than S_1; S_3 much larger than S_2; S_4 subequal to S_1; S_5 small. *Mentum plate* with 10-15 strong subacute teeth, the median tooth about twice as wide as the immediate flanking teeth. *Thorax*. Prothoracic setal formula: 1·1·1(2)·3(2, 4)·1(2)·1·2·1; seta 1-P more than twice length of cranium, 2-P slightly shorter; 3-P definitely shorter than cranium; 4-P very slender, less than 0.33 length of cranium; 14-P and 3-M usually double; 10-T occasionally (14%), and 12-T frequently (78%) split or frayed apically, 12-T rarely (5%) double from base. *Abdomen*. Setae 6-I, II with ventral branch 0.8-0.9 length of dorsal branch; 10-VII strongly barbed, up to 1.5 times length of 1-VII; 1-I, II, 3-IV-VI, 5-VI and 8-II usually single; 12-I, II, IV, 5-II, III, VIII, 3-III, 8-III-V, 10-III, IV, and 11-III-V usually double; 13-III-V usually triple. Comb scales 33-48 (x = 40.7) in a broadly triangular patch, the individual scales somewhat paddle-shaped, fringed with spicules, apical spicules stronger than lateral spicules. *Siphon* nearly straight, tapering slightly distad, usually pale yellowish brown with darker brown areas at base and apex, occasionally with a brownish median band; length 0.96-1.16 (x = 1.03) mm, index 5.50-5.86 (x = 5.69); microsculpture of transverse rows of minute tubercles, becoming slightly more prominent at extreme apex; pecten reaching basal 0.33-0.41 (x = 0.36), of 10-15 (x = 12.5) teeth, the teeth becoming longer distad, each with 6-8 widely spaced basal, and 10 or more closely spaced apical denticles; usually 6 pairs of 1-S, inserted from just beyond pecten at basal 0.35-0.41 (x = 0.37), extending to apical 0.11-0.22 (x = 0.14), the longest 1-S 2.0-2.9 (x = 2.3), and the shortest 1-S 1.2-1.3 length of siphon diameter at their insertions, each lightly barbed; 2-S apical, pale, 0.33-0.50 length of apical pecten tooth. *Saddle* 0.30-0.36 mm long, microsculpture of slightly

overlapping transverse rows of 10-20 minute spicules, the spicules becoming more prominent dorsoapically; 1-X fine, about 0.20-0.25 length of saddle; 2-X with one branch (usually the ventralmost) much longer than the others; 4-X of 14-15 (usually 14), 4-10 branched hairs, the basalmost one or 2 hairs reduced, sometimes appearing disconnected from grid. Anal gills slender, tapering, dorsal gill 0.6-0.9 saddle length, ventral gill 1.0-1.3 length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 26♂, 31♀, with associated skins (6 l, 6 p); 35 L, 21 l: Honshu (C-1807, C-1810, C-1811, C-1905, C-2178, C-2179, C-2180, C-2181, C-2182, C-2183, C-2184, C-2185, C-2306, E-2186). KOREA. 7♂, 7♀, with associated skins (1 l, 1 p): Korean Peninsula (L-0817, L-0824, L-1962, L-1968). 14♂, 6♀, 9 L, 1 l: Cheju Do (M-0846, M-0851, M-0856, M-0861, M-0862, M-0877).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsuchima). KOREA (Korean Peninsula, Cheju Do). SOUTH PRYMORYE. NORTH CHINA.

36B. *CULEX (EUMELANOMYIA) HAYASHII RYUKYUANUS* NEW SUBSPECIES

Culex (Neoculex) hayashii: Bohart and Ingram, 1946b: 71, Okinawa Is., Ryukyu Archipelago.

FEMALE. Wing length 2.6-3.2 mm. Antennal flagellum 1.06-1.13 (5) of proboscis; flagellomere 1 1.32-1.43 (5) of Flm 2. Palpus 0.15-0.17 (5) of proboscis; segment 3 1.86-2.73 (5) of 2. Cell R_2 2.54-3.74 (8; x = 3.00) length of vein r_{2+3}. Hindtarsomere 1 1.00-1.08 (x = 1.04; 8) of tibia.

MALE. Wing length 2.1-2.3 mm. Antennal flagellomore 12 1.06-1.23 of Flm 13, both 0.64-0.76 of Flm 1-11. Palpus 0.65-0.78 (9) of proboscis; length ratio of 2-5: 4.75-7.25 : 6.00-8.25 : 1.50-2.38 : 1.00. Cell R_2 1.90-3.16 (20; x = 2.39) times as long as vein r_{2+3}. Hindtarsomere 1 0.98-1.11 (21; x = 1.05) of tibia.

TYPE-SERIES. Holotype male (#21179, K-0696-10) with associated slides of genitalia, wings, legs, pupal and larval skins: nr. Shirahama, Iriomote Is., Ryukyu Archipelago, 19 IV 1971, blocked stream, Mizusawa & Nishikawa. Paratypes: 14 males with slides of associated 6 pupal and 6 larval skins, genitalia (14 males), mouthparts (8 males, 1 larval skin), wings (14 males) and legs (12 males), in total. Paratypes from Ishigaki Is. - 1 male with pupal and larval skins (K-0617): Foot of Mt. Maeshi, 12 IV 1971, blocked stream, Mizusawa & Nishikawa; 1 male with pupal and larval skins (K-0642): Mt. Banna, 18 IV 1971, blocked stream, Mizusawa & Nishikawa; 3 males with 3 pupal and 3 larval skins (K-0643): Mt. Banna, 18 IV 1971, blocked stream, Mizusawa & Nishikawa; 1 male (K-2188): Inoda, 18 XII 1968, U. S. Army Med. Center, Ryukyu Is. Paratypes from Iriomote Is. - 1 male (K-0919): nr. Uehara, 24 X 1971, net, Mizusawa, Shinonaga & Kikuchi; 6 males (K-1010): nr. Funaura, 16 XI 1971, Mizusawa; 1 male with pupal and larval skins (K-1329): Itokawa-rindo, 6 XII 1972, Saugstad, Mizusawa & Imamura.

The holotype and half the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN THE TYPES. RYUKYU ARCHIPELAGO. 2♂; with associated skins (2 l, 2 p), 3 L: Amami Guntô (I-0234, I-0284). 23♂, 11♀, with associated skins (10 l, 10 p); 2 l: Okinawa Guntô (J-0451, J-0475, J-0476, J-0490, J-0501, J-0502, J-0514). 41♂, 54♀, 67 L:

Yaeyama Guntô (K-0668, K-0670, K-0919, K-0924, K-0925, K-0939, K-0946, K-0949, K-0951, K-0953, K-0954, K-0955, K-0956, K-1002, K-1005, K-1059, K-1065, K-1067, K-1078).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô).

TAXONOMIC DISCUSSION. Subspecies *ryukyuanus* can be discriminated from the nominate subspecies by the smaller value of cell R_2 - vein r_{2+3} ratio, and in general the smaller body size and shorter male palpus; segment 5 of the male palpus is usually more shortened than in *hayashii*. A slight difference was found also in the length ratio of hindtarsomere 1 to tibia. All these values are given in the descriptions. The larva of *hayashii ryukyuanus* appears not significantly different from *h. hayashii* from Honshu. Specimens from Cheju Do were found identical with Japanese specimens in the adult, but the larval siphon is rather longer, the index 6.35-6.94 (8; x = 6.58). Adult specimens from the Korean mainland also appear similar to those from Japan, but the specimens in our collection are insufficient in both number and condition. Further study is desirable. Only one larval exuvium from the mainland of Korea (Seoul) was available for our study; it has a yet longer siphon (index ca. 7.7), and a shorter pecten reaching only basal 0.27-0.28 of the siphon (0.33-0.42; 18; x = 0.37; from Japan and Cheju Do).

Sirivanakarn (1972) states that the record of *hayashii* from Taiwan (Lien 1968c) is doubtful, being based only on larvae. Biery (1973) reported the collection of 30 adult *hayashii* in light traps on Taiwan from 1970-72. These records may also be regarded with suspicion because of the possibility of confusion with other species as *okinawi* and *brevipalpis*.

BIONOMICS. *Culex (Eumelanomyia) hayashii* is not rare throughout Japan including Ryukyu Archipelago. Larvae are found most frequently in rock pools and blocked streams, occasionally smaller rock holes or rather large artificial containers with clean water. Associated species include *Anopheles lindesayii japonicus, An. sinensis, Culex tritaeniorhynchus, Cx. pseudovishnui, Cx. bitaeniorhynchus* and *Cx, infantulus* (LaCasse and Yamaguti 1950). Adult females are known as amphibian biters. Host preference appears to be frogs with some feeding also on newts (Miyagi 1972b).

37. *CULEX (EUMELANOMYIA) OKINAWAE* BOHART
(Figs. 56, 57, 194; Table 73)

Culex (Neoculex) okinawae Bohart, 1953: 187 (♂, ♀, P, L). Type-locality: East Taira, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 194). (Four specimens studied.) Wing length 3.0-3.5 mm. *Head.* Vertex roughly covered with pale yellowish brown narrow curved scales and numerous yellowish brown erect forked scales; eye margin with pale narrow curved scales; tempus covered with broad pale scales; 5 vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel pale testaceous, with several minute mesal hairs; flagellum 0.98 (1) of proboscis; flagellomere 1 1.36 of Flm 2. Palpus 0.15 (1) of proboscis, dark scaled; segment 3 1.88 (1) of 2. Proboscis 1.12 (1) of forefemur, dark scaled. *Thorax.* Pronotal lobes with integument pale brown, with only a few narrow scales; anterior lobe bearing 10 or more long and short bristles; posterior lobe bearing 6-9 bristles arranged in a curved row along posterodorsal margin to dorsoposterior margin. Scutum with integument brown, covered with dark

brown narrow curved scales; acrostichal bristles present, small; anterior dorsocentrals an alternating series of long and short bristles; 1-3 humerals; 4-5 bristles present in fossal area near lateral and posterior margins, their position variable. Scutellar lobes with scales similar to those of scutum, 3 long dark bristles on each lateral lobe and 4-6 on median lobe, several additional short bristles on each lobe. Pleura with integument pale brown (the color contrast between scutum and pleura not so distinct as in *Cx. (Eum.) brevipalpis)* without scales except a few pale rather broad ones on sternopleuron; about 10 propleural bristles, 4-7 prealars, more than 10 sternopleurals, 8-10 upper mesepimerals, one lower mesepimeral. *Wing*. Cell R_2 3.20-3.52 (2) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. All coxae with pale rather broad scales. Forefemur pale posteroventrally toward base, midfemur pale on ventrobasal half of posterior surface, hindfemur pale except apical area; femora, tibiae and tarsi otherwise dark scaled. Hindtarsomere 1 1.00-1.05 (2) of tibia. *Abdomen*. Terga II-VII entirely dark scaled. Sterna roughly covered with pale scales.

MALE (Figs. 57, 194). Wing length 2.4-2.8 mm. Antennal flagellomere 12 1.04-1.18 (1) of Flm 13, both 0.72-0.76 (1) of Flm 1-11. Palpus 0.46 (1) of proboscis, with a few moderately long bristles on segments 4, 5 and at apex of 3; length ratio of 2-5: 5.27-5.80 : 5.72-6.40 : 1.00-1.20 : 1.00 (2). Proboscis 1.14 (1) of forefemur. Cell R_2 3.24-3.33 (2) length of vein r_{2+3}. Upper mesepimeral bristles 4-6. Anterior claw of midtarsus simple. *Genitalia*. Tergum IX with a single, median, wide, well sclerotized and distinctly convex lobe bearing 13 (undoubtedly variable) medium sized bristles. Basistyle bristled except on apical half of mesal surface, bearing a row of 4-5 rather long bristles on mesal surface in middle; subapical lobe at apical 0.33, markedly protrudent, broad, hirsute on mesal side, bearing 3 rods (α, β, γ) proximally, 4 mesal modified setae (δ_{1-4}) and a pointed, narrow, lateral leaflet (ϵ) distally and a long accessory seta (χ) laterally; all rods and χ curved or twisted characteristically; (δ_1 with apical half of distal side comb-like, δ_2 longest, δ_3 intermediate, δ_4 shortest and twisted. Dististyle 0.67 length of basistyle, 5-6 times as long as wide, somewhat sigmoid, a little angulate at apical 0.33 on convex side, with a short seta near the portion, vertically bifurcate at apical 0.25; lateral fork narrow and pointed, subapically expanded, with a subapical short seta on concave side; mesal fork of about equal width to apex in lateral view, strongly sclerotized along concave side and terminating in a sharp hook directed opposite claw, which is 0.1 length of dististyle. Cercal setae 3-5; paraproct with a crest of strong spines at apex, 3-4 outer spines of equal thickness from base to apex. Tergoapical division of aedeagus of rather widely separated paired ovoids, each bearing 16-18 apical and mesal denticles; subbasal knob indistinct; basal condyle short in tergal view; sternobasal division a little pigmented.

LARVA (Fig. 56). *Head*. Width 1.16-1.19 mm; pale yellowish brown, 1.48-1.56 times as wide as long; labrum concave; bases of seta 1-C separated by at least twice their length; 2-C absent; 4-C mesad and slightly cephalad of 6-C; 6-C more strongly barbed than in *Cx. hayashii*, about 0.67 length of cranium; 5-C about 0.7 length of cranium, nearly tandem with 6-C; 14-C apparently branched from base; 16, 17-C minute. *Antenna* slightly arcuate, 0.85-0.97 length of head, fairly uniformly light brown except for darker brown basal ring, strongly spiculate, especially on dorsal and lateral aspects basad of seta 1-A, the spicules becoming shorter and stouter distad; 1-A inserted at apical 0.29-0.31, with about 25 strongly barbed branches, about 0.8 length of antenna; 2, 3-A subapical, subequal, slightly shorter than 1-A. Mouthparts appear

virtually identical to those of *hayashii*, excepting that 15 or more hairs of pectinate brush may be present. *Mentum plate* with 15-18 teeth, the median tooth nearly twice as wide as immediate flanking teeth. *Thorax.* Prothoracic setal formula: 1·1·1·2(1)·1·1·2(1)·1; 1, 2-P nearly twice length of cranium, 3-P 0.67-0.83 length of cranium; 4-P very slender, 0.33 or less length of cranium; 7-P slightly longer than cranium; 12-T usually with a few relatively long fine barbs, but not apically split as in *hayashii*. *Abdomen.* Setae 6-I, II with ventral branch shorter than dorsal branch; 10-VII apparently very lightly barbed or unbarbed, subequal to 1-VII. Comb scales 49-62 in a roughly triangular patch, the individual scales paddle-shaped, sometimes appearing a little more elongate than in *hayashii*, fringed with spicules, the apical and subapical spicules stronger than the lateral spicules. *Siphon* nearly straight, pale yellowish brown, indistinctly darker near middle, basal ring and extreme apex darker brown; length 1.25-1.50 mm, index 6.99-7.44; microsculpture of irregular transverse rows of minute tubercles; pecten reaching basal 0.31-0.38, of 9-15 teeth, the teeth becoming longer distad, each with 5-8 widely spaced denticles on basal 0.67 and 10 or more closely spaced denticles on apical 0.33, usually 6 pairs of 1-S, inserted from basal 0.33-0.35 to apical 0.14-0.16, the longest 1-S 3.0-3.5 and the shortest 1-S 1.2-1.8 times siphon diameter at their respective insertions, apparently unbarbed; 2-S apical, light brown, 0.25-0.33 length of apical pecten tooth. *Saddle* 0.33-0.37 mm long; microsculpture essentially same as in *hayashii*, but individual spicules less conspicuous; seta 1-X 0.25-0.33 length of saddle; 2-X nearly as long as 3-S; 4-X of 14, 3 to 9 branched tufts, the basal 2 tufts occasionally appearing detached from the grid. Anal gills elongate, tapering to slightly fusiform; dorsal gill about 0.75 saddle length, ventral gill a little longer.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 5♂, 4♀, with associated skins (7 l, 7 p); 3 L: Okinawa Guntô (J-0476, J-0501, J-0502, J-0514, J-0718) 2 L, 2 l: Yaeyama Gunto (K-1329).

DISTRIBUTION. RYUKYU ARCHIPELAGO. (Amami, Okinawa and Yaeyama Guntô). TAIWAN. PHILIPPINES.

TAXONOMIC DISCUSSION. Though the male genitalia are quite distinctive, the general habitus of *Cx. okinawae* is almost identical with *hayashii ryukyuanus*, only the erect scales of the vertex appear a little darker, usually brownish in *okinawae*, while usually pale yellow in *hayashii ryukyuanus*, but variations occur and the difference is not always definite. The larvae can be distinguished by the characters mentioned in the key, but the branching of seta 2-X should be restudied with more material. A few larval specimens from Taiwan exhibited distinctly shorter siphons, the indices ranged from 6.00 to 6.60 (5; $x = 6.33$).

BIONOMICS. Apparently rare. Larvae were obtained from shaded blocked streams, and rock or ground pools along streams. Sirivanakarn (1972) stated that collections of this species were from relatively high altitudes. Females feed on frogs (Kamimura 1976b).

38. *CULEX (EUMELANOMYIA) BREVIPALPIS* (GILES)
(Figs. 57, 58, 195; Table 74)

Stegomyia brevipalpis Giles, 1902: 384 (♂, ♀). Type-locality: Shahjahanpur, India.

Culex (Neoculex) brevipalpis: Bohart and Ingram, 1946b: 72, Shanawan and Nakasoni, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 195). (Description based on 3 specimens.) Wing length 2.7-3.0 mm. *Head.* Vertex covered with bronzy narrow curved scales and many brown erect forked scales; eye margin with pale narrow curved scales; tempus densely covered with broad pale scales; 4-5 vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel brown, mesal side darker, with a few minute bristles and several small scales; flagellum 1.05 (1) of proboscis; flagellomere 1 1.33 of Flm 2. Palpus 0.20 (1) of proboscis, dark scaled; segment 3 1.56 (1) of 2; 4 0.21 of 3. Proboscis 1.07 (1) of forefemur, dark scaled. *Thorax.* Pronotal integument pale brown, both lobes with only a few pale narrow curved scales; anterior lobe bearing 4 dark stout bristles together with some short ones; posterior lobe bearing a curved row of 3 stout and 2-5 short dark bristles along dorsal to dorsoposterior margin. Scutum with integument brown, narrowly pale on margins, covered with bronzy brown narrow curved scales, some scales on margins paler; acrostichal bristles absent, but 2 long and 2 short dark bristles on anterior promontory; anterior dorsocentrals an alternating series of long and short bristles; usually one humeral and 1,2 posterior fossals. Scutellar lobes with scales similar to those of scutum, each bearing 4 (rarely 5) long dark bristles together with some short ones. Pleural integument pale brown, often with greenish tinge, without scale patch; a few scales on sternopleuron; one stout propleural bristle accompanied by several fine ones, 1,2 rather stout and 3-9 fine prealars, 3,4 stout and many fine sternopleurals, 4-10 fine upper mesepimerals, no lower mesepimerals. *Wing.* Cell R_2 1.93-2.52 (3) length of vein r_{2+3}; 1a ending at level between cubital fork and m-cu. Halter with dark scaled knob. *Legs.* Forecoxa with gray scales on anterior surface; mid- and hindcoxae with pale scales. Femora rather pale posteroventrally toward base; femora otherwise, tibiae and tarsi dark. Hindtarsomere 1 1.10-1.11 (3) of tibia. *Abdomen.* Tergum I with a median patch of dark scales; II-VIII entirely dark scaled. Sterna pale scaled; V-VII with dark narrow apical bands (that of V sometimes indistinct).

MALE (Figs. 57, 195). Wing length 2.7-2.8 mm. Antennal flagellum 0.93-1.01 (2) of proboscis; flagellomere 12 0.79-0.80 (2) of Flm 13, both 0.86-0.90 of Flm 1-11. Palpus 0.61-0.66 (2) of proboscis, twisted; apex of segment 3 broadened, with an apical group of short to medium bristles; 4 broadened, with 1,2 short stout bristles apically, without long bristles, 0.81-0.92 (2) length of 3; 5 with a few medium-sized bristles, no long bristles; length ratio of segments 2-5: 2.10-2.18 : 2.36-2.60 : 2.10-2.18 : 1.00 (2). Cell R_2 1.45-2.25 (4) length of vein r_{2+3}. Anterior claw of fore- and midtarsi longer than posterior claw, with a blunt-tipped median tooth. *Genitalia.* Tergum IX with moderately wide, well sclerotized, moderately protrudent lobes, each bearing 6-7 medium-sized bristles. Basistyle bristled excepting mesal side distal to well protrudent subapical lobe, which is placed at apical 0.33, bearing 3 rods (α, β, γ) proximally, and 3 poorly differentiated curved setae (δ_{1-3}), rather short seta (μ) and a narrow lateral leaflet (ϵ) distally, together with a long curved accessory bristle (χ) laterobasally; α, β and γ progressively slightly shorter, γ more slender than other 2, curved, narrowed apically. Dististyle arcuate, apically tapering, with a fine seta on concave side at apical 0.4 and another more distally on convex side; claw short, apically broadened. Cercal setae 2,3; paraproct with an apical crest of spines, some lateral spines broad up to apex. Tergoapical division of aedeagus slightly wider than long, consisting of a pair of sclerotized conical processes, each process with more than 20 denticles on apical half of tergomesal surface; subbasal knob undeveloped; basal condyle elongate; sternobasal division pigmented.

LARVA (Fig. 58). *Head.* Width 1.03-1.13 mm; light yellowish brown, 1.27 times as wide as long (1); apex of labrum nearly straight; seta 1-C dark brown, stout, slightly curved mesad, 0.33 as long as distance between bases; 4-C rather close together, much longer than distance between bases; 6-C caudad of and well mesad of 7-C, usually double, very rarely (2.3%) triple; 5-C a little mesocaudad of and slightly shorter than 6-C; 10-C usually double; 11, 13-C rather well developed; 16, 17-C lacking, rarely a rudimentary seta present. *Antenna* 0.43-0.50 mm long, pale, only narrowly dark at base, straight, dorsally and ventrobasally spiculate, distal part with only a few spicules or none; seta 1-A inserted at apical 0.21-0.26, with about 20 strongly barbed branches; 2-6-A apical; 2-4-A equal in length; 5-A with very small accessory sensorium on proximal division; 6-A shorter than 5-A. *Mandible* proximally with a number of very fine microspines on dorsolateral surface; MdS_1 weakly pigmented; MdS_3 very short, usually single, twin in one specimen; MdS_4 similar to MdS_1, nearly 0.75 as long as it; MdS_5 less than half as long as MdS_1; mandibular comb of 18-26 spiculate prominences (teeth), each with a long filamentous apical spicule. Cutting organ small, 2 subequal dorsal teeth; 2 unequal, somewhat clavate, accessory denticles mesad of mesal dorsal tooth; ventral tooth with VT-4 slender, VT_3 shorter than $VT_{1,2}$, acute; ventral blade slender, extending beyond apex of VT_0, with mesal pectination of short teeth; pectinate brush of 6-8 laterally pectinate hairs, some of these hairs apparently with mesobasal pectination. Piliferous process with labula very strongly developed, twice as long as anterior part, proximally curved, with apex subacute, apex of anterior part appearing to form a rather small midventral protuberance on labula. *Maxilla:* Cardo with 1-Mx single to triple. Mesostipes 0.63 as wide as long, with lateral sclerotized surface smooth; twin equal stipital sensoria at middle, short, with apex pointed, without differentiated basal ring; 4-Mx slightly shorter than 5-Mx; 6-Mx subequal to 4-Mx. Palpostipes short, excluding lateral artis about 0.33 as long as mesostipes; $S_3 > S_1 = S_4 > S_2 = S_5$ in length; ampulla apparently absent. *Mentum plate* with 16-18 teeth, median tooth much larger than others, with pointed apex; 4, 5 submedian teeth truncate at apex, remaining teeth with acute apex; one specimen with median tooth divided. *Thorax.* Prothoracic setal formula: 1·1·1·2(1, 3)·1·1·2(1)·1; 2-P a little shorter than 1-P; 3-P about 0.33 length of 1-P, single, very rarely (2.9%) bifurcate; 1, 5-P, 5, 6, 10, 12-M and 10-T very long; 6-P simple or barbed; 9-P usually single; 7, 14-P, 1, 4-M and 2-T usually double; 9-M usually 5 branched. *Abdomen.* Setae 7-I and 6-II about as long as 6-C; 6, 8, 11-II, 3, 4, 11, 12-III, 6-IV, 6, 8-V and 10-VII usually double. Comb scales 43-54 in a patch; individual scales long, parallel-sided, with apex rounded, apically fringed with spicules, the spicules progressively longer apically. *Siphon* very long, brown, darker at apex and base, 24.3-30.2 as long as apical width, length 2.08-2.54 mm, index 11.2-13.5; microsculpture indistinct; pecten reaching basal 0.16-0.21 of siphon, of 13-18 (x = 16.4) teeth, intervals rather wider apically; each tooth with about 10 or more ventral denticles; 1-S of 5 (occasionally 4) pairs, located at basal 0.25-0.33, 0.35-0.62, 0.55-0.81, 0.75-0.88 and 0.89-0.96 respectively, proximal 4 pairs lateral, apical pair subventral, each with 2-4 (rarely 5) branches, shorter than siphon diameter at insertion; 2-S at apical unpigmented part of siphon, stiff, upright, shorter than apical pecten tooth. *Saddle* with microsculpture of spiculiferous short ridges; 1-X shorter than saddle; 4-X of 9-10 cratal tufts, each 2-11 branched. Anal gills slightly narrowed apically, with apex rounded; dorsal gill 1.0-1.4 length of saddle; ventral gill 0.4-0.6 length of dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 4♂, 3♀, with associ-

ated skins (5 l, 5 p); 59 L, 3 l: Yaeyama Gunto (K-0684, K-0698, K-0699, K-1236, K-1238).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Gunto). TAIWAN. PHILIPPINES. BORNEO. JAVA. SOUTH CHINA. HAINAN ISLAND. INDOCHINA. MALAYA. SINGAPORE. THAILAND. BURMA. INDIA. SRI LANKA. MOROTAI. NEW GUINEA. BISMARCK ARCHIPELAGO.

TAXONOMIC DISCUSSION. Some differences in the larval characters were noted between specimens from Iriomote Is., Ryukyu Archipelago, and Bram's description (1967) of Thailand specimens. These are shown in Table 6.

TABLE 6. Comparison of larval characteristics between Ryukyu and Thailand specimens of *Culex (Eumelanomyia) brevipalpis*.

Character	Ryukyu (n = 30)	Thailand (n = 96)*
Seta 5-C	2	2-4
Seta 6-C	2-3 (3 branched - 2.3%)	2-4
Seta 3-P	0.33 length of 1-P	0.5 length of 1-P
Seta 4-P	1-3; x = 2.3	2-5
Seta 8-P	1	2
Siphon index	11.2-13.5; x = 12.26 (n = 21)	7-15; x = 10.8

*After Bram 1967.

BIONOMICS. Apparently rare on Okinawa Is., more common on Iriomote Is. Larvae usually occur in tree holes and bamboo. Collections have also been reported from containers such as coconut shells, water jugs, barrels and stone basins (Sirivanakarn 1972). As adults have not been collected from man or domestic animals (ibid), *brevipalpis* appears to be of little or no medical significance.

SUBGENUS *LOPHOCERAOMYIA* THEOBALD

Lophoceraomyia Theobald, 1905a: 245. Type-species: *Lophoceraomyia uniformis* Theobald, 1905a; Ceylon.

Small to medium-sized mosquitoes, with proboscis, palpus and legs unbanded. Larvae diverse in structure.

FEMALE. *Head.* Eyes contiguous above and below. Vertex with at least some broad scales anterolaterally to eye margin; erect scales usually dark, covering posterior half or more of vertex; temporal bristles usually 2. Antenna a little longer than proboscis; pedicel simple or with a slight prominence; flagellomere 1 1.1-1.4 of Flm 2. Palpus dark scaled, usually without segment 4. Proboscis without pale band, dark scaled, longer than forefemur, slender, with 2-5 ventrobasal bristles. *Thorax.* Pronotal lobes without or with few scales, posterior lobe with bristles along posterior margin. Scutum rather roughly covered with narrow scales; acrostichal bristles absent except for 1-4 anterior pairs, all the other scutal bristles present. Pleura without distinct scale patches, usually only sternopleuron with some translucent scales; lower

mesepimeral bristles present or absent. *Wing*. Veins dark scaled, the dorsal scales usually scanty except apically; 1a ending at level between cubital fork and m-cu; m-cu distinctly proximad of r-m. *Legs*. Tarsomere 5 shorter than or as long as 4; hindtarsomere 1 1.00-1.17 of tibia. *Abdomen*. Laterotergite unscaled. Seminal capsules 3, one slightly larger than other 2.

MALE. Antenna shorter than or about as long as proboscis; pedicel simple or with distinct prominence; flagellum strongly plumose; flagellomere 12 usually distinctly longer than Flm 13, length ratio of Flm 12-13 to Flm 1-11 variable; Flm 7, 8 or often Flm 5-10 with various types of modified setae. Palpus longer than proboscis (species in this region), apex upturned, poorly to moderately bristled; palpifer occasionally with a pair of apical spiculate short processes. Proboscis longer than forefemur, with false joint at basal 0.2-0.3, with a number of ventrobasal setae. Foretarsomere 4 slightly shortened; 5 moderately modified, longer than 4, with a pair of short curved setae on apex of ventrobasal swelling and another slender lateral pair, and with a pair of setiferous ventrosubmedian or subbasal processes; midtarsomeres 4, 5 not modified, 5 shorter than 4. Anterior claw of foretarsus with a blunt-tipped median tooth, posterior claw with sharp laterobasal tooth; anterior claw of midtarsus simple; posterior claw as in foretarsus. *Genitalia*. Tergum IX a poorly sclerotized narrow band, lobes poorly developed, widely separated, with usually medium-sized bristles. Sternum IX largely membranous, with or without bristles. Basistyle usually swollen basally in tergal view, without scales, with a row or group of bristles on tergal surface in middle; subapical lobe usually not divided and all modified setae closely packed, the modified setae are 3 rods (α, β and γ), mesal leaflet (δ), usually broad lateral leaflet (ϵ), several shorter medioapical setae (μ) and lateral accessory bristle (χ). Dististyle usually apically tapering, simple or with apical annulations, usually with a short seta on each convex and concave side near apex; claw short, almost apical. Paraproct without basal sternolateral process, with apical crest of spines, some lateral spines stout and blunt-tipped, others pointed and slender. Aedeagus composed of a pair of lateral pieces connected by tergosubbasal and sternobasal bridges; tergoapical division of each lateral piece with one or 2 well developed, usually tergally directed apical processes, with smooth, denticulate or reticulate surfaces.

LARVA. *Head*. Seta 1-C stout, straight, deeply pigmented, shorter than distance between bases; 4-C weak, single or branched from middle; 5, 6-C well developed, behind level of 7-C; 14-C with branches well divergent from base; 16, 17-C short and stiff. *Antenna* 0.6-0.9 length of head, spiculate, usually curved; seta 1-A inserted at apical 0.20-0.33, with many strongly barbed branches; 2, 3-A subapical. Mouth brush of fine numerous hairs. *Mandible* with a number of dorsolateral needle-like microspines near base. Mandibular ring distinct, close to dorsobasal margin. Mandibular spurs 5. Mandibular brush well developed. Mandibular comb of a number of spiculate prominences (teeth), each with an outstanding long filamentous spicule. Cutting organ small; mesal dorsal tooth with a fairly large mesobasal denticle; ventral tooth with VT-4 spiniform, $VT_{1,2}$ often very slender and unpigmented, VT_3 always stout, triangular; ventral blade extending far beyond apex of VT_0, finely serrate mesally, occasionally much smaller VB_2 present; hairs of pectinate brush about 10 or more, laterally pectinate. Piliferous process well protrudent, apically cleft, with ordinary 5 hair groups; labula more or less extending beyond apex of anterior part. Mandibular hairs divided into 2 groups, hairs of distal group basally barbed, one or 2 most proximal hairs of distal group widely spaced. *Maxilla*. Cardo rather broadly fused mesobasally with cranium,

a strongly sclerotized strip-like apical margin of cranium to cardo lacking or incomplete around the point of fusion. Mesostipes usually with a few rather stout pectinate spicules on mesal margin near base; twin equal stipital sensoria proximad of middle, without basal ring; ventral stipital seta 4-Mx stiff and pigmented; hairs of maxillary brush long and slender; pseudoartis undeveloped, but occasionally slightly developed. Lacinia with proximal lacinial seta 5-Mx at or proximad of level of stipital sensoria. Palpostipes very short, basally broadened, not fused ventrobasally with mesostipes; apex with ampulla and 5 palpal sensoria, S_3 longest, S_4 usually curved; lateral artis well developed. *Mentum plate* somewhat pentagonal, with about 20 or less medium-sized teeth; median tooth twice or more as broad as submedian tooth; lateral flanking teeth larger and more widely spaced apically than mesal flanking teeth. Aulaeum with unpigmented median tooth. *Thorax.* Seta 0-P dendritic; 3-P much shorter than 1-P, single or branched; 8-P variable; 12-P longer than 9, 10-P. *Abdomen.* Setae 6-I, II and 7-I strong; 7-II weak; 6-III-VI moderate to strong; 13-II, VI dendritic. Comb scales numerous in a patch, distal scales often longer, individual scales paddle-shaped, usually apically and laterally fringed evenly with spicules, occasionally with a small apical spine; 5-VIII more weakly barbed than 1, 3-VIII. *Siphon* long (index more than 6), apically tapering; pecten within basal half of siphon, each tooth with ventral denticles up to near apex; 1-S distad of pecten, 3 or more subventral or sublateral pairs, usually weak; 2-S at apical membranous portion, shorter than apical pecten tooth. *Saddle* with minute spicules never markedly stronger apically; 1-X shorter than saddle; 2-X with one main branch and 1-4 short accessory branches; 3-X single; 4-X of 10-12 cratal tufts.

DISTRIBUTION. Japan and Korea (Cheju Do), Oriental and Australian regions, and Pacific islands.

KEYS TO SPECIES OF *CULEX (LOPHOCERA OMYIA)*

FEMALE ADULT

1. Abdomen with basal bands; antennal pedicel without protuberance. . . 2
   Abdomen without basal bands. 3

2(1). Scutal integument yellowish brown; proboscis with 4 ventrobasal setae; posterior pronotal lobe unscaled; 3-5 prealar bristles. *infantulus* (p. 199)
   Scutal integument reddish brown; proboscis with 2 ventrobasal setae; posterior pronotal lobe with hair-like scales; 6-9 prealar bristles. *cinctellus* (p. 202)

3(2). Antennal pedicel without protuberance; lower mesepimeral bristle absent. . . . . *rubithoracis* (p. 204)
   Antennal pedicel with protuberance. 4

4(3). Scutal integument dark brown; lower mesepimeral bristle usually present, rarely absent. . . . . *bicornutus* (p. 207)
   Scutal integument light brown; lower mesepimeral bristle absent. *tuberis* (p. 210)

MALE ADULT

1. Antennal pedicel simple; palpifer with spiculate processes. 2
Antennal pedicel with protuberance; palpifer simple. 4

2(1). Tergoapical process of aedeagus with surface reticulate; flagellomeres 7, 8 with modified setae. . . . . *infantulus* (p. 199)
Tergoapical process of aedeagus with surface smooth; flagellomeres 5-10 with modified setae. 3

3(2). Basistyle with a group of bristles on tergal surface in middle; paraproct with apical crest of numerous spines. . . . . *cinctellus* (p. 202)
Basistyle with a row of bristles on tergal surface in middle; paraproct with apical crest reduced to several spines. . . *rubithoracis* (p. 204)

4(2). Proboscis slightly swollen and bearing many setae in an area distad of false joint; sternum IX with bristles. . . . . *bicornutus* (p. 207)
Proboscis simple; sternum IX without bristles. . . . . *tuberis* (p. 210)

LARVA

1. Distal comb scales with a small stout apical spine.
bicornutus (p. 207)
All comb scales without apical spine, evenly fringed with fine spicules. 2

2(1). Thoracic integument entirely spiculate; seta 13-T with 1 or 2 strong barbed branches together with 8-13 weak ones (9-14 in tot?l).
rubithoracis (p. 204)
Thoracic integument smooth, or at most only anterolaterally spiculate; seta 13-T with subequal weak branches. 3

3(2). Seta 5-C usually 3 branched, very rarely 2 or 4 branched; 14-P single; 2-VIII usually double (after Colless 1965 and Bram 1967).
cinctellus (p. 202)
Seta 5-C single or double; 14-P 2-4 branched; 2-VIII usually single, very rarely double. 4

4(3). Siphon longer, 20.0-24.3 length of apical diameter; seta 6-C double; 1-VII 6-7 branched. . . . . *infantulus* (p. 199)
Siphon shorter, 13.3-15.6 length of apical diameter; seta 6-C single; 1-VII double. . . . . *tuberis* (p. 210)

39. *CULEX (LOPHOCERAOMYIA) INFANTULUS* EDWARDS
(Figs. 59, 60, 196; Table 75)

Culex (Lophoceratomyia) infantulus Edwards, 1922a: 287 (♂). Type-locality: Hong Kong. Hsiao and Bohart, 1946: 25, Kyushu, Japan; LaCasse and Yamaguti, 1950: 197 (♂, ♀, L).

Culex (Lophoceraomyia) infantulus: Bohart and Ingram, 1946b: 73, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 196). Wing length 2.8-3.5 mm. *Head.* Vertex covered with rather pale brown narrow curved scales, with some dark and/or pale broad scales anterolaterally to eye margin; numerous dark erect forked scales over almost entire vertex; tempus covered with broad pale yellowish scales; 5-6 vertical and usually 2 temporal dark bristles on each side. Clypeus yellowish to dark brown. Antenna: pedicel simple, yellowish-brown, mesally infuscate, with several minute bristles, occasionally with a few dark small scales; flagellum 1.08-1.10 (5) of proboscis; flagellomere 1 1.32-1.41 (5) of Flm 2, with some dark scales. Palpus 0.16-0.19 (5) of proboscis, segment 3 2.00-3.00 (5) of 2; 4 absent in 6 dissected specimens. Proboscis 1.12-1.14 (5) of forefemur, with 4 ventrobasal bristles, mesal 2 of which are shorter. *Thorax.* Pronotal lobes with integument pale brown, lacking scales, or with a few broad scales on anterior lobe which bears several rather stout dark bristles anteromesally and a number of fine pale ones elsewhere; posterior lobe with 3, 4 dark brown bristles along posterior margin. Scutum with integument yellowish brown, covered with rather dark brownish narrow curved scales, scales of supraalar area and prescutellar space appearing slightly paler; scutal bristles dark brown, acrostichals reduced to 2-4 anterior pairs. Scutellum with scales similar to those of prescutellar space; median lobe with 4-6 (usually 5, 6), each lateral lobe with 4, 5 long dark brown bristles, each lobe with several additional fine bristles. Pleural integument brown to pale brown; sternopleuron with a few broad pale scales dorsally and midposteriorly, remainder of pleura unscaled; pleural bristles mostly dark brown, upper mesepimerals and a few finer propleurals and sternopleurals pale brown, 5 to more than 10 propleurals, 3-5 prealars, more than 10 sternopleurals, 4-6 upper mesepimerals and one lower mesepimeral. *Wing.* Cell R_2 1.94-2.39 (5) length of vein r_{2+3}, longer than M_{1+2}. Halter with dark scaled knob. *Legs.* Forecoxa covered with rather dark scales anteriorly, scales at base appearing pale; mid- and hindcoxae with pale scales. Forefemur pale in posterior half of ventral surface; midfemur pale in lower half of posterior surface excepting apical area; hindfemur largely pale on both anterior and posterior surfaces except for apical area, dorsal dark area reaching base; femora otherwise, tibiae and tarsi dark. Tarsomere 5 shorter than 4; hindtarsomere 1 1.08-1.17 (6) of tibia. *Abdomen.* Tergum I with median patch of dark scales; II-VII dark scaled, with basal bands of pale scales, the bands on II, III and VII often reduced. Sterna pale scaled.

MALE (Figs. 60, 196). Wing length 2.3-2.9 mm. Antenna: pedicel glabrous; flagellum 0.90-0.94 (5) of proboscis; flagellomere 12 1.22-1.44 (5) of Flm 13, both 0.92-1.05 (5) of Flm 1-11; Flm 7 with 2 or 3 (usually 2) apically curved broad short modified setae; 8 with 4, 5 (usually 5) rather long slender leaf-like modified setae. Palpifer with a ventral spiculate process and a bundle of short spicules at apex. Palpus 1.07-1.11 (5) of proboscis, dark scaled; segments 4, 5 and apex of 3 with only several rather short bristles; length ratio of 2-5: 1.45-1.60 : 2.45-2.84 : 0.96-1.04 : 1.00 (5). Proboscis 1.19-1.28 (5) of forefemur, with 7-9 ventrobasal bristles; false joint indistinct. Cell R_2 1.32-2.08 (5) length of vein r_{2+3}. Foretarsomere 5 1.07-1.15 (2) of 4; hindtarsomere 1 1.12-1.17 (5) of tibia. *Genitalia.* Tergum IX with lobes only slightly prominent, each bearing 2-5 bristles. Sternum IX with 2-5 bristles. Basistyle not much swollen in basal half in tergal view, bristled except for mesal surface and base of lateral surface; subapical lobe not very prominent, α, β and γ of proximal group equal in length, relatively short, curved at apex;

δ narrow; ϵ a little wider and shorter than δ; 4 setae (μ) present between these two leaflets. Dististyle arcuate, slightly more than half as long as basistyle, with a lamellose expansion on apical half of concave side; seta on convex side shorter than and distal to that of concave side. Cercal tergal surface weakly sclerotized; 2-4 cercal setae on each side; paraproct well sclerotized. Tergal division of aedeagus consisting of well sclerotized basal bridge, paired basal square structures and long apical processes which are horn-shaped, strongly curved, tergally directed at apex, with reticulate surface; sternal division fairly wide, apparently jointed with tergal division in a wide isthmus.

LARVA (Fig. 59). *Head*. Width 0.96-1.10 mm; yellowish brown; 1.38-1.51 times as wide as long; labrum slightly concave between bases of seta 1-C; 1-C 0.35-0.46 (6) as long as distance between bases, apex needle-like; 4-C posteriad of 7-C and anteriad of 6-C, usually single, subequal to distance between bases; 5-C well caudad of 7-C, always double; 6-C a little anteriad of a line between 5, 7-C; 13-C occasionally with barbs; 16, 17-C single or double. *Antenna* 0.55-0.64 mm long, 0.79-0.88 as long as head, dark at base and in distal part, curved, proximal part dorsally, laterally and ventrobasally spiculate, distal part laterally spiculate only; 1-A inserted at apical 0.24-0.35, with 28-34 barbed branches; 2, 3-A equal in length, pigmented; 4-A slightly shorter than 2-A, 5-A with a slender accessory sensorium on proximal division. *Mandible* with MdS_2 consisting of nearly 10 short slender spurs; mandibular comb of about 10 or less spiculate prominences (teeth). Cutting organ: mesal dorsal tooth with a large truncate mesobasal denticle; ventral tooth with VT-4 not reaching apex of VT_0; $VT_{1,2}$ very narrow, unpigmented; VT_3 pigmented; pectinate brush 12-15 haired. Piliferous process with labula only slightly extending beyond apex of anterior part. Mandibular hairs (6-7) + (9-10). *Maxilla*. Seta 1-Mx very weak, single. Mesostipes about 1.5 times as long as wide, smooth on lateral surface, with a few rather stout pectinate spicules on mesal margin near base; stipital sensoria located at basal 0.33; 4-Mx of medium length. Parartis a weakly sclerotized expansion of dorsobasal margin at middle. Lacinia with 5-Mx at or a little proximad of level of stipital sensoria; 6-Mx slightly shorter than 4-Mx. Palpostipes excluding lateral artis about 0.25 length of mesostipes, with mesal unsclerotized band from apex to base; $S_3 > S_1 > S_2 = S_4 > S_5$ in length. *Mentum plate* with 15-19 teeth, median tooth twice as broad as submedian tooth, with apex narrow and acute, 4-5 mesal flanking teeth subequal, closely spaced up to near apex, lateral most teeth often abortive. *Thorax*. Prothoracic setal formula: 1·1·1-2·2(1)·1·1·3(2)·2; 3-P distinctly shorter and weaker than 1, 2-P; 4-P fairly strong, 4, 6-8-P subequal; 4, 14-P, 4-M and 2-T usually double; 7-P usually triple; 1-T usually single. *Abdomen*. Setae 4-I and 7-II often with distinct barbs; 6-I-II and 7-I stronger and more deeply pigmented than 6-III-VII; 6-I, when 3 branched, with one branch often much shorter and weaker than other 2; 6-III-VII progressively longer; 1-I, 1, 8-II, 4-IV, 3-V and 2-VIII usually single; 12-I, 3-II, 5, 11-III, 3, 8, 11-IV, 5, 8-V and 5-VI usually double; 11-II, 6, 13-III and 9-VII usually triple; 1-IV and 6-IV-VI usually 4 branched; 1-VII usually with 6 branches. Comb scales 40-51 in a patch, posterior scales longer than anterior ones, individual scales elongate, paddle-shaped, apically rounded, apically fringed with moderate spicules, laterally with shorter spicules. *Siphon* yellowish brown, darker at base and apex often with a rather broad dark band in middle, 20.0-24.3 times as long as apical width; length 1.67-1.97 mm, index 8.75-10.25; microsculpture consisting of faint short transverse rows of minute denticles; pecten reaching basal 0.23-0.32 of siphon, of 12-17 teeth including 0-2 basal abortive teeth, the teeth usually progressively longer and

more widely spaced apically, occasionally apical tooth markedly detached, each tooth with several ventral denticles; 1-S of 3-5 (usually 4) subventral or sublateral pairs, basalmost 1-S inserted at basal 0.35-0.54 (usually 0.38-0.44), each most frequently double, occasionally single, rarely triple, longer than siphon diameter at insertion; 2-S stiff, directed proximally. *Saddle* 0.29-0.34 mm long; microsculpture of short rows of short spicules, progressively stronger apically; 2-X with one long and 1-3 short branches; 4-X of 10-12 cratal tufts, each 2-9 (mostly 6-8) branched. Anal gills pointed, 0.62-0.85 as long as saddle, ventral gill as long as or slightly shorter than dorsal one.

SPECIMENS EXAMINED. KOREA. 2♂: Cheju Do (M-0852, M-0877). RYUKYU ARCHIPELAGO. 6♂, 4♀, with associated skins (4 l, 4 p); 4 L, 2 l: Okinawa Guntô (J-0451, J-0476, J-0490, J-0492, J-0501, J-0502, J-0898, J-0905, J-1292, J-2193, J-2194). 270♂, 331♀, with associated skins (3 l, 3 p); 69 L, 2 l: Yaeyama Guntô (K-0181, K-0667, K-0674, K-0907, K-0919, K-0924, K-0925, K-0934, K-0939, K-0940, K-0946, K-0948, K-0949, K-0951, K-0954, K-0956, K-0961, K-0972, K-0976, K-1002, K-1010, K-1023, K-1027, K-1037, K-1065, K-1078, K-1080, K-1082, K-1088, K-1089, K-1101, K-1111, K-1329, K-1337, K-2063).

DISTRIBUTION. PALAEARCTIC JAPAN. (Hokkaido, Honshu, Shikoku, Kyushu). KOREA (Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). SOUTH CHINA. HONG KONG. INDOCHINA. THAILAND. PHILIPPINES. JAVA. MALAYA. INDIA. NEPAL. SRI LANKA. MALDIVE ISLANDS.

BIONOMICS. Very common throughout the Ryukyu Archipelago except for Miyako Guntô, rare in temperate Japan. The larvae are found most frequently in blocked streams, rock pools, ground pools, and occasionally in crab holes. Sirivanakarn (1977) reported larvae found in containers such as palm bracts, leaf axils and earthenware jars. Females fed on reptiles and amphibians as well as chicks and mice, and showed a higher preference for amphibians than reptiles in the laboratory (Miyagi 1972b).

40. *CULEX (LOPHOCERAOMYIA) CINCTELLUS* EDWARDS
(Figs. 60, 197)

Culex (Lophoceratomyia) cinctellus Edwards, 1922a, b: 281, 473 (*nom. nov.* for *Lophoceratomyia taeniata* Leicester, 1908: 127 (♂, ♀). Type-locality: Kuala Lumpur and Klang, Malaya).

Culex (Lophoceraomyia) cinctellus: Bohart, 1959: 197, Yaeyama, Ryukyu Archipelago.

FEMALE (Fig. 197). Wing length 3.1-3.5 mm. *Head.* Vertex covered with pale golden-yellow narrow curved scales and numerous erect forked scales; eye margin with broad pale scales; tempus covered with broad pale scales; 4-6 vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel dark brown, without protuberance; flagellum 1.06-1.14 (4) length of proboscis; flagellomere 1 1.13-1.27 (4) of Flm 2. Palpus 0.17-0.18 (4) as long as proboscis, segment 3 1.89-2.44 (4) of 2; 4 absent in 4 slide mounted specimens. Proboscis 1.17-1.23 (4) of forefemur, with 2 ventrobasal setae, rarely an additional short seta present. *Thorax.* Pronotal integument yellowish brown; anterior lobe with only a few rather broad scales and bearing more than 10 bristles of various sizes; posterior lobe with several hair-like scales and 3-5 stout bristles along posterior margin together with a few fine

ones along posterodorsal margin. Scutum with integument rather reddish brown, covered with bronzy narrow curved scales, those on margins somewhat paler; acrostichal bristles reduced to one or 2 pairs of dark bristles on anterior promontory; bristles in and around fossal area variable, usually one stout humeral and one stout posterior fossal present. Scutellum covered with pale bronzy narrow curved scales; each lateral lobe bearing 4 dark stout bristles and median lobe bearing 5-7, each lobe with additional short bristles. Pleural integument yellowish brown; pale or dark rather broad scales on upper and posterior margins of sternopleuron but not forming a distinct patch; pleural bristles bronzy to pale yellow, about 10 or more propleurals, 6-9 prealars, more than 10 sternopleurals along upper to posterior margin, 5-9 upper mesepimerals, one distinct lower mesepimeral. *Wing*. Cell R_2 1.67-1.97 (3) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Forecoxa covered with dark scales anteriorly and with pale scales laterally; mid- and hindcoxae with pale scales. Posterior half of ventral surface of forefemur, lower half of anterior surface and most of posterior surface of mid- and hindfemora, and posteroventral surface of tibiae pale scaled; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 shorter than 4; hindtarsomere 1 1.04-1.09 (4) length of tibia. *Abdomen*. Tergum I with median patch of dark scales; II-VII dark scaled, with distinct basal bands of pale scales, lateral margin with pale scales; VIII and sterna pale scaled.

MALE (Figs. 60, 197). Wing length 2.7-3.2 mm. Antenna: flagellum 0.92-0.96 (4) of proboscis; flagellomere 12 1.21-1.35 (3) of Flm 13, both 1.18-1.21 (3) of Flm 1-11; 1 with 13-17 hairs shortened, 8-10 of them stiff; 2-4 with 13 or 14 hairs shortened, 4-6 of them stiff; 5 with 3-5 rather long leaflets and 2-4 basally broadened hairs together with 12-14 shortened hairs; 6 with a tuft of 15-18 stout dark setae, 4-6 of them straight or slightly arcuate, others strongly twisted, intermediate forms present, 12-15 hairs shortened; 7 with 3-4 broad short, apically narrow dark leaflets and a tuft of about 10 short stout twisted dark setae, nearly 10 hairs shortened; 8 with a tuft of 7-8 rather long narrow curved dark thickened setae, together with about 10 shortened hairs; 9 with 3-5 long narrow leaflets and 3-4 long straight dark setae, together with more than 10 shortened hairs; 10 with 3-5 curved or straight long dark setae and more than 10 rather shortened hairs. Palpus 1.16-1.21 (4) length of proboscis (longer than probscis by length of segment 5); 4, 5 and apex of 3 hairy; length ratio of 2-5: 1.03-1.21 : 2.26-2.54 : 1.00-1.03 : 1.00 (4); palpifer with 2 brush-like processes at apex. Proboscis bearing 12-15 stout ventrobasal setae, with a false joint at basal 0.26-0.27 (5). Lateral lobes of scutellum usually with 3 long dark bristles. Upper mesepimeral bristles 3-6. Cell R_2 1.40-1.72 (4) length of vein r_{2+3}. Foretarsomere 5 1.46-1.60 of 4; hindtarsomere 1 1.10-1.17 (4) length of tibia. Abdominal segment VIII dark scaled with an indistinct basal pale band. *Genitalia*. Tergum IX with poorly protrudent lobes, each bearing 2-4 short bristles. Sternum IX with a square sclerotization in basal half, without bristles. Basistyle bearing a group of medium-sized bristles about middle of tergal side, without bristles on basal area of lateral surface and subapical area of mesal surface, otherwise bristled; subapical lobe prominent, bearing 3 rods (α, β, γ) and an additional leaflet of proximal group, and 2 striated leaflets (δ and ϵ) and 4-6 setae (μ) of distal group; α with lamellose apex and pointed tip; β and γ curved at apex with sharp tip; additional leaflet narrow, rather short, faintly striate, placed just outside rods; δ longest of all the setae of distal group, moderately wide; ϵ very wide; μ curved at apex, shorter than and placed between leaflets. Dististyle wide, 0.67-0.75 length of basistyle, frilled on apical part, with 2 minute setae about apical 0.2, seta on

convex side. Cercal tergal surface weakly sclerotized; 2-4 cercal setae on each side; paraproct well sclerotized. Tergal division of aedeagus well sclerotized, bulbous in dorsal view, tergal side widely and triangularly incised apically at middle, apical half formed by paired, distally convergent, tergo-distally directed and apically pointed processes. Sternal division very wide, connected with tergal division by a narrow isthmus.

LARVA. (After Colless 1965 and Bram 1967). *Head.* Seta 4-C 2-5 branched; 5-C usually triple, occasionally double or quadruple on one side only; 6-C double; 8-C 2-4 branched. *Antenna* with a narrow dark basal ring, dark in distal part. *Mentum plate* with 14-16 lateral teeth. *Thorax* with light to moderate spiculation on anterolateral surface of prothorax; 3-P considerably shorter and more slender than 1,2-P, 2-4 branched; 4,8-P double, 5,6-P single, 7-P 3,4 branched, 14-P single. *Abdomen.* Seta 7-I double, 2-VIII double. Comb scales 40-50 in a patch, individual scales fan-shaped, fringed. *Siphon* index 7.0-9.1 (x = 8.2); pecten restricted to basal 0.25 or less of siphon, of 8-11 teeth, each with 11-14 equal fine ventral denticles; 1-S of 4 subventral pairs, each 2,3 branched, shorter than siphon diameter at insertion. Seta 2-X 4,5 branched. Anal gills as long as or a little longer than saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 173♂, 91♀: Yaeyama Guntô (K-0181, K-0181a, K-0183, K-0580, K-0582, K-0583, K-0584, K-0919, K-0924, K-0925, K-0946, K-0951, K-0956, K-1002, K-1010, K-1021, K-1078, K-1089, K-1111, K-1328).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô). HAINAN ISLAND. PHILIPPINES. BORNEO. JAVA. SUMATRA. MALAYA. SINGAPORE. THAILAND. INDIA.

TAXONOMIC DISCUSSION. Thirteen larval specimens (4 from Thailand, 5 from Perak, Malaya, 2 from Johore, Malaya, 2 from Sabah, Borneo; USNM) were examined. Relative length of seta 1-C to the distance between their bases is rather variable, 0.33-0.49 (6); 13-T with 7-11 subequal weak branches; 2-VIII single in 2 specimens from Thailand, double in all the others. There were 2 larval specimens from the Ryukyu Archipelago. (Nakara R., Iriomote, XI-14-51, ground pool, R. Bohart; USNM). One of them is a very poor specimen and cannot be identified with certainty, another is nearly identical with *cinctellus,* but, in this specimen, 1-C is more slender and paler, 0.47-0.49 as long as distance between bases; 2-VIII single on one side and double on another. No other specimens from the Ryukyu Archipelago were available.

BIONOMICS. Adults are common in Yaeyama Guntô. Bohart (1959) stated, "Larvae breed in open grassy ground pools." No other records of larvae exist in this region. Both Sirivanakarn (1977) and Bram (1967) cite other authors as believing *cinctellus* to be primarily a bird feeder, but that it may bite man on occasion.

41. *CULEX (LOPHOCERAOMYIA) RUBITHORACIS* (LEICESTER)
(Figs. 61, 62, 198; Table 76)

Lophoceratomyia rubithoracis Leicester, 1908: 119 (♂, ♀). Type-locality: Kuala Lumpur, Malaya.

Culex rubithoracis: Yamada, 1932: 217, Honshu and Kyushu, Japan; Intermill, 1967: 1, Okinawa Is., Ryukyu Archipelago.

Culex (Lophoceratomyia) rubithoracis: LaCasse and Yamaguti, 1950: 192 (♂, ♀, L).

FEMALE (Fig. 198). (4 specimens). Wing length: 2.2-2.8 mm (3). *Head.* Vertex covered with dark broad scales anteriorly and pale yellowish brown narrow curved scales posteriorly; side of vertex and tempus covered with pale broad scales; dark erect forked scales on posterior part of vertex; 5 vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel simple, dark brown mesally, with several minute bristles, occasionally with one or 2 small scales; flagellomere 1 1.19-1.31 (2) length of Flm 2. Palpus 0.16-0.17 (2) of proboscis; 3 1.71-2.00 (2) of 2; 4 absent in 2 slide mounted specimens. Proboscis 1.02-1.10 (2) of forefemur, with 2 (3) ventrobasal setae. *Thorax.* Anterior pronotal lobe rather dark brown, unscaled, bearing more than 10 dark brown bristles of various sizes; posterior pronotal lobe with a number of dark hair-like scales on dorsal half, bearing 3, 4 dark bristles along posterior margin. Scutum with integument brown, with a weak purplish-reddish reflection, covered with dark narrow curved scales, the scales rather dense on fossal area; scutal bristles dark, acrostichals reduced to one anterior pair, occasionally humerals absent, posterior fossals 1, 2. Scutellum yellowish brown, covered roughly with scales similar to those of scutum; each lobe bearing 4 long dark bristles together with several fine ones. Pleural integument light to pale brown, scales absent; propleuron rather darker, with 6 to more than 10 bristles, sternopleuron with 5, 6 rather long dark and about 10 fine pale bristles, 2, 3 rather stiff dark prealars, 3, 4 fine yellowish brown upper mesepimerals, no lower mesepimerals. *Wing.* Cell R_2 1.82-2.08 (3) length of vein r_{2+3}, longer than M_{1+2}. Halter with dark scaled knob. *Legs.* Forecoxa covered anteriorly with dark scales; mid- and hindcoxae anterolaterally with pale scales. Fore- and midfemora pale on posterior and ventral surfaces, hindfemur pale on both anterior and posterior surfaces including ventral surface, these pale areas apically narrowed and not reaching apex, dorsal dark area of hindfemur almost reaching base; remainder of femora, tibiae and tarsi dark. Tarsomere 5 shorter than 4; hindtarsomere 1 1.00-1.03 (3) length of tibia. *Abdomen.* Tergum I with a median patch of dark scales; II-VII dorsally dark scaled, with lateral oacheous scales. Sterna covered with ochreous scales.

MALE (Figs. 62, 198). (7 specimens). Wing length: 2.1-2.3 mm (5). Antenna: pedicel blackish brown, glabrous; flagellum 0.95-0.96 (2) length of proboscis; flagellomere 12 1.41-1.70 (3) of Flm 13, both 1.14-1.21 (3) of Flm 1-11; 1 with 10-12 hairs shortened and 7-9 of their stiff; 2-4 with 7-9 hairs shortened and 3-6 of them stiff; 5 with 3, 4 slender leaflets and about 10 shortened hairs; 6 with 14-18 dark leaflets, 3, 4 of them weakly curved, others strongly twisted, 11, 12 shortened hairs also present; 7 with 2 or 3 broad dark curved leaflets and 5-7 short dark curved leaflets, 8-11 shortened hairs also present; 8 with 5, 6 dark rather long, slender, curved leaflets and 10-12 shortened hairs; 9 with 3, 4 rather dark, subapically broadened rather long leaflets and 14-17 shortened hairs; 10 with 16, 17 rather shortened hairs, 2 of them slightly thickened. Palpus 1.14-1.21 (2) times as long as proboscis; segments 3, 4 and apex of 3 with many moderately long bristles; length ratio of 2-5: 1.06-1.23 : 2.26-2.42 : 0.98-1.02 : 1.00 (2); palpifer with a pair of brush-like processes at apex. Proboscis 1.31-1.39 (2) of forefemur, with false joint at basal 0.28 (1), with 11-13 stout ventrobasal setae. Cell R_2 1.36-1.85 (4) length of vein r_{2+3}. Foretarsomere 5 1.34-1.40 (3) length of 4; hindtarsomere 1 1.02-1.06 (5) length of tibia. *Genitalia.* Tergum IX with weakly protrudent lobes, each with 1-3 short bristles. Sternum IX without bristles. Basistyle with a tergomedian row of 3, 4 (usually 3) curved bristles of medium length, mesad of it another row of fine bristles from base to base of subapical lobe,

long bristles laterally and short to moderate bristles ventrally, several fine bristles scattered between the tergomedian row and lateral long bristles in apical 0.67; subapical lobe close to apex, well protrudent, with 3 rods subequal in length, α a little broadened apically, β and γ curved, slightly more slender than α; δ moderately broad, not striated; ϵ apparently broader but shorter than δ; 4-6 more or less thickened medioapical setae (μ_{1-6}), μ_1 longest, slightly arcuate, others strongly curved about at middle; moderately long. Dististyle with annulations on convex side in apical 0.2, a short seta on each convex and concave side about at apical 0.25; claw apically broadened. Cercal tergal surface weakly sclerotized; 1-3 cercal setae on each side; paraproct with apex sternally expanded and apparently bilobed, one lobe a rounded lamella and another an acute tooth, apical crest reduced, consisting of 4-7 short pointed spines. Tergoapical division of aedeagus of each lateral piece with a single acute, tergomesally directed, horn-like, smooth apical process.

LARVA (Fig. 61). *Head.* Width: 0.91-0.98 mm; yellowish brown, 1.48-1.57 times as wide as long; labrum straight or only slightly concave between bases of seta 1-C; 1-C 0.36-0.46 (x = 0.40) as long as distance between bases, apex needle-like; 4-C posteriad of 7-C and anteriad of 6-C, always branched, shorter than distance between bases; 5-C well caudad of 7-C; 6-C almost always double, usually longer and stouter than 5-C, a little anteriad of a line between 5, 7-C; 10-C usually triple; 13-C occasionally barbed; 14-C usually double; 16-C single, 17-C usually single, rarely double. *Antenna* 0.48-0.52 mm long, 0.78-0.84 length of head, yellowish brown, darker at base and partially in distal part, proximal part dorsally, laterally and ventrobasally spiculate, distal part laterally spiculate only; 1-A inserted at apical 0.27-0.33 (x = 0.31), with 27-33 barbed branches; 2, 3-A equal in length, pigmented; 4-A much shorter than 2-A. *Mandible* with MdS_2 consisting of 8, 9 slender spurs; MdS_4 intermediate between $MdS_{1,3}$ in length and pigmentation. Mandibular comb of less than 10 spiculate prominences (teeth). Cutting organ: mesal dorsal tooth with a fairly large mesobasal denticle; ventral tooth with VT-4 not reaching apex of VT_0; $VT_{1,2}$ very narrow and unpigmented, VT_3 fairly long, weakly pigmented; pectinate brush of 9, 10 laterally pectinate hairs. Membranous process with labula extending only a little beyond apex of anterior part. Mandibular hairs (5-7) + (8-10). *Maxilla.* Cardinal seta 1-Mx single, very fine. Mesostipes about 1.5 times as long as wide, smooth on lateral surface, with a few rather stout pectinate spicules on mesal margin near base; stipital sensoria located at about basal 0.33; ventral stipital seta 4-Mx short but stout. Parartis not well differentiated. *Lacinia* with proximal lacinial seta 5-Mx at or slightly proximad of level of stipital sensoria; distal lacinial seta 6-Mx longer than 4-Mx. Palpostipes excluding lateral artis 0.25-0.30 length of mesostipes; $S_3 > S_1 > S_2 = S_4 > S_5$ in length. *Mentum plate* (ventromentum) with 12-15 teeth, median tooth about twice as broad as submedian tooth, with apex narrow and acute, most lateral teeth usually very small. *Thorax.* Integument distinctly spiculate. Prothoracic setal formula: 1·1·3-7·2·1·1·3(2)·2; 3-P short and weak; 4-P subequal to 7, 8-P in length; 5-M shorter than 6-M; 13-T with 1 or 2 long barbed branches together with 8-13 weaker branches; usually, 7-P triple, 14-P single, 8-M 5, 6 branched and 7-T 7 branched. *Abdomen.* Integument smooth excepting segments VIII and X. Seta 6-I with 1 branch usually slightly stronger than other 2; 6-II with 1 weak and 2 strong branches; 6-III-VI of medium length; 12-I, 5-II, III, 10-III, 12-IV, V 4, 7-VII and 2-VIII usually double; usually, 6-III, IV 5 branched and 6-VI 4 branched. Comb scales 26-40 in a patch, posterior scales longer than anterior scales, individual scales elongate, paddle-shaped, apically fringed with moderate spicules, shorter spicules laterally. *Siphon*

yellowish brown, darker at base, 13.0-14.8 times as long as apical width; length 1.22-1.34 mm, index 6.93-8.00; microsculpture indistinct; pecten reaching basal 0.23-0.32, of 8-11 teeth, apical teeth longer and more widely spaced, each tooth with nearly 10 ventral denticles; 1-S of usually 4 (rarely 3) pairs, each with 2-4 (rarely one) branches, longer than siphon diameter at insertion, basalmost 1-S located at basal 0.28-0.38 of siphon; 2-S stiff. *Saddle* 0.28-0.31 mm long, microsculpture distinct in apical half, of short transverse or oblique ridges bearing several minute spicules, becoming evenly scattered single longer spicules toward apex; 1-X shorter than saddle; 2-X with one long and 1, 2 (usually 2) short branches; 4-X of 10-12 cratal tufts, each 3-10 branched. Anal gills 1.2-1.5 length of saddle, a little tapering apically, with apex rounded.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 5♂, 4♀, with associated skins (4 l, 4 p); 11 L, 12 l: Amami Guntô (I-1855, I-1880, I-1881). 2♂: Okinawa Guntô (J-2308, J-2309).

DISTRIBUTION. PALAEARCTIC JAPAN. (Honshu, Shikoku, Kyushu). RYUKYU ARCHIPELAGO (Amami and Okinawa Guntô). TAIWAN. PHILIPPINES. BORNEO. JAVA. SUMATRA. SOUTH CHINA. MALAYA. SINGAPORE. THAILAND. BURMA. INDIA. SRI LANKA.

BIONOMICS. NOTES. Not common throughout Japan. Larvae were obtained from ground pools of clean water in Amami Ôshima. Other larval habitats are large natural ponds, rice paddies, irrigation or drainage ditches and the margin of slowly moving streams; associated species include *Culex tritaeniorhynchus*, *Cx. hayashii* and *Cx. infantulus* (LaCasse and Yamaguti 1950). Favored breeding sites are characterized by emergent or submergent vegetation and in being open and sunlit in contrast to the shaded sites preferred by its close relatives (Sirivanakarn 1977). Females feed on *Bufo bufo japonicus*, but not on man (Yamada 1932).

42. *CULEX (LOPHOCERAOMYIA) BICORNUTUS* (THEOBALD) (Figs. 62, 63, 199; Table 77)

Lophoceratomyia bicornuta Theobald, 1910a: 25 (♂). Type-locality: Dawna Hills, nr. Kawkareik, Lower Burma.

Culex (Lophoceraomyia) minor: Bohart, 1959: 197, Yaeyama, Ryukyu Archipelago (after Sirivanakarn, 1976, personal communication).

FEMALE (Fig. 199). Wing length 3.2-3.6 mm. *Head.* Vertex covered with bronzy narrow curved scales and numerous dark erect forked scales; eye margin bordered with pale rather narrow curved scales; tempus heavily covered with pale broad scales; 4-5 vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel brown, darker mesally, with a small protuberance together with a few short hairs and small scales on mesal surface; flagellum 1.07-1.12 (4) length of proboscis; flagellomere 1 1.25-1.36 (4) of Flm 2. Palpus 0.21-0.25 (4) of proboscis; segment 3 3.33-3.88 (4) of 2; 4 absent in 4 dissected specimens. Proboscis 1.06-1.14 (3) of forefemur, with 4 ventrobasal bristles, mesal 2 finer. *Thorax.* Pronotal integument brown to dark brown; anterior lobe bearing more than 10 bristles of various sizes, without scales; posterior lobe unscaled or with several dark narrow curved scales anterodorsally and a few rather broad scales posteriorly; 3, 4 rather stout bristles along posterior margin, sometimes an additional short one present. Scutum with integument rather dark brown, covered with dark bronzy narrow

curved scales; acrostichal bristles reduced to usually 2 pairs of dark bristles on anterior promontory; usually one stout humeral, one medium-sized angular and one stout posterior fossal present, sometimes additional small bristles present in and around fossal area. Scutellum with dark hair-like scales; each lateral lobe bearing 4 long dark bristles, median lobe bearing 4, 5. Pleural integument brown to dark brown on anterior half, becoming posteriorly paler, often with greenish tinge; several pale or dark, rather broad scales loosely set on sternopleuron; about 10 propleural bristles, 3-5 prealars, more than 10 sternopleurals along upper to posterior margin, 4-7 fine upper mesepimerals, one lower mesepimeral, rarely 2 or lacking. *Wing*. Cell R_2 1.36-1.72 (4) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Forecoxa with gray scales anteriorly, pale scales laterally; mid- and hindcoxae with pale scales. Posterior half of ventral surface of forefemur, lower half of posterior surface of mid- and hindfemora pale scaled, the pale area basally broadened; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 about as long as 4; hindtarsomere 1 1.05-1.10 (4) length of tibia. *Abdomen*. Tergum I with a median spot of dark scales; II-VIII dark scaled. Sterna pale scaled.

MALE (Figs. 62, 199). Wing length 2.8-3.1 mm. Antenna: pedicel with a prominent protuberance on mesal side; flagellum 0.94-1.00 (4) length of proboscis; flagellomere 12 0.98-1.28 (4) of Flm 13, both 1.00-1.21 (4) of Flm 1-11; 1 with 10-12 hairs shortened; 2 with 9-12 hairs shortened or reduced; 3 with 2-5 hairs shortened and 6-10 reduced; 4 with 7-9 hairs shortened and 3-6 reduced; 5 with 15-17 shortened hairs and 6, 7 stout straight setae; 6 with 20 or more shortened hairs and a tuft of 12-15 twisted dark setae, a few intermediate forms present; 7 with 2-6 shortened hairs, 7-10 short narrow dark leaflets, a tuft of 6, 7 strongly twisted, apically narrow, dark setae and another tuft of about 20 short dark twisted setae; 8 with 8-12 shortened hairs and tuft of 6-9 long dark sigmoid setae, one of them expanded at middle, some hairs between leaflets and shortened hairs of an intermediate form, 9-12 short leaflets accompanied by one or 2 shortened hairs also present; 9 with 5, 6 long dark, arcuate or straight, setae and more than 10 hairs a little shorter than ordinary hairs; 10 with a number of slightly shortened hairs. Palpus 1.13-1.21 (4) length of proboscis; segments 4, 5 not very hairy; length ratio of 2-5: 1.03-1.19 : 2.35-2.76 : 0.80-0.94 : 1.00 (4). Proboscis 1.16-1.19 (4) length of forefemur, with a false joint at basal 0.22-0.24 (4) bearing a pair of hairy pads between the joint and base, slightly swollen distad of the joint to about middle, the swollen portion bearing many somewhat long and stiff setae laterodorsally and lateroventrally; ventrobasal setae 12-17, slender. Scutellar lateral lobes bearing 3 long bristles and median lobe bearing 4. Cell R_2 1.07-1.49 (4) length of vein r_{2+3}. Foretarsomere 5 1.05-1.13 length of 4; hindtarsomere 1 1.11-1.16 (4) length of tibia. *Genitalia*. Tergum IX with poorly protrudent lobes, each bearing 2-5 bristles. Sternum IX with 4-10 bristles. Basistyle bristled except for areas laterally at base and mesally near apex, with a row of 6-8 (most often 7) long characteristically curved bristles on tergal surface in middle; subapical lobe prominent, α isolated a little proximally to others, curved at basal 0.25-0.33 and at apical 0.20-0.25; β curved about middle and at apex; γ curved at apex; α, β subequal in length and close to each other and also to other specialized setae forming a distal group; δ a simple rod, placed on a hairy knob together with 3 short setae (μ), one of these setae simply arcuate and usually shorter than other 2 which are strongly curved with a retrorse hook near apex; ϵ distalmost and striated; χ apically curved, just laterad of γ. Dististyle 0.67-0.75 length of basistyle, narrowed towards apex, somewhat sigmoid, seta of convex side placed between apex and seta of concave

side; claw small. Cercal tergal surface well sclerotized; 2-5 cercal setae on each side; paraproct well sclerotized. Tergal division of aedeagus composed of 2 pairs of processes connected by a subbasal bridge; lateral process longer than inner one, slightly incurved, with 20 or more denticles arranged in an irregular triple row on mesal side, apex divided, the tergal apex strongly sclerotized and pointed, the sternal apex poorly sclerotized, forming a spiculate knob; mesal process horn-shaped, outcurved, tergoposteriorly directed. Sternal division of paired lamellae sternally expanded and connected by basal bridge.

LARVA (Fig. 63). *Head.* Width 0.86-0.98 mm; pale yellowish brown, 1.20-1.34 times as wide as long; labrum slightly concave between bases of seta 1-C; 4-C at about level of 7-C, longer than distance between bases; 5, 6-C caudad of 7-C, usually double; 6-C a little anterior to a line between 5- and 7-C; 9, 11-C usually with 4 or 5 branches; 13-C usually 5 branched. *Antenna* 0.52-0.54 mm long, 0.66-0.75 as long as head, brown at base and in distal part, pale otherwise, proximal part dorsally and laterally spiculate, spicules slender on basal area, progressively stouter and shorter apically, a few spicules laterally on distal part; 1-A inserted at apical 0.23-0.30, with many barbed branches; 2, 3-A equal, 4-A a little shorter. *Mandible* with MdS_2 apparently a complex of about 10 unpigmented short slender spurs; MdS_3 about 0.67 length of MdS_1; MdS_4 slightly pigmented, length intermediate between $MdS_{1,3}$; MdS_5 0.33-0.40 length of MdS_1. Cutting organ: mesal dorsal tooth with a fairly large, weakly sclerotized, truncate or round-tipped mesal denticle; ventral tooth with VT-4 just reaching apex of VT_0, $VT_{1,2}$ unpigmented, slender, longer than the dark acutely triangular VT_3; short, mesally pectinate VB_2 present; pectinate brush 12-15 haired. Piliferous process with labula extending far beyond apex of anterior part. Mandibular hairs (6-8) + (9-11). *Maxilla.* Seta 1-Mx single, about as long as palpostipes. Mesostipes about 1.5 times as long as wide, with lateral surface smooth, a few rather thickened pectinate spicules on mesal margin near base; stipital sensoria a little proximad of middle; 4-Mx of medium length. Parartis not well differentiated. Lacinia with 5-Mx on level of stipital sensoria; 6-Mx a little shorter than 4-Mx. Palpostipes excluding lateral artis 0.20-0.25 length of mesostipes; $S_3 > S_1 > S_2 = S_4 = S_5$. *Mentum plate* with 15-21 ($x = 18.4$) teeth. *Thorax.* Prothoracic setal formula usually 1·1·1·2·1·1·2·1; 3-P distinctly shorter and more slender than 1-2-P; usually, 10-P single and 8-M 4 branched. *Abdomen.* Setae 6-III-VI strong but distinctly more slender and paler than 6-I, II; 10-I, 9, 10-III, 4, 5-IV, 5-V, 12-VI, 4, 7, 14-VII usually single; 7-I, 3-II, 3, 8-III, 3, 8, 11-IV, 8-V, 1-VI and 3-VII usually double; 1-V, 6-VI and 1-VII usually triple. Comb scales 36-65 ($x = 51.6$) in a patch, consisting of 2 types of scales: one small or medium, located proximally, with apex rounded and evenly fringed with spicules; another long, located apically, with a single (occasionally bifid) small stout apical spine, laterally fringed with spicules; 3-VIII usually 6 branched, longest of all segment VIII setae. *Siphon* light yellowish brown, 19.8-24.3 times as long as apical width; length 1.43-1.75 mm, index 7.68-10.00; pecten reaching basal 0.24-0.40, of 14-18 teeth, progressively larger apically, a few apical teeth often a little more widely spaced, each tooth with less than 10 large ventral denticles; 1-S of 3 (occasionally 4) subventral pairs, each 1-4 branched, slightly longer than siphon diameter at insertion, basalmost 1-S located at basal 0.41-0.52; 2-S upright, rather stout. *Saddle* 0.29-0.32 mm long, covered with spicules arising from short ridges, spicules on unsclerotized ventroapical area longer and denser, not associated with ridges; a number of stouter spicules on dorsolateral area at apex; 2-X usually 3

branched, dorsal 2 branches short; 4-X of 11-13 cratal tufts, each with 3-11 branches. Anal gills conical, a little shorter than saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 140♂, 142♀, with associated skins (47 l, 47 p); 121 L, 3 l: Yaeyama Guntô (K-0111, K-0134, K-0135, K-0136, K-0146, K-0147, K-0148, K-0151, K-0152, K-0159, K-0160, K-0173, K-0177, K-0184, K-0561, K-0562, K-0563, K-0564, K-0565, K-0568, K-0570, K-0571, K-0573, K-0575, K-0577, K-0578, K-0601, K-0611, K-0619, K-0627, K-0635, K-0637, K-0640, K-0646, K-0692, K-0698, K-0700, K-0912, K-0916, K-0919, K-0925, K-0931, K-0933, K-0951, K-0956, K-0970, K-0972, K-0977, K-0979, K-1002, K-1025, K-1029, K-1043, K-1045, K-1050, K-1060, K-1062, K-1078, K-1080, K-1081, K-1089, K-1119, K-1121, K-1245, K-1306, K-1316, K-1324, K-1331, K-1404, K-1405, K-1452, K-1454, K-2330, K-2331).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô). LAN YU. VIETNAM. MALAYA. SINGAPORE. THAILAND. LOWER BURMA. WESTERN INDIA.

TAXONOMIC DISCUSSION. Colless (1965) recognized *bicornutus* as a distinct species based on Malayan material. Bram (1967), opposing Colless' view, treated it as a "form" of *minor* in his view of Thailand *Culex*, because of variability of the male proboscis, larval pecten teeth and larval habitat, which he thought the primary diagnostic characters indicated by Colless. Specimens from Yaeyama Guntô, previously treated as *minor*, constantly possess a slightly swollen hairy portion on the male proboscis distad of the false joint. This appears to be the most constant and distinct character of *bicornutus*. They are also identical with *bicornutus* in having the long specialized hairs of male antennal flagellomere 5, long male palpus (longer than proboscis by half to full length of terminal segment), and short inner process of the aedeagus. The larval pecten teeth usually have gradated ventral denticles typical of *bicornutus*, but individual teeth agreeing with those of *minor* frequently occur, and specimens having the whole pecten typical of *minor* rarely exist. Larvae in Yaeyama Guntô are found most often in tree holes well above the ground, though they occur in a rather wide variety of habitats including ground pools and crab holes. Dr. Sirivanakarn (1976, personal communication), in his revision of the subgenus *Lophoceraomyia* of Southeast Asia*, confirmed that *bicornutus* was distinct from *minor* and the latter did not occur in northern subtropical areas. Since we lack enough material of true *minor*, and are not in position to discuss the relation between it and *bicornutus*, we here follow the latest treatment of Dr. Sirivanakarn.

BIONOMICS. Very common in Ishigaki and Iriomote islands. The larvae are found usually in tree holes, occasionally in rock holes or ground pools. This may indicate a need for further study of Ryukyuan material as Sirivanakarn (1977) indicated that *bicornutus* is more frequently found in rock pools, whereas *minor* prefers container habitats.

43. *CULEX (LOPHOCERAOMYIA) TUBERIS* BOHART
(Figs. 64, 65, 200; Table 78)

Culex (Lophoceraomyia) tuberis Bohart, 1946: 42 (♂, L). Type-locality: Chizuka, Okinawa Is., Ryukyu Archipelago.

*This monograph was published in 1977; see Literature Cited.

FEMALE (Fig. 200). Wing length 3.1-3.7 mm. *Head.* Vertex covered with pale yellow narrow curved scales and numerous dark brown erect forked scales; eye margin bordered with broad pale scales; tempus heavily covered with broad pale yellowish scales; 4 (rarely 5) vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel brown, with a very small prominence and a few minute hairs and small scales mesally; flagellum 1.09-1.11 (4) length of proboscis; flagellomere 1 1.19-1.37 (4) of Flm 2. Palpus 0.21-0.24 (4) length of proboscis; segment 3 2.50-2.95 (4) of 2; 4 absent in 4 dissected specimens. Proboscis 1.09-1.17 (4) of forefemur, with 2-5 ventrobasal bristles. *Thorax.* Pronotal integument yellowish brown, without scales; anterior lobe bearing more than 10 bristles of various sizes; posterior lobe bearing 3-6 (usually 3-4) bristles along posterior margin, often with one additional short bristle. Scutum with integument brown, covered with dark brown very narrow scales; acrostichal bristles reduced to a pair of large and one or 2 pairs of short dark bristles on anterior promontory; 1-3 stout humerals often accompanied by a few short bristles, 1-3 medium-sized angulars, one stout posterior fossal usually accompanied by one or 2 short bristles. Scutellum with pale brown hair-like scales; each lobe bearing 4 (rarely 5) long dark bristles together with a few fine ones, one or 2 medium-sized dark bristles often on both lateral lobes. Pleural integument yellowish brown, becoming paler posteriorly, often with a slight bluish or greenish tinge; a number of broad pale scales loosely set on midposterior sternopleuron; about 10 propleural bristles, 3-6 prealars, more than 10 sternopleurals along upper to posterior margin, 3-8 upper mesepimerals, no lower mesepimeral. *Wing.* Cell R_2 1.50-1.95 (4) length of vein r_{2+3}. Halter with dark scaled knob. *Legs.* Coxae with yellowish pale scales. Posterior half of ventral surface of forefemur, posterior and ventral surfaces of mid- and hindfemora pale scaled, the pale area basally broadened; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 equal to or slightly shorter than 4; hindtarsomere 1 1.07-1.08 (4) length of tibia. *Abdomen.* Tergum I with a median spot of dark scales; II-VII dark scaled, with lateral margin covered with pale ochreous scales. Sterna pale scaled.

MALE (Figs. 65, 200). Wing length 2.7-2.9 mm. Antenna: pedicel with a prominent protuberance on mesal side; flagellum 0.92-1.00 (3) length of proboscis; flagellomere 12 1.15-1.39 (3) of Flm 13, both 1.14-1.16 (3) of Flm 1-11; 1 with 10, 11 hairs shortened; 2 with 4, 5 hairs shortened and 6-7 reduced; 3 with 3-5 hairs shortened and 6-7 reduced; 4 with 7-9 hairs shortened and 3-5 reduced; 5 with 11, 12 shortened hairs and 7 somewhat broadened setae, one of which is much longer than others; 6 with 15-20 shortened hairs, a number of which are somewhat basally thickened, a tuft of 7, 8 dark twisted setae present; 7 with 10, 11 shortened hairs, a tuft of 5-7 dark strongly twisted, apically narrow and curled setae and another tuft of 11-14 short dark twisted setae, accompanied by 2-4 short hairs; 8 with 9, 10 rather shortened hairs and a tuft of 6 long dark sigmoid setae, 3 of them are expanded at apical 0.4, 10-12 short narrow leaflets followed by 1, 2 short hairs; 9 with 4-7 slightly shortened hairs and 5 long dark arcuate setae. Palpus 1.10-1.13 (3) times as long as proboscis, 4 and 5 not very hairy; length ratio of 2-5: 1.15-1.54 : 2.67-3.12 : 0.82-0.92 : 1.00 (4). Proboscis 1.21-1.24 (3) length of forefemur, with a false joint at basal 0.21-0.23 (3), a pair of rather indistinct, wide, hairy pads between the joint and base; ventrobasal bristles 9-13 (3), slender. Scutellar lateral lobes usually bearing 3 long and one medium-sized dark bristles. Cell R_2 1.25-1.42 (3) length of vein r_{2+3}. Foretarsomere 5 1.31-1.33 (3) length of 4; hindtarsomere 1 1.04-1.10 (3) length of tibia. *Genitalia.* Resembling those

of *Cx. (Lop.) minor*. Tergum IX with poorly protrudent lobes, each bearing 3-6 short bristles. Sternum IX without bristles. Basistyle bristled excepting areas laterally at base and mesally near apex, with a row of 5-8 (most often 6) long characteristically curved bristles on tergal surface in middle, the bristles a little more widely spaced than in *minor* and often irregularly arranged; subapical lobe protrudent, proximal group consisting of 3 rods (α, β and γ) transversely arranged, α a little shorter than other 2, curved at apex, β and γ subequal, curved about at middle and at apex; distal group composed of mesal leaflet (δ), lateral leaflet (ϵ) and 3 setae (μ); δ narrow, not striated, located on a hairy knob together with μ which have apparently simple apices and are shorter than δ; one of the setae again shorter than other 2; ϵ moderately wide, faintly striate; χ apically curved just laterad of proximal group. Dististyle 0.6 length of basistyle, somewhat sigmoid, apically narrowed, seta on convex side distal to that on concave side; claw small. Cercal tergal surface distinctly sclerotized; 2-5 cercal setae on each side; paraproct well sclerotized. Tergoapical division of aedeagus composed of 2 pairs of processes connected by a subbasal bridge; lateral process longer than inner one, slightly incurved, with less than 10 (usually 4, 5) denticles scattered on mesal surface and a number of denticles sternoapically, apex divided, the tergal apex pointed, the sternal apex forming a spiculate knob; mesal process horn-shaped, outcurved, directed tergoposteriorly. Sternal division of aedeagus of paired lamellae expanded sternally and connected by basal bridge.

LARVA (Fig. 64). *Head*. Width 0.96-1.08 mm; yellowish brown; 1.26-1.45 times as wide as long; labrum straight between bases of seta 1-C; 1-C less than 0.33 as long as distance between bases, with apex needle-like; 4-C usually single, behind level of 7-C, shorter than distance between bases, 5-C well caudad of 7-C, 89% single; 6-C a little laterad of 5-C, anteriad of a line between 5, 7-C, always single; 14-C very weak, somewhat stellate; 16-C single, 17-C usually single, occasionally double. *Antenna* 0.49-0.55 mm long, 0.62-0.76 length of head, only slightly curved, pale yellow, with a dark sclerotized portion ventrally at base, spiculate except for mesoventral aspect and most of distal part, which laterally bears a few spicules; 1-A inserted at apical 0.20-0.24, with 20 or more branches, strongly barbed; 2-A subequal to 1-A in length, 3-A slightly longer, 4-A shorter than 2-A. *Mandible* with MdS_2 apparently a complex of several pectinate slender spines; MdS_4 intermediate between MdS_1 and MdS_3 in length and pigmentation; MdS_5 basally pigmented. Mandibular comb of 13-17 hairy prominences. Cutting organ with mesal dorsal tooth bearing a mesal denticle lateroapically directed; ventral tooth rather straight, with VT-4 nearly reaching apex of VT_0, mesal denticles subequal in length, $VT_{1,2}$ narrow, apically setiform, unpigmented, VT_3 very acutely triangular; pectinate brush 12-14 haired. Piliferous process with labula extending well apical of anterior part. Mandibular hairs (5-8) + (6-8). *Maxilla* with 1-Mx single, very slender, shorter than palpostipes. Mesostipes about 1.5 times as long as wide, lateral margin somewhat angulate behind 4-Mx, lateral surface smooth, 1, 2 slightly thickened pectinate spicules on mesal margin near base; stipital sensoria at basal 0.33-0.40; 4-Mx rather long, about 0.3 length of mesostipes. Parartis not well differentiated. Lacinia with 6-Mx shorter than 4-Mx. Palpostipes excluding lateral artis 0.25-0.33 length of mesostipes; $S_3 > S_1 > S_2 \doteqdot S_4 \doteqdot S_5$. *Mentum plate* usually short (length rather variable), with 17-19 teeth, median tooth more than twice as broad as submedian tooth, with narrow acute apex; 3, 4 mesal flanking teeth almost square; lateral teeth pointed, progressively stronger laterad; often an abortive tooth at base on each side. *Thorax*. Prothoracic setal formula: 1·1·1·1(2)·1·1·2·1(2-4); 3-P short;

8-P variable, almost 80% single and of medium length, nearly 20% short, single or 2 forked, rarely 3, 4 forked; 4-P 90% single; 12-T usually double. *Abdomen.* Setae 6-I, II, and 7-I dark brown, very stiff, gently sigmoid or arcuate; 6-I with 2, 3 long, 0-2 medium and 0, 1 short branches, most frequently (71%) with 2 long and one medium branches; 6-II with 2, 3 long, 0, 1 medium and 0-2 short branches, most frequently (69%) 2 long and one short branches; 6-I-VI shortest on segment III, progressively longer toward basal and apical segments; 10-II, 2-III, 10, 12-IV, 5-V, VI usually single; 11, 13-I, 3-II, 8, 13-III, 1, 4, 11-IV, 1, 8-V, 1-VI and 10-VII usually double; 6-V, VI usually triple; 5-VIII rather stiff, usually double. Comb scales 61-73 (x = 67.5) in a triangular patch, distal scales much longer than proximal scales, individual scales elongate, paddle-shaped, with rounded apex, fringed with moderate spicules apically and fine spicules laterally. *Siphon* light yellowish brown, dorsally with basal margin dark brown, 13.3-15.6 times as long as apical width; length 1.22-1.48 mm, index 6.00-7.25; pecten reaching basal 0.35-0.45, of 9-11 teeth including 0-2 basal abortive ones, pecten teeth progressively larger apically, each tooth with about 10 ventral denticles; 1-S of 4 (rarely 3) subventral pairs, each usually double, rarely single, about as long as siphon diameter at insertion; basalmost 1-S located at basal 0.47-0.57; 2-S stiff, upright. *Saddle* 0.31-0.36 mm long, covered with very fine spicules arranged in irregular rows, a few dorsoapical spicules slightly larger; 4-X of 12 cratal tufts, each 2-7 branched. Anal gills fusiform, 0.6-0.9 length of saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 2♂, 3L: Okinawa Guntô (Paratypes 2♂: Chizuka, Okinawa Is., IX 1945, rock hole, Bohart and Ingram, USNM. 1L: E. Taira, Okinawa Is., 20 IX 1951, deep rock hole, Bohart; 2 L: E. Taira, Okinawa Is., 20 IX 1951, cliff rock hole, Bohart, USNM). 25♂, 22♀, with associated skins (17 l, 17 p); 84 L, 14 l: Yaeyama Guntô (K-0583, K-0584, K-0919, K-0951, K-1002, K-1014, K-1016, K-1026, K-1027, K-1096, K-1099, K-1120, K-1128, K-1212, K-1241, K-1247, K-1317, K-1372, K-1373, K-1377, K-1463, K-1464, K-1465, K-1466, K-1467, K-1630, K-1631).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Guntô).

TAXONOMIC DISCUSSION. Key characters and description of this species given above are based on specimens from Yaeyama Guntô, since we could not obtain this species on Okinawa Is., the type-locality. After the description was completed, 2 paratype males with slides of associated genitalia and antennae (Chizuka, Okinawa, Sept. 1945, R. Bohart and R. Ingram; USNM); and 3 larval specimens (East Taira, Okinawa, IX-20-51, R. M. Bohart coll.; USNM) were examined. Unfortunately, the male paratypes were in poor condition, the genitalia distorted in mounting. However, at least no obvious differences from Yaeyama specimens were detected as far as the observable characters were concerned. The larval specimens had some points different from those of Yaeyama, *viz.*, seta 5-C double in all 3 specimens (only 11% double, otherwise single in Yaeyama specimens), 14-P single in 2 specimens, double in one (2-4 branched in Yaeyama specimens), 1-VII single or double (always double in Yaeyama specimens), siphon appearing to be a little more slender, 14.9-16.0 (x = 15.6) times as long as apical width (13.3-15.6; x = 14.5 in Yaeyama specimens). More specimens from Okinawa Is. are necessary to evaluate these differences and to elucidate the status of the population of Yaeyama Guntô.

BIONOMICS. Apparently rare in Okinawa Is., common in Yaeyama. Bohart obtained this species from a rock hole in Okinawa Is. We collected many larvae from fresh water crab holes on Ishigaki and Iriomote islands, together with *Uranotaenia ohamai* and *Ur. yaeyamana*. It may be a

situation similar to that of *Ur. jacksoni* (= *stonei* Bohart and Ingram) which Bohart obtained from a very deep, narrow rock hole, whereas we found it only in crab holes.

SUBGENUS *CULICIOMYIA* THEOBALD

Culiciomyia Theobald, 1907: 227. Type-species: *Culex inornata* Theobald, 1907 (= *Cx. fragilis* Ludlow, 1903); Borneo.

Small to rather large mosquitoes with proboscis and tarsi unbanded; larvae with seta 4-X usually 8 tufted and strong apical spicules on saddle.

FEMALE. *Head.* Eyes contiguous above. Vertex with broad scales at least on eye margin, usually also on lateroanterior part; erect forked scales over almost entire vertex; 5-8 vertical and 2 temporal bristles on each side, a row of several rather stiff bristles below temporals along eye. Antenna longer than or as long as proboscis; flagellomere 1 1.1-1.4 length of Flm 2. Palpus dark scaled, 0.17-0.25 of proboscis; Flm 4 lacking or minute. Proboscis as long as to a little longer than forefemur, dark scaled, without pale band, with several, usually 4, ventrobasal bristles. *Thorax.* Anterior pronotal lobe unscaled or with only a few broad scales; posterior pronotal lobe with scattered narrow scales, and bristles along margin around posterodorsal corner. Scutum densely covered with narrow scales, appearing smooth; acrostichal bristles absent except one to a few anterior pairs, all the other scutal bristles present, but those of fossal area usually few. Pleura often with only a few indistinct translucent broad scales on sternopleuron, and occasionally a few broad scales on upper mesepleuron, otherwise unscaled; 1,2 lower mesepimeral bristles present. *Wing.* Vein scales dark; m-cu usually well proximad of r-m, occasionally in line (varying individually in *pallidothorax*); 1a ending at level from m-cu to r-m. *Legs.* Tarsi unbanded; foretarsomere 5 usually shorter than, rarely as long as, 4; hindtarsomere 1 1.03-1.11 length of tibia. *Abdomen.* Laterotergite unscaled; III-VII usually with pale basal bands in species of this region. Seminal capsules 3.

MALE. Antennal flagellum shorter than proboscis; flagellomere 12 shorter to longer than Flm 13, both shorter (0.73-0.97) than 1-11. Palpus longer (1.03-1.34) than proboscis; segment 3 with a row of outstanding medially broadened lateroventral setae; 4 distinctly shorter than 5, both more or less bristled. Proboscis longer than forefemur, dark scaled, without pale band, with false joint at about middle and a number of rather long bristles just ventrally proximad of the joint, bearing several undifferentiated ventrobasal bristles. Cell R_2 shorter to longer than vein r_{2+3}, 1a ending proximad to distad of m-cu. Foretarsomere 4 shortened; 5 moderately modified, longer than 4, with 2 pairs of short curved setae at apex of ventrobasal swelling and one or 2 straight setae laterally, with a pair of short curved setae midventrally but without processes; midtarsomere 4 and 5 not modified. Anterior claw of fore- and midtarsi longer than posterior claw, with blunt tipped median tooth, posterior claw with sharp laterobasal tooth. *Genitalia.* Tergum IX with lobes poorly differentiated, widely separated and bristled. Sternum IX without bristles. Basistyle basally swollen, unscaled; subapical lobe at about apical 0.33, moderately to strongly protrudent, hairy on mesodistal surface, with 3 rods (α, β and γ), mesal leaflet (δ) and lateral leaflet (ϵ), occasionally with a few median weakly modified setae (μ) between δ and ϵ, and rather many stiff lateral setae; α more or less mesoproximally removed; ϵ and χ often difficult to discriminate from lateral

stiff bristles. Dististyle somewhat sigmoid, with or without a crest of spines on convex side near apex, with one short seta on concave side and at least one on convex side near apex. Paraproct with apical crest consisting of many slender bristle-like tergomesal spines and fewer stout sternolateral ones; basal sternolateral process well developed. Aedeagus composed of a pair of lateral pieces; tergoapical division of each piece a horn-shaped, tergally denticulate structure connected with the other by subbasal bridge; lamellose sternobasal division not very large.

LARVA. *Head.* Seta 1-C slender, pale, shorter than distance between bases; 2-C usually present, minute; 4-C anteriad of 7-C; 5, 6-C well developed, posteriad of 7-C; 16, 17-C present, stiff, minute. Antenna long, spiculate; 1-A well developed, inserted at basal 0.4-0.7; 2, 3-A subapical. Mouth brush of fine numerous hairs. *Mandible* with needle-like microspines dorsolaterally proximad of middle; 5 mandibular spurs. Mandibular brush well developed. Mandibular comb of spiculate prominences, spicules usually stronger than in *Lophoceraomyia*, each with 2 long filamentous spicules. Cutting organ small, with both dorsal teeth simple; ventral tooth with one spiniform lateral denticle (VT-4) and 3 triangular mesal denticles (VT_{1-3}), VT_3 occasionally modified; 1 or 2 mesal accessory denticles dorsoproximad of VT_3; ventral blade single or double, VB_1 far extending beyond apex of VT_0, with mesal pectination; pectinate brush of laterally or bilaterally pectinate hairs. Piliferous process well protrudent, apically cleft; labula moderately extending beyond apex of anterior part. Mandibular hairs divided into 2 groups, hairs of distal group basally barbed. *Maxilla.* Cardo rather narrowly to broadly fused mesobasally with cranium, thickened anterior margin reaching point of fusion, but not extending onto cranium; cardinal seta 1-Mx moderately developed. Mesostipes a little longer than wide, usually with one or a few rather thickened pectinate spicules on mesal margin near base; stipital sensoria double, equal, with apically divided basal ring, located at middle or distad of it; ventral stipital seta 4-Mx slender; pseudoartis developed, but not fused with cranium. Lacinia with proximal lacinial seta 5-Mx at or distad of level of stipital sensoria; distal lacinial seta 6-Mx slender, similar to 4-Mx. Palpostipes short, excluding lateral artis 0.25-0.33 length of mesostipes, basally broadened, not ventrobasally fused with mesostipes; lateral artis well developed; apex with ampulla and 5 palpal sensoria. *Mentum plate* somewhat pentagonal, with many (26-38) small teeth, median tooth a little larger, lateral flanking teeth larger and more widely separated apically than mesal flanking teeth, or all flanking teeth subequal. Aulaeum without median tooth. *Thorax.* Seta 3-P shorter than 1, 2-P; 12-P longer than 9, 10-P. *Abdomen.* Setae 6-I-VI, 7-I, and 1-IV, V strong. Comb scales numerous, in a patch, fringed apically with longer spicules and laterally with shorter spicules. *Siphon* moderately to very long; pecten basally restricted; each tooth usually with several subequal ventral denticles, sometimes many; 1-S distad of pecten, of 3-5 subventral pairs; 2-S subapical. *Saddle* with conspicuous spicules on apical margin; 2, 3-X usually single; 4-X usually 8, rarely 9 or 10 cratal tufts.

DISTRIBUTION. Japan and Korea. Oriental, Australian and Ethiopian regions. Western Pacific islands.

KEYS TO SPECIES OF *CULEX (CULICIOMYIA)*

FEMALE ADULT

1. Thorax without definite dark patch from posterior pronotal lobe to upper mesepimeron; cell R_2 less than 2.0 length of vein r_{2+3}. *ryukyensis* (p. 217)

   Thorax with dark patch from posterior pronotal lobe to upper mesepimeron; cell R_2 often more than 2.0 length of vein r_{2+3}. 2

2(1). Upper mesepimeral patch blackish brown, well defined, darker than posterior-pronotal and other pleural dark areas. *nigropunctatus* (p. 220)

   Upper mesepimeral patch brown, ill-defined, paler than posterior-pronotal or other pleural dark areas. . . . . *pallidothorax* (p. 223) *kyotoensis* (p. 226) *sasai* (p. 228)

MALE ADULT

1. Dististyle without crest of spines; specialized setae of palpal segment 3 very short. . . . . *ryukyensis* (p. 217)

   Dististyle with a crest of spines; specialized setae of palpal segment 3 long, outstanding. 2

2(1). Subapical lobe of basistyle with only 2 weakly modified setae laterad of ϵ; δ broad, foliate; dististyle with several short setae in basal half. *nigropunctatus* (p. 220)

   Subapical lobe of basistyle with 7 or more weakly modified setae laterad of ϵ; δ narrow; dististyle without setae in basal half. 3

3(2). Subapical lobe of basistyle with ϵ foliate, striated. *pallidothorax* (p. 223)

   Subapical lobe of basistyle with ϵ setiform, simple, difficult to discriminate from other lateral setae. 4

4(3). Palpus longer than proboscis usually by slightly more than length of segment 5; cell R_2 usually more than 2.0 length of vein r_{2+3}. *kyotoensis* (p. 226)

   Palpus longer than proboscis usually by less than length of segment 5; cell R_2 usually less than 1.7 length of vein r_{2+3}. . . . *sasai* (p. 228)

LARVA

1. Siphon with false joint (a narrow unsclerotized band), index over 9. *nigropunctatus* (p. 220)

   Siphon without false joint, index less than 9. 2

2(1). Siphon markedly inflated in middle; pecten of 10 or fewer teeth. *pallidothorax* (p. 223)

   Siphon not inflated in middle; pecten of 11 or more teeth. 3

3(2). Siphon with 3 pairs of 1-S. . . . . *ryukyensis* (p. 217)
Siphon with 4 or more pairs of 1-S. 4

4(3). Saddle not emarginate; siphon index 6.1 or more; seta 1-S weak, shorter than siphon diameter at insertion, usually single or double; 13-C usually with 6 or more branches. . . . . *kyotoensis* (p. 226)
Saddle emarginate near seta 4-X; siphon index 5.8 or less; 1-S moderately strong, usually about length of siphon diameter at insertion, usually with 3 or more branches; 13-C usually 2-4 branched. *sasai* (p. 228)

44. *CULEX (CULICIOMYIA) RYUKYENSIS* BOHART
(Figs. 65, 66, 201; Table 79)

Culex (Culiciomyia) ryukyensis Bohart, 1946: 41 (♂, ♀, L). Type-locality: Chizuka, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 201). Wing length 3.0-3.9 mm. *Head.* Vertex covered with pale bronze-yellow narrow curved scales and numerous grayish brown erect forked scales; eye margin bordered with broad pale scales except at middle; tempus covered with broad pale scales; 5, 6 vertical and 2 temporal dark bristles on each side, followed by a few yellowish bristles down to underside of head. Clypeus brown. Antenna: pedicel tawny yellow, with a few minute hairs and small scales mesally; flagellum 1.12-1.21 (4) length of proboscis; flagellomere 1 1.18-1.24 length of Flm2. Palpus 0.21-0.25(4) length of proboscis; segment 3 3.04-3.28 length of 2; minute 4 occasionally present. Proboscis 1.02-1.11 (4) length of forefemur. *Thorax.* Pronotal integument brown or pale brown, often with a greenish tinge; anterior lobe with a few loosely set, gray rather broad scales and bearing more than 10 bristles of various sizes; posterior lobe with several dark narrow curved scales on dorsal margin and bearing 5-7 bristles along margin around dorsoposterior corner, posterior 3 of them usually long. Scutum with integument brown, covered with grayish brown narrow curved scales; acrostichal bristles reduced to 4-6 dark anterior bristles; 2-5 humerals, 1-4 angulars and one or 2 posterior fossals, sometimes a few bristles in fossal area near anterior dorsocentral series. Scutellum with scales similar to those of scutum, bearing 4 (rarely 5) long dark bristles on each lateral lobe and 6-8 on median lobe, usually with a few additional fine bristles on each lobe. Pleural integument pale brown, often with a greenish tinge; propleuron, postspiracular area, lower prealar knob and anterior sternopleuron darker and concolorous to posterior pronotal lobe, but not forming a definite integumental patch; a few pale rather broad scales on upper mesepimeron; about 10 or more propleural bristles, many of them dark; 7-12 prealars, nearly 20 sternopleurals along upper to posterior margin, 8-15 fine upper mesepimerals, one stout lower mesepimeral. *Wing.* Cell R_2 1.29-1.96 length of vein r_{2+3}; base of M_{1+2} proximal to that of R_2. Halter knob covered with dark gray scales. *Legs.* Forecoxa covered with dark gray scales; mid- and hindcoxae with a few gray or pale scales. Posteroventral surface of forefemur, greater part of posterior surface of midfemur, and hindfemur, excepting dorsal surface, pale scaled; femora otherwise, tibiae and tarsi dark scaled. Hindtarsomere 1 1.06-1.10 length of tibia. *Abdomen.* Tergum I with a median spot of dark scales; II dark scaled; III-VII dark scaled and with basal bands of pale ochreous scales; VIII and sterna pale scaled.

MALE (Figs. 65, 201). Wing length 2.6-3.2 mm. Antenna: flagellum 0.82-0.90 (4) length of proboscis; flagellomere 12 0.78-0.95 length of Flm 13, both 0.90-0.97 of Flm 1-11. Palpus 1.03-1.08 (4) length of proboscis (longer by less than 0.5 length of segment 5); 3 with 3-5 short, medially widened, lanceolate setae; 4 and 5 moderately bristly; length ratio of 2-5: 1.05-1.24 : 1.92-2.21 : 0.68-0.71 : 1.00 (4). Proboscis 1.20-1.23 (4) length of forefemur, with an indistinct false joint at middle, median group of bristles not conspicuous. Cell R_2 0.78-1.17 (4) length of vein r_{2+3}; 1a ending at level of m-cu or between m-cu and r-m. Foretarsomere 5 2.00-2.07 (4) length of 4; hindtarsomere 1 1.11-1.14 (4) length of tibia. *Genitalia.* Tergum IX with each lobe bearing 5-12 rather long bristles. Basistyle bristled excepting a small area distal to subapical lobe on tergal surface; subapical lobe markedly produced, 0.33 or more of basistyle length, divided stepwise into 3 parts, each terminal bearing a rod; mesal rod (α) apicalmost, very stout, pigmented, median rod (β) equal to α in length and color; lateral rod (γ) basalmost, narrow, unpigmented, longer than β; δ subbasal and distalmost, narrow, hardly striated and a little sinuate; an apically curved seta (μ); just external to δ, ϵ basal, reduced to a weakly pigmented simple seta; 2-3 rather stiff bristles just external to ϵ; χ uncertain. Dististyle very wide, gently arcuate, about 0.6 length of basistyle, 4.0 as long as wide, with several short setae on convex side in apical 0.25 in addition to usual one on concave side; apex narrow, with a sharp hook opposite minute claw. Cercal tergal surface poorly sclerotized; cercal setae 2-4; paraproct well sclerotized, tergomesal spines of apical crest rather long and slender; basal sternolateral process clavate. Tergoapical division of aedeagus 1.41-1.49 (5) as long as wide, strongly sclerotized, subbasally expanded; each lateral piece apically tapering, with basal main denticle at about basal 0.33, and about 10 or more smaller distal denticles.

LARVA (Fig. 66). (Description based on specimens from Okinawa Island.) *Head.* Width: 1.03-1.17 mm; quite pale, 1.26-1.36 (x = 1.31) as wide as long; labrum straight or nearly so; setae 1-C curved mesad, separated by a little more than their length; 2-C mesad and a little cephalad of 3-C; 4-C slender, separated by 0.6 times their length, more prominently barbed when single; 5, 6-C usually triple, about 0.67 length of cranium; 13-C sparsely but strongly barbed; 14-C usually single. *Antenna* nearly straight, 0.62-0.79 mm long, quite pale, moderately spiculate except for midmesoventral aspect, spicules becoming sparser distad; 1-A inserted at basal 0.42-0.50 (x = 0.46), with about 17-22 strongly barbed branches, not reaching apex; 2, 3-A subequal, about 0.33 length of antenna, 4-A a little shorter. *Mandible* with a few dorsolateral microspines; MdS_3 shorter than MdS_2, slender; MdS_4 0.67-0.75 length of MdS_1. Mandibular comb of 9-12 spiculate prominences, each prominence with at least one stronger apical spicule and 2 long filamentous hairs located on mesal aspect; apical spicules becoming weaker on more lateral prominences. Cutting organ with VT_0 sometimes very shallowly cleft apically; VT-4 not reaching tip of VT_0; VT_3 more acute and slightly longer than VT_1 and VT_2, VT_4 may or may not be present (sometimes appearing as a basal denticle of VT_3); 1 or 2 prominent, weakly sclerotized accessory denticles, the more dorsal denticle fairly stout, apically bifurcate; if present, the more ventral denticle simple, acute; VB_1 with pectination on mesal margin moderately coarse and short; VB_2 nearly transparent, much shorter, mesal pectination more acute than on VB_1; pectinate brush of 10-14 bilaterally pectinate hairs. Mandibular hairs 10-14. *Maxilla.* Cardo rather narrowly fused with cranium mesobasally; seta 1-Mx weakly pigmented, longer and stronger than 4-Mx, nearly as long as palpostipes. Mesostipes about 1.33 as long as broad, bearing a few blunt

spines laterally distad of palpostipes; stipital sensoria at middle. Lacinia with 5-Mx distad of level of stipital sensoria; 6-Mx a bit longer than 4-Mx. Palpostipes with S_1 moderately slender; S_2 about 0.75 length of S_1; S_3 1.5 as large as S_1; S_4 subequal to S_2; S_5 very small. *Mentum plate* with 30-32 teeth, median tooth about 3 times as broad as adjacent flanking teeth, mesal 10-11 flanking teeth on each side subequal, blunt-tipped; more lateral teeth larger and more acute. *Thorax*. Integument apparently smooth at 400X; prothoracic setal formula: 2·1·2(1)·2·1·1·2·2; seta 2-P longer than, but definitely less strongly barbed than 1-P; 3-P 0.67 length of 1-P, but more strongly barbed; 8-P a little shorter and weaker than 7-P; 12-P longer than cranium, subequal to 5-P; 14-P usually single, occasionally with 1 or 2 small barbs; 5-M much shorter and weaker than 6-M; 12-M longer than 10-M; 2-T usually double; 7-T usually 6, 7 branched. *Abdomen*. Seta 1-I, II with branches occasionally abortive; 4-I somewhat fan-shaped; 5-I sometimes dendritic; 6, 7-I usually double, 6-I subequal to cranium, 7-I a little shorter; 9-II, 1-III, 12-III, V, 10-IV and 1-VII usually single; 1-III occasionally with a few small barbs; 6-III noticeably longer than 6-I, when double, dorsal branch longer than ventral branch; 6-IV usually triple; 6-V usually double, branches subequal; 3-VI usually tandem with, to a bit laterad of 2-VI; 1-VII quite variable in length; 8-VII usually 4 or 5 branched. Comb scales 32-52 (x = 41.6) in a broadly triangular patch, the individual scales paddle-shaped, fringed with spicules, the apical and subapical spicules much stronger than lateral spicules. *Siphon* pale yellowish brown, with an incomplete dark brown basal ring, slightly sinuate; length 1.47-1.74 mm, index 4.69-5.87 (x = 5.38); microsculpture consisting of small, elongate tubercles largely confined to apical 0.25, extending a bit more proximad on ventral aspect; pecten reaching basal 0.25-0.38 (x = 0.30), of 11-19 (x = 15.5) teeth, basal one or 2 teeth often reduced, apical one or 2 teeth usually somewhat detached, each tooth with 3-5 strong denticles ventrally; 3 pairs of 1-S, the most proximal tuft inserted beyond pecten at basal 0.36-0.49 (x = 0.42), the remaining tufts inserted at basal 0.61-0.77 (x = 0.68), and 0.84-0.89 (x = 0.86); 2-S 0.5 length of apical pecten tooth. *Saddle* 0.30-0.35 mm long; microsculpture consisting largely of short, transverse rows of spicules, becoming more prominent caudally, the caudal margin usually bearing 18-25 dark brown, distinctly larger spiniform teeth in 2, 3 irregular rows between seta 1, 3-X; 1-X 0.77-1.00 length of saddle; 4-X of 7-9 (usually 8) cratal tufts, each tuft 2-9 (usually 5-8) branched. Anal gills elongate, nearly parallel-sided, sometimesfusiform, dorsal gill 2.9-5.1 length of saddle, ventral gill usually 0.8 length of dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 6♂, 4♀; with associated skins (3 l, 3 p); 51 L, 4 l: Amami Guntô (I-0236, I-0237, I-0238, I-0240, I-0243, I-0244, I-0251, I-0285). 14♂, 21♀; with associated skins (10 l, 10 p); 47 L, 5 l: Okinawa Guntô (J-0513, J-0898, J-1132, J-1133, J-1206, J-1253, J-1256, J-1263, J-1291, J-2328, J-2329). 84♂, 72♀; with associated skins (9 l, 9 p); 48 L, 4 l: Yaeyama Guntô (K-0592, K-0601, K-0607, K-0610, K-0636, K-0667, K-0695, K-0700, K-0701, K-0732, K-0913, K-0916, K-0919, K-0924, K-0925, K-0930, K-0946, K-0979, K-1011, K-1026, K-1045, K-1058, K-1062, K-1065, K-1081, K-1106, K-1111, K-1113, K-1114, K-1126, K-1306, K-1308, K-1324, K-1467, K-2284).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô).

TAXONOMIC DISCUSSION. At present, *Cx. ryukyensis* appears endemic to the Ryukyu Archipelago, and is common throughout Amami, Okinawa and Yaeyama Guntô. In the larvae, some clinal geographical variations were

observed. The relative lengths and degree of barbing of many large body setae (e.g. 1-8-P, 5-7-M, 6-I-VI, 1-III-V, VII), though also subject to much individual variation, are larger in specimens from the southern part of the Archipelago than in those from the northern areas. The branching of setae 1-III and 1-S and the number of the pecten teeth from the 3 different areas are shown in Table 7.

TABLE 7. Variations of some larval characteristics in three populations of *Culex (Culiciomyia) ryukyensis*.

Character	Amami Ôshima (n = 6)	Okinawa (n = 16)	Yaeyama (n = 9)
Seta 1-III, % single	54.7 (n = 27)	76.4 (n = 45)	100.0 (n = 14)
Pecten teeth	11-18 (x = 14.7)	11-19 (x = 15.5)	16.21 (x = 18.6)
Seta 1-S			
proximal tuft	1-3 (x = 2.00)	2-3 (x = 2.10)	2-3 (x = 2.44)
middle tuft	1-2 (x = 1.73)	2-3 (x = 2.05)	2-4 (x = 2.78)
distal tuft	1-2 (x = 1.58)	1-2 (x = 1.90)	2-3 (x = 2.31)
total	1-3 (x = 1.76)	1-3 (x = 2.02)	2-4 (x = 2.51)

BIONOMICS. Common throughout the Ryukyu Archipelago except for Miyako Guntô. The larvae are found in a wide variety of places, such as ground pools, blocked streams, tree holes, crab holes and artificial containers; frequently in turbid water.

Feeding habits and disease relationships of the adults are unknown; but in general, members of the subgenus *Culiciomyia* are not of medical importance.

45. *CULEX (CULICIOMYIA) NIGROPUNCTATUS* EDWARDS (Figs. 67, 68, 202; Table 80)

Culex (Culiciomyia) nigropunctatus Edwards, 1926: 121 (*nom. nov.* for *Culiciomyia annulata* Theobald, 1907: 230 (♂, ♀). Type-locality: Kuching, Borneo). Bohart 1959: 197, Ishigaki Is. and Iriomote Is., Ryukyu Archipelago.

FEMALE (Fig. 202). Wing length 2.8-3.7 mm. *Head.* Vertex covered with pale yellow narrow curved scales in middle and numerous yellowish brown erect forked scales; eye margin bordered with broad pale scales; tempus and both sides of vertex densely covered with broad pale scales; 5, 6 dark vertical and 2 rather small dark temporal bristles on each side, followed by a few dark brown bristles down to underside of head. Clypeus brown. Antenna: pedicel yellowish brown, with a few mesal bristles and scales; flagellum 1.24 (2) length of proboscis; flagellomere 1 1.19-1.39 (4) length of Flm 2. Palpus 0.17-0.18 (2) length of proboscis; segment 3 2.29-2.66 (4) length of 2. Proboscis 1.09 (2) length of forefemur. *Thorax.* Anterior pronotal lobe with integument yellowish brown, with several rather broad pale scales, bearing more than 10 bristles of various sizes; posterior pronotal lobe with integument brown in upper 0.67, with narrow curved, dark brown scales on dorsal margin, bearing 3-7 bristles along margin around dorsoposterior corner. Scutum with

integument light brown, uniformly covered with narrow curved, brown scales; acrostichal bristles reduced to 3-5 dark bristles on anterior promontory; 3-5 humerals, one angular and one posterior fossal present. Scutellum covered with narrow curved, pale brown scales, bearing 4 (rarely 5) long, dark brown bristles on each lateral lobe and 6-10 on median lobe, with a few fine bristles on each lobe. Pleural integument brown to dark brown on propleuron, postspiracular area, lower prealar knob and cephalic middle sternopleuron; mesepimeron with a conspicuous blackish brown upper patch; pleura otherwise quite pale; only a few broad pale or gray scales loosely set on sternopleuron, a few pale scales on upper mesepimeron, these scales often lacking; about 10 or less propleural bristles and prealars, nearly 20 sternopleurals along upper to posterior margin, 5-13 upper mesepimerals, one lower mesepimeral. *Wing*. Cell R_2 1.86-2.88 (8) length of vein r_{2+3}; base of M_{1+2} about at level of that of R_2. Halter knob dark gray scaled. *Legs*. Forecoxa covered with dark gray scales on anterior side, mid- and hindcoxae with gray or pale scales. Posteroventral surface of forefemur, posterior surface of mid- and hindfemora, lower half of anterior surface of hindfemur and underside of tibiae pale scaled; femora, tibiae and tarsi otherwise dark scaled. Hindtarsomere 1 1.04-1.10 (4) length of tibia. *Abdomen*. Tergum I with a median spot of dark scales; II-VII dark scaled, with lateral margin pale scaled; III-VII each with a basal band of pale ochreous scales, the pale bands broadened toward posterior segments, sometimes a narrow apical band of pale ochreous scales present; VIII and sterna pale scaled.

MALE (Figs. 68, 202). Wing length 2.6-3.2 mm. Antenna: flagellum 0.87-0.93 (4) length of proboscis; flagellomere 12 1.06-1.20 (4) length of Flm 13, both 0.73-0.80 of Flm 1-11. Palpus 1.27-1.34 (4) length of proboscis (longer by a little more than length of segment 5); 3 with 5, 6 medially widened lanceolate setae; 4 with tufted numerous long bristles; 5 bristled; length ratio of 2-5: 1.00-1.07 : 1.58-1.87 : 0.61-0.71 : 1.00 (4). Proboscis 1.24-1.28 (4) length of forefemur, with an indistinct false joint at middle. Scutellar lateral lobes bearing 3 (rarely 4) long bristles. Upper mesepimeral bristles 4-9. Cell R_2 1.54-1.94 (4) length of vein r_{2+3}; 1a ending at or before level of m-cu. Foretarsomere 5 1.86-1.90 (3) length of 4; hindtarsomere 1 1.06-1.13 (4) length of tibia. Anterior claw of midtarsus slender and much longer than posterior claw. *Genitalia*. Tergum IX with each lobe bearing 6-14 medium-sized bristles. Basistyle bristled except for subapical area of tergal side; subapical lobe moderately protrudent, mesodistal margin with tufted hairs; α isolated, proximal to other specialized setae and close to mesobasal margin, moderately pigmented, just curved at apex, a little shorter than other 2 rods; β stout and pigmented; γ as long as and narrower than β, slightly pigmented; 3 rod-shaped stout setae (μ) of assorted lengths with rounded apex on mesal side of lobe; δ at base of lobe mediodistally, very wide, faintly striate; ϵ between γ and δ on lateral side of lobe, narrow, somewhat sigmoid, pointed and moderately pigmented; a seta similarly curved to ϵ laterad of it; χ moderately long, followed proximally by a row of several bristles distal to middle of basistyle. Dististyle curved, somewhat recurved at apex, about 0.67 length of basistyle, with a crest of 15 or more spines on convex side, bearing several setae in basal half and a short seta at about apical 0.33 on convex side, and another short seta more distally on concave side; apex with a small hook opposite claw of moderate size. Cercal tergal surface broadly but weakly sclerotized; cercal setae 1-3; spines of apical crest of paraproct strongly pigmented; basal sternolateral process noticeably developed and markedly pigmented; tergoapical division of aedeagus 1.14-1.26 (2) as long as wide, subbasally expanded; each lateral

piece with a large basal denticle together with 5-9 small distal denticles on tergomesal surface. Sternobasal division rather large.

LARVA (Fig. 67). *Head.* Width 1.14-1.22 mm; pale, 1.32-1.50 (x = 1.37) as wide as long; microsculpture indistinct except under oil immersion, consisting of short rows of minute spicules arranged in a polygonal pattern; labrum slightly concave; seta 1-C separated by about 1.25-1.50 times their length; 2-C cephalomesad of 3-C; 4-C separated by 0.6-0.7 times length; 5, 6-C usually triple, about 0.67 length of cranium; 10-C usually double; 13-C weakly barbed; 14-C usually single, occasionally bifid; 16, 17-C a little larger than in *pallidothorax* or *ryukyensis*. *Antenna* nearly straight, slightly inflated and strongly spiculate proximad of seta 1-A, 0.53-0.59 mm long; 1-A inserted at apical 0.31-0.38 (x = 0.34), with about 21-30 strongly barbed branches, each about 0.67 length of antenna; 2, 3-A at apical 0.10-0.12, each about 0.6 antenna length; 4-A a little shorter. *Mandible* with a few midlaterodorsal microspines; MdS_2 about 0.5 length of MdS_1; MdS_3 about 0.6 length of MdS_1; MdS_4 only a little shorter than MdS_1; MdS_5 about 0.67 length of MdS_3. Mandibular comb of apparently 10-13 spiculate prominences, each prominence also bearing 2 filaments, the longer filament 0.75-0.80 length of ventral blade, the other about 0.5 that length. Cutting organ with VT_0 deeply scalloped on midventromesal aspect; VT-4 occasionally apically bifid, not reaching tip of VT_0; VT_1 and VT_2 subequal, weakly sclerotized; VT_3 complex, apex divided into at least 4 or 5 distinct denticles; a weakly sclerotized accessory denticle contiguous with base of mesal dorsal tooth, this accessory denticle with tip unequally bifid, bearing a smaller basal denticle; ventral blade strongly arcuate, well pigmented, finely pectinate on mesal margin; pectinate brush of 8-9 bilaterally pectinate hairs. Mandibular hairs 10-14. *Maxilla.* Cardo rather narrowly fused with cranium mesobasally; seta 1-Mx at least 1.5 length of 4-Mx. Mesostipes about 1.33 as long as wide, bearing about 30-35 short, subacute to acute spines on dorsolateral aspect; stipital sensoria just proximad of middle of mesostipes; 4-Mx longer than in *ryukyensis*, lightly pigmented. Lacinia with all spicules slender; 5-Mx distad of stipital sensoria; 6-Mx a little shorter than 4-Mx. Palpostipes with S_1 moderately slender; S_2 slightly smaller; S_3 at least 1.5 as large as S_1; S_4 a little smaller than S_2; S_5 a little smaller than S_4. *Mentum plate* with 31-38 bluntly rounded to subacute teeth, the median tooth only about 1.5 times as broad as adjacent flanking teeth, the lateralmost 2 or 3 flanking teeth more acute, but not noticeably larger than others. *Thorax.* Integument apparently smooth; prothoracic setal formula: 1·1·1·2(1)·1·1·2(3)·2; seta 3-P definitely shorter than 1-P, but nearly as long as cranium; 14-P usually single; 1-M much larger than 1-T; 10-T rarely bifid. *Abdomen.* 1-I, II distinctly stronger than in other species of *Culiciomyia* of this region; 6-II with branches noticeably unequal; 7-II with barbing usually quite sparse but strong; 3-III, IV usually single; 6-III-VI very long, strongly barbed; 8-III-V, 13-VII and 5-VIII usually double; 3, 8-VI usually triple; 8-VII noticeably stiffer than 6-VII; 5-VIII moderately to strongly barbed. Comb scales 35-52 (x = 44.1) in a broadly triangular patch; individual scales somewhat elongate, fringed with spicules, the apical and subapical spicules noticeably longer than the lateral spicules. *Siphon* pale yellowish-brown, slightly darker apically, basal ring very dark; microsculpture of irregular transverse rows of small, widely spaced tubercles; length 2.45-2.90 mm, index 9.02-9.96 (x = 9.43); false joint at apical 0.36-0.41 (x = 0.38); pecten reaching basal 0.17-0.22 (x = 0.20), of 9-13 (x = 11.2) teeth, distal teeth more widely spaced, each with usually 9-12 ventrobasal denticles; 3 pairs of 1-S, most proximal pair inserted beyond pecten at basal 0.28-0.40 (x = 0.32), other rufts inserted at basal 0.48-0.54 (x = 0.52), and 0.83-0.90 (x = 0.87), most

distal tufts often double, sometimes triple, others usually single; 2-S 0.6 length of apical pecten tooth. *Saddle* 0.31-0.40 mm long; microsculpture consisting of short, transverse rows of needle-like spicules, the spicules enlarged on caudal margin between seta 1,3-X, more numerous but not as prominent as in *ryukyensis* or *pallidothorax;* 1-X 1.1-1.5 length of saddle, 2,3-X subequal, 5.0-6.0 length of saddle; 4-X of 7-9 (usually 8) cratal tufts, each tuft 4-8 branched. Anal gills elongate, bluntly rounded, 2.7-4.0 length of saddle, ventral gill usually 0.75-0.88 length of dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 12♂, 8♀, 10 L, 5 l: Yaeyama Guntô (K-0952, K-0956, K-0919, K-1114, K-1475, K-2310, K-2311).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô). TAIWAN. PHILIPPINES. HAINAN ISLAND. BORNEO. SUMATRA. JAVA. THAILAND. MALAYA. SINGAPORE. INDIA. SRI LANKA. PALAU ISLANDS. CAROLINE ISLANDS.

BIONOMICS. Apparently not common. Larvae are found in blocked streams, abandoned crab holes and rice paddies.

46. *CULEX (CULICIOMYIA) PALLIDOTHORAX* THEOBALD
(Figs. 68, 69, 203; Table 81)

Culex pallidothorax Theobald, 1905c: 32 (♂, ♀). Type-locality: India; Yamada 1932: 216, Honshu and Kyushu, Japan.

Culex (Culiciomyia) pallidothorax: Bohart and Ingram, 1946b: 75, Nago, Taira, Chizuka, Hentona, Nakasoni and Kochiya, Okinawa Is.; Ie Is.; Henza Is.; Takabanare Is.; Hamahika Is., Ryukyu Archipelago; LaCasse and Yamaguti 1950: 182 (♂, ♀, L).

Descriptions based chiefly on specimens from Taiwan.

FEMALE (Fig. 203). Wing length 3.6-3.8 mm. *Head.* Vertex covered with pale narrow curved scales; eye margin with broad pale, scales; tempus covered with broad pale, scales, with grayish brown scales above; 5-8 dark vertical and 2 dark temporal bristles on each side. Clypeus dark brown. Antenna: pedicel pale brown, rather dark on mesal surface, with a few minute bristles; flagellum 1.05-1.06 (1) length of proboscis; flagellomere 1 1.12-1.15 length of Flm 2, with small mesobasal scales. Palpus 0.24 (1) length of proboscis; segment 3 2.9-3.0 of 2. Proboscis 1.14 length of forefemur. *Thorax.* Pronotal integument brown; anterior lobe unscaled, with about 10 or more brown bristles; posterior lobe with upper margin often appearing paler, with grayish brown narrow curved scales along upper margin, bearing 4,5 brown bristles along posterior margin. Scutum with integument brown or rather light brown, covered with brown or light brown narrow curved scales, scales around prescutellar space paler; scutal bristles brown; acrostichal bristles reduced to several anterior ones; fossal area with usually 2 bristles along humeral margin, 1,2 near scutal angle and 2,3 near posterior margin. Scutellum with scales similar to those around prescutellar space; 4,5 long brown bristles on each lateral lobe and 7 on median lobe, a few additional short bristles on each lobe. Pleural integument brown on upper subspiracular area, postspiracular area, narrow concave area between sternopleuron and prealar knob, midanterior sternopleuron and upper mesepimeron, otherwise pale; pleural bristles mostly pale brown, a few stout ones of propleurals and sternopleurals brown to dark brown, 7,8 propleurals, about 10 or less prealars, more than 10 sternopleurals,

7 to about 10 upper mesepimerals, one rather stout lower mesepimeral. *Wing.* Cell R_2 2.22-3.39 (5) length of vein r_{2+3}; base of M_{1+2} slightly proximal to that of R_2 or on same level. Halter knob with pale ochreous scales. *Legs.* Forecoxa covered with grayish brown scales on anterior surface; midcoxa with a patch of anterolateral pale gray scales; hindcoxa unscaled. Forefemur with posterior half of ventral surface pale; midfemur with lower margin of anterior surface and most of posterior surface pale, the pale area apically narrowed; hindfemur with lower half of anterior surface and most of posterior surface pale, the pale area of posterior surface apically narrowed; remainder of femora, tibiae and tarsi dark scaled. Hindtarsomere 1 1.04-1.11 (5) length of tibia. *Abdomen.* Tergum I with a median patch of brown scales; II-VII dark scaled, with mediobasal patch of pale scales on II, and complete basal bands of pale scales on III-VII, the bands progressively more developed on posterior segments. Sterna basally pale scaled, apically dark scaled.

MALE (Figs. 68, 203). Wing length 3.3-3.4 mm. Antennal flagellum 0.89-0.92 (1) length of proboscis; flagellomere 12 0.96-0.99 length of Flm 13, both 0.81-0.83 of Flm 1-11. Palpus 1.28-1.29 (1) length of proboscis (longer by about the length of segment 5), 3 with 6-8 medially broadened setae; 4, 5 and apex of 3 moderately bristled; length ratio of 2-5: 0.72-0.83 : 1.52-1.58 : 0.68-0.72 : 1.00. Proboscis 1.22 (1) length of forefemur. Cell R_2 1.43-1.92 (4) length of vein r_{2+3}; 1a ending before m-cu. Foretarsomere 5 1.82-1.90 (4) length of 4; hindtarsomere 1 1.08-1.15 (5) length of tibia. *Genitalia.* Tergum IX with each lobe bearing 4-11 bristles. Basistyle bristled over entire surface except for a narrow basal area, long bristles sternally and laterally; subapical lobe well protrudent, angulate at lower mesoapical corner, hairy on lower apical and mesal margins; α basalmost, shorter than and separated a little from β and γ; β and γ close together, equal in length; β stouter than γ, pigmented; δ moderately broad, rounded apically; 2 weakly modified setae (μ) close to δ; ϵ below γ on apical flank of the lobe, broad and striated, followed by 2 or 3 striated setae and 8-15 aggregated, rather long, stout bristles; χ indistinguishable from these bristles. Dististyle about 0.7 length of basistyle, sigmoid, with a crest of about 10 or more acute spines on convex side; claw short, unpigmented. Cercal tergal surface weakly sclerotized; 3-5 cercal setae. Aedeagus with tergoapical division 1.24-1.35 (4) as long as wide; each lateral piece elongate, very narrow apically in tergal view, with 9-11 tergal denticles in addition to the basal main denticle which is distinctly larger than others.

LARVA (Fig. 69). *Head.* Width 1.24-1.33 mm; yellowish to light brown, 1.34 to 1.54 (x = 1.43) as wide as long; labrum straight to very slightly concave; seta 1-C separated by about 1.5 their length; 2-C nearly directly mesad of 3-C; 5, 6-C 0.50-0.67 length of cranium; 7-C less than half length of cranium; 8-C usually double; 14-C usually single; 15-C forked at basal 0.33. *Antenna* nearly straight, 0.7-0.8 mm long, mostly pale, slightly darker apically, sparsely spiculate except for mediomesoventral aspect, spicules less frequent distad of seta 1-A; 1-A inserted at basal 0.46-0.52 (x = 0.49), with 17-21 strongly barbed branches, about reaching apex of antenna; 2, 3-A subequal, 0.25-0.33 length of antenna; 4-A a little shorter. *Mandible* with a very few laterodorsal microspines; seta MdS_2 less than 0.5 length of MdS_1; MdS_3 lightly pigmented, shorter than MdS_2; MdS_4 about 0.75 length of MdS_1, lightly pigmented, MdS_5 about length of MdS_2. Cutting organ with VT-4 nearly attaining apex of VT_0; VT_3 a little longer and more acute than $VT_{1,2}$; 2 weakly sclerotized accessory denticles mesad of the dorsal teeth, the more dorsal denticle bifurcate at apex, the more ventral denticle simple, sharp to bluntly

rounded; VB_1 exceeding tip of VT_0, pectination on mesal margin moderately coarse; VB_2 much smaller, about reaching level of VT_2, mesal pectination more acute than on VB_1; pectinate brush of 8-10 bilaterally pectinate hairs. Mandibular hairs (5-6) + (5-7), 10-13 in total. *Maxilla*. Cardo broadly fused mesobasally with cranium; seta 1-Mx a little longer than 4-Mx. Mesostipes about 1.25 as long as broad; lateral surface smooth; stipital sensoria slightly proximad of middle. Lacinia with slender spicules only; 5-Mx a little distad of stipital sensoria. Palpostipes with S_1 about 1.5 length of S_2; S_3 only a little longer than but much stouter than S_1; S_4 a little shorter than S_2; S_5 shortest. *Mentum plate* with 30-32 teeth, the apical tooth triangular, about 3 times as wide as adjacent flanking teeth, the flanking teeth becoming progressively larger laterally. *Thorax*. Integument apparently smooth; prothoracic setal formula: 2·1·2(3)·2·1·1·2(3)·2(3); seta 2-P longer than 1-P, but more weakly barbed; 3-P much shorter than 1,2-P, more strongly barbed than 1-P; 7,8-P usually double; 9,10-P subequal, slender, relatively short; 12-P subequal to 2-P; 7-M noticeably shorter than, but more strongly barbed than 6-M; 2-T usually triple; 10-T longest thoracic seta, at least 1.75 length of cranium. *Abdomen*. Integument apparently smooth (an occasional specimen showing faint traces of microspicules at 400X); seta 5-I frequently dendritic; 6-I strong, subequal to cranium; 7-I a little smaller than 6-I; 7-II with barbs sparse but strong; 6-III much longer than 6-I, II, about 1.5 length of cranium; 1-IV, V very long; 6-IV usually double, quite variable in length; 1-VII about length of 6-II, lightly to moderately barbed; 5-VII usually double; 6-VII usually not dendritic; 5-VIII a little weaker than 1-VIII, lightly to moderately barbed. Comb scales 35-53 (x = 43.2) in a broadly triangular patch, the individual scales elongate, slightly broadened apically, apically and laterally fringed with spicules, the apical spicules only a little larger than the lateral spicules. *Siphon* yellowish, except for very dark basal ring, markedly inflated in middle, maximum diameter 1.3-1.5 of basal diameter, apical diameter about 0.25 of maximum diameter; length 1.81-1.93 mm, index 5.03-5.82 (x = 5.45); pecten reaching basal 0.29-0.41 (x = 0.36), of 6-10 (x = 7.5) teeth, with basal 1,2 teeth often reduced, becoming longer and more widely spaced distad, the larger teeth with 3,4 strong ventral denticles; usually 4, rarely 5 pairs of 1-S, the subapical tuft only slightly out of line, the most proximal tuft just distad of the pecten, at basal 0.40-0.48 (x = 0.44), the remaining tufts inserted at basal 0.51-0.64 (x = 0.58), 0.70-0.81 (x = 0.75) and 0.83-0.91 (x = 0.88); 2-S strongly bent near base, about 0.5 length of apical pecten tooth. *Saddle* 0.36-0.40 mm long; microsculpture consisting of short, transverse rows of caudally directed spicules, becoming more prominent dorsocaudally, culminating in 1 to 2 rows, usually totaling 10-15 acutely triangular teeth, between the bases of 1,3-X; 1-X 0.6-0.8 length of saddle; 4-X of 8-10 (usually 8) cratal tufts, each tuft 8-15 branched, 1.00-1.67 length of saddle. Anal gills fusiform, dorsal gill 2.2-3.1 length of saddle, ventral gill about 0.67 length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1 L: Kyushu (Takachihokyo, Miyazaki Pref., 20 X 1964, Kamimura, KKCOL). TAIWAN. 5♂, 5♀, 20 L (5♂, 5♀, 5 L: Wushe, Nantou Hsien, 9 XI 1955, blocked stream, Lin & Chung; 3 L: Kentin, Pingtung Hsien, 14 IV 1970, man-made container, Mizusawa; 12 L: Neihu, Taipei Hsien, 1 XII 1973, blocked stream, Lien & Mizusawa).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Shikoku, Kyushu, Yakushima). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). TAIWAN. PHILIPPINES. SOUTH CHINA. INDOCHINA. MALAYA. THAILAND. BURMA. INDIA. NEPAL. SRI LANKA. MOLUCCAS. NEW GUINEA.

BIONOMICS. Apparently rare in Honshu, common in Kyushu. Larvae occur in polluted water in cement water tanks for garden irrigation or fire fighting, drums, barrels, bowls, tin cans, tubs and benjos; fewer collections were made from ground water; associated species include *Culex pipiens*, *Cx. tritaeniorhynchus*, *Cx. halifaxii* and *Aedes togoi;* females overwinter in moist sand caves (LaCasse and Yamaguti 1950).

Miyagi (1972b found some *pallidothorax* females to feed on chicks (11/70 = 15.7%) under laboratory conditions. No engorgement occurred on amphibian, reptilian or mammalian hosts which were provided.

47. *CULEX (CULICIOMYIA) KYOTOENSIS* YAMAGUTI AND LACASSE (Figs. 70, 71, 204; Table 82)

Culex (Culiciomyia) ryukyensis: LaCasse and Yamaguti, 1947: 119, Maizuru, Kyoto and Otsu, Honshu; Magasaki, Kyushu, Japan; LaCasse and Yamaguti 1950: 187 (♂, ♀, L).

Culex honjimaensis Sasa, et al. 1947: 153, Honjima, Kagawa Pref., Japan. *(nomen nudum).*

Culex (Culiciomyia) kyotoensis Yamaguti and LaCasse, 1952: 1 (♂, ♀, L). Type-locality: Japan.

Culex kyotoensis: Barrett, 1969: 16, Cheju Do, Korea.

FEMALE (Fig. 204). Wing length 2.8-4.6 mm. *Head.* Vertex with a large triangular median patch of pale narrow curved scales, the apex reaching eye at middle, with broad, pale scales near anterior margin, and with broad, pale scales on eye margin; numerous dark erect forked scales over entire vertex; tempus covered with broad, pale scales; 5, 6 vertical and 2 dark temporal bristles on each side, a row of several rather stiff bristles below temporals along eye margin down to underside of head. Clypeus dark brown. Antenna: pedicel yellowish brown, mesally dark brown, with several minute bristles and a few small scales; flagellum 1.00-1.24 (5) length of proboscis; flagellomere 1 1.18-1.26 length of Flm 2, with a few small scales mesally in basal half. Palpus 0.19-0.26 (4) length of proboscis; segment 3 3.00-3.35 of 2; 4 lacking or very small. Proboscis 1.02-1.07 (4) length of forefemur. *Thorax.* Pronotal integument rather dark brown; anterior lobe unscaled, with more than 10 dark bristles; posterior lobe dorsally with yellowish brown narrow curved scales, bearing 3-5 dark bristles along posterior margin, often with 1-4 additional fine bristles along posterodorsal to dorsoposterior margin (4-8 bristles in total). Scutum with integument brown, covered with narrow curved, grayish brown scales, scales on anterior and supraalar margins and prescutellar space somewhat paler; scutal bristles dark, acrostichals reduced to 1-3 (usually 2) anterior pairs, 1-3 humerals, 0-2 angulars and 1, 2 posterior fossals. Scutellum with scales similar to those of prescutellar space; median lobe with 5-10, each lateral lobe with 4 long dark bristles, each lobe with several additional fine bristles. Pleural integument rather dark brown on upper subspiracular area, postspiracular area, concave portion between prealar knob and sternopleuron, upper mesepimeron, propleuron and anteromedian sternopleuron; scales absent or occasionally a few translucent scales present on posterior sternopleuron; pleural bristles brown to pale brown, 6-10 propleurals, 4-10 prealars, more than 10 sternopleurals, 5 to more than 10 upper mesepimerals, usually one, rarely 2 lower mesepimerals. *Wing.* Cell R_2 2.50-4.59 (21; x = 3.44) length of vein r_{2+3}; base of M_{1+2} at level of or slightly distal to that of R_2. Halter

knob dark scaled. *Legs*. Forecoxa anteriorly dark scaled; midcoxa laterally dark scaled; hindcoxa unscaled. Fore- and midfemur posteroventrally pale toward base; hindfemur pale on both anterior and posterior surface ventrally, the pale area basally broadened, extending ventrally to apex, dorsal dark area almost reaching base; remainder of femora, tibiae and tarsi dark. Hindtarsomere 1 1.05-1.09 (6) length of tibia. *Abdomen*. Tergum I with a median patch of dark scales; II-VII dark scaled, apparently narrowly pale scaled on lateral margin; III-VII with basal bands of pale scales; VIII pale scaled. Sterna pale scaled.

MALE (Figs. 71, 204). Wing length 2.6-3.6 mm. Vertex in general with more broad scales than in female. Antenna: pedicel with a few minute bristles but without scales; flagellum 0.86-0.93 (7) length of proboscis; flagellomere 12 0.77-0.96 (8) of Flm 13, both 0.75-0.93 (8) of Flm 1-11. Palpus 1.24-1.30 (9) length of proboscis (longer than proboscis by slightly more than or just length of segment 5); 3 with 5-8 medially broadened modified setae; 4 and apex of 3 somewhat broadened; 4, 5 and apex of 3 with numerous bristles of medium length; length ratio of 2-5: 0.90-1.08 : 1.79-2.25 : 0.69-0.81 : 1.00. Proboscis 1.17-1.26 (5) length of forefemur. Cell R_2 1.78-2.59 (15; $x = 2.13$) length of vein r_{2+3}; 1a ending at or before level of m-cu. Foretarsomere 5 1.81-2.04 (9) length of 4. *Genitalia*. Tergum IX with each lobe bearing 2-11 rather short bristles. Basistyle bristled except for subapical area of mesal side; subapical lobe moderately protrudent, mesodistal angle hairy; α placed at a short distance from β and γ, distinctly shorter and more slender than β, poorly pigmented; β stout, long, curved at apex, pigmented, close to γ which is slender, subequal to β in length, curved at apex, poorly pigmented; δ at mesodistal corner of lobe, narrow, but wider and longer than α, not striated; a rather stout seta (μ) just laterad of δ; several short setae present on a lobe between rods and δ; 7-10 rather tufted stout setae laterad of β and γ, mesal 3-4 of them thicker and striated, ϵ and χ indistinguishable from these setae. Dististyle 0.67 length of basistyle, curved and a little recurved at apex, with a crest of 3-6 small spines on convex side near apex, with subapical short setae occasionally more than 2; apex with a small hook opposite claw, which is small but still longer than hook. Cercal tergal surface poorly sclerotized; cercal setae 2-4; basal sternolateral process fairly long, rather slender, pigmented. Tergoapical division of aedeagus 1.29-1.37 (5) as long as wide, subbasally expanded; each lateral piece very narrow apically in tergal view, with 4-9 denticles on tergomesal surface, basal main denticle distinctly larger than other denticles.

LARVA (Fig. 70). *Head*. Width 0.96-1.04 mm; pale yellowish-brown, 1.27-1.33 as wide as long; microsculpture virtually non-existent, consisting of a few very indistinct spicules; labrum slightly concave; seta 1-C curved mesad, separated by 1.25-0.33 their length; 5, 6-C usually triple, about 0.67 length of cranium; 7-C a little shorter, usually 6, 7 branched; 13-C usually 6, 7 branched, well barbed; 18, 19-C minute. *Antenna* slightly arcuate, 0.56-0.64 mm long, pale, slightly darker distad of seta 1-A, strongly spiculate, spicules sparser on midmesoventral aspect as well as distad of 1-A; 1-A about 0.6 length of antenna, inserted at basal 0.48-0.55 ($x = 0.50$), with 20 or more strongly barbed branches, exceeding tip of antenna; 2, 3-A about 0.43 length of antenna. *Mandible* and *maxilla* very similar to those of *Culex (Culiciomyia) sasai*, with the following exceptions: more lateral dorsal tooth much smaller than mesal dorsal tooth; VT_3 not noticeably larger than VT_1 or VT_2; basal denticle of VT_3 more prominent; pectinations on VB_1 small, relatively uniform; a number of rather thickened spicules of lacinia weaker. *Mentum plate* with 27-30 subacute teeth, the lateralmost teeth not quite as strong as in *sasai*. *Thorax*.

Integument apparently smooth; prothoracic setal formula: 2·1·2(3)·2·1·1·2·2(1); seta 1-M well developed, much larger than 2-M, subequal to 4-M. *Abdomen.* Seta 5-I sometimes semidendritic; 6-III usually (95%) single; 1-IV usually (90%) single, subequal to 1-V; 1-IV, V longer than 6-IV, V; 6-IV, V, 12-IV, 5-V-VIII, 3-VI, VII and 11, 13-VII usually double; 1-VIII sometimes with branches apically divided; 5-VIII usually double. Comb scales 28-45 (x = 35.4) in a broadly triangular patch, individual scales elongate, somewhat apically broadened, fringed with spicules, the apical spicules longer and stronger than the lateral spicules. *Siphon* somewhat sinuate, tapering gradually from base, yellowish-brown, paler apically, basal ring brownish, incomplete; microsculpture indistinct, apparently consisting of faint transverse rows of minute spicules, a few subacute tubercles on apicoventral aspect; length 1.44-1.67 mm, index 6.05-6.92 (x = 6.57), (length 1.65-2.04 mm (6), index 7.08-7.76, x = 7.42 (4), in specimens from Cheju do); pecten reaching basal 0.22-0.28 (x = 0.25), (basal 0.35 in one aberrant specimen), of 13-20 (x = 15.7) teeth (17-22, x = 19.2, in 6 specimens from Cheju do), each with 3-6 (usually 4) denticles, the apical 1-3 teeth somewhat detached, 1-4 basalmost usually greatly reduced; 4 pairs of 1-S all weak and shorter than siphon diameter at insertion, the most proximal tuft inserted beyond pecten at basal 0.30-0.42, (x = 0.36); the remaining tufts inserted at basal 0.43-0.68 (x = 0.56), 0.66-0.83 (x = 0.75) and 0.83-0.92 (x = 0.87) respectively; 2-S about 0.67 length of apical pecten tooth. *Saddle* 0.26-0.34 mm long; microsculpture of short, transverse rows of small spicules, most prominent on lateral aspect, the spicules becoming elongate caudad, culminating in about 20 greatly enlarged, acute teeth between 1, 3-X; 1-X 0.86-1.06 (x = 0.97) length of saddle; 4-X of 8 cratal tufts, each 2-8 branched. Anal gills elongate, somewhat fusiform; dorsal gill 2.2-3.4 length of saddle, ventral gill 0.8-0.9 length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 44♂, 44♀; with associated skins (58 l, 58 p); 39L, 55 l: Honshu (C-1820, C-1896, C-1897, C-1903, C-1955, C-2021, C-2104, C-2300, C-2303, D-0001, D-0021, D-0061, E-2190, E-2191, E-2247). KOREA. 5♂, 8♀, 6 L: Cheju Do (M-0846, M-0852, M-0854, M-0861, M-0862, M-0877).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Shikoku, Kyushu, Yakushima, Tsuchima). KOREA (Cheju Do). TAIWAN.

BIONOMICS. Rather common throughout the range; not occurring in high mountains. Larvae are found in a wide variety of containers including artificial ones, the water varying from clean to fairly strongly polluted; larvae also occur occasionally in ground waters, but apparently not in tree holes, however, LaCasse and Yamaguti (1950) recorded them in bamboo stumps. Associated species include *Anopheles lindesayii japonicus*, *An. sinensis*, and *Culex infantulus* in fresh water, with *Culex tritaeniorhynchus*, *Aedes japonicus*, *Ae. togoi* and *Ae. albopictus* in more or less polluted water (LaCasse and Yamaguti 1950). A few adult females (2.5%) fed on chicks but not reptiles, amphibians or mice in the laboratory (Miyagi 1972b).

48. *CULEX (CULICIOMYIA) SASAI* KANO, NITAHARA AND AWAYA
(Figs. 71, 72, 205; Table 83)

Culex (Culiciomyia) sasai Kano, Nitahara and Awaya, 1954: 14 (♂, ♀, L). Type-locality: foot of Mt. Fuji, Japan; Lee and Lee, 1975: 59, Korea.

FEMALE (Fig. 205). Wing length 3.2-3.9 mm. *Head.* Vertex covered with pale bronze-yellow narrow curved scales at middle and with numerous dark brown erect forked scales; scales on both sides of vertex rather broad, gray with yellowish or bluish tinge according to light; eye margin bordered with pale rather broad scales; tempus covered with broad pale ochreous or whitish scales; 5-7 dark vertical and 2 temporal dark bristles on each side, followed by a few dark or yellowish bristles down to underside of head. Clypeus brown. Antenna: pedicel yellowish brown, mesal surface darker, with a few minute hairs and scales; flagellum 1.15-1.25 (5) length of proboscis; flagellomere 1 with a few small scales, 1.09-1.24 (5) length of Flm 2. Palpus 0.22-0.27 length of proboscis; segment 3 2.81-3.85 of 2; 4 lacking or occasionally developed to a short segment 0.14 length of 3. Proboscis 0.97-1.08 length of forefemur. *Thorax.* Pronotal integument brown or rather dark brown; anterior lobe with a few loosely set broad, gray scales and bearing more than 10 to nearly 20 dark brown bristles; posterior lobe with several narrow curved, dark brown scales on upper margin and bearing 4-6 bristles along margin around posterodorsal corner, posterior 3 usually long. Scutum with integument brown, covered with narrow curved, bronze-brown scales which appear pale gray in some light; acrostichal bristles reduced to 3-6 dark ones on anterior promontory; 2-4 humerals, one or 2 angular and posterior fossals present. Scutellum covered with scales similar to but paler than those on scutum, bearing 4-6 long dark bristles on each lateral lobe and 6-8 on median lobe, a few additional fine bristles on each lobe. Pleural integument pale brown to dark brown on propleuron, postspiracular area, lower prealar knob, anterior middle sternopleuron and upper mesepimeron, otherwise quite pale; 10 or more propleural bristles, most of them dark brown; 6-10 prealars, nearly 20 sternopleurals, 7-13 upper mesepimerals, 7-13 upper mesepimerals, one or 2 lower mesepimerals. *Wing.* Cell R_2 2.17-3.13 (20; x = 2.55) length of vein r_{2+3}; base of M_{1+2} proximal to or at level of that of R_2. Halter with gray scaled knob. *Legs.* Forecoxa anteriorly covered with gray scales; midcoxa with pale or gray scales; hindcoxa usually without scales. Posterior surface of femora and anterior surface of hindfemur pale scaled, the pale area apically narrowed; remainder of femora, tibiae and tarsi dark scaled. Hindtarsomere 1 1.03-1.11 (5) length of tibia. *Abdomen.* Tergum I with a median spot of dark scales; II dark scaled; occasionally with a small mediobasal patch of pale scales; III-VII dark scaled, each with a basal band of pale scales; VIII and sterna pale scaled.

MALE (Figs. 71, 205). Wing length 2.5-3.5 mm. Antenna: flagellum 0.81-0.89 length of proboscis; flagellomere 12 0.81-1.04 length of Flm 13, both 0.77-0.87 of 1-11. Palpus 1.13-1.25 (12) length of proboscis (longer by less than length of 5); segment 3 with 5-8 medially broadened lanceolate setae; 4 and 5 bristled; length ratio of 2-5: 0.86-1.16 : 1.54-2.16 : 0.63-0.79 : 1.00 (12). Proboscis 1.19-1.27 (5) length of forefemur. Cell R_2 1.17-1.70 (20; x = 1.41) length of vein r_{2+3}; 1a ending at or before level of m-cu. Foretarsomere 5 1.69-1.95 (8) length of 4; hindtarsomere 1 1.06-1.11 (4) length of tibia. *Genitalia.* Tergum IX with each lobe bearing 7-13 bristles. Basistyle bristled except subapical area of mesal side; subapical lobe moderately protrudent, its mesodistal angle hairy; α proximalmost, more or less separated from β, shorter than other 2, stout, pigmented; β stout, curved at apex, pigmented; γ distalmost, subequal to β in length, slender, curved at apex, unpigmented; β and γ close together; δ on mesal edge of lobe, narrow, not striated, subequal to α in length; 2 short setae (μ) between rods and δ; ϵ and χ indistinguishable from 12-15 aggregated stout short setae just laterad of lobe, mesal 0.67 of these setae thicker than others. Dististyle 0.67-0.75 length of basistyle, strongly curved and

markedly recurved at apex, with a crest of 4-6 spines on convex side, apex sharply hooked opposite small claw. Cercal tergal surface poorly sclerotized; 2-6 cercal setae; basal sternolateral process pigmented. Tergoapical division of aedeagus 1.26-1.43 (7) as long as wide, expanded subbasally; each lateral piece slender apically in tergal view, with 6-13 tergomesal denticles, basal main denticle larger than other denticles.

LARVA (Fig. 72). (Description based on specimens from Mt. Fuji). *Head.* Width 1.16-1.27 mm; usually pale yellowish-brown, 1.22-1.40 (x = 1.29) as wide as long; microsculpture consisting of transverse rows of fine spicules, especially prominent cephalad of seta 4-C (easily visible at 100X); labrum straight to slightly convex; 1-C curved mesad, separated by 1.25-1.50 their length; 2-C well mesad and a little cephalad of 3-C; 4-C rarely lightly barbed, separated by 0.6-0.7 their length; 5, 6-C little more than 0.5 length of cranium; 11-C usually triple; 13-C occasionally lightly barbed; 14-C usually single; 16-C rarely double; 18, 19-C a little shorter and more slender than 16, 17-C. *Antenna* nearly straight, 0.63-0.76 mm long, strongly spiculate except on mesoventral aspect, the spicules becoming a little sparser and stouter distad of seta 1-A; 1-A inserted at basal 0.42-0.50 (x = 0.45), with about 18-25 strongly barbed branches, each slightly more than 0.5 length of antenna, usually not attaining tip of antenna; 2, 3-A slightly less than 0.33 length of antenna. *Mandible* with a small dorsolateral patch of moderately long microspines near base; MdS_3 very short, slightly curved; MdS_4 a little shorter than MdS_1. Mandibular comb of apparently 14-19 spiculate prominences, the lateralmost 3-5 prominences greatly reduced, the more mesal prominences also bearing at least 2 filamentous spicules, one much longer than the other. Cutting organ with lateral dorsal tooth only slightly smaller than mesal dorsal tooth; VT-4 nearly reaching tip of VT_0; VT_3 slightly longer than VT_1 or VT_2, sometimes with a minute basal denticle; an elongate, apically bifurcate accessory denticle ventromesad of dorsal teeth, apparently reaching level of VT_2; sometimes another, more ventromesad accessory denticle present; VB_1 slightly sinuate, coarsely pectinate on mesal margin, the pectinations blunt, of at least 2 different sizes; VB_2 much smaller, about attaining base of VT_2, acutely pectinate on apical half of mesal margin; pectinate brush of 7-11 bilaterally pectinate hairs, the mesalmost hair often reduced. One to several denticle-like structures on dorsal aspect between base of piliferous process and mandibular apodeme. Mandibular hairs (5-6) + (7-9), 13-14 in total. *Maxilla.* Cardo broadly fused with cranium mesobasally, seta 1-Mx darker than 4-Mx. Mesostipes about 1.20-1.33 as long as wide, lacking prominent spines or spine-like structures on dorsolateral aspect; stipital sensoria just proximad to middle of mesostipes; 4-Mx shorter than 5-Mx. Lacinia with a number of rather thickened spicules; 5-Mx distad of stipital sensoria. Palpostipes deeply rugose on mesal aspect, S_1 moderately slender; S_2 about 0.67 length of S_1; S_3 quite large, over 1.5 as long and nearly twice as thick as S_1; S_4 subequal to S_2; S_5 a little smaller than S_4. *Mentum plate* with 26-33 subacute teeth, the median tooth somewhat spearhead-shaped, over twice as broad as adjacent flanking teeth, the next 8-10 flanking teeth on each side gradually increasing in size laterad; the lateralmost 4-5 teeth usually much larger and more acute. *Thorax.* Integument apparently smooth; prothoracic setal formula: 2·1·2(1)·2·1·1·2(3)·2(1, 3); setae 3, 8-P definitely shorter than 1, 2, 5, 7-P, as well as cranium; 5-M usually single, noticeably shorter than 6, 7-M; 8-T sometimes with as few as 8 branches. *Abdomen.* Setae 2-I, 10, 12-III, 12-V, 1, 9-VI and 14-VII usually single; 1, 3, 5-II, 3, 5-III and 6-IV usually double; 5-VIII frequently (74%) double; 13-V usually triple; 7-IV occasionally dendritic when 7 or more branched; 1-V usually slightly shorter than

cranium, a little longer than 1-IV; 1-VII subequal to slightly shorter than 1-IV; 6-VII occasionally dendritic; 8-VII a little longer than 6-VII. Comb scales 27-48 (x = 40.8) in a broadly triangular patch, individual scales somewhat spoon-shaped, fringed with spicules, the apical spicules longer and slightly stronger than the lateral spicules. *Siphon* nearly straight, tapering gradually, pale brownish yellow, paler in apical 0.17, basal margin darker brown, incomplete; length 1.35-1.80 (x = 1.61) mm, index 4.61-5.79 (x = 5.02); microsculpture consisting of somewhat irregular transverse rows of minute tubercles, the tubercles becoming a little more prominent ventroapically; pecten reaching basal 0.28-0.38 (x = 0.33), of 12-19 (x = 16.1) teeth, each with usually 3-5 ventrobasal denticles; usually 4, rarely 5 pairs of 1-S, about length of siphon diameter at insertion, the basalmost pair usually inserted just distad of pecten at basal 0.35-0.48 (x = 0.41), other tufts inserted at basal 0.46-0.62 (x = 0.54), 0.60-0.79 (x = 0.70) and 0.81-0.89 (x = 0.85) respectively; 2-S about 0.67 length of apical pecten tooth. *Saddle* usually deeply emarginate laterally near seta 4-X, 0.35-0.39 mm long; microsculpture of short transverse rows of 3-10 small dark blunt spicules, the spicules becoming larger and more acute caudad, culminating in 15-25 greatly enlarged acute teeth between 1,3-X; 1-X 0.67-0.80 length of saddle; 4-X of 8-9 (usually 8) cratal tufts, each 3-7 branched. Anal gills elongate, tapering gradually from base, dorsal gill 3.0-3.7 saddle length, ventral gill 0.8-0.9 length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 222♂, 196♀, with associated skins (65 l, 65 p); 138 L, 36 l: Honshu (C-1544, C-1574, C-1581, C-1820, C-1821, C-2021, C-2104, C-2105, D-0002, D-0015, D-0018, D-0022, D-0748, D-0812, D-0813, D-0814, D-1200, D-1201, D-1202, D-1203, D-1204, D-1264, D-1265, D-1266, D-1278, D-1279, D-1280, D-1281, D-1578, D-1582, D-1583, E-1576, E-1695, E-1699). 2♀: Kyushu (H-0070). 1 L, 1 l: Yakushima (H-1824). KOREA. 10♂, 15♀, 2 L: Korean Peninsula (L-1491, L-2145).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Izu Shichito: Aogashima, Shikoku, Kyushu, Yakushima). KOREA (Korean Peninsula). TAIWAN.

TAXONOMIC DISCUSSION. The larval specimens from Mt. Ohdaigahara (1,300-1,600 m), Nara Prefecture, appear to differ in some respects from specimens obtained from the northwestern foot (1,100-1,600 m) of Mt. Fuji, and were not included in the above description. The principal differences observed are in the lengths of various body setae, index of siphon, and denticles of pecten teeth (Table 8). No significant differences were found in the adults of these 2 populations.

Despite the specific distinctness in the larval stage, the adults of *Cx. sasai* are quite similar to *kyotoensis* and *pallidothorax*. In the female, definite characters for identification were not detected. The overall body color including the integumental patch from the posterior pronotal lobe to upper mesepimeron is, in general, lightest in *pallidothorax*, darkest in *sasai*, and intermediate in *kyotoensis*, but the differences are slight and variation is considerable. Thus, it is always difficult to identify them by this character. Only the cell R_2 - vein r_{2+3} ratio and the relative position of the base of M_{1+2} to that of R_2 may serve for discrimination of these species in a limited degree (Table 9). In the male, *pallidothorax* may be easily identified by striated broad leaf-like modified seta ϵ of the subapical lobe of the genitalia. *Culex sasai* is almost identical to *kyotoensis* in the genitalia, but most specimens of these 2 species can be separated by the relative length of the palpus to the proboscis, and the R_2 - r_{2+3} ratio mentioned in the key and descriptions. Korean specimens of *sasai* showed a little larger value in the R_2 - r_{2+3} ratio in the male, viz., 1.41-1.89 (9; x = 1.57).

TABLE 8. Comparison of larval characteristics of two populations of *Culex (Culiciomyia) sasai*.

Character		Mt. Fuji (n = 20)	Mt. Ohdaigahara (n = 20)
Relative length to cranium	Seta 7-P	0.93-1.28 (x = 1.06)	0.86-1.06 (x = 0.92)
	Seta 8-P	0.67-0.92 (x = 0.76)	0.55-0.67 (x = 0.61)
	Seta 1-IV	0.62-0.97 (x = 0.78)	0.46-0.69 (x = 0.57)
	Seta 1-V	0.81-0.97 (x = 0.89)	0.51-0.83 (x = 0.67)
	Seta 1-VII	0.62-0.86 (x = 0.74)	0.43-0.67 (x = 0.57)
	Seta 12-IV	Always single	1-3 (x = 1.86; 1: 20%)
	Ventral denticles of pecten teeth	2-5 (57.1% with 4 or less denticles)	4-7 (45.0% with 5 or more denticles)
	Siphon index	4.61-5.79 (x = 5.02)	3.44-4.67 (x = 4.03)

TABLE 9. Comparison of wing characteristics of the females of *Culex (Culiciomyia) pallidothorax*, *Cx. (Cui.) kyotoensis* and *Cx. (Cui.) sasai*.

Character	*pallidothorax*	*kyotoensis*	*sasai*
Cell R_2 - vein r_{2+3} ratio	2.22-3.29 (n = 5)	2.66-4.59 (n = 20)	2.17-3.13 (n = 19)
x	2.69	3.44	2.55
Ratio more than 3.20	-	65%	0%
Ratio less than 2.50	-	0%	63%
Base of Cell M_{1+2} to base of cell R_2	At same level or slightly proximad	Distad or at same level	Proximad or rarely at same level

Chen (1974) published a key to the species of *Culex* from Taiwan, including *kyotoensis*, *pallidothorax* and *sasai*, using cibarial characters. In respect to these 3 species, he examined 5-14 specimens of each species from a single collection; thus wider variations may occur. However, his key may still deserve to be reproduced here.

1. Cibarial teeth 30 to 31 on the dorsal row; line of origin of teeth weakly convex in middle and somewhat concave toward lateral flanges; posterior hard palate relatively narrow, 30-33 μ wide. . . . . *sasai*
Cibarial teeth 34 to 40 on the dorsal row; line of origin of teeth strongly convex in middle and relatively concave toward lateral flanges; posterior hard palate evidently much more widened, 38-51 μ wide. . . 2

2(1). Lateral flange strongly sclerotized; clypeal phragma poorly developed; ventral papillae set close to ventral flange. . . . . *pallidothorax*
Lateral flange weakly sclerotized; clypeal phragma well developed; ventral papillae set near ventral flange. . . . . *kyotoensis*

These characters should be evaluated as to whether they could also be adopted to the Japanese populations.

BIONOMICS. Common from lowlands to mountainous regions. Larvae are found in a wide variety of natural and artificial containers including tree holes, rock holes, temporary ground pools, concrete and wooden tanks, barrels, tin cans, discarded boots, pails, discarded tires, vases, etc. Associated species include *Culex kyotoensis* in lowlands, and *Aedes japonicus* in mountains.

SUBGENUS *BARRAUDIUS* EDWARDS

Barraudius Edwards, 1921b: 332. Type-species: *Culex pusillus* Macquart, 1850; Egypt.

Rather small yellowish mosquitoes, the larvae occur in brackish water.

FEMALE. *Head.* Eyes contiguous above, moderately separated below. Vertex with narrow scales only; erect forked scales on posterior 0.67 of vertex; 4-6 vertical and 2 temporal bristles. Antenna longer than proboscis; flagellomere 1 1.3-1.4 length of Flm 2. Palpus about 0.2 length of proboscis, segment 4 undeveloped or minute. Proboscis unbanded, shorter than forefemur, with several unmodified ventrobasal bristles. *Thorax.* Pronotal lobes and scutum with narrow scales only. Posterior pronotal bristles arranged in a row along posterior margin. All scutal bristles present. Pleura with distinct scale patches; one lower mesepimesal bristle present. *Wing.* Crossvein m-cu well proximad of r-m; 1a reaching level between cubital fork and m-cu. Tarsi unbanded; foretarsomere 5 longer than or length of 4, hindtarsomere 1 distinctly shorter than tibia (about 0.75-0.80). *Abdomen.* Laterotergite unscaled. Seminal capsules 3.

MALE. Antennal flagellum shorter than proboscis; flagellomere 12 much shorter than Flm 13, both together shorter than Flm 1-11. Palpus longer than proboscis, slender, without long apical bristles. Proboscis shorter than forefemur, with false joint slightly proximad of middle, without long bristles at the joint; ventrobasal bristles not modified. Foretarsomere 4 shortened; 5 moderately modified, about twice as long as 4, with apparently 2 pairs of short curved setae on top of ventrobasal swelling, 3 pairs of rather stiff laterobasal setae, and one pair of ventral processes at about basal 0.25, each bearing a short curved seta. Midtarsomere 5 unmodified, shorter than 4. Anterior claw of fore- and midtarsi with a blunt-tipped median tooth, posterior claw with a sharp laterobasal tooth. *Genitalia.* Tergum IX narrow, poorly sclerotized, lobes poorly differentiated, widely separated, bristled. Sternum IX without

bristles. Basistyle cylindrical, laterally and sternally scaled; subapical lobe divided, each section bearing 1-3 rather short modified setae, homology of these modified setae not always certain. Dististyle simple. Paraproct with apical crest of numerous pigmented spines, some lateral spines stout, blunt-tipped; laterobasal process undeveloped. Aedeagus with sternobasal division large, well sclerotized; tergoapical division rather simple, composed of paired tergomesal and sternolateral processes.

LARVA. *Head.* Distinctly broader than long; seta 1-C slender, shorter than distance between bases; 5, 6-C well developed; 4-C posteriad of 7-C, short and slender. *Antenna* spinulate; seta 1-A distad of middle of shaft, with well developed barbed branches; 2-6-A close to apex. Mouth brush of fine numerous hairs. *Mandible* with a group of laterodorsal microspines; 5 mandibular spurs, MdS_1 longest, weakly pigmented; MdS_2 multiple, 0.6 length of MdS_1; $MdS_{3,4}$ similar to MdS_1 in shape, MdS_3 shorter and paler than MdS_4 which is subequal to MdS_1; MdS_5 pale, shortest, basally broadened. Mandibular ring distinct, on basal aspect. Mandibular brush well developed. Mandibular comb of about 10 spiculate prominences. Cutting organ with mesal dorsal tooth bearing denticles; ventral tooth with lateral denticle (VT-4) spiniform, not reaching apex of VT_0; 3 mesal denticles (VT_{1-3}) triangular; ventral blade (VB_1) apically slender, extending beyond apex of VT_0; VB_2 apparently undeveloped; pectinate brush well developed, the basal hairs laterally pectinate, the apical hairs bilaterally pectinate. Piliferous process well protrudent, shallowly cleft at apex, with labula extending a little beyond apex of broader anterior part, bearing the usual 5 hair groups. Mandibular hairs divided into 2 groups; hairs of distal group laterally barbed, basally spiculate. *Maxilla.* Cardo narrowly connected mesobasally with cranium. Mesostipes longer than wide, with spicules all slender, some unilaterally pectinate, arcuate mesobasal spicules also not very stiff; stipital sensoria each with a basal ring. Maxillary brush with approximately 15 very long simple slender hairs, other hairs also slender. Parartis with an ill-defined dorsobasal lamellose expansion. Pseudoartis undeveloped. Lacinia with all spicules slender. Palpostipes short; apex with ampulla and 5 palpal sensoria. *Mentum plate* a somewhat rounded triangle. Aulaeum with median tooth. *Thorax.* Seta 0-P and 13, 14-M dendritic; 3-P nearly length of 1, 2-P, single; 4-P long; 9, 10-P rather weak; 12-P strong. *Abdomen.* Setae 6-I-VI and 7-I strong; 13-II, VI dendritic. Comb scales numerous in a patch. *Siphon* straight; pecten moderately developed, teeth pale, slender, with slender ventral denticles; 1-S of 8-11 almost ventral setae in a zigzag row, basalmost 1-S within pecten; lateral or subdorsal setae absent. *Saddle* with seta 1-X shorter than saddle; 2-X with dorsal branch(es) shorter than ventral branch; 4-X of 11-13 cratal setae. Anal gills short.

DISTRIBUTION. Coastal areas of southern and eastern Palaearctic region. This subgenus is represented by a single species in this region.

49. *CULEX (BARRAUDIUS) INATOMII* KAMIMURA AND WADA (NEW STATUS)
(Figs. 73, 74, 206; Table 84)

Culex (Barraudius) modestus subsp.: Wada, Kamimura and Sasa, 1968: 120.
Culex (Barraudius) modestus inatomii Kamimura and Wada, 1974: 13 (♂, ♀, P, L). Type-locality: Utôma, Okayama Pref., Japan.
Culex (Barraudius) inatomi: Lee and Lee, 1975: 59, Kyong Ki Do, Korea (misspelling).

FEMALE (Fig. 206). Wing length 3.2-4.0 mm. *Head.* Vertex covered with yellowish brown narrow curved scales, those on eye margin paler; erect forked scales many, grayish brown; tempus covered with broad white scales; 4-6 vertical and 2 temporal dark bristles on each side. Clypeus brown. Antenna: pedicel light brown, mesal surface infuscate, with several small hairs and small pale scales; flagellum 1.16-1.18 (2) length of proboscis; flagellomere 1 1.25-1.44 (5) length of Flm 2, with small pale scales. Palpus 0.20-0.21 (4) length of proboscis, dark scaled above and pale scaled beneath; segment 3 1.56-2.14 (4) of 2; 4 absent or minute. Proboscis 0.89-0.94 (4) length of forefemur, dark scaled above, pale scaled beneath. *Thorax.* Pronotal lobes with integument light brown, roughly covered with narrow curved, yellowish brown bristles of different lengths; posterior lobe bearing 3-7 dark brown bristles along dorsoposterior margin. Scutum with integument brown, uniformly with narrow curved, bronzy brown scales, a few scales on supraalar and prescutellar margins paler; scutal bristles medium-sized, dark brown; 3-6 bristles on fossal area along humeral to sutural margin. Scutellar lobes covered with narrow curved, pale yellow scales, each lobe bearing 4-7 long dark bristles and several fine ones. Pleural integument light brown; patches of broad white scales on upper sternopleuron, posterior-lower sternopleuron and upper mesepimeron; 3-7 propleural bristles, 2 of them usually stout; 5-9 prealars, 7-9 sternopleurals along upper to posterior margin, 5-9 upper mesepimerals, 1 stiff lower mesepimeral. *Wing.* Veins dark scaled. Cell R_2 3.64-6.71 (5) length of vein r_{2+3}. Halter with pale scaled knob. *Legs.* Forecoxa with both dark and pale scales; mid- and hindcoxae with pale scales. Posterior 0.67 of ventral surface to posterior surface of forefemur, posterior surface of mid- and hindfemora, and lower anterior surface of hindfemur pale scaled, the pale anterior area of hindfemur apically narrowed, dorsal dark area usually reaching base; posterior surface of tibiae and of tarsomeres 1 with pale scales; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 slightly longer than or as long as 4; hindtarsomere 1 0.74-0.78 (5) length of tibia. *Abdomen.* Tergum I medially dark scaled, laterally pale scaled; II-VII dorsally broadly dark scaled, laterally pale scaled; VIII and sterna pale scaled.

MALE (Figs. 74, 206). Wing length 2.4-2.6 mm (reared examples). Antenna: flagellum 0.94-0.97 (4) length of proboscis; flagellomere 12 0.56-0.62 (4) of Flm 13, both 0.83-0.86 of Flm 1-11. Palpus 1.43-1.50 (3) length of proboscis (longer than proboscis by slightly more than length of segment 5), without long bristles excepting a few stiff medium-sized bristles at apices of 3, 4 and 5, ventrally pale scaled on 2-4, with a few pale scales ventrally at base of 5, dark scaled otherwise; length ratio of 2-5: 0.61-0.70 : 1.17-1.38 : 0.71-0.78 : 1.00 (4). Proboscis 0.88-0.95 (4) length of forefemur, with false joint at basal 0.42-0.44 (3). About 10 or less anterior pronotal bristles, 3-4 posterior pronotals, 2-4 propleurals, 3-6 prealars, 1-4 upper mesepimerals. Cell R_2 3.06-3.36 (4) length of vein r_{2+3}. Foretarsomere 5 1.86-2.05 (4) length of 4; hindtarsomere 1 0.74-0.80 (4) length of tibia. Abdominal segment VIII dark scaled. *Genitalia.* Tergum IX with each lobe bearing 3-7 medium-sized bristles. Basistyle cylindrical, laterally and sternally scaled rather sparsely, fairly evenly bristled laterally except basal part, bristles of mesal area smaller; subapical lobe relatively small, a little protrudent, at apical 0.33-0.40 of basistyle, divided into proximal and distal sections, each equal in size, bearing 2 rather short modified setae; proximal seta (α) of proximal section stout, bluntly pointed, distal seta (β) a little longer and broader than α, with blunter apex; distal seta of distal section in form of a narrow, faintly striate, somewhat pig-

mented leaflet; proximal seta rod-shaped, narrow, just hooked at apex; usually one seta, shorter than proximal seta, between them, its position and size variable, sometimes lacking; one or 2 accessory small setae sometimes present on distal section; often one seta placed between sections. Dististyle slender, arcuate, apically tapering, 0.51-0.58 (4) length of basistyle, pigmented, with 2 small setae, one on convex side at about apical 0.25 another on concave side near apex; claw 0.11-0.13 (4) length of dististyle, pigmented. Cercal tergal surface poorly sclerotized; cercal setae relatively large, 2-4 on each side; paraproct rather weakly sclerotized. Tergoapical division of aedeagus 1.00-1.29 (6) as wide as long; each lateral piece composed of a moderately sclerotized, long, pigmented, simple and smooth tergomesal process and a short unpigmented sternolateral process, apex of the latter smooth.

LARVA. *Head* (Fig. 73). Width 0.94-1.13 mm; 1.36-1.50 as wide as long; seta 1-C slender, about 0.67 length of distance between bases; 4-6-C distinctly posterior to 7-C; 4-C almost always single, extremely slender, well mesad and slightly anteriad of 6-C; 5-C usually triple, distinctly posteriad and slightly mesad of 6-C which is most frequently (68%) double; 10, 11, 14-C usually double. *Antenna* 0.48-0.62 mm long, 0.67-0.80 length of head, pigmented at base and in distal part, dorsally, laterally and ventrobasally spinulate on proximal part, laterobasally a few spinules on distal part; seta 1-A with about 30 barbed branches, inserted at apical 0.26-0.39 of shaft; 2-4-A pigmented, slightly barbed, subequal in length; 6-A pigmented, twice length of 5-A and 0.25 length of 2-A. *Mandible* with a laterodorsal group of a number of very fine simple microspines. Cutting organ with mesal dorsal tooth bearing a detached large mesobasal denticle and a very small median denticle; ventral tooth with VT-4 stout; VT1-3 progressively larger proximad; ventral blade with fine mesal pectination; pectinate brush 7-10 haired. Mandibular hairs (6-8) + (8-12), 16-19 in total (2). *Maxilla*. Cardo well sclerotized and pigmented; seta 1-Mx single, stiffer than usual for the genus. Mesostipes 1.4-1.6 as long as wide, with lateral surface smooth; stipital sensoria equal, somewhat proximad of middle; 4-Mx moderately long, slender, slightly pigmented. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes excluding lateral artis about 0.25 length of mesostipes; $S_3 > S_1 > S_4 > S_2 > S_5$ in length. *Mentum plate* with 11-13 rather large teeth. Aulaeum with median tooth simple, lightly pigmented. *Thorax*. Prothoracic setal formula: 1·1·1·1(2)·1·1·3(2)·2(3); usually, seta 4-P single, 7-P triple and 8, 14-P double; 14-P often with fine barbs; usually, 1-M single and 4-M double; 12-T often with long barbs, sometimes appearing 2 or 3 forked apically; 13-T somewhat stiff and stellate. *Abdomen*. Setae 9, 13-I, 3-II, 8, 12-III, 3-IV, 4, 11-VI, 11-VII and 1-X usually double; 14-V, VII, VIII, 7-VI and 0, 4-VIII usually single; 13-VII usually 4-branched; 6-II, IV, VI most frequently (74-79%) triple; 6-V usually triple. Comb scales 37-81 (x = 61.4) in a patch, individual scales broadly paddle-shaped, fringed laterally and apically with subequal spinules. *Siphon* poorly pigmented except basal margin, apically tapering, apex 0.64-0.78 as wide as base; length 0.74-1.00 mm, index 3.54-4.00 (x = 3.83); microsculpture of transverse rows of minute denticles; pecten reaching basal 0.27-0.36 (x = 0.31), of 9-14 teeth including 0-4 basal abortive ones, each tooth with several rather long and slender denticles; seta 1-S of 8-11 ventral, usually fairly evenly spaced setae, basalmost 1-S 6-12 branched, at basal 0.24-0.33 (x = 0.28), more often placed within pecten, others usually with more than 10 branches; 2-S at apex of siphon, upright, much shorter than apical pecten tooth. *Saddle* 0.31-0.46 mm; microsculpture of spiculiferous short ridges, the spicules becoming ventroapically free; 1-X weak, shorter than saddle; 2-X usually triple, dorsal 2 branches much

shorter than ventralmost branch; 4-X of 11-13 cratal tufts, each with 5-11 branches. Anal gills 0.6-1.1 length of saddle, ventral gill often slightly shorter.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 37♂, 35♀, with associated skins (2 l, 2 p); 29 L: Honshu (F-0227, F-0229, F-0230, F-0231).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu). KOREA (Korean Peninsula). MANCHURIA.

TAXONOMIC DISCUSSION. *Culex inatomii* was described as a subspecies of *modestus*. However, differences in the subapical lobe of the male genitalia appear to be sufficient to treat it as a distinct species. In *inatomii*, the subapical lobe is equally divided, the proximal section bears 2 modified setae (α, β); the distal section also with 2 modified setae, the proximal seta hooked at tip, the distal seta broad and leaf-like. We examined one male of *modestus* Ficalbi from the Ukraine in the collection of the BMNH. In this specimen, the subapical lobe is unequally divided, the proximal section larger and more strongly protrudent, bearing 3 modified setae (α, β, γ), the distal section with one thick seta. Figures given by Edwards (1921b), Martini (1931), Barraud (1934) and Gutsevich et al. (1970) are identical with this specimen or show a more slender seta of the distal section. The apex of the sternolateral process of the aedeagus is smooth in *inatomii*, somewhat shaggy in *modestus*. The male palpus is longer than proboscis by more than the length of segment 5 in *inatomii*, by the length of 5 in the male specimen from Ukraine, or less than it in a male from Saratov, USSR. Larval seta 4-P is single in 80% of *inatomii* (31 examined), while it is double in 91% of *modestus* (13 examined). Females of *modestus* were not available for study. One male from Manchuria (Keisharu) in the collection of the BMNH had genitalia identical with *inatomii*. One female from the same locality and 3 females from North China (Peking Distr.) in the collection of the BMNH are not different from *inatomii*. Mr. K.-W. Lee informed us that the male genitalia of Korean specimens were identical with those of *inatomii*.

BIONOMICS. In Japan, *Cx. inatomi* was found only at one locality, Utôma, Kurashiki City, Okayama Pref., Western Honshu, where the larvae occurred in pools of brackish water in a reedy field near the coast. Adult females bite man and livestock throughout the day and are attracted by light (Kamimura 1976b).

SUBGENUS *LUTZIA* THEOBALD

Lutzia Theobald, 1903: 155. Type-species: *Culex bigotii* Bellardi, 1862; Mexico.

Large brownish or dark mosquitoes; larvae with mouth parts modified for predation; siphon short, subequal to dorsally elongate saddle in length.

FEMALE. *Head.* Eyes contiguous above. Decumbent scales of vertex narrow, eye margin without broad scales, erect forked scales broadly over vertex. Antennal flagellum as long as or longer than proboscis. Palpus not more than 0.33 length of proboscis; segment 3 3.0 length of 2, or longer. Proboscis pale banded or entirely dark. *Thorax.* Anterior and posterior pronotal lobes with scales. All scutal bristles present. Pleura with patches of broad scales at least on propleuron, sternopleuron and mesepimeron; lower mesepimeral bristles 4-12, usually in a longitudinal row. *Wing.* Crossveins r-m

and m-cu very close. *Legs*. Foretarsomere 5 subequal to or distinctly shorter than 4. Hindtarsomere 1 equal to or slightly shorter than tibia. *Abdomen*. Laterotergite practically unscaled.

MALE. Antenna without modified hairs; flagellum shorter than proboscis. Palpus longer than proboscis, upturned and apically tapering, apical segments bristled or simple. Foretarsomere 4 shortened, 5 about 1.67 length of 4, modified, with 2-3 pairs of stout ventrobasal setae; midtarsomere 4 normal, 5 slightly shorter than 4, hardly modified, without stout ventrobasal setae; hindtarsomere 1 almost as long as tibia. Both claws of fore- and midtarsi toothed. *Genitalia*. Tergum IX a narrow transverse band, lobes at most weakly developed. Sternum IX without bristles. Basistyle without scales, subapical lobe located at apical 0.33-0.40, moderately protrudent, with 3 subequal rods (α, β and γ), without leaf-like setae. Dististyle simple, arcuate, apically tapering, not more than 0.5 length of basistyle, with 1 short seta on concave side near apex and several on convex side. Proctiger with cercal tergal surface weakly to moderately sclerotized; 3-10 cercal setae; paraproct with apical crest of numerous spines, the laterosternal spines blunt-tipped; basal sternolateral process short to long, poorly sclerotized, somewhat deformed. Aedeagus simple for the genus; tergoapical division of a pair of single sclerotized horn-shaped structures, connected by a subbasal bridge, expanded a little subbasally, apically divergent, with tergosubbasal prominent knobs; sternobasal division of paired, rather large, more or less pigmented lamellae connected with each other by a rather wide basal bridge.

LARVA. *Head*. Integument with strong microsculpture; seta 1-C slender, 3-C very fine, 4-7-C posteriad of antennal base, 5, 6-C single; 6-C posteriad of 5-C; 8-C well anteriad of 6-C; 12-C on level or anteriad of 13-C. Mouth parts modified for predation. Labral area strongly produced, hairs of mouth brush relatively few, stout and strongly pectinate. Antenna short, smooth; 1-A very fine, single, inserted in basal half. *Mandible* relatively narrow in basal half, without seta 1-Md; mandibular ring rather small, close to dorsal artis. Mandibular spur slightly removed dorsomesally from lateral margin, single, rather short, slender, barbed. Mandibular brush well developed, with hairs stout, sigmoid, laterally finely pectinate. Mandibular comb lacking. Cutting organ with 3-5 slender subequal dorsal spines not reaching apex of VT_0; only a single dorsal tooth developed, fairly strong, simple; ventral tooth very strongly developed, very dark, without lateral denticles, with 3 mesal denticles, $VT_{1,2}$ very short, with truncate apex, VT_3 very large, subpentagonal; a single ventral blade (VB_1) stout, not reaching apex of VT_0, with mesal pectination of rather strong closely spaced teeth; 3-4 modified scale-like hairs of pectinate brush, each with several apical spicules. Piliferous process rather small, moderately protrudent, shallowly cleft at apex; labula not extending beyond apex of anterior part; PPH_1 and PPH_2 each modified into a usually double tooth, $PPH_{3,5}$ reduced, PPH_4 a small ventrosubapical group of forked spicules. Mandibular hairs 9-14, in a single group, strongly barbed. *Maxilla* relatively small, with cardo, mesostipes and palpostipes coalesced, forming a single pentagonal sclerite, border of the conjunctions between cardo and mesostipes, and between mesostipes and palpostipes distinct but not forming a sclerotized internal ridge, that between cardo and mesostipes usually a narrow membrane. Cardo triangular, weakly sclerotized, mesal angle fused or articulated with a small cranial knob, with which the laterobasal angle (pseudoartis) of the mesostipes is also fused or jointed. Mesostipes trapezoidal, a little wider than long; lateroanterior surface narrowly sclerotized, with a number of tubercles; ventral surface anteriorly with some tubercles near mesal margin and about 10 xiphoid

spicules on mesal margin; twin equal short stipital sensoria on divided basal ring near anterior margin close to lacinial suture; dorsal stipital seta 2-Mx almost on anterior surface, extremely short, on a moderate-sized socket; ventral stipital seta 4-Mx near anterior margin. Lacinia occupying nearly mesal half of dorsal surface, with 2-3 spines on mesal margin just dorsoproximad of a group of xiphoid spicules, and a group of stout spicules anteriorly; proximal lacinial seta 5-Mx distal to middle; distal lacinial seta 6-Mx apparently absent; mesobasal angle moderately sclerotized, tergolacinial flexor muscle attached there; parartis undeveloped. Maxillary brush of numerous short stiff spicules, the dorsal and mesal spicules stronger and forked. Palpostipes shorter than mesostipes, apex slightly protrudent beyond anterior margin of mesostipes; lateral artis reduced; lateral stipital seta 2-Mx absent; 4 palpal sensoria (S_5 absent), ampulla present. *Mentum plate* with usually 9 strong very dark teeth, median tooth distinctly larger than flanking teeth. Aulaeum hairy, apically bifurcate. *Thorax*. Setae 1-3-P rather short, on a common sclerotized callus; most medium-sized to large setae with a basal callus. *Abdomen*. Setae 7-I,II nearly as strong as 6-I,II. Comb scales usually arranged in a patch, each evenly fringed apically and laterally with rather strong spicules. *Siphon* short (Old World species), with prominent acus, pecten and a characteristic ventral row of barbed setae; microsculpture strong. *Saddle* complete, much longer dorsally than ventrally, with microsculpture strong; setae 2, 3-X single; grid with lateral longitudinal bars broad and poorly sclerotized; 4-X on grid, more than 10, mostly branched hairs. Anal gills short.

DISTRIBUTION. Oriental, Australian, Ethiopean and Neotropical regions; southeastern Palaearctic region.

TAXONOMIC DISCUSSION. South American species of the subgenus *Lutzia* are different from the species of the Old World in having pale marked wing veins and pale banded tarsomeres; in the larvae, seta 6-C far anteriad of 5-C and on level of 4, 7-C; 11, 13-C approximated; mentum plate with median tooth bifid, the total number of teeth many more (14-18); siphon longer than saddle, with 1-S of smooth multibranched subventral setae. As stated by Belkin (1962), *Lutzia* may be a very ancient derivative of *Culex*. Its morphological modifications are more distinct than in the other subgenera of the genus. Though we follow the current treatment of *Lutzia*, we feel it more reasonable to consider *Lutzia* as a genus.

KEYS TO SPECIES OF *CULEX (LUTZIA)*

FEMALE ADULT

1. Palpus, proboscis and legs excepting basal area of femora almost entirely dark; prealar area without scales. . . . . *shinonagai* (p. 245)
   Palpus, proboscis and legs with pale scales; prealar area with a scale patch below knob. 2

2(1). Abdominal terga VII, VIII, and often VI entirely pale. . *fuscanus* (p. 240)
   Abdominal terga VI, VII always, and VIII usually with dark scales. *halifaxii* (p. 242)

MALE ADULT

1. Palpus without conspicuous, long apical bristles; paraproct without prominent cluster of denticles. . . . . *shinonagai* (p. 245)
Palpus with numerous conspicuous, long apical bristles. 2

2(1). Paraproct without prominent cluster of denticles. . . . *fuscanus* (p. 240)
Paraproct with a prominent cluster of denticles. . . *halifaxii* (p. 242)

LARVA

Comb scales 18-20, broadly paddle-shaped; pecten restricted to middle 0.33, teeth closely spaced, subequal, with ventral denticles. *shinonagai* (p. 245)

Comb scales more than 30, elongate; pecten extending nearly whole length of siphon, teeth rather broadly spaced, one or 2 apical teeth simple and strong. . . . . *fuscanus* (p. 240) *halifaxii* (p. 242)

50. *CULEX (LUTZIA) FUSCANUS* WIEDEMANN
(Figs. 74, 75, 207; Table 85)

Culex fuscanus Wiedemann, 1820: 9 (♂, ♀). Type-locality: India. Intermill 1970: 2, Okinawa Is., Ryukyu Archipelago.
Culex (Lutzia) fuscanus: Lee, 1971: 701, Namcheju, Cheju Do, Korea.

FEMALE (Fig. 207). Wing length 4.8-5.8 mm. *Head.* Vertex covered with narrow curved, pale yellowish scales and numerous long, dark erect forked scales, some of the forked scales in middle of vertex dirty yellow; tempus covered with broad pale scales; about 10 vertical and 2 or 3 temporal bristles on each side. Clypeus dark brown. Antenna: pedicel testaceous, mesal side infuscate, with minute hairs and small yellowish pale scales; flagellum 1.01-1.06 (3) length of proboscis; flagellomere 1 1.30-1.42 length of Flm 2. Palpus 0.26-0.27 (3) length of proboscis, dark scaled with scattered pale scales; segment 3 3.07-3.40 (3) of 2. Proboscis 1.02-1.07 (3) length of forefemur, with a very broad median band of pale scales which are also scattered on dark area, and often cover distal dark area. *Thorax.* Pronotal integument dark brown; anterior lobe with rather broad pale yellowish scales and bearing many dark and a number of yellowish brown bristles; posterior lobe covered with narrow curved, yellowish brown scales on anterior 0.67 and rather broad, creamy white scales on posterior 0.33, with many dorsal bristles. Scutum with integument dark brown, covered with narrow curved, bronze-brown scales and with rather indistinct patches of narrow curved pale scales, these patches are the anterior acrostichal, humerals, fossals, supraalars, posterior dorsocentrals and prescutellar; scutal bristles blackish brown. Scutellar lobes covered with narrow curved, pale yellowish scales, each bearing 8-17 long dark bristles together with a few short ones. Pleura with integument grayish brown, with patches of rather broad white scales on propleuron, lower flank of prealar knob, upper sternopleuron, posterior-lower sternopleuron, upper mesepimeron and anteromedian mesepimeron; more than 10 dark and a few yellowish brown

propleural bristles; more than 10 fine pale bristles on prealar knob, upper to posterior margin of sternopleuron and upper mesepimeron; a row of 6-12 mostly stout lower mesepimerals. *Wing*. Veins dark scaled; cell R_2 2.56-2.70 (2) length of vein r_{2+3}. Halter with dark knob covered with rather pale scales. *Legs*. Coxae with rather broad pale scales. Forefemur, tibiae and tarsomere 1 usually covered with pale scales on posterior to ventral surface; basal half or more of posterior side of mid- and hindfemora pale scaled; hindfemur with a streak of pale scales on anterior side; femora, tibiae and tarsi otherwise dark scaled but femora, tibiae and basal tarsomeres with scattered pale scales in dark-scaled area. Foretarsomere 5 as long as 4; hindtarsomere 1 0.97-0.99 (3) length of tibia. *Abdomen*. Tergum I with dark scales in middle, sometimes with a small spot of yellowish scales at middle of apical margin; II-IV usually with a narrow apical band of pale yellowish brown scales, V covered with pale yellowish brown scales on apical 0.50-0.67, sometimes with only a narrow apical band, VI-VIII usually entirely covered with pale yellowish brown scales, VI sometimes dark on most basal part, dark scales rarely appearing on VII; II-VII with a laterobasal or lateral spot of white scales on each side. Sterna rather roughly covered with pale yellowish scales.

MALE (Figs. 74, 207). Wing length 5.0-5.2 mm. Antenna: flagellum 0.87 (1) length of proboscis; flagellomere 12 1.19 of Flm 13, both 1.03 of Flm 1-11. Palpus 1.38 (1) length of proboscis (longer by length of segment 5 or slightly shorter), with rather many pale scales at joints and scattered elsewhere; 1 very short, 3 hairy, 4 and 5 with tufted bristles; length ratio of 2-5: 0.52 : 1.21 : 0.58 : 1.00. Proboscis longer than forefemur, with a false joint and a narrow pale band at apical 0.33. Scales of scutum yellowish brown, patches of pale scales more indistinct than in female; pleural bristles finer, propleurals pale yellowish brown. Cell R_2 1.19 (1) length of vein r_{2+3}; both claws of fore- and midtarsi with a blunt-tipped submedian tooth. *Genitalia*. Tergum IX with lobes broad, rounded, poorly sclerotized, a little protrudent and widely separated, each bearing 10-13 bristles. Basistyle a little broadened basally, about 3 times as long as wide, bristled except for basolateral aspect; subapical lobe at apical 0.33, bearing proximal 3 rods (α, β and γ), 3-4 mesodistal setae, and one laterodistal seta, the rods just curved at apex, subequal to each other in thickness, β and γ equal in length, α slightly shorter, Dististyle slightly less than 0.5 length of basistyle, 4.0 as long as basal width, bearing a small seta on concave side near apex, 2-4 setae scattered on apical half of convex side; claw stout, 0.1 length of dististyle. Cercal setae 5-7; basal sternolateral process of paraproct long, rather slender. Tergoapical division of aedeagus nearly twice as long as wide; mesotergally each lateral piece with a single row of several inconspicuous denticles, not forming a prominent cluster. Sternobasal division of aedeagus spinulate.

LARVA (Fig. 75). (Description based on specimens from Taiwan.) *Head*. Width 1.30-1.41 mm; 1.43-1.57 (x = 1.49) as wide as long, yellowish to brownish yellow, with distinctly darker patches surrounding bases of setae 5, 7-C, less distinct patches present around bases of 4, 8, 9-C, an additional dark spot located between and caudad of bases of 5-C (attachment of levators of epipharynx); integument with prominent microsculpture, consisting of interrupted transverse ridges, each section of the ridges with several irregular, blunt elevations directed anteriad, these elevations becoming much less prominent cephalad of 4-C; 1-C slender, separated by 2.0-2.6 (x = 2.2) their length; 4, 6-C nearly on line; 6-C well caudolaterad of 5-C; 7-C only a little closer to antenna base than to 6-C; 13-C laterocaudad of 12-C; 15-C slender, usually separated by less than length. *Antenna* 0.29-0.34 mm long, straight, about

0.33 length of head, gradually tapering distad, nearly smooth, usually quite pale, becoming slightly darker in apical 0.25; seta 1-A inserted at basal 0.15-0.45; 2, 4-A subapical, each slightly less than 0.5 length of antenna. *Mandible* and *maxilla* identical with those of *halifaxii*. *Mentum plate* with 9-11 (usually 9) strong subacute teeth, the median tooth about 1.5 as thick as flanking teeth, occasionally apically cleft. *Thorax*. Integument spiculate, more strongly so dorsally, the mesothoracic spicules larger (easily detectable at 40X, spine-like shape seen at 100X), (Korean specimens have noticeably weaker spicules than most Taiwan specimens); seta 7-P subequal to 1-P; 8-P usually triple. *Abdomen*. Integument spiculate, but less so than that of thorax; the spicules more conspicuous dorsally than ventrally on most segments; 4-I varying from nearly smooth to very strongly barbed; 7-I, II usually 4 branched; 3-II, III sometimes with very few faint barbs; 8-II, IV usually double; 5-VIII usually single. Comb scales 34-52, in an oblong to roughly triangular patch, individual scales somewhat elongate, apically fringed with very strong spicules, weaker lateral spicules. *Siphon* yellowish to yellow-brown, apically darker brown, basally very dark; length 0.73-0.85 mm, index 1.70-2.17 (x = 1.96); diameter nearly constant over basal 0.67, then narrowing abruptly; microsculpture consisting of numerous transverse rows of short ridges culminating in one or more caudally directed tooth-like projections; 9-12 sharply pointed pecten teeth in a single row, usually reaching apical 0.13 of siphon, all but the apicalmost one or 2 teeth having a strong subbasal denticle, these apical teeth usually stronger and darker than the others; 1-S a slightly zigzag midventral row of 14-20, 1-3 (usually 2) branched, barbed setae; 2-S slender, apical, subequal in length to apical pecten tooth. *Saddle* 0.80-0.87 mm long, microsculpture consisting of acute, triangular, caudally directed spicules arising singly or doubly from short transverse ridges, the spicules mostly subequal, except somewhat enlarged on extreme dorsocaudal aspect of saddle; seta 1-X usually 0.60-0.75 dorsal saddle length; 2, 3-X subequal, 2.5-3.0 dorsal saddle length; 4-X of 12-16, 3-6 branched cratal tufts, each 0.5-1.5 dorsal saddle length. Anal gills subequal, oval, about 0.20-0.25 dorsal saddle length.

SPECIMENS EXAMINED. KOREA. 5♂, 5♀; with associated skins (10 l, 10 p); 5 L: Cheju Do (M-2140). RYUKYU ARCHIPELAGO. 3♂, 7♀; with associated skins (1 l, 1 p); Okinawa Guntô (J-0899, J-2147, J-2148, J-2149). 1♀: Yaeyama Guntô (K-0934). TAIWAN. 2♂, 3♀, 60L (1♀: Chihpen, Taitung Hsien, 19 IV 1970, resting, Mizusawa; 9 L: Neihu, Taipei Hsien, 1 XII 1973, blocked stream, Lien & Mizusawa; 49 L: Neihu, Taipei Hsien, 3 II 1974, ground pool, Lien & Matsuki; 2♂, 2♀, 2 L: Taiwan Mainland). PHILIPPINES. 2♀ (1♀: Subasta, Mindanao, 19 VIII 1972, net, Mizusawa & Soma; 1♀: Mt. Talomo, Mindanao, 21 VIII 1972, net, Mizusawa & Soma).

DISTRIBUTION. KOREA (Cheju Do). RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Guntô). SOUTH PRYMORYE. TAIWAN. SOUTH CHINA. PHILIPPINES. BORNEO. JAVA. SUMATRA. INDOCHINA. MALAYA. THAILAND. BURMA. INDIA. SRI LANKA. ANDAMAN ISLANDS. CAROLINE AND PALAU ISLANDS.

BIONOMICS. Rare throughout the Ryukyus. Larvae were obtained in a blocked stream and ditches.

51. *CULEX (LUTZIA) HALIFAXII* THEOBALD
(Figs. 76, 208; Table 87)

Culex halifaxii Theobald, 1903: 231 (♀). Type-locality: Dindings, Straits Settlements, Malaya.

?Culex concolor: Marlatt, 1903: 116, Sendai, Miyagi Pref., Japan.
Culex tigripes: Mochizuki, 1913: 14, Fukuoka, Kyushu, Japan.
Lutzia vorax Edwards, 1921b: 327 (♂). Type-locality: Tokio, Japan; Bram, 1967: 17 (synonomy).
Lutzia fuscana vorax: Yamada, 1932: 217, Korea.
Culex (Lutzia) vorax: Bohart and Ingram, 1946b. 70; Okinawa Is. and Iheya Is., Ryukyu Archipelago, LaCasse and Yamaguti, 1950: 251 (♂, ♀, L); Bohart, 1956 (1957): 73, Chichijima and Hahajima, Ogasawara Isls.; Iwojima, Volcano Isls.

FEMALE (Fig. 208). Wing length 4.4-5.8 mm. *Head.* Eyes almost contiguous below. Vertex covered with narrow curved, pale yellowish scales; numerous erect forked scales over almost entire vertex, lateral and posterior ones dark brown, anteromedian ones yellowish brown; tempus covered with broad, pale yellowish scales; about 10 or more vertical bristles on each side in an often irregular double row, a few most mesal ones yellowish brown, others dark; 2, 3 dark temporal bristles on each side. Clypeus rather dark brown. Antenna: pedicel yellowish brown, mesoventrally darker, with pale small scales and fine bristles on mesal surface; flagellum 1.01-1.05 (5) length of proboscis; flagellomere 1 yellowish brown in basal half or more, 1.20-1.41 length of Flm 2, mesoventrally with pale small scales. Palpus 0.24-0.26 (5) length of proboscis, dark scaled, with dorsomesally pale scales, and occasionally a few laterally; segment 3 3.08-3.92 (5) length of 2; 4 absent in 5 dissected specimens. Proboscis 1.07-1.12 (5) length of forefemur, dark scaled, ventrally and laterally pale scaled in middle 0.33. *Thorax.* Pronotal integument light to rather dark brown; anterior lobe covered with narrow to broad pale scales, bearing many bristles, usually mesally dark brown and laterally pale brown; posterior lobe dorsally with narrow curved, ochreous brown scales, posteriorly some narrow to rather broad pale scales, occasionally a few narrow pale scales anteriorly present, more than 10 mostly dark brown bristles on dorsal half, those on posterior margin stronger, some lower bristles yellowish brown. Scutum with integument rather dark brown, covered with narrow curved, brown and pale yellowish scales, the pale scales forming an anteromedian spot, a pair of posterior fossal spots and short posterior dorsocentral stripes, pale scales present also on margins and posterior prescutellar space; scutal bristles dark brown. Scutellar lobes with narrow curved, pale yellowish scales and more than 10 long and medium dark brown bristles, together with additional fine pale ones. Pleural integument light brown, small patches of pale broad scales on propleuron, below prealar knob, upper sternopleuron, lower-posterior sternopleuron, upper mesepimeron and midanterior mesepimeron, prealar knob with a few additional scales on posterior side; pleural bristles pale and slender excepting some propleurals; many on propleuron, prealar knob, sternopleuron and upper mesepimeron; 5-9 lower mesepimerals usually in a row near anterior margin from middle to lower 0.25. *Wing.* Veins dark scaled; c with pale scales ventrobasally. Cell R_2 2.00-2.74 (5) length of vein r_{2+3}. Halter knob dark scaled. *Legs.* Forecoxa mottled with pale and dark scales; mid- and hindcoxae with patches of pale scales. Femora with narrow pale basal band and pale apical fringe; forefemur with a row of pale spots on anterior surface, ventral surface largely pale; midfemur with a row of pale spots and additional scattered pale scales on anterior surface, pale in basal half of posterior surface and with scattered pale scales in apical dark area; hindfemur with scattered, partly aggregating pale scales on anterior surface, posterior surface same as in midfemur. Tibiae with apical fringe; fore- and midtibiae

with a row of pale spots on anterior surface, pale in posterior surface; hindtibia usually more extensively pale anteriorly than in fore- or midtibia. Posterior surface of basal tarsomeres pale. Femora, tibiae and tarsi otherwise dark. Foretarsomere 5 equal or subequal to 4 in length; hindtarsomere 1 0.86-0.99 (5) length of tibia. *Abdomen.* Tergum I medially dark scaled; laterotergite unscaled or posteriorly with only several pale scales; II-VII dark scaled, with laterobasal patches and apical bands of pale yellowish scales, basal bands usually progressively broader in posterior segments; VII with apical band often convex, occasionally extending anteriorly to base at middle, occasionally laterobasal patches extending dorsobasally forming a complete basal band; VIII most frequently basally pale scaled, with apical fringe of pale scales and dark scaled in between, development of pale scaled area various, often extending posteriorly or anteriorly in middle dividing dark area, occasionally pale scales covering entire surface. Sterna entirely pale scaled or with dark subapical bands or laterosubapical patches. *Genitalia.* Seminal capsules 3, one slightly larger than other 2.

MALE (Fig. 76). Wing length 4.0-5.3 mm. Antenna: flagellum 0.84-0.91 (5) length of proboscis; flagellomere 12 1.03-1.21 length of Flm 13, both 0.89-1.04 of Flm 1-11. Palpus 1.35-1.38 (5) length of proboscis, with distinct ventrobasal patches of pale scales on segments 4 and 5, and irregularly scattered pale scales on 3-5; 3-5 with numerous long bristles, those on 5 progressively shorter apically; length ratio of 2-5: 0.57-0.67 : 1.23-1.35 : 0.60-0.70 : 1.00. Proboscis 1.12-1.27 (5) times length of forefemur, with pale band over the joint at apical 0.33. Cell R_2 1.36-1.61 (5) length of vein r_{2+3}. Hindtarsomere 1 1.01-1.04 (5) length of tibia. Both claws of fore- and midtarsi with a blunt-tipped submedian or subbasal tooth. *Genitalia.* Tergum IX a narrow stripe, with undifferentiated and widely separated lobes, each bearing 6-12 bristles. Basistyle subcylindrical, about 3.0 as long as wide, bristled except for basolateral aspect; subapical lobe at about apical 0.33, bearing proximal 3 rods (α, β and γ), 3-4 small mesodistal setae, and a rather thickened laterodistal seta; the rods just curved at apex, subequal in size and shape; the lobe sometimes divided into proximal and distal divisions by a shallow notch. Dististyle about 0.4 length of basistyle, 4.0 as long as basal width, bearing one small seta on concave side near apex and 2-9 scattered setae on convex side; claw stout, 0.1 length of dististyle. Cercal setae 3-10 (x = 6); paraproct rather poorly sclerotized; sternolateral process moderately long. Tergoapical division of aedeagus 1.50-1.75 as long as wide; each lateral piece with a prominent cluster of more than 10 denticles at about middle (clearly seen in lateral view); sternobasal division of aedeagus with surface smooth.

LARVA. Not different from *fuscanus*, excepting, in general, weaker spicules on thoracic and abdominal integument (the degree of spiculation is roughly similar in specimens examined from Honshu, Okinawa, Yaeyama and Ogasawara), frequent absence of dark spots at bases of dorsal head setae, and ridges of microsculpture of siphon culminating more frequently in a single tooth; but as there are wide variations in both species, they cannot be considered diagnostic characters. *Mandible* with a number of needle-like to moderately stout microspines laterodorsally near base; 9-14 mandibular hairs. *Maxilla* approximately 1.4 as wide as long; seta 1-Mx single, slender, reaching about apex of palpostipes; ventromesal tubercles usually in a double row; 4-Mx at middle of anterior 0.17, 0.4 length of mesostipes. Lacinia with 5-Mx slender, at anterior 0.33. Palpostipes about 0.6 length of mesostipes; S_1 equal to or a little longer than S_2, S_4 subequal to S_1, S_3 shorter to subequal to S_2.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 31♂, 20♀; with associated skins (36 l, 36 p); 41 L, 25 l: Honshu (C-1586, C-1898, C-1899, C-2226, C-2276, C-2304, C-2305, D-0053, D-0054, D-0062, D-0089, D-0395). 1♂: Shikoku (G-1277). 5♂, 5♀; with associated skins (9 l, 9 p); Tsushima (H-0548, H-2006, H-2007, H-2008). KOREA. 2♀: Korean Peninsula. (L-2141). RYUKYU ARCHIPELAGO. 3♂, 3♀, with associated skins (6 l, 6 p): Amami Guntô (I-0263). 1♂, 1♀, with associated skins (2 l, 2 p); 4 l: Okinawa Guntô (J-0905, J-1132, J-1259, J-1261). 72♂, 62♀; with associated skins (2 l, 2 p); 39 L, 1 l: Yaeyama Guntô (K-0117, K-0181, K-0184, K-0588, K-0591, K-0592, K-0600, K-0601, K-0636, K-0640, K-0645, K-0667, K-0669, K-0674, K-0675, K-0678, K-0686, K-0722, K-0724, K-0726, K-0732, K-0906, K-0907, K-0925, K-0934, K-0938, K-0940, K-0946, K-0951, K-0956, K-0976, K-0991, K-1010, K-1022, K-1034, K-1065, K-1089, K-1115, K-1243, K-1538). OGASAWARA ISLS. 20♂, 41♀, with associated skins (10 l, 10 p); 47 L, 1 l (N-1169, N-1173, N-1173, N-1180, N-1507, N-1514, N-1515, N-1516, N-1518, N-1519, N-1546, N-1548, N-1550, N-1557, N-1558, N-1559, N-1561, N-1566, N-1721, N-1725, N-1728, N-1729).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Izu Shichito, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). OGASAWARA ISLANDS. VOLCANO ISLANDS. SOUTH PRYMORYE. NORTH AND SOUTH CHINA. ORIENTAL AND AUSTRALIAN REGIONS. MARIANA ISLANDS.

TAXONOMIC DISCUSSION. We here follow Bram (1967) concerning the synonomy of *halifaxii* and *vorax*. Further study seems to be necessary on the geographical variation of the abdominal patterns, as it appears fairly conspicuous.

BIONOMICS. Common throughout Japan including the Ryukyu Archipelago except the northern districts of temperate Japan. Larvae are found feeding on larvae of mosquitoes and midges in ground pools, rock holes, blocked streams, slowly moving streams, and various types of natural and artificial containers. This species appears to prefer water with a high organic content and can exploit more habitats than can *fuscanus* (Bram 1967). Like *fuscanus*, *halifaxi* does not appear to occur in sufficient numbers to have a noticeable impact on prey species. Adult females do not feed on man in nature, but occasionally do in the laboratory (Kamimura 1976b). Miyagi (1972b) observed a high feeding preference of this species (as *vorax*) on chicks, but obtained completely negative results on reptiles, amphibians and mice.

52. *CULEX (LUTZIA) SHINONAGAI* NEW SPECIES
(Figs. 76, 77, 209; Table 87)

MALE (Figs. 76, 209). Wing length 3.5-4.3 mm. *Head.* Vertex covered roughly with somewhat narrow curved, brownish pale scales, eye margin more densely scaled, long, dark erect forked scales on posterior 0.67 of vertex; tempus covered with broad pale scales; 5-8 stout vertical and usually 3 fine temporal bristles on each side. Clypeus pale brown. Antenna: pedicel testaceous, infuscate and mesally with small dark scales and short dark hairs; flagellum 0.78-0.80 (3) length of proboscis; flagellomere 12 0.91-0.94 length of Flm 13, both 0.89-0.94 of Flm 1-11. Palpus 1.10-1.23 (3) length of proboscis, entirely dark scaled, without tufted bristles; length ratio of segments 2-5; 0.67-0.77: 1.31-1.56 : 0.81-0.95 : 1.00 (3). Proboscis 1.14-1.15 (2) length of

forefemur, dark scaled. *Thorax*. Pronotal integument rather dark brown; anterior lobe with broad pale scales and bearing more than 10 dark bristles; posterior lobe with narrow curved dark scales near dorsal margin, bearing 3-6 stout dark bristles along posterior margin together with 2-3 fine ones along posterodorsal margin. Scutum with integument brown to rather dark brown, covered with narrow curved, dark scales; scutal bristles dark, usually 4-5 bristles on fossal area near humeral margin and scutal suture. Scutellum yellowish or pale brown, roughly covered with somewhat narrow curved, brownish scales, some narrow curved, dark scales intermixed; 5-8 long dark bristles on each lateral lobe, 6-12 on median lobe, each lobe also usually with several fine bristles. Pleural integument pale brown, some areas slightly infuscate; small patches of broad white scales on propleuron, upper sternopleuron (occasionally lacking), midcaudal sternopleuron, upper mesepimeron and midanterior mesepimeron; 8-10 propleural bristles, some long and dark, others fine and yellowish; more than 10 rather fine dark prealars; about 10 sternopleurals, of which one on level of lower margin of mesepimeron is outstanding; 4-11 fine brownish upper mesepimerals, 4-7 brown lower mesepimerals. *Wing*. Veins dark scaled. Cell R_2 1.67-1.88 (4) length of vein r_{2+3}. Halter knob dark scaled. *Legs*. Forecoxa covered laterally with dark scales and basally and anteriorly with pale scales; mid- and hindcoxae with patches of pale scales, midcoxa appearing to have dark scales. Femora somewhat basally pale; legs otherwise dark scaled. Foretarsomere 5 with a pair of short setiferous ventromedian processes. Hindtarsomere 1 0.94-1.00 (3) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median or submedian tooth; posterior claw with sharp subbasal tooth. *Abdomen*. Terga dark scaled; II-VIII with laterobasal patches of white scales (usually the patches rather indistinct on II and III). Sterna hirsute, II-VII roughly pale scaled, VIII and apices of VI and VII dark scaled. *Genitalia*. Tergum IX a rather wide band, lobes distinctly convex, widely separated, each with 6-10 bristles. Basistyle 3.0 as long as wide in sternal view, bearing long bristles on tergal and lateral surfaces, short to medium bristles on sternal and mesal surfaces, base of sternal surface without bristles; subapical lobe at apical 0.33-0.40 of basistyle, bearing 3 rods (α, β and γ), 3 setae mesodistal and a seta laterodistal to the rods; α, β and γ subequal in size, just hooked at apex, α and β sometimes simple. Dististyle distinctly tapering toward narrow apex, nearly 0.5 length of basistyle, bearing one short seta at about apical 0.17 on concave side and 1-3 on convex side; claw stout, 0.1 length of dististyle. Cercal setae 5-9; paraproct rather poorly sclerotized; sternolateral process rather short. Tergoapical division of aedeagus 1.6-2.0 as long as wide; tergal mesal side of each lateral piece with several indistinct denticles not forming a prominent cluster; sternobasal division of aedeagus smooth.

FEMALE. (Description based on a single reared example). Wing length 3.7 mm. Vertex roughly covered with narrow curved, dark bronzy scales, eye margin with narrow curved, pale scales; tempus roughly covered with rather broad pale scales. Clypeus dark brown. Antennal flagellum 0.81 length of proboscis. Palpus 0.2 length of proboscis. Proboscis as long as forefemur. Pleura without upper sternopleural scale patch, with a fine yellowish postspiracular bristle on left side, probably abnormal. Cell R_2 1.56 length of vein r_{2+3}. Forecoxa covered with dark scales on anterior side, mid- and hindcoxae with a patch of pale scales. Sternum VIII with only scattered lateral scales.

LARVA (Fig. 77). (Described from a single exuvium). Width of head: approximately 1 mm. *Head*. Brownish; microsculpture very strong, consisting of low tooth-like structures tending be be arranged in irregular transverse rows, weaker

anteriorly and becoming short transverse ridges anteriad of seta 4-C; labrum distinctly concave between bases of 1-C; 1-C long, slender, separated by 0.7 their length; 5-7-C dark; 7-C slightly shorter than 5, 6-C; 6-C well laterocaudad of 5-C, well caudad and slightly mesad of 7-C. *Antenna* 0.25 mm long, light brown, becoming distally darker, nearly straight, about 0.33 length of head; 1-A inserted at basal 0.38; 2-4-A long, dark, each about 0.67 antenna length, 2,3-A subapical, 4-6-A apical. *Mandible* and *maxilla* cannot be seen clearly enough to describe, but appear very similar to those of *halifaxii;* seta 1-Mx single or double, longer than palpostipes. *Mentum plate* with 9 teeth. *Thorax.* Integument nearly smooth, spicules much less apparent than in *halifaxii. Abdomen.* Seta 7-III 3 forked at basal 0.4. Comb scales 18-20 in a patch, individual scales broadly paddle-shaped, apically fringed with strong spicules, laterally with weaker ones. *Siphon* moderate to dark brown, apically and basally nearly black, abruptly narrowed at apical 0.33; length 0.56 mm; microsculpture consisting of transverse rows of low triangular ridges most culminating in a single denticle; pecten of 9,10 closely spaced, 2,3 denticulate teeth, restricted to middle 0.33 of siphon; a ventrolateral seta 2-4 branched, well dorsad and slightly distad of apical pecten tooth; 1-S of 12 long, sparsely but strongly barbed setae ventrally in a zigzag row, reaching apical 0.33, proximal setae longer than siphon, distal setae 0.66-0.75 length of siphon. *Saddle:* dorsal length 0.58 mm, ventral length 0.22 mm; microsculpture very similar to that of siphon, becoming dorsoapically stronger; seta 1-X about 0.33 dorsal saddle length; 4-X of 13, 1-3 branched hairs, 3 most anterior hairs much smaller than others. Anal gills very short, rounded.

TYPE-SERIES. Holotype ♂ (#7354, N-1507) with slides of associated genitalia, wing and legs, Kitafukurozawa, Chichijima, Ogasawara Isls., 19 V 1973, net, Shinonaga. Paratypes: 9♂, 1♀; with slides of associated skins (1 l, 1 p); genitalia (5♂), mouthparts (3♂), wings (4♂, 1♀) and legs (4♂, 1♀), in total. Paratypes from Chichijima - 6♂ (N-1507): Kitafukurozawa, 19 V 1973, net, Shinonaga; 1♂ (N-1510): Kitafukurozawa, 26 V 1973, net, Shinonaga; 1♂ (N-1714): nr. Mt. Chuozan, 28 IX 1973, net, Mizusawa; 1♀; with associated skins (1 l, 1 p) (N-1716): nr. Mt. Chuozan, 28 IX 1973, tree hole, Mizusawa. Paratype from Hahajima - 1♂ (N-1564): 3 VI 1973, net, Hayashida.

The holotype and half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

DISTRIBUTION. OGASAWARA ISLANDS.

TAXONOMIC DISCUSSION. This new species is unique for the subgenus *Lutzia* in having the male palpus not hairy. It definitely has no close relationship to the Neotropical species in its dark-scaled wing veins and tarsi, and the short larval siphon. It is easily discriminated from *fuscanus* and *halifaxii* by the absence of pale bands or pale scaling on the proboscis and legs, the strongly developed microsculpture of the larval head, the broader comb scales and the medially restricted pecten. This is one of the 4 species endemic to the Ogasawara Islands.

BIONOMICS. Apparently rare. One larva was found in a tree hole.

7. GENUS *HEIZMANNIA* LUDLOW

Heizmannia Ludlow, 1905b: 130. Type-species: *Heizmannia scintillans* Ludlow, 1905; Philippines.

Small to medium-sized, densely scaled mosquitoes with submetallic coloration.

FEMALE. Eyes separated above. Vertex with decumbent scales all broad, erect scales absent or very inconspicuous, a silvery patch of broad scales always anteromedially present, several vertical and temporal bristles on each side. Clypeus usually bare. Antennal flagellomere 1 not markedly longer than Flm 2. Palpus at most 0.2 length of proboscis. Proboscis variable in length. *Thorax.* Anterior pronotal lobes large, approximated, with relatively few (about 10) bristles on anterior margin, with broad scales; posterior pronotum with broad scales, and 2-4 bristles near posterior margin. Scutum densely covered with broad or moderately broad scales; some bristles present on anterior margin from middle to humeri, supraalars many; prescutellars absent, or 1,2, other scutal bristles absent. Scutellum covered with broad scales, with relatively few long bristles on each lobe. Postnotum with a group of short bristles occasionally mixed with a few broad scales in subgenus *Heizmannia*, bare in subgenus *Mattinglyia*. Paratergite scaled. Pleura with large patches of broad scales on propleuron, sternopleuron and mesepimeron, usually on postspiracular area, and often on subspiracular area; pleural bristles relatively few, spiraculars and postspiraculars absent, lower mesepimerals 1,2; base of mesomeron on level or slightly above that of hindcoxa. *Wing.* Squama fringed with hair-like scales; alula fringed with broad scales. Veins dark scaled; cell R_2 longer than vein r_{2+3}. *Legs.* Hindtarsomere 1 shorter than tibia. Claws equal, usually simple, rarely those of fore- and midtarsi toothed. *Abdomen.* Tergum I hirsute, laterotergite scaled; terga with large laterobasal patches of pale scales. Seminal capsules 3.

MALE. Antenna subplumose in subgenus *Heizmannia*, plumose in *Mattinglyia;* flagellomeres 12 and 13 elongate (except in *complex* (Theobald), after Mattingly 1970). Palpus short as in female. Fore- and midtarsomeres 4 and 5 not modified, 5 shorter than 4. Claws of foretarsus sometimes unequal; claws of hindtarsus basally toothed; claws of midtarsus simple, often unqual; claws of hindtarsus equal and simple. *Genitalia.* Broad and thick. Tergum IX with fine bristles. Sternum IX relatively long, with bristles and scales, apex often trilobed. Basistyle globular, scaled; with subapical lobe, proximal claspette and distal claspette, the subapical lobe bearing one or 2 strong setae; the proximal claspette with conspicuous tufts of variously modified hairs, the distal claspette (? true claspette) with filament transparent and often modified; apex of basistyle broadly rounded, bearing modified setae. Dististyle articulated on a rather vertical plane, often greatly modified, apex lobed, frequently pickax- or beak-shaped; terminal claw also somewhat modified. Cercal setae absent; paraproct apically attenuated. Aedeagus tergally open, with sternal edges attached to each other at middle, bearing many sternal and apical teeth.

LARVA. (Extracted from Mattingly 1970). *Head.* Wider than long; seta 4-C multibranched, conspicuous; 6-C usually anteriad of 4-C; often with very unequal branches; 1-A small, with few branches or single; mentum plate with 7-11 teeth on either side of median tooth. *Thorax.* Spines at bases of pleural setae variously developed. *Abdomen.* Comb scales 20 or less (except in *reidi* Mattingly). Siphon without acus; pecten composed of at most 15 teeth; 1-S of a single pair, usually double (3,4 branched in *aureochaeta* (Leicester)). Saddle incomplete; 2-X 2-5 branched, 3-X single, occasionally double; 4-X of 7-10 hairs, usually most proximal 1 or 2 precratal, each hair usually single or double, rarely triple (except in *reidi* and *achaetae* (Leicester)).

DISTRIBUTION. Korea. China (Chekiang). Oriental region.

Two species belonging to the subgenus *Heizmannia* occur in this region.

SUBGENUS *HEIZMANNIA* LUDLOW

Heizmannia Ludlow, 1905b: 130. Type-species: *Heizmannia scintillans* Ludlow, 1905; Philippines.

Subgeneric characters given in the foregoing generic description.
DISTRIBUTION. Same as for the genus.

KEY TO SPECIES OF *HEIZMANNIA (HEIZMANNIA)**

FEMALE ADULT

Posterior pronotum dark scaled; hindfemur pale scaled at most in basal 0.6. . . . . *kana* (p. 249)
Posterior pronotum pale scaled; hindfemur with pale scaled area reaching apex. . . . . *lii* (p. 251)

53. *HEIZMANNIA (HEIZMANNIA) KANA* NEW SPECIES
(Fig. 210)

Heizmannia sp.: Tanaka, 1971a: 4; Amami Guntô, Ryukyu Archipelago.

FEMALE (Fig. 210). Wing length 3.0-3.5 mm. *Head.* Vertex covered with broad dark scales with slight metallic luster, a medioapical silvery white spot of broad scales also covering interocular space; similar pale scales laterally on eye margin and down to underside of head; 4, 5 vertical and 5, 6 temporal bristles on each side. Clypeus dark brown. Antenna: pedicel dark, bearing a few dark small hairs on mesal surface; flagellomere 1 with a few dark small moderately broad scales. Palpus 0.17 length of proboscis, clothed with dark somewhat metallic scales. Proboscis subequal to or slightly shorter than forefemur, dark scaled, with a weak metallic reflection. *Thorax.* Pronotal integument dark brown; anterior lobes large, narrowly separated, covered with broad silvery white scales on at least anterolateral 0.67, posteromesal margin dark scaled, 8-12 dark rather stout bristles on anterior margin, 5-8 mesally and 3, 4 laterally; posterior lobe covered with broad, dark metallic scales, bearing 3, 4 bristles near posterior margin. Scutum with integument very dark brown, covered with moderately broad dark scales which show metallic greenish, partly bronzy or bluish, reflections; a spot of broad silvery white scales on each side above paratergite; many bristles on anterior and supraalar margins. Scutellum heavily covered with broad dark metallic-green scales, each lobe bearing 3, 4 stout bristles and several small ones. Postnotum with a group of black and yellow bristles, without scales. Paratergite covered with broad silvery white scales. Pleural integument dark brown; broad silvery white scales covering propleuron, postspiracular area, subspiracular area, sternopleuron (except anterolower area) and mesepimeron (except posterior half and

*The male of *kana*, and the larva of *lii* are unknown to us.

lower 0.33); several yellow propleural bristles, 10 or less prealars, several, mostly fine, sternopleurals on lower-posterior part, a few fine upper mesepimerals, one stout lower mesepimeral. Bases of mesomeron and of hindcoxa on same level. *Wing*. Alula fringed with moderately broad dark scales. Vein scales with metallic purple reflection; plume scales of veins r_2 and r_3 narrow. Cell R_2 2.0-2.3 length of r_{2+3}. Halter with dark scaled knob. *Legs*. Coxae pale brown to dark brown, each with a patch of broad silvery white scales. Hindfemur white scaled on basal 0.5-0.6 on both lateral surfaces, with a dark dorsal stripe and a dark narrow ventral stripe also reaching base; legs otherwise dark scaled with metallic purple reflection. Claws simple. *Abdomen*. Terga dark scaled with metallic purple or blue reflection; I with a patch of white scales on each side; laterotergite heavily covered with silvery white scales; II-VII with laterobasal patches of silvery white scales, the patches at most reaching apical 0.25 on II, diminishing in size toward posterior segments, on VI and VII the patches extend dorsally to form complete or incomplete basal bands. Sterna dark scaled, II-VII each with a basal band of pale scales. One seminal capsule slightly larger than other 2.

Male and immature stages unknown.

TYPE-SERIES. Holotype ♀ (#1219, I-0303) with an associated genitalia slide, Mt. Yuwan, Amami Ôshima, Ryukyu Archipelago, 1 VII 1970, net, Mizusawa & Nishikawa. Paratypes: 5♀, with slides of associated wing (1♀) and legs (2♀), in total. 1♀ (I-0302): Mt. Yuwan, 30 VI 1970, net, Mizusawa & Nishikawa; 1♀ (I-0303): Mt. Yuwan, 1 VII 1970, net, Mizusawa & Nishikawa; 3♀ (I-0304): Mt. Yuwan, 2 VII 1970, net, Mizusawa & Nishikawa.

The holotype and half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN THE TYPES. RYUKYU ARCHIPELAGO. 9♀: Amami Guntô (I-1837, I-1848, I-1884).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami Guntô).

TAXONOMIC DISCUSSION. Though we are reluctant to describe this species as new because of the lack of knowledge of the male and immature stages, it cannot be identified with any described species. The most closely related species are *reidi* Mattingly (= *cheni* Lien) (Taiwan-India), *scintillans* Ludlow (Southeast Asia) and *viridis* Barraud (India). We examined all the type specimens of *cheni* from Taiwan preserved in the Taiwan Provincial Malaria Research Institute, 2 males and 1 female from Punchihu, Alishan, Taiwan, and 8 females from Fenchihu, Chuchi, Chia-i, toward Tolin, Taiwan, in the collection of the Naval Medical Research Unit No. 2, Taiwan. In this species, the proboscis and cell R_2 are longer (proboscis 1.2-1.4 length of forefemur, R_2 2.7-3.7 length of vein r_{2+3}, after Mattingly 1970); the mesepimeral patch is reduced to a small anteromedian patch just above the lower mesepimeral bristle; the laterobasal patches of tergum II reach the apical margin; terga VI and VII usually have no mediobasal pale scales; a pale area of the hindfemur reaches the apical 0.17 or more on the anterior surface. We examined 3 females and 3 males of *scintillans* from Selangor, Malaya, and 2 female paratypes of *viridis* from Malabar in the collection of the BMNH. *Heizmannia scintillans* differs from *Hz. kana* in that flagellomere 1 bears both pale and dark scales; the proboscis appears slightly longer, 1.1-1.2 length of the forefemur; a pale area on the anterior surface of the hindfemur is longer, reaching apical 0.2-0.3, and narrower leaving narrow dark edges on the anterior surface dorsally and ventrally; the laterobasal patches of the tergum II reaches the apical margin, the laterobasal patches of the other terga are also more developed. *Heizmannia viridis* may be distinguished from *Hz. kana* by the pale

yellow postnotal bristles; the hindfemur lacking a dark stripe on the ventral surface; and the laterobasal patches of tergum II reaching the apical margin.

BIONOMICS. The adult females were found in jungles. One female exposed to human bait failed to take a blood meal. Nothing is known of the larval habitats, but other members of the genus are usually container inhabitants (Mattingly 1970).

54. *HEIZMANNIA (HEIZMANNIA) LII* WU
(Figs. 78, 211)

Heizmannia lii Wu, 1936: 46 (♂, ♀). Type-locality: Yun-Shi, Hangchow, Chekiang, China; Stone, Knight and Starcke, 1959: 132, Korea.

FEMALE (Fig. 211). (Descriptions based on 2 pairs of paratypes from China). Wing length 2.8-3.1 mm. *Head.* Vertex covered with broad dark scales, with a medioapical patch of broad silvery white scales which also cover interocular space; tempus covered with broad silvery white scales on lower area, the pale area extending dorsally along eye margin, almost reaching the medioapical patch; 3-5 vertical and 3-6 temporal bristles on each side. Clypeus brown. Antenna: pedicel brown, darker on mesal surface, covered sparsely with small white scales on mesal half; flagellomere 1 with mesal white scales. Palpus dark scaled, 0.13-0.14 length of proboscis. Proboscis as long as forefemur, dark scaled, with a spot of pale scales ventrally at base. *Thorax.* Anterior pronotal lobes only slightly separated, covered with broad white scales, basally with many fewer dark scales only, bearing 9-11 fairly stout dark brown bristles on anterior margin, 6-7 mesally and 3-4 laterally; posterior pronotal lobe covered with broad white scales excepting lower area, bearing 2-3 yellowish brown bristles along posterior margin. Scutum with integument rather light brown, covered with broad, dull bronze brown scales, some white scales on supraalar margin; more than 10 bristles of different sizes on anterior margin, many supraalar bristles. Scutellum covered with scales similar to those of scutum, bearing 2-3 brown long bristles on each lateral lobe and 4-5 on median lobe, and a few fine bristles on each lobe. Postnotum with a group of yellowish brown bristles. Paratergite with a patch of broad white scales. Pleural integument brown, patches of broad silvery white scales on propleuron, postspiracular area, subspiracular area, sternopleuron and mesepimeron; pleural bristles pale yellowish brown, 3-5 propleurals, nearly 10 prealars, 3-5 upper mesepimerals, one stout lower mesepimeral. Base of mesomeron only slightly above that of hindcoxa. *Wing.* Alula fringed with dark rather broad scales. Cell R_2 2.7-2.9 length of vein r_{2+3}. Halter with dark scaled knob. *Legs.* Coxae covered with broad white scales. Forefemur basally with a pale stripe on anterior surface, pale scaled basally on posterior half of ventral surface; midfemur pale scaled on lower 0.67 of posterior surface and ventral surface; hindfemur pale scaled on both sides, dark on dorsal aspect only, the pale area narrowed at apex but almost reaching it ventrally; femora, tibiae and tarsi otherwise dark scaled. Hindtarsomere 1 0.7-0.8 length of tibia. *Abdomen.* Tergum I medially dark scaled and laterally white scaled; II-VII dark scaled, with fairly large laterobasal patches of white scales, the patches reaching apical margin on 1-3 anterior segments, progressively shortened toward posterior segments, not reaching apical margin on 3-5 posterior segments; V mediobasally with several white scales; VI and VII with laterobasal patches extending dorsally forming basal bands; VIII dark

scaled. Sterna VI and VII apically dark scaled and basally pale scaled; other sterna cannot be seen in the specimens examined.

MALE (Fig. 78). Wing length 2.9 mm. Antenna: flagellomere 13 about 2.0 length of Flm 12, both about 2.0 length of Flm 1-11 (after Wu 1936). Palpus appearing to be a little shorter than in female. Cell R_2 2.6-3.5 length of vein r_{2+3}. Claw of foretarsus with a long slender tooth (after Wu 1936). *Genitalia.* Tergum IX with 6-11 fine bristles on each side. Sternum IX trilobed at apex, median lobe narrow, bearing 2, 3 bristles. Basistyle rounded, laterally and sternally scaled, tergolaterally and apically bearing striated bristles, with only a few bristles sternally near mesal margin, with 2 groups of specialized setae at apex, the dorsal group of 5, 6 dark, curved, striated and minutely spiculate leaflets, the ventral group of 7, 8 striated broader leaflets; subapical lobe moderately protrudent, with 2 strong pigmented setae; a group of short bristles along edge between the lobe and apex of basistyle. Claspette (distal claspette) stem covered densely with fine hairs, filament transparent, of a complicated form as shown in Fig. 78; proximal claspette with 3 groups of hairs; the most basal one on a prominent rounded lobe with hairs mostly smooth, only partially very finely spiculate; the median group on a smaller base, with hairs very long and extending beyond apex of basistyle, some hairs appeared fused at middle; the distal group on a wider base, the hairs stouter, distinctly spiculate; a round pad bearing minute hairs present at about middle of sternal mesal surface of basistyle. Dististyle transparent, about 0.5 length of basistyle, mesotergally curved and laterosternally expanded at apical 0.33 (the shape somewhat pickax-like), with a finger-like process at apical 0.33 accompanying a deep cleft between the process and apex on mesosternal side, the process not extending beyond distal margin of dististyle; 2 bristles and many branched hairs on apical 0.33 on laterotergal aspect; laterosternal area of apical 0.33 striated; apex with pigmented claw. Paraproct with narrow apex. Aedeagus spinous, spines at apex larger than others.

LARVA. (Translated from Lee 1971: 749-50, by Mr. Lee.) *Head.* Seta 1-C slightly stout, curved inwards; 4-C as large as 7-C, 17-21 branched; 5-C 8 branched; 6-C 1-3 branched, one branch much longer than others and usually stout; 7-C 14, 15 branched. Antenna sparsely spiculate, with apical half slightly darkened; 1-A double, at about middle of shaft. *Abdomen.* Comb scales 20-25 in a triangular patch, individual scales apically fringed. Siphon slightly enlarged at middle, without acus; pecten of 7-10 short broad teeth, each tooth with 1, 2 denticles on one side; 1-S double, inserted at about middle of siphon. Saddle incomplete, apical margin with fine spicules; 1-X with 3 long fairly stout branches. Anal gills long, fairly broad, with rounded apices, about 2.5 length of segment X.

SPECIMENS EXAMINED. KOREA. 1♂, 1♀: Korean Peninsula. (1♀: Kwangnung, Kyongki Do, Lee, NIHK. 1♂: L-2288). CHINA. 2♂, 2♀ (Paratypes 1♂: Hanchow, 11 V 1936, Wu; 1♂: Hanchow, 7 V 1936, Wu; 2♀: Hanchow, 30 IV 1936, Wu, BMNH.

DISTRIBUTION. KOREA (Korean Peninsula). CHINA (Chekiang).

TAXONOMIC DISCUSSION. Korean specimens examined included 1 male, 1 partially denuded female and a strongly depressed male genitalia slide. The male and female specimens were found to differ from the type specimens of *Heizmannia lii* from China in the following points: the temporal pale-scaled area is reduced to a patch close to eye and does not extend to near the medioapical pale patch of vertex; broad pale scales in addition to dark ones present on scutellar median lobe in the male and female, and also on posterior prescutellar space in the female; abdominal tergum VI with laterobasal patch not

connected with mediobasal patch; cell R_2 about 1.5-1.9 length of vein r_{2+3} in the female, 2.04 in the male. Some of these characters may vary individually. The male genitalia appear to be identical with the type specimen of *lii*. Chaetotaxy of the female specimen is as follows: 4 verticals, 3 temporals, 7+3 anterior pronotals, 2 posterior pronotals, 3·4·3 scutellars, 3 propleurals, 2 postspiraculars, 7 prealars, 3 posteromedian sternopleurals, 2 upper mesepimerals, and 1 lower mesepimeral. We consider the above differences as local or individual and treat these Korean specimens as *lii*, but further study with more material of better condition is desirable. *Heizmannia taiwanensis* Lien 1968b, from Taiwan may be very closely allied to *Hz. lii*, differing apparently only in the presence of a dark ventral stripe on the anterior surface of the hindfemur and the absence of the ventral group of broad striated leaflets (Mattingly 1970).

BIONOMICS. Larvae were collected from stumps in Chekiang, China (Wu 1936). In Korea, they are found in tree holes in mountainous areas, together with *Toxorhynchites christophi*, *Aedes kobayashii* and *Ae. nipponicus;* adult females bite man in the daytime (Lee 1971).

8. GENUS *AEDES* MEIGEN

Aedes Meigen, 1818: 13. Type-species: *Aedes cinereus* Meigen, 1818; Europe.

A polymorphic genus; most characters extremely variable.

FEMALE. Eyes separated or contiguous above and below. Decumbent scales of vertex variable, erect forked scales present, amount variable. Vertical and temporal bristles distinctly differentiated. Antennal flagellum shorter to longer than proboscis; flagellomere 1 1.0-2.2 length of Flm 2. Palpus usually less than 0.4 length of proboscis, 3-4 segmented, segment 4 frequently present. Proboscis more often longer than forefemur, sometimes equal or shorter, with several ventrobasal bristles. *Thorax*. Anterior pronotal lobes widely separated, bristled; posterior pronotal lobe with posterior bristles. Scutum moderately to strongly arched, with scales mostly narrow; acrostichal and dorsocentral bristles present or absent, other scutal bristles usually present. Scutellum with scales variable. Postnotum bare. Paratergite narrow, scaled or unscaled. Pleura with scale patches, often extensively scaled; spiracular bristles absent, propleural, postspiracular, prealar, sternopleural and upper mesepimeral bristles present; lower mesepimerals variable. Base of mesomeron slightly to well above that of hindcoxa. *Wing*. Squama fringed with hair-like scales; alula with fringe scales variable. Base of vein sc without ventral bristles; dorsal remigial bristles present or absent; bases of r_S and r_{4+5} without spur; cell R_2 longer than vein r_{2+3}. *Legs*. Fore- and midtarsomere 5 shorter to a little longer than 4; hindtarsomere 1 shorter than tibia; claws equal or subequal; pulvilli absent or hair-like. *Abdomen*. Tergum I hirsute; laterotergite scaled or bare. Seminal capsules 1 or 3.

MALE. Antennal flagellum plumose; flagellomeres 12-13 elongate. Palpus extremely variable, sometimes same as in female, 3-5 segmented. Foretarsomere 4 shortened; 5 barely to strongly modified, with or without setiferous midventral process; midtarsomeres 4 and 5 usually less modified than in foretarsus, 5 usually barely modified. Claws dentate or edentate; anterior claw of fore- and midtarsi enlarged. *Genitalia*. Tergum IX usually well developed,

with distinctly sclerotized portion; lobes usually well developed, occasionally absent. Sternum IX usually bristled. Basistyle usually scaled, with or without mesal membrane, with or without apical or basal tergomesal lobe; claspette variably developed, or absent. Dististyle variable, with or without apical claw. Cercal setae present or absent; paraproct usually with relatively simple, moderately to strongly sclerotized apex. Aedeagus simple and tubular, or paired and more or less complex, poorly to strongly sclerotized.

LARVA. *Head.* Wider than long; labrum and mouth brush not modified, excepting some predatory species not occurring in this region; collar narrow; seta 2-C absent; 3-C always very small; 4-6-C variable in position and development; 16,17-C apparently not developed. Antenna variable in length, not differentiated at the insertion of 1-A, spiculate or smooth; 1-A usually short, single or branched; 2,3-A usually apical or nearly so. *Mandible* usually with microspines dorsolaterally at middle to near base; 3 mandibular spurs, MdS_1 longest curved, and most deeply pigmented, MdS3 similar but a little shorter and paler, MdS_5 much shorter, almost straight, pale. Mandibular brush well developed; mandibular comb of setiform teeth, lateral teeth slender and subplumose. Cutting organ usually small, usually with one or 2 dorsal spines ($DS_{1,2}$); usually 2, occasionally one, dorsal teeth, shape variable, accessory denticle usually present; ventral tooth usually with one lateral denticle (VT-4) and 2 or 3 mesal denticles (VT_{1-3}); ventral blade (VB) 1 or 2; VB_1 variable in length, VB_2, when present, much smaller; pectinate brush well developed, hairs slender or broad. Piliferous process usually not sclerotized, well protrudent, with the usual 5 hair groups, apically cleft; labula narrower than anterior portion. Mandibular hairs in 2 groups. *Maxilla.* Cardo triangular, narrowly or somewhat broadly fused mesobasally with cranium, when fusion point is very narrow, a strip-like sclerotization along anterior margin from about anterior termination of hypostomal suture through the point of fusion to cardo well developed; cardinal seta 1-Mx variable. Mesostipes variable in shape, occasionally mesal area detached, spicules of mesal margin variable; stipital sensoria double, with or without basal ring; dorsal stipital seta 2-Mx shortest of all ring-based maxillary setae; ventral stipital seta 4-Mx variable; parartis a weakly sclerotized expansion at the base of maxillary suture, without strongly sclerotized connecting rod; pseudoartis well developed, separated from cranium or fused with it at apex. Lacinia occupying mesal half of dorsal surface of mesostipes, hairy, proximal lacinial seta 5-Mx around level of stipital sensoria, slender, pale; distal lacinial seta 6-Mx at apex, often modified; hairs of maxillar brush variable. Palpostipes variable in size, but usually shorter than mesostipes, without lateral stipital seta 2-Mx, separated or mesobasally fused with mesostipes; apex with ampulla and 4, 5 palpal sensoria, the latter short, $S_{1,2,4}$ ring-based, S_5 sometimes absent; usually, $S_{1,2}$ dorsolateral, S_{3-5} ventromesal in position. *Mentum plate* triangular, deeply pigmented, usually with small teeth; aulaeum with filamentous spicules. *Thorax.* Setae 1-4, 8, 12-P variable in development; 5-7-P, 5-10, 12-M, 7, 9, 10-T strong; 13-P usually absent. *Abdomen.* Setae 6-I, II and 7-I usually strong, 6-III-VI and 7-II variable in development; 12-I present or absent. Comb scales always present, variable in shape and number. *Siphon* short to moderately long; acus present or absent; pecten usually well developed, the teeth often dark; 1-S a single pair, at about apex of pecten, occasionally small accessory siphonal setae present; 2-S always single, simple and short. *Saddle* with or without acus, usually incomplete, sometimes complete; seta 1-X variable; 2-X branched; 3-X usually long and single, rarely branched; 4-X of 8 or more hairs, each branched or single, precratal hairs present or absent; grid occasionally incomplete.

DISTRIBUTION. Worldwide.

KEYS TO SUBGENERA OF *AEDES*

FEMALE ADULT

1. Lateral scutellar lobes with narrow scales. 2
   Lateral scutellar lobes with broad scales. 11

2(1). Vertex with decumbent scales narrow, or at most broad in middle. . 3
   Vertex with decumbent scales largely broad. 8

3(2). Metameron with scales. . . . . *Ochlerotatus* (in part) (p. 257)
   Metameron without scales. 4

4(3). Base of mesomeron a little above that of hindcoxa; tarsi unbanded; scutum broadly yellow scaled laterally. . . *Neomelaniconion* (p. 418)
   Base of mesomeron well above that of hindcoxa; tarsi banded. 5

5(4). Prealar knob without scales. 6
   Prealar knob with scales. 7

6(5). Paratergite with scales. . . . . *Ochlerotatus* (in part) (p. 257)
   Paratergite without scales. . . . . *Edwardsaedes* (p. 422)

7(5). Scutum with distinct pale stripes or patterns; proboscis dark throughout. *Finlaya* (in part) (p. 302)
   Scutum without distinct ornamentation; proboscis broadly pale midventrally. . . . . *Aedimorphus* (in part) (p. 405)

8(2). Pleura with numerous minute hairs on unscaled areas; laterotergite unscaled. . . . . *Geoskusea* (p. 414)
   Pleura without such hairs; laterotergite scaled. 9

9(8). Scutum ornamented; postspiracular area unscaled. *Finlaya* (in part) (p. 302)
   Scutum concolorous. 10

10(9). Paratergite scaled; genitalia simple; postspiracular area scaled. *Aedes* (p. 425)
   Paratergite unscaled; genitalia unusually well developed; postspiracular area scaled or unscaled. . . . . *Verrallina* (p. 436)

11(1). Vertex with decumbent scales largely narrow; acrostichal bristles present. . . . . *Aedimorphus* (in part) (p. 405)
   Vertex with decumbent scales largely broad; acrostichal bristles absent. 12

12(11). Pedicel at most with several small scales mesally; at most hindtarsomeres 1 and 2 white banded. . . . . *Finlaya* (in part) (p. 302)
   Pedicel covered with broad silvery scales except dorsally or dorsolaterally; hindtarsomeres 1-5 white banded. . . . . *Stegomyia* (p. 368)

MALE GENITALIA

1. Dististyle with claw. 2
   Dististyle without claw. 7

2(1). Claspette present. 3
   Claspette absent. 6

3(2). Aedeagus simple, cylindrical; claspette with a filament, without setae at apex. 4
   Aedeagus complex, paired, with sclerotized teeth; claspette without filament, with setae at apex. 5

4(3). Basistyle with both apical and basal tergomesal lobes (occasionally apical tergomesal lobe weakly developed). . . . . *Ochlerotatus* (p. 257)
   Basistyle without apical or basal or both tergomesal lobes. *Finlaya* (p. 302)

5(3). Dististyle simple, claw not on a lobe or process; claspette usually well developed with apex strongly expanded and heavily setose. *Stegomyia* (p. 368)
   Dististyle complex, claw on a mesal lobe or process; claspette often weakly differentiated. . . . . *Aedimorphus* (p. 405)

6(2). Dististyle inserted at apex of basistyle; aedeagus simple. *Geoskusea* (p. 414)
   Dististyle inserted before apex of basistyle; aedeagus paired. *Neomelaniconion* (p. 418)

7(1). Dististyle inserted at apex of basistyle, apically bifurcate; basistyle without strong processes or spines. . . . . *Edwardsaedes* (p. 422)
   Dististyle inserted before apex of basistyle, or basistyle with strong processes or spines. 8

8(7). Aedeagus paired, bulbous in tergal view, with strongly sclerotized teeth; basistyle with sternomesal claspettoid, without strong processes or spines; dististyle bifurcate at base. . . . . *Aedes* (p. 425)
   Aedeagus composed of opisthophalus, prosophallus and phallus; basistyle without claspettoid, with strong processes or spines; dististyle variable. . . . . *Verrallina* (p. 436)

LARVA

1. Mandible with seta 1-Md; maxilla with cardo separated from cranium; siphon lacking acus; seta 12-I absent. . . . . *Stegomyia* (p. 368)
   Mandible without seta 1-Md; maxilla with cardo narrowly fused mesobasally with cranium; siphon with acus. 2

2(1). Seta 12-I present. 3
   Seta 12-I absent. 6

3(2). Mandibular cutting organ with lateral dorsal tooth reduced; mesal dorsal tooth narrow, very long, reaching fork of $VT_{0,1}$, poorly pigmented, with very slender mesal denticles; seta 8-C distinctly longer than 9, 10-C. . . . . *Geoskusea* (p. 414)
Mandibular cutting organ with both dorsal teeth short, stout, usually very dark; mesal denticles, when present, never very slender; seta 8-C subequal to 9, 10-C. 4

4(3). Seta 4-X of 15 or more tufts; 5-C posteriad of 7-C; saddle with acus (except for *vigilax* and *sticticus*). . . *Ochlerotatus* (in part) (p. 257)
Seta 4-X of 15 or less tufts, when 15, 5-C anteriad of 7-C; saddle lacking acus (except for *Aureostriatus*-Group of *Finlaya*). 5

5(4). At least one of setae 4-6-C at level of or anteriad of 7-C. *Finlaya* (p. 302)
Setae 4-6-C posteriad of 7-C. . . . . *Neomelaniconion* (p. 418)

6(2). Seta 3-X branched; 9-12-M, T with very large basal calli (tubercles), which also bear 13-M and 8-T (Belkin 1962). *Edwardsaedes* (p. 422)
Seta 3-X single; 9-12-M, T with moderate-sized basal calli (tubercles, which do not bear 13-M and 8-T. 7

7(6). Siphon with small accessory setae subapically and/or subdorsally. *Aedes* (p. 425)
Siphon without accessory setae. 8

8(7). Setae 5, 6-C approximated, distance between 6, 7-C 2.0 or more as that between 5, 6-C. . . . . *Aedimorphus* (p. 405)
Setae 5, 6-C widely separated, distance between 6, 7-C less than 2.0 as that between 5, 6-C. 9

9(8). Seta 1-S longer than siphon diameter; 7-II 1, 2 branched, strong. *Ochlerotatus* (in part) (p. 257)
Seta 1-S shorter than siphon diameter at insertion; 7-II weak, with 4 or more short branches. . . . . *Verrallina* (p. 436)

SUBGENUS *OCHLEROTATUS* LYNCH ARRIBÁLZAGA

Ochlerotatus Lynch Arribálzaga, 1891a: 374: 1891b: 143. Type-species: *O. confirmatus* Lynch Arribálzaga, 1891; Argentina.

Medium to rather large mosquitoes.

FEMALE. *Head.* Eyes usually more or less separated above and below. Interocular space with or without scales. Decumbent scales of vertex usually narrow; broad scales present in *impiger;* erect scales numerous on posterior half of to entire vertex. Antennal flagellum shorter than proboscis; flagellomere 1 1.3-1.7 length of Flm 2. Palpus 0.15-0.40 (usually less than 0.25) length of proboscis; segment 4 minute, at most 0.33 length of 3. Proboscis slender, distinctly longer than (1.2-1.6 times) forefemur. *Thorax.* Pronotal lobes with narrow and broad scales; anterior lobes well separated, with many

bristles, posterior lobe with 4 to more than 10 bristles near posterior margin. Scutum with scales variable; all scutal bristles usually developed, only acrostichal bristles occasionally medially reduced. Scutellum with narrow scales only. Paratergite usually scaled. Pleural scales variable, usually extensive, metameron usually scaled; pleural bristles usually many, often pale; lower mesepimeral bristles present or absent. Base of mesomeron well above that of hindcoxa. *Wing*. Remigium with dorsal bristles. Cell R_2 longer than vein (1.6-2.4 times) vein r_{2+3}. *Legs*. Foretarsomere 5 longer than 4; midtarsomere 5 subequal to 4 in length. Claws of fore- and midtarsi unidentate, equal or occasionally anterior claw a little larger; claws of hindtarsus equal, usually unidentate, occasionally simple. *Abdomen*. Laterotergite pale scaled. Segment VIII retractile.

MALE. Antennal flagellum strongly plumose, 0.6-0.8 length of proboscis; flagellomeres 12 and 13 elongate, Flm 12 longer than Flm 13, both subequal to Flm 1-11 in length. Palpus a little longer than (1.0-1.3 times) proboscis; apex of segment 3 somewhat swollen, upturned and hairy; 4 and 5 slightly swollen, downturned and hairy; 3 longest; 4 length of or longer than 5. Proboscis distinctly longer than forefemur. Lower mesepimeral bristles more often lacking than in female. Cell R_2 length of or slightly longer than vein r_{2+3} (relatively shorter than in female). Foretarsomere 4 greatly shortened; 5 much longer than 4, with usually 4 short curved setae on top of ventrobasal swelling, several pairs of laterobasal, stiff setae, and also a midventral setiferous process; midtarsomere 4 a little shortened, with several stiff ventroapical setae; 5 longer than 4, not modified. Anterior claw of fore- and especially midtarsi enlarged, uni- or bidentate; posterior claw unidentate; claws of hindtarsus equal, unidentate or simple. *Genitalia*. Tergum IX sclerotized in middle; lobes distinctly protrudent, usually rather approximated, bearing usually rather short stout setae. Sternum IX bristled. Basistyle scaled, usually elongate, with basal tergomesal lobe and often apical tergomesal lobe; mesal membrane present from apex to base; claspette well developed, with stem long and slender, filament variously developed. Dististyle 0.4-0.6 length of basistyle, simple; claw apical 0.17-0.30 length of dististyle. Cercal setae present; paraproct with strongly sclerotized apical tooth. Aedeagus simple, tubular, usually sternally open, with a round tergobasal orifice and a small midbasal process.

LARVA. *Head*. Broad; seta 1-C frequently shorter than distance between bases, sometimes a little longer than it; 4, 6, 7-C usually about on level of antennal base, 5-C distinctly caudad of them. *Antenna* usually short (long in *diantaeus*), spinulate; seta 1-A branched, inserted at basal 0.33-0.56; 2-A stronger than 3-A, usually somewhat curved distad of middle. *Mandible* with dorsolateral microspines simple, without mandibular seta 1-Md. Cutting organ with 1 or 2 dorsal spines; 2 dorsal teeth, lateral tooth smaller; ventral tooth with one or 2 lateral denticles (VT-4 or VT-1, 4) and 3 mesal denticles (VT_{1-3}); accessory denticles at base of cutting organ always present; ventral blade apparently usually 2, VB_2 much smaller; pectinate brush well developed, of 5-8 mostly mesally pectinate hairs. Piliferous process well protrudent, deeply cleft apically; labula variable. Mandibular hairs of distal group usually more widely spaced proximally. *Maxilla*. (Excluding the greatly modified maxilla of *impiger* - *vide* the species description.) Cardo triangular, narrowly fused mesobasally with cranium, a strongly sclerotized narrow strip-like ridge extending from anterior termination of hypostomal suture along anterior margin of cranium to anterior margin of cardo; cardinal seta 1-Mx single or double. Mesostipes about as long as or slightly longer than wide, with stout spicules on mesal margin; stipital sensoria at or distad of middle; dorsal stipital seta

2-Mx and ventral stipital seta 4-Mx sublaterally near apex; hairs of maxilla brush rather short, some stiff; pseudoartis developed, free from or loosely fused with cranium. Lacinia with proximal lacinial seta 5-Mx at or slightly distad of level of stipital sensoria; distal lacinial seta 6-Mx usually strongly basally barbed. Palpostipes shorter than mesostipes, apically narrowed, often definitely or loosely fused mesobasally with mesostipes; apex with ampulla and usually 5 palpal sensoria, S_5 smallest, rarely reduced. *Mentum plate* with 19-35 small teeth. *Thorax.* Setae O-P, 13, 14-M and 8-T usually short and dendritic; 13-P absent. *Abdomen.* Seta 12-I present or absent *(impiger);* 6-I-V and 7-I usually strong; 6-VI, 7-II, 13-III-V and 1-IV, V occasionally strong; 13-II, VI usually dendritic. Comb scales variable in shape and number. *Siphon* with acus usually attached, occasionally free, index 1.7-4.9; pecten restricted to basal 0.6 (usually basal 0.4-0.5) of siphon, of closely spaced dark teeth; 1-S well developed, inserted at about apex of pecten or a little beyond; 2-S apical or subapical on siphon; accessory siphonal setae occasionally present. *Saddle* complete or incomplete (incomplete in species of this region); acus present or absent; 1-X on saddle; 2-X multibranched; 3-X single; 4-X of 12 to about 20 cratal hairs, precratal hairs usually present.

DISTRIBUTION. Worldwide.

KEY TO SPECIES OF *AEDES (OCHLEROTATUS)*

FEMALE ADULT

1. Tarsi with pale bands. 2
   Tarsi without pale bands. 4

2(1). Subspiracular area and metameron without scales; lower mesepimeral bristles absent (after Belkin 1962). . . . . *vigilax* (p. 262)
   Subspiracular area and metameron with scales. 3

3(2). Abdominal terga with a broad pale longitudinal median line; tarsi with 2 articular bands on 2-4. . . . . *dorsalis* (p. 264)
   Abdominal terga without a longitudinal median band; tarsal bands basal. *excrucians* (p. 267)

4(3). Costa with a long pale basal mark reaching humeral crossvein; vertex usually with some submedial broad, decumbent dark scales; sternopleural patch not reaching cephalic corner; mesepimeron bare on lower 0.25-0.33. . . . . *impiger daisetsuzanus* (p. 271)

   Costa at most with scattered pale scales between pale basal spot and humeral crossvein (if a long basal mark present, sternopleural patch reaching cephalic corner and mesepimeral patch fully or almost reaching lower margin); decumbent scales on vertex all pale and narrow. 5

5(9). Supraalar bristles mostly dark brown to black; sternopleural and mesepimeral patch variable. . . . . *communis* (p. 278)
   Supraalar bristles mostly pale yellow to brown. 6

6(5). Sternopleural patch reaching cephalic corner. 7
Sternopleural patch not reaching cephalic corner; mesepimeron bare on lower 0.25-0.33. 9

7(6). Lower mesepimeral bristles absent; mesepimeron usually bare on lower 0.25-0.33; tempus usually with a dark spot. . . . . *sticticus* (p. 275)
Lower mesepimeral bristles present; mesepimeral patch fully or almost reaching lower margin; tempus entirely pale. 8

8(7). Lateral erect forked scales of vertex dark, dark scales also present in middle; costa without pale basal spot. . . . . *hakusanensis* (p. 292)
Erect forked scales of vertex mostly yellow; costa with or without pale basal spot. . . . . *punctor* (p. 281)
hexodontus hokkaidensis (p. 286)
Ae. (Och.) sp. (p. 296)

9(6). Abdominal terga with complete pale basal bands; erect forked scales of vertex yellow. . . . . *intrudens* (p. 296)
Abdominal terga without complete basal bands; lateral erect forked scales of vertex dark. . . . . *diantaeus* (p. 299)

MALE GENITALIA

1. Aedeagus without strong tergal ridges; basistyle without conspicuous tufted bristles in apical half; lower mesal division of basal tergomesal lobe without specialized setae. 2
Aedeagus with strong tergal ridges; basistyle with conspicuous tufted bristles in apical half; lower mesal division of basal tergomesal lobe with 2 specialized setae; claspette filament triangularly expanded. 10

2(1). Apex of aedeagus smooth. 3
Apex of aedeagus denticulate or serrate. 6

3(2). Apical tergomesal lobe lacking; basal tergomesal lobe without specialized seta; claspette filament very slender, setiform (after Belkin 1962). *vigilax* (p. 262)
Apical tergomesal lobe present; basal tergomesal lobe with specialized seta; claspette filament well developed, broad. 4

4(3). Claspette filament with triangular expansion on convex side. *impiger daisetsuzanus* (in part) (p. 271)
Claspette filament without triangular expansion. 5

5(4). Basal tergomesal lobe not apically expanded; with 2 specialized setae; claspette filament with only a short expansion on convex side. *dorsalis* (p. 264)
Basal tergomesal lobe strongly apically expanded, with one specialized seta; claspette filament with a small triangular expansion on concave side near base, and a long narrow expansion on convex side. *sticticus* (p. 275)

6(2). Basal tergomesal lobe without specialized seta; claspette filament angulate on convex side near base. . . . . *excrucians* (p. 267)
Basal tergomesal lobe with specialized seta. 7

7(6). Claspette filament with triangular expansion on convex side. *impiger daisetsuzanus* (in part) (p. 271)
Claspette filament without triangular expansion on convex side. . . . 8

8(7). Claspette stem long, extending beyond basal tergomesal lobe; claspette filament with basal ridges on convex side. . . . . *communis* (p. 278)
Claspette stem short, reaching posterior end of basal tergomesal lobe; claspette filament without ridges on convex side. 9

9(8). Basal tergomesal lobe of basistyle with proximal tergalmost surface flat and broad, bearing a stout seta and many bristles, the lower distal surface with scattered short bristles on weakly prominent papillae; claspette filament longer, more slender and paler. *hakusanensis* (p. 292)
Ae. (Och.) sp. (p. 296)
Basal tergomesal lobe of basistyle with proximal tergalmost surface narrow and convex, bearing a stout seta and only a few bristles, the lower distal surface densely covered with bristles on strongly prominent papillae; claspette filament shorter, stouter and darker. *punctor* (p. 281)
hexodontus hokkaidensis (p. 286)

10(1). Basistyle sternoapically with tufted bristles; cercal tergal surface simple. . . . . *intrudens* (p. 296)
Basistyle sternomesally with tufted bristles; cercal tergal surface covered with tubercle-based minute spicules. . . . . *diantaeus* (p. 299)

LARVA*

1. Comb scales fringed with spicules up to apex, the apical spicule occasionally stronger, but subapical spicules at least 0.5 length of apical spicules, arranged in a patch; pecten teeth evenly spaced. 2
Comb scales with a single (rarely double) strong apical spine, laterobasally fringed with fine spicules only. 4

2(1). Seta 1-P double and strong; 13-III-V strong; comb scales 28-81, usually more than 40. . . . . *communis* (p. 278)
Seta 1-P single and weak; 13-III-V weak; comb scales 15-33. 3

3(2). Seta 1-A 2-3 branched; pecten teeth 7-12, the apical tooth at basal 0.32-0.42 of siphon. . . . . *vigilax* (p. 262)
Seta 1-A 5-12 branched; pecten teeth 16-28, the apical tooth at basal 0.45-0.51 of siphon. . . . . *dorsalis* (p. 264)

*The larva of *Ae. (Och.)* sp. is unknown.

4(1). Pecten with all teeth rather evenly spaced. 5
Pecten with one or more apical teeth distinctly detached. 9

5(4). Setae 2,3-P distinctly more slender and shorter than 1-P; 8-P short; 1-X slender, shorter than saddle; individual comb scale with apical spine rather weak or moderate. 6
Setae 2,3-P or both strong, often nearly length of 1-P; 8-P medium to strong; 1-X rather strong, length of or longer than saddle; individual comb scale with apical spine very strong. 7

6(5). Seta 5-C single, rather stiff; 12-I absent; 7-II more than 0.5 length of 6-II; comb scales 9-17. . . . . *impiger daisetsuzanus** (p. 271)
Seta 5-C 2-4 branched, slender; 12-I present; 7-II less than 0.5 length of 6-II; comb scales 18-25. . . . . *sticticus* (p. 275)

7(5). Seta 1-M distinctly longer and stouter than 3-M. . *hakusanensis* (p. 292)
Seta 1-M shorter than or length of 3-M, weakk. 8

8(7). Setae 6-IV,V single; 3-P, 13-V and 6-VI almost always single, very rarely double. . . . . *punctor* (p. 281)
Setae 6-IV-VI and 13-V usually double, occasionally triple; 3-P 2-4 branched. . . . . *hexodontus hokkaidensis* (p. 286)

9(4). Comb scales 28-38 in a patch; siphon index 4.2-4.9. *excrucians* (p. 267)
Comb scales 8-16 in an irregular single or double row; siphon index 3.0-3.7. 10

10(9). Antenna shorter than head; seta 5-C well caudad of and tandem with or only slightly mesad of 6-C. . . . . *intrudens* (p. 296)
Antenna longer than head; seta 5-C distinctly mesocaudad of 6-C. *diantaeus* (p. 299)

55. *AEDES (OCHLEROTATUS) VIGILAX* (SKUSE)
(Fig. 79; Table 88)

Culex vigilax Skuse, 1889: 1731 (♀). Type-locality: Gosford, Kiama and National Park, New South Wales; Brisbane, Queensland, Australia.
Aedes (Ochlerotatus) vigilax: Tanaka, Nagano, Kishimoto and Miyagi, 1975: 298, Kuroshima, Yaeyama Guntô, Ryukyu Archipelago.

FEMALE and MALE. Specimens from this region are not available.

LARVA (Fig. 79). *Head.* Width 1.03-1.13 mm; brown, 1.35-1.48 as wide as long; labrum slightly concave on apical margin; seta 1-C pigmented, 0.75-0.80 length of distance between bases; 6-C slightly anteriad or on level of 7-C; 4-C mesocaudad of 6-C; 5-C well caudad of and tandem with or slightly mesad of 6-C; 10-C usually double. *Antenna* 0.33-0.36 mm long, pale, sparsely spinulate; 1-A double or triple, occasionally weakly barbed, inserted at

*Maxilla is modified; *vide* description and taxonomic discussion.

basal 0.43-0.49, not reaching apex of shaft; 5-A with an accessory sensorium on proximal division. *Mandible* (2 dissected specimens) with a number of very fine dorsolateral microspines near base. Cutting organ with 2 dorsal spines; lateral dorsal tooth simple or with a mesal denticle, mesal dorsal tooth with a strong mesal denticle; ventral tooth with 2 lateral denticles, VT-4 as large as VT_0; VT_2 larger than VT_1 and VT_3; apparently 2 ventral blades, VB_1 reaching tip of VT_0, with fine mesal pectination; VB_2 difficult to see; pectinate brush of 5-7 mesally pectinate hairs, most anterior hair as long as VB_1. Piliferous process with labula as long as or only slightly longer than the broader anterior part. Mandibular hairs (5-7) + (9-11), hairs of anterior group barbed or apically frayed, hairs of posterior group more distinctly frayed at apex. *Maxilla* (2 dissected specimens) with 1-Mx single, occasionally apically bifid. Mesostipes 1.2 times as long as wide, with several denticles on lateral surface; stipital sensoria equal, distad of middle, without basal ring; 4-Mx lightly pigmented. Lacinia with 5-Mx slender, slightly distad or on level of stipital sensoria; 6-Mx apparently basally thickened and strongly barbed. Palpostipes excluding apodeme 1.5 times as long as wide, apical half fairly broad; apex with 5 short palpal sensoria, S_1 much larger than the others, S_{2-4} subequal. *Mentum plate* with 19-23 teeth. *Thorax*. Seta 1-P of medium size for the species, 2,3-P slender, 0.5 length of 1-P; 7-P usually double; 8-P very short, usually single; 12>10>9-P in length; 1-M short, subequal to 3-M; 1-T usually double. *Abdomen*. Seta 7-II very short, 0.14-0.17 length of 6-II (1 specimen); 1-VIII smooth and weak; 12-I, 14-III, 13,14-IV, and 12,14-V usually single; 10-I, 8-II, 10-IV and 14-VI usually double. Comb scales 21-28, in a triangular patch; individual scales rather short, fringed with spicules up to apex, the spicules progressively stouter towards apex, apical spicules usually a little stronger than others. *Siphon* pale brown, narrowly dark brown at base and apex, with acus frequently free or barely connected with siphon, often slightly broadened just distad of base, apex 0.63-0.69 as wide as broadest diameter; length 0.62-0.71 mm, index 1.73-1.93; microsculpture imbrication-like; pecten reaching basal 0.32-0.42, of 7-12 dark brown, evenly spaced teeth, occasionally a few basal teeth abortive; each tooth with several ventrobasal denticles; 1-S located a little beyond pecten at basal 0.44-0.50, subpalmate, a little shorter than siphon diameter at insertion; 2-S near apex of siphon, just reaching or extending beyond it, shorter than apical pecten tooth. *Saddle* narrowly incomplete, pale, 0.32-0.41 mm long, with microsculpture similar to that of siphon, with several spicules dorsoapically; seta 1-X shorter than saddle; 4-X of 13-14 cratal and 2-3 precratal tufts (15-17 tufts in total), cratal tufts 4-11 branched, precratal tufts 2-6 branched. Anal gills very short, conical, 0.3-0.5 length of saddle, dorsal gill length of, or at most slightly longer than ventral one.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 20 L: Yaeyama Guntô (10 L: Kuroshima, 25 VIII 1967, ground pool, Nagano, IMCOL. 10 L: K-2263).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô). TAIWAN. PHILIPPINES. INDONESIA. INDOCHINA. ?MALAYA. THAILAND. NEW GUINEA. AUSTRALIA. SOLOMON ISLANDS. NEW HEBRIDES. NEW CALEDONIA. LOYALTY ISLANDS. FIJI.

BIONOMICS. Previously, this species had been found only on Kuroshina, a small flat heart-shaped island, 4.1 km wide, 3.2 km long, situated between Ishigaki and Iriomote Is., the 2 major islands of the Yaeyama Guntô. Larvae were found in ground pools. In Southeast Asia and Australia, larvae usually occur in brackish water in coastal regions, occasionally in fresh water. Females are vicious biters of man and livestock.

MEDICAL IMPORTANCE. Iyengar (1954) showed that this species was the principal vector of *Wuchereria bancrofti* in New Caledonia.

56. *AEDES (OCHLEROTATUS) DORSALIS* (MEIGEN)
(Figs. 80, 81, 212; Table 89)

Culex dorsalis Meigen, 1830: 242 (♀). Type-locality: Berlin, Germany.
Aedes dorsalis: Yamada, 1927: 573, Hokkaido and Honshu, Japan; Yamada, 1932: 226, Korea.
Aedes (Ochlerotatus) dorsalis: LaCasse and Yamaguti, 1950: 133 (♂, ♀, L).
Aedes (Ochlerotatus) dorsalis albus LaCasse and Yamaguti, 1950: 129, 136 *(nomen nudum).*

FEMALE (Fig. 212). Wing length 4.4-5.0 mm. *Head.* Eyes moderately separated above, narrowly below. Vertex with broad median area including interocular space covered with narrow curved, white scales, and lateral area covered with narrow curved, tawny yellow scales; medially with numerous erect forked, white scales and laterally with dark brown ones; tempus covered with pale ochreous broad scales; about 10 or more vertical bristles, lateralmost 2-4 dark, others pale, about half of them on interocular space; 4-5 dark temporal bristles. Clypeus dark brown. Antennal pedicel brown, mesally darker, covered with small broad, white scales on mesal and dorsal surfaces, a few short bristles among the scales; flagellum 0.85-0.89 (5) length of proboscis; flagellomere 1 yellowish brown, with a few pale and dark scales, 1.31-1.45 length of Flm 2. Palpus 0.22-0.25 (5) length of proboscis, speckled with dark and pale scales; segment 3 1.43-2.08 of 2. Proboscis 1.26-1.35 (5) length of forefemur, with several ventrobasal bristles, basally and apically dark scaled, pale scaled in medial 0.6. *Thorax.* Pronotal integument dark brown; anterior lobe covered mesoanteriorly with narrow curved, yellowish brown scales, lateroposteriorly with rather broad white scales, scales intermediate in shape and color in-between, bearing many brown bristles of moderate size, the bristles lateroposteriorly paler; posterior lobe covered dorsally with narrow curved curved, bronze-brown scales, and posteroventrally with broad white scales, bearing 4-9 dark bristles along posterior margin, occasionally one or 2 bristles pale. Scutum with integument dark brown, covered with white and yellowish or bronzy brown narrow curved scales excepting paired small areas before posterolateral angles; the brown scales forming a median line reaching posterior margin or extending onto scutellum, rather indistinct paired supraalar patches, and marginal band from humerus to wing-root; scales on margins slightly broader; acrostichal bristles usually restricted to several short anterior ones, most anterior ones pale, others dark, occasionally a few fine bristles remain posteriorly; many pale bristles at anterior end of anterior dorsocentral series, other anterior dorsocentral bristles short and dark; posterior dorsocentrals and prescutellars long and pale; more than 10 mostly dark bristles of various sizes scattered on fossal area near humeral and posterior margins; supraalars anteriorly brown, posteriorly pale. Scutellum with integument pale brown, rather roughly covered with slender white scales, each lobe bearing many long pale bristles. Paratergite dark brown, with broad white scales. Pleural integument brown, darker on post- and subspiracular areas, covered with broad white scales excepting lower anterior area of sternopleuron, mesomeron, metepisternum and metepimeron; metameron; also white scaled; scales on sternopleuron reaching anterior angle, those on mesepimeron reaching lower

margin; pleural bristles pale, many on propleuron, prealar knob, upper to posterior margin of sternopleuron, and upper mesepimeron; 8-15 postspiracular, 2-5 lower (anteromedian) mesepimerals. Prosternum pale scaled. *Wing*. Alula fringed with pale, rather broad scales. Vein c pale scaled, speckled with varying amounts of dark scales on apical 0.5; sc pale scaled, with dark scales mixed apically; remigium pale scaled, occasionally some dark scales present; r pale scaled, unevenly speckled with dark scales; r_1 dark scaled and speckled with pale scales; rs and r_{1+2} with pale plume scales; r_2 and r_3 with both dark and pale plume scales; r_{4+5} dark scaled and with scattered pale scales; m pale scaled, occasionally a few dark scales intermixed; m_{1+2} pale scaled in basal 0.33, dark scaled otherwise; m_{3+4} pale scaled at base, dark scaled otherwise; cu, cu_1 and cu_2 dark scaled, with scattered pale scales; 1a pale scaled, often a few dark scales intermixed; short dorsal fringe scales mainly dark apically, mainly pale in basal 0.33; long fringe scales pale only on a short basal area. Cell R_2 1.63-2.13 (5) length of vein r_{2+3}. Halter knob pale scaled. *Legs*. Coxae pale scaled. Femora mainly pale scaled, speckled with dark scales; hindfemur with ill defined dark dorsosubapical patch; posterior surface of mid- and hindfemora almost entirely pale scaled. Fore- and midtibiae speckled with pale and dark scales on anterior surface, almost entirely pale scaled on posterior surface; hindtibia with many dark scales dorsally, otherwise almost entirely pale scaled. Tarsomeres 1 pale scaled, with dark scales mixed; each tarsus with pale basal band on 2 and 2 pale articular bands on 2-4; 5 pale scaled. Midtarsomere 5 as long as 4; hindtarsomere 1 0.75-0.81 (5) length of tibia. Claws equal, usually with sharp submedian tooth, sometimes one or both claws of hindtarsus simple. *Abdomen*. Tergum I medially pale scaled; II-VII broadly pale scaled along median line and laterally, dark scaled in-between; each tergum with pale basal band, usually not fused with lateral pale area in most segments; occasionally VII or VI-VII almost entirely pale scaled. Sterna pale scaled.

MALE (Figs. 81, 212). Wing length 4.0-4.8 mm. Vertex usually with more pale scales. Antennal pedicel apparently lacking bristles; flagellum 0.63-0.75 (5) length of proboscis; flagellomeres 12 and 13 dark, Flm 12 1.27-1.48 length of Flm 13, both together 0.97-1.18 length of the pale brown Flm 1-11. Palpus 1.19-1.24 (5) length of proboscis; segment 1 dark scaled, with a few pale scales mixed; 2-5 pale scaled, with dark scales at base of 2, joint 2-3, and apices of 3 and 4; 4 and apex of 3 ventrally with numerous long bristles; length ratio of 2-5: 0.92-1.08 : 1.50-1.77 : 1.05-1.12 : 1.00 (5). Proboscis 1.37-1.41 (5) length of forefemur. Acrostichal bristles more often present in posterior part; fossal area lacking bristles, or with very few fine ones. No anteromedian mesepimerals. Cell R_2 0.97-1.32 (6) length of vein r_{2+3}. Hindtarsomere 1 0.79-0.86 (4) length of tibia. Anterior claw of foretarsus with a blunt-tipped median and a sharp laterobasal tooth, anterior claw of midtarsus slightly sinuate, much longer than posterior claw, with a blunt-tipped submedian tooth; posterior claw of fore- and midtarsi with a sharp subbasal tooth; claws of hindtarsus similar to those of female. *Genitalia*. Tergum IX sclerotized in middle; lobes protrudent, sclerotized and moderately separated, each with 4-9 rather short, stout setae. Sternum IX oblong-quadrate, with 5-9 bristles. Basistyle subcylindrical, 3.8-5.0 length of median narrowest portion, laterally and sternally scaled, laterally and sternoapically with long bristles, and short bristles otherwise; apical tergomesal lobe convex, with several bristles, one of them a little thickened in middle; basal tergomesal lobe strongly protrudent, roughly quadrate in tergal view, with apical surface covered with prominent-based bristles, bearing 2 stout setae: one longer,

apically recurved, located at middle near apical margin, another posteriorly at base; claspette stem pilose, with 2 or 3 basal and several apicomesal short bristles; filament falciform, 4.5 times as long as wide, as long as stem, pigmented, just hooked at tip. Dististyle slender, 0.53-0.64 length of basistyle, with 3-4 setae on convex side and one on concave side near apex; claw slender, nearly straight, pigmented, 0.22-0.30 (9) length of dististyle. Paraproct strongly laterally and apically sclerotized, with single or double tergally hooked apical tooth; tergal surface not sclerotized; 2-9 (usually 5-8) cercal setae; tergite X moderately sclerotized, with surface apparently granulate. Aedeagus elongate-oval in tergal view, 1.92-2.29 (6) as long as wide, notched at apex, closed but tergally with a round basal opening, sternally widely open.

LARVA (Fig. 80). *Head.* Width 1.18-1.26 mm; brown, 1.27-1.34 as wide as long; seta 1-C pigmented, 0.80-0.95 (5) as long as distance between bases; 5, 6-C nearly tandem with each other, smooth to moderately barbed; 4, 6-C on same level as 7-C or slightly posterior to it; 8, 13-C usually single; 14-C sometimes with 1 or 2 fine accessory branches. *Antenna* 0.36-0.43 mm long, less than 0.5 length of head, only slightly curved, lightly pigmented, spiculate throughout but more sparsely apically; seta 1-A inserted at basal 0.41-0.51 of shaft, with 5-9 (5-12, after LaCasse and Yamaguti 1950) barbed branches, scarcely reaching apex of shaft; 5-A with an accessory sensorium on basal division; 2 = 4 3 5 6-A in length. *Mandible* with many rather stout dorsolateral microspines near base. Cutting organ with 2 dorsal spines; lateral dorsal tooth with one or more mesal denticles, mesal dorsal tooth with a few mesal denticles continuous with a row of accessory denticles on mesobasal surface of cutting organ; ventral tooth with 2 lateral denticles, VT-4 a little smaller than VT_0; VT_3 smaller than or subequal to other 2; VT_{1-3} each with a tiny secondary denticle on anterior side; 2 ventral blades, VB_1 stout, extending a little beyond apex of VT_0, with very strong mesal pectination of long and short teeth; VB_2 similar to VB_1 but much shorter; pectinate brush of 5-8 mesally pectinate hairs. Piliferous process with labula as long as or only a little longer than the broader anterior part. Mandibular hairs (6-7) + (9-13), hairs of anterior group simple, those of posterior group apically frayed. *Maxilla* with seta 1-Mx usually smooth, single or double. Mesostipes as long as broad, indistinctly tuberculate on lateral surface; stipital sensoria slightly distal to middle, equal, each on a short basal ring; 4-Mx unpigmented; lacinia with 5-Mx slightly distad of or on level of stipital sensoria. Palpostipes narrow in apical half, excluding apodeme 1.6 as long as wide, 0.5 length of mesostipes; apex with short ampulla and 5 short palpal sensoria, $S_3 \geq S_1 > S_2 \geq S_4 \geq S_5$ in length. *Mentum plate* with 19-21 teeth. *Thorax.* Seta 1-P of medium size, 2, 3-P short and slender, at most 0.67 length of 1-P; 8-P very short; 1-M slender, longer than 3-M; usually, 9-P, 1-M, 6, 12-T single, and 5-P double. *Abdomen.* Seta 7-II smooth to fairly strongly barbed, 0.20-0.45 (x = 0.30) length of 6-II; 10-II, IV, 9-II, 2-V, VI, and 8-V usually single; 8-II, 13-V and 6-VI usually double; usually 6-I 3 branched and 5-VIII 6 branched; 2-VIII not on a sclerotized callus. Comb scales 19-26 (15-31, after LaCasse and Yamaguti 1950) in a patch, individual scales rather small, laterally and apically fringed with spicules, the spicules progressively larger apically. *Siphon* pale brown, dark brown at base, with acus attached, slightly broadened just distad of base, apex 0.67 as wide as base; length 0.89-1.07 mm, index 2.32-2.48; microsculpture faint; pecten reaching basal 0.45-0.51 of siphon, of 20-28 (16-24, after LaCasse and Yamaguti 1950) dark brown, evenly spaced teeth, occasionally basal 1-4 teeth abortive, each with several ventrobasal denticles; 1-S beyond pecten at apical 0.40-0.46, slightly shorter than siphon diameter at insertion;

2-S close to and extending beyond apex of siphon, weak, much shorter than apical pecten tooth. *Saddle* 0.36-0.43 mm long, covering dorsal half of segment X, with short rows of microspicules on entire surface, the spicules a little more distinct apically; segment X subventrobasally with a free acus, minutely spiculate on ventral unsclerotized area; seta 1-X slender, shorter than saddle; 4-X of 12-17 cratal and 3-4 precratal tufts (15-20 in total), each 6-13 branched. Anal gills very short, 0.33-0.67 length of saddle, ventral gill shorter than dorsal one.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 5♀: Hokkaido (A-0038, A-0040, A-0043, A-0214). 28♂, 25♀, 21 L, 18 l: Honshu (B-2124, F-0096, F-0097, F-0230).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido. Honshu, Shikoku, Kyushu). KOREA (Korean Peninsula). HOLARCTIC REGION. TAIWAN. MEXICO.

BIONOMICS. *Aedes dorsalis* is apparently not ubiquitous in Japan. Although found from Hokkaido to Kyushu, *Aedes dorsalis* larvae occur in brackish ground water in the coastal region, sometimes also in fresh water. Adult females are vicious day and dusk biters of man and livestock.

MEDICAL IMPORTANCE. Viruses of western equine encephalitis and California encephalitis have been isolated from wild-caught females in the U.S.A. (Carpenter and LaCasse 1955). Crane and Elbel (1977) reported evidence of transovarial transmission of California encephalitis virus in this species in the western U.S.

57. *AEDES (OCHLEROTATUS) EXCRUCIANS* (WALKER)
(Figs. 81, 82, 213; Table 90)

Culex excrucians Walker, 1856: 429 (A). Type-locality: Nova Scotia, Canada.
Aedes excrucians: Sasa and Takahasi, 1948a: 116, Hokkaido, Japan.
Aedes excrucians subsp.: Shogaki, 1950: 3, Akan-kohan, Hokkaido, Japan.
Aedes (Ochlerotatus) excrucians: LaCasse and Yamaguti, 1950: 138 (♂, ♀).

FEMALE (Fig. 213). Wing length 4.3-6.8 mm. *Head.* Eyes narrowly separated above, moderately below. Vertex covered with narrow curved, pale scales on posterior half and median line including interocular space, anteriorly with yellowish brown ones; many long erect forked scales over almost entire vertex, medially pale and laterally dark; tempus covered with broad pale yellowish scales, a small patch of broad dark scales within the pale scaled area; at least 8 vertical bristles, mesal ones including a few on interocular space yellowish, lateral ones dark; 5-7 dark temporal bristles, lowest one somewhat detached. Clypeus very dark brown. Antennal pedicel testaceous, very dark on mesal surface, dorsally and mesally with small, broad white scales, mesally with short dark bristles; flagellum 0.89-0.91 (5) length of proboscis, flagellomere 1 with small white broad scales, 1.34-1.42 length of Flm 2. Proboscis 1.18-1.25 (5) length of forefemur, dark scaled, with variable amounts of scattered pale scales, occasionally median area largely pale scaled. Palpus 0.25-0.28 (5) length of proboscis, dark scaled, with scattered pale scales; segment 3 1.68-2.23 (5) length of 2; 4 0.09-0.32 length of 3. *Thorax.* Anterior pronotal lobe with integument very dark brown, bearing many dark and yellowish bristles, covered with narrow curved, white scales, some mesal scales somewhat yellowish; posterior pronotal lobe with integument brown, anterodorsally covered with narrow curved, brownish scales, posteroventrally

with narrow curved or crescent-shaped white scales, bearing 5-14 dark or yellowish brown bristles along posterior margin. Scutum with integument very dark brown, posteriorly rather lighter, covered with narrow curved white and bronze-brown scales; the white scales covering prescutellar space, anterior and lateral margins, and forming a narrow dorsocentral line, occasionally blurred or indistinct, reaching both anterior and posterior margins; the pale scaled dorsocentral line and lateral margin occasionally almost confluent behind fossal area; acrostichal bristles developed, some of prescutellars and supraalars pale yellowish brown, other scutal bristles dark, acrostichals and anterior dorsocentrals rather short; fossal area usually with more than 10 rather short bristles laterally and posteriorly, none or very few medially. Scutellum with integument brown, covered with narrow curved, white scales and bearing many long brown bristles, those on median lobe rather pale. Paratergite with rather broad, pale scales. Pleural integument light brown, darker on sub- and postspiracular areas and anterior corner of sternopleuron; propleuron, post- and subspiracular areas, lower prealar knob, upper and lower-posterior sternopleuron, upper 0.67 of mesepimeron, and metameron covered with rather broad, pale scales; upper sternopleural scales barely reaching anterior corner; pleural bristles pale yellowish brown, many on propleuron, prealar knob, sternopleuron and upper mesepimeron, 5-14 postspiraculars, 0-4 lower (anteromedian) mesepimerals. *Wing*. Alula fringed with dark, rather narrow scales. Veins speckled with dark and pale scales; fringe scales on posterior margin dark. Cell R_2 1.88-2.05 (5) length of vein r_{2+3}. Halter stalk pale scaled on apical half of anterior ridge, knob pale scaled. *Legs*. Coxae and trochanters pale scaled. Femora with apical pale fringe, speckled with pale and dark scales on anterior surface, mainly pale scaled on posterior surface except for apical area. Anterior surfaces of fore- and midtibiae, and hindtibia speckled with dark and pale scales; posterior surfaces of fore- and midtibiae mainly pale scaled; tibial pale apical fringe lacking. Tarsomeres 1 with pale basal band, dorsally and apically dark scaled, pale scaled otherwise, occasionally mottled with dark and pale scales dorsally and laterally; tarsomeres 2-5 dark scaled, occasionally with a few pale scales on 2, foretarsomeres 2-4 and mid- and hindtarsomeres 2-5 with fairly broad pale basal bands. Midtarsomere 5 as long as 4; hindtarsomere 1 0.65-0.70 (5) length of tibia. Claws equal, with long stout submedian tooth. *Abdomen*. Tergum I with a median patch of white and pale ochreous scales; II-VII speckled with dark and pale ochreous scales, usually more dark scales on anterior segments and more pale scales on posterior segments, pale scales more whitish laterally. Sterna pale scaled, with ill-defined median line of dark scales.

MALE (Figs. 81, 213). Wing length 4.3-6.3 mm. Often with more pale scales on vertex and scutum. Antennal flagellum 0.76-0.81 (5) length of proboscis; flagellomere 12 1.20-1.50 (5) length of Flm 13, both 0.93-1.06 of Flm 1-11. Palpus 1.25-1.32 (5) length of proboscis, dark scaled, with pale scales at bases of segments 2-4 and middle of 3, with numerous long bristles ventroapically on 3 and ventrobasally on 4, 4 and 5 with numerous bristles of medium length; length ratio of 2-5: 0.87-0.96 : 1.54-1.65 : 1.00-1.09 : 1.00. Proboscis 1.28-1.32 (5) length of forefemur. Lower mesepimeral bristles lacking. Cell R_2 1.06-1.53 (5) length of vein r_{2+3}. Midtarsomere with 7-10 stout ventroapical setae; hindtarsomere 1 0.71-0.75 (5) length of tibia. Anterior claw of foretarsus a little longer than posterior claw, with a blunt-tipped submedian tooth; posterior claw with a sharp triangular basal tooth; anterior claw of midtarsus sinuate, much longer than posterior claw, with a blunt-tipped submedian tooth; posterior claw with a sharp subbasal tooth; claws of hindtarsus similar to

those of female. *Genitalia*. Tergum IX sclerotized in median area; lobes sclerotized, moderately protrudent and separated, each bearing 4-17 medium-sized setae. Sternum IX oblong-quadrate, with 8-12 bristles. Basistyle subcylindrical, somewhat emarginate on tergomesal margin at middle, 5.2-8.3 length of tergal narrowest portion, sternally scaled, bristled throughout except for a narrow sternobasal space, long bristles on lateral, sternomesal and sternoapical surfaces; apical tergomesal lobe from middle of basistyle to apex, moderately apically protrudent, laterally and sternally bristled, without bristles on tergoapical surface, a few most apical bristles rather broad and striated; basal tergomesal lobe only convex, covered with short bristles, the surface rugose up to base of apical tergomesal lobe; claspette stem long, pilose in basal 0.67, with a few basal bristles; filament shorter than stem, about 4 times as long as wide, basally angulate on convex side, hooked at tip, convex edge very thin. Dististyle 0.51-0.54 (7) length of basistyle, slender, slightly swollen in middle, curved in apical 0.5, pilose on sternal surface, with 3-4 setae on convex side and one on concave side near apex; claw 0.20-0.23 (7) length of dististyle, slender, pigmented. Paraproct with a single, tergally hooked apical tooth; cercal tergal surface not sclerotized; tergite X well sclerotized; 2-6 cercal setae. Aedeagus elongate-oval in tergal view, 1.72-2.44 as long as wide, weakly sclerotized, tergally closed but with moderately large round tergobasal opening, sternally widely open, apex deeply notched, with several small teeth.

LARVA (Fig. 82). *Head*. Width 1.50-1.61 mm; brown, 1.36-1.56 as wide as long; front margin of labrum slightly concave; seta 1-C pigmented, 0.73-0.86 (3) as long as distance between bases; 4, 6-C about on level or a little anteriad of 7-C; 5-C usually triple, well posteriad of and tandem with 6-C; 6-C usually double, rather stiff; usually, 8-C double and 13-C single. *Antenna* 0.54-0.59 mm long, shorter than head, brown, darker distad of seta 1-A, rather strongly spinulate; 1-A inserted at basal 0.37-0.46, with 6-11 barbed branches, not reaching apex of shaft; 2-A rather stiff, pigmented. *Mandible* (2 dissected specimens) with a number of dorsolateral microspines of various sizes near base. Cutting organ with 2 dorsal spines; lateral dorsal tooth 2 or 3 cuspid; mesal dorsal tooth with one or 2 mesal denticles; a row of several acute accessory denticles from base of mesal dorsal tooth onto mesobasal surface of cutting organ; ventral tooth with 2 lateral denticles, VT-4 only a little smaller than VT_0; VT_2 larger than VT_1 and VT_3; 2 ventral blades, VB_1 stout, extending a little beyond apex of VT_0, with fine mesal pectination, VB_2 much shorter than VB_1; pectinate brush of 6-7 well developed mesally pectinate hairs, most anterior hair nearly as long as VB_1. Piliferous process with labula a little longer than the broader anterior part. Mandibular hairs (7-9) + (12-14), hairs of anterior group apically simple or weakly barbed, hairs of posterior group apically frayed. *Maxilla* (2 dissected specimens) with seta 1-Mx single. Mesostipes 1.2 as long as wide, with lateral surface smooth; apical brush very dense; equal twin stipital sensoria slightly distad of middle; 4-Mx close to apex; lacinia with 5-Mx slender, a little distad of level of stipital sensoria; 6-Mx thickened in basal 0.5, with stiff barbs. Palpostipes strongly apically narrowed, excluding lateral artis 1.5 as long as wide, about 0.5 length of mesostipes; apex with 4 short palpal sensoria, S_1 distinctly larger than others, S_{2-4} subequal, S_5 apparently reduced. *Mentum plate* with 23-25 teeth. *Thorax*. Integument covered with slender spicules. Setae 1, 12-P strong, 2, 3-P slender, 2-P not more than 0.5 length of 1-P; 3-P shorter than 2-P; 8-P medium to strong; 1-M shorter than 3-M; usually, 3-P, 4-M and 2-T double, 6-M 7 branched, and 5-T single. *Abdomen*. Integument of segments I-VII covered

with slender spicules, VIII with rather shorter and stouter spicules. Seta 7-II 0.34-0.56 (x = 0.41) length of 6-II; 13-III-V and 1-IV, V strong; 14-IV, V and 11-VII usually single; 3-I, 8-II, 11-III, 1, 3-IV and 1-VII usually double; 2-VIII usually free, occasionally on a common callus with 1-VIII. Comb scales 28-38 in a patch, individual scales thorn-shaped with a single, rarely double, apical spine, laterobasally fringed with spicules. *Siphon* rather slender for Japanese *Ochlerotatus*, brown, darker on basal margin, with acus attached, broadest just distad of base, apically tapering, 4.1-4.6 as long as wide, apex 0.51-0.57 of broadest part; length 1.76-2.00 mm; index 4.2-4.9; microsculpture of short transverse rows bearing minute denticles; pecten reaching basal 0.38-0.44, of 12-26 dark brown teeth including 1-6 basal abortive teeth, 1-3 apical teeth detached, each with 1-4 ventral denticles; seta 1-S located beyond pecten at apical 0.46-0.51, longer than siphon diameter at insertion; 2-S a little proximal to apex of siphon, not reaching it, much shorter than apical pecten tooth. *Saddle* 0.57-0.66 mm long, narrowly incomplete, with ventral margin shallowly incised, with short rows of minute denticles on entire surface, these also covering ventral unsclerotized area, the denticles becoming apically stronger excepting a narrow dorsal area; a free acus subventrally proximad of saddle; seta 1-X a little shorter than saddle; 4-X of 15-18 cratal and 5-7 precratal tufts (21-25 in total), cratal tufts 4-8 and precratal tufts 2-5 branched. Anal gills apically tapering, dorsal gill 1.0-1.3 length of saddle, ventral gill shorter than dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 68♂, 73♀: with associated skins 12 l, 12 p); 75 L, 12 l: Hokkaido (A-0187, A-0188, A-0203, A-0204, A-0206, A-0207, A-0217, A-0218, A-0219, A-0220, A-0221, A-0222, A-1781, A-1783, A-1784, A-1794, A-1800, A-2281).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido). NORTHERN PALAEARCTIC and NEARCTIC REGIONS.

TAXONOMIC DISCUSSION*. McDaniel and Webb (1974) discussed female and larval characters of the *stimulans*-group including *fitchii* (Felt and Young), *excrucians* and *stimulans* (Walker) from Maine, U.S.A. They stated that none of the *excrucians* had a proboscis with numerous white scales, and the larva of *excrucians* lacked setae 1-I-III. Specimens from Hokkaido differ from their report.

BIONOMICS. Common in Hokkaido. Larvae are found in ground pools of more or less polluted water, formed by melted snow, and associated with *Ae. punctor*, *Ae. esoensis*, *Ae. yamadai* and *Ae. vexans nipponii*. It is apparently univoltine (Sato and Iwase 1959). The adults emerge during May and females are severe biters during the day. Sato et al. (1973) found *excrucians* to be commoner at lower altitudes, and to exhibit dawn and dusk peaks of activity.

MEDICAL IMPORTANCE. Natural infections of tularemia have been found in this species (Gutsevich et al. 1970).

*After the completion of the manuscript, Arnaud et al. (1976, Ann. Parasitol. Hum. Comp. 51:477-94) resurrected *Ae. (Och.) surcoufi* (Theobald, 1912) for the southwestern European population of *excrucians*. Japanese *excrucians* agrees with North American *excrucians* in the claws of the adult, and with *surcoufi* in the larva in having setae 6-III-VI constantly double, while these setae are usually single in North American *excrucians*.

58. *AEDES (OCHLEROTATUS) IMPIGER DAISETSUZANUS* NEW SUBSPECIES*
(Figs. 83, 84, 214; Table 91)

Aedes (Ochlerotatus) impiger: Tanaka, 1972: 229, Yukomambetsu, Hokkaido, Japan.

FEMALE (Fig. 214). Wing length 3.3-3.8 mm (reared specimens). *Head.* Vertex covered with narrow curved, yellow scales, sometimes broader creamy white scales covering more than 0.5 of median part; tempus covered with broad, creamy white scales; broad dark scales usually present submedially on vertex and on tempus, and sometimes forming small patches; fairly long, erect forked, pale yellow scales medially on posterior part of vertex and dark ones laterally; vertical bristles many, those on interocular space yellow, lateral ones dark; several temporals black. Clypeus pitch-black. Antenna: pedicel pitch-black, dorsally and mesally covered with small pale moderately broad scales intermixed with dark ones, some short dark bristles mesally; flagellum 0.81-0.88 (2) length of proboscis; flagellomere 1 1.36-1.44 (2) length of Flm 2, ventromesally with small pale scales. Palpus dark scaled, with scattered pale scales, 0.18-0.19 (2) length of proboscis; segment 3 1.90-1.95 (2) of 2; 4 0.06-0.18 length of 3. Proboscis dark scaled. *Thorax.* Pronotal integument dark; anterior lobe with rather narrow curved, creamy white scales, bearing black and yellow bristles; posterior lobe with narrow curved, pale yellow scales, those on posterior lower corner broader and paler, 6-12 yellow bristles along posterior margin. Scutum with integument dark, roughly covered with narrow curved, bronzy brown scales in most median part and with creamy white ones otherwise, sometimes bronzy brown scales forming vague longitudinal median stripes; acrostichal bristles developed; usually more than half of supraalar bristles dark, others yellowish, occasionally *vice versa;* other scutal bristles mostly dark, a few bronze-brown ones present among prescutellars. Scutellum with narrow curved, creamy white scales, scutellar bristles mostly dark bronzy and black ones intermixed. Paratergite scaled. All pleura excepting mesomeron, metepisternum and metepimeron with patches of moderately broad white scales, sternopleural patch not reaching cephalic angle; lower 0.25-0.33 of mesepimeron bare; all pleural bristles well developed, yellow or yellowish white; 2-4 lower mesepimerals. *Wing.* Alula with rather narrow dark scales. Veins dark scaled; vein c with a pale long basal mark reaching humeral cross vein; base of r sprinkled with a few pale scales. Halter knob white scaled. *Legs.* Coxae and trochanters with white rather narrow scales. Femora with white apical fringe; fore- and midfemora posteriorly and ventrally white scaled, with scattered white scales (sometimes with more white scales than dark ones) dorsally in forefemur and anteriorly in midfemur; hindfemur white scaled excepting apical dark spot which extends basally up to about middle on dorsal surface; tibiae and underside of

*The nominal subspecies, *Aedes (Ochlerotatus) impiger impiger* (Walker, 1848) does not occur in this region.

Culex impiger Walker, 1848: 6 (♀). Type-locality: St. Martin's Falls, Albany River, Hudson's Bay, Ontario, Canada.

DISTRIBUTION. NORTHERN HOLARCTIC REGION (except Japan).

tarsomere 1 sprinkled with white scales; femora, tibiae and tarsi otherwise dark scaled. Midtarsomere 5 as long as 4; hindtarsomere 1 0.71-0.72 (2) length of tibia. Claws equal and unidentate. *Abdomen.* Tergum I with a large median patch of broad white scales; II-VII dark scaled, with fairly wide basal bands of white broad scales. Sterna white scaled, each with a dark apical band.

MALE (Fig. 84). Wing length 3.6-4.1 mm (reared specimens). Vertex mostly covered with broad pale scales, narrow scales reduced in number and limited to median area. Antennal flagellum 0.64-0.65 (2) length of proboscis; flagellomere 12 1.25-1.40 (2) of Flm 13, both 0.97-1.09 of Flm 1-11. Palpus 1.04-1.07 (2) length of proboscis; length ratio of segments 2-5 : 1.31-1.47 : 1.95-2.06 : 1.31-1.47 : 1.00. Lower mesepimeral bristles 2-6. Cell R_2 1.18-1.27 (2) length of vein r_{2+3}. Hindtarsomere 1 0.77-0.80 (2) length of tibia. Anterior claw of midtarsus slender, much longer than posterior claw; all claws unidentate. *Genitalia.* Tergum IX with median sclerotized part 3-4 times as wide as median length; lobes well sclerotized, with 5-14 stout setae of medium length. Sternum IX rounded, trapezoidal, with 4-6 bristles near apex. Basistyle cylindrical, a little arcuate, 5.4-6.7 times as long as width of tergal median narrowest part, wholly bristled; apical tergomesal lobe not very prominent, tergally glabrous, with several small sternal bristles; basal tergomesal lobe narrowly conical, rather pointed at apex, with many long bristles, uppermost one largest, more or less pigmented (not pigmented in teneral specimens), other bristles gradually diminishing in size, sternal surface with scattered small bristles; claspette stem strongly and evenly curved, apical 0.5 more slender than basal 0.5 which is pilose and bears 2 short setae on mesal side near base; filament long, weakly sclerotized along concave side, a little curved at apex, with a triangular membranous expansion, the widest part near base. Dististyle rather slender, 0.46-0.51 (5) length of basistyle, somewhat swollen in middle, rugose above, pilose beneath, with 1-3 small setae on convex side and 0-1 on concave side subapically; claw 0.21-0.30 (4) length of dististyle, slender, bifurcate at tip. Paraproct strongly sclerotized, apical tooth rather blunt, divided; 2-4 (7) cercal setae. Aedeagus cylindrical, slightly constricted near middle, narrowed at apex, 2.38-2.79 (6) as long as wide, sternally open, tergally closed, with a circular tergobasal orifice and a round notch tergally at apex; apex denticulate or smooth.

LARVA (Fig. 83). *Head.* Width 1.15-1.25 mm; brown, 1.28-1.36 as wide as long; front margin of labrum slightly concave; seta 1-C pigmented, 0.67-0.81 (7) as long as distance between bases; 4, 6-C a little anteriad or about on level of 7-C; 5-C rather stiff, well posteriad of and tandem with or slightly mesad of 6-C, usually distinctly but sparsely barbed, occasionally almost smooth; 6-C stiffer than 5-C, usually smooth, occasionally with a few barbs; 14-C usually single. Microsculpture consisting of meshes formed by rows of oblong minute tubercles, finer tubercles within each mesh. *Antenna* 0.35-0.40 mm long, shorter than head, dark, finely spinulate; seta 1-A inserted at basal 0.45-0.55, with 3-6 barbed branches, not reaching apex of shaft; 5-A with an accessory sensorium on the proximal division. *Mandible* with a number of rather strong dorsolateral microspines near base. Cutting organ with 2 dorsal spines, one pale, reaching apex of VT-4, another short and pigmented; lateral dorsal tooth simple or bicuspid; mesal dorsal tooth with 1-3 mesal denticles, the base extending mesally and bearing several acute accessory denticles; ventral tooth with 2 lateral denticles, VT-4 smaller than VT_0; VT_{1-3} subequal or progressively smaller; 2 ventral blades, VB_1 stout, pigmented, not reaching tip of VT_0, with fine mesal pectination; VB_2 pale, 0.67 length of VB_1, with rather coarse mesal pectination; pectinate brush of 6-8 mesally pectinate hairs, most distal

hair longer than VB_1. Piliferous process with labula as long as or slightly longer than the broader anterior part. Mandibular hairs (6-8) + (11-13), finely barbed, hairs of anterior group somewhat apically frayed, hairs of posterior group distinctly apically frayed. *Maxilla*. Cardo, palpostipes, ventral and lateral surfaces of mesostipes and lacinial suture well sclerotized. Cardo narrowly triangular, seta 1-Mx single (one specimen with 2 setae on a single alveolus). Mesostipes broadly rectangular, 1.4 as wide as long, notched on apical margin at mesal 0.33, narrowly connected ventrobasally with cranium at mesal 0.2 (pseudoartis), with many ventromesodistal spinelike strong spicules; lateral surface tuberculate; maxillary brush somewhat ventral; twin stipital sensoria at apical 0.2, without basal ring, anterior sensorium slightly longer; 4-Mx rather long, slender, pigmented; 2-Mx very short. Lacinia with 5-Mx slender, near apical margin distad of stipital sensoria; 6-Mx shorter than 4-Mx, basally barbed; microsculpture of sclerotized ventral surface similar to that of cranium, but without smaller tubercles within the meshes. Palpostipes fairly large, ventrobasally fused with mesostipes, oblong, only very slightly apically narrowed, excluding lateral artis 1.67-1.75 as long as wide, only slightly shorter than mesostipes; apex with ampulla and 5 short palpal sensoria, S_1 distinctly stouter than others, $S_1 > S_3 > S_2 > S_4 \geq S_5$ in length. *Mentum plate* with 23-27 teeth. *Thorax*. Seta 1-P rather strong, usually single; 2-P slender, distinctly shorter than 1-P; 3-P slender, shorter than 2-P, usually single; 8-P short, usually single; 12-P rather strong; 1-M shorter than 3-M; 9, 14-P, 5, 7, 10-M, and 2, 10-T usually single; 5-P usually double. *Abdomen*. Seta 12-I absent; 7-II rather strong, 0.58-0.73 (x = 0.64) length of 6-II; 1-IV, V medium-sized, smooth or sparsely barbed; 13-IV-VI strong; 1-VII smooth or barbed; 2-VIII most frequently on a common callus with 1-VIII, occasionally free; 10-I, 13, 14-III, 14-IV, 1, 3-V, 4, 7-VI and 1-VII usually single; 8, 11-II and 6-IV usually double. Segment VIII minutely laterally spinulate. Comb scales 9-17 in an irregular single or double row; individual scales with a single, moderately strong apical spine, fringed with spicules laterobasally, one or 2 apical spicules stout. *Siphon* pale brown, narrowly darker at base, with acus attached, widest a little distad of base, 2.78-3.14 long as wide, apex 0.58-0.70 width of greatest diameter; length 1.07-1.22 mm, index 2.96-3.52; microsculpture faint, consisting of short rows of minute spicules; pecten reaching basal 0.29-0.39, of 12-19 evenly spaced dark brown teeth including 1 or 2 basal abortive teeth; each tooth with 1-4 ventral denticles; seta 1-S inserted beyond pecten at basal 0.40-0.51, about as long as siphon diameter at insertion; 2-S proximal to apex of siphon, not reaching it, shorter than apical pecten tooth. *Saddle* 0.42-0.46 mm long, covering dorsal 0.60-0.75 of the segment; ventral margin often irregular, usually broadly incised; segment X with short rows of minute spicules on entire surface including saddle, the spicules only slightly stronger subdorsally at apex; a free acus subventrally proximad of saddle; seta 1-X shorter than saddle, usually single; 4-X of 14-17 cratal and 1 or 2 precratal tufts (15-18 in total), each tuft 2-8 branched. Anal gills equal, apically tapering, 1.1-1.4 length of saddle.

TYPE-SERIES. Holotype male (#2130, A-0211-5) with associated slides of genitalia and larval skin: Yukomambetsu, in Mt. Daisetsu, Hokkaido, Japan, 7 VI 1970, ground pool, Tanaka, Mizusawa & Nishikawa. Paratypes: 14 males, 11 females, 23 larvae, with slides of associated genitalia (8 males), mouthparts, wings and legs (2 males, 2 females); data same as holotype.

The holotype and one-half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN TYPES. PALAEARCTIC JAPAN.

58 L: Hokkaido (A-0190, A-0191, A-0211).

DISTRIBUTION. JAPAN (Hokkaido).

TAXONOMIC DISCUSSION. Among the Japanese species of the subgenus *Ochlerotatus*, *Ae. impiger daisetsuzanus* is unique in the presence of broad scales on the vertex in the adult, and the strongly modified maxilla and the absence of seta 12-I in the larva. The characteristic larval maxilla is especially remarkable. All other Japanese species of *Ochlerotatus* studied have maxillae typical for browsers; their maxillae in general are moderately sclerotized; the mesostipes slightly longer than wide, peach-shaped, with a narrow somewhat detached mesal area (lacinial sclerite - Gardner et al. 1973), bearing spine-like spicules along the mesal margin; the maxillary brush apical and moderately long; the stipital sensoria and lacinial seta 5-Mx located usually somewhat distad of middle; the palpostipes much shorter than the mesostipes. The strongly sclerotized maxilla in general, very broad square mesostipes with a broad mesal detached area, somewhat ventrally located maxillary brush, distally removed stipital sensoria and lacinial seta 5-Mx, and very large palpostipes of *impiger daisetsuzanus* resemble the maxilla of predaceous *Toxorhynchites*. The maxilla of *impiger daisetsuzanus* may possibly be regarded as an intermediate type between browsers and predatory species. However, the mandible of *impiger daisetsuzanus* is not modified. The feeding habit of this species is not known to us; it will be of interest to see if it correlates in any way with the modified maxilla and unmodified mandible.

The Japanese subspecies *daisetsuzanus* is identical with North American *impiger* in the male genitalia and most of the larval characteristics including the modified maxilla, but differs from it in the following points. In the adults, the thorax is less hairy, the scutal bristles are relatively shorter; the posterior pronotal bristles are 5-12, usually in an irregular single or double row close to the posterior margin (13 to about 20 in the posterior area in North American *impiger*); the male pleural bristles are whitish to yellowish brown (dark brown to almost black in North American *impiger*). In the larva, the following differences were found (the values of North American *impiger* [2 specimens from Alaska] are shown in parentheses). Seta 11-II single or double (2-5 branched), 4-III 4-6 (2-4), 1-IV single, subequal to 1-V in length and strength (1-3, shorter and more slender than 1-V), 6-IV 2-3 (single), 8-VI 1-3 (3-7), 8-VII 5-8 (3-6), anal gills 1.1-1.4 length of saddle (2.1-3.0). These larval differences should be reevaluated with more material).

The habitats of North American *impiger* are arctic treeless areas and alpine meadows above the timber line. In Montana and Utah (ca 40-50° N), they were found at an elevation of 2,300 to 3,100 m above sea level (Mail 1934, Rees and Nielsen 1951; cited in Carpenter and LaCasse 1955). Larvae of *daisetsuzanus* were found in Daisetsu Mts. (43° 40' N) at an elevation of 1,100 m, close to the timber line, but still in a coniferous forest.

BIONOMICS. Only one locality is known, but the subspecies is probably distributed over the central mountainous areas of Hokkaido. As stated in the TAXONOMIC DISCUSSION, larvae of *Ae. impiger daisetsuzanus* inhabit the coniferous forest region, occuring in temporary ground pools of melted snow. Carpenter and LaCasse (1955) cite 2 papers which state *impiger impiger* feeds on man.

59. *AEDES (OCHLEROTATUS) STICTICUS* (MEIGEN)
(Figs. 84, 85, 215; Table 92)

Culex sticticus Meigen, 1838: 1 (♀). Type-locality: Bavaria, Germany.
Aedes sticticus: Yamada, 1927: 570, Northern Hokkaido, Japan.

Description based on North American specimens.

FEMALE (Fig. 215). Wing length 3.0-4.7 mm. *Head.* Eyes narrowly separated above and moderately below. Vertex including interocular space covered with narrow curved, white scales, eye margin more densely scaled, numerous erect forked, pale yellowish scales over vertex except on anterior margin; tempus covered with broad pale, somewhat yellowish scales, usually with a small spot of dark scales within the pale scaled area; about 10 or more vertical and 6-7 temporal bristles on each side, the bristles on or near interocular space yellowish brown, others dark. Clypeus rather dark brown. Antenna: pedicel yellowish brown, mesal surface dark, with small pale scales and a few fine bristles; flagellum 0.80-0.86 (3) length of proboscis; flagellomere 1 1.27-1.46 length of Flm 2, with pale scales, a few dark scales often intermixed. Palpus 0.21-0.23 (2) of proboscis, dark scaled, some pale scales intermixed; segment 3 1.62-1.86 length of 2; 4 very small, globular. Proboscis 1.36-1.42 (2) length of forefemur, dark scaled, with rather short ventrobasal bristles. *Thorax.* Pronotal integument dark brown; anterior lobe covered with crescent-shaped or rather broad white scales, bearing many pale to yellowish brown bristles; posterior lobe covered with pale crescent-shaped scales on dorsal margin, posteroventrally with rather broad pale scales, and broadly crescent-shaped, dark brown scales in middle, bearing 6 to about 10 brown bristles along posterior margin. Scutum with integument dark brown, covered with yellowish brown and narrow curved or crescent-shaped pale scales, the yellowish brown scales forming a broad median longitudinal band covering space between dorsocentral series of bristles and reaching prescutellar space; fossal and supraalar areas each with a patch of the yellowish brown scales, occasionally fossal patch obscure; prescutellar space pale scaled; acrostichal bristles developed, anterior scutal bristles dark brown, supraalar and other posterior bristles brown. Scutellum covered with narrow curved, pale scales, each lobe with about 10 or more brown or yellowish brown bristles. Paratergite ventrally with rather broad pale scales. Pleural integument mostly dark brown, patches of white broad scales on propleuron, postspiracular area, subspiracular area, lower flank of prealar knob, sternopleuron, mesepimeron and metameron; sternopleural patch reaching anterior angle, mesepimeral patch usually not reaching lower margin; pleural bristles pale yellowish, many on propleuron, prealar knob, upper to posterior sternopleuron and upper mesepimeron, 5-9 postspiraculars, no lower mesepimerals. *Wing.* Alula fringed with rather narrow dark scales. Veins dark scaled, some pale scales present at base of costa on posterior margin and on remigium, sometimes scales on posterior margin of costa from base to confluence of subcosta, and on subcosta appearing pale. Cell R_2 1.68-2.42 (7) length of vein r_{2+3}. Halter knob pale scaled. *Legs.* Coxa pale scaled. Femora with pale apical fringe; forefemur dorsally speckled with dark and pale scales, pale scaled ventrally excepting anterior margin; midfemur speckled with dark and pale scales on anterior surface, almost entirely pale scaled on posterior surface; hindfemur pale excepting

apex and apical 0.5 (or less) of dorsal surface. Fore- and midtibiae and tarsomeres 1 posteriorly pale scaled, dark area often with scattered pale scales; hindtibia and tarsomere 1 anteriorly and posteroventrally pale scaled. Femora, tibiae and tarsi otherwise dark scaled. Midtarsomere 5 subequal to 4 in length; hindtarsomere 1 0.64-0.70 (6) length of tibia; all claws equal and unidentate. *Abdomen.* Tergum I medially dark scaled, with scattered pale scales; II-VII dark scaled, with complete basal bands of pale scales, the bands extending apically on lateral aspect, VII with pale scales on apical margin. Sternum II pale scaled; III-VII pale scaled, with lateroapical patches or apical bands of dark scales, the patches or bands becoming larger on posterior segments.

MALE (Figs. 84, 215). Wing length 4.2-4.4 mm. Tempus without a spot of dark scales. Antenna: pedicel glabrous; flagellum 0.74-0.76 (1) length of proboscis; flagellomere 12 1.29-1.30 length of 13, both 0.93-0.95 of Flm 1-11. Palpus 1.11 (1) length of proboscis; apex of segment 3 slightly swollen, turned upwards, with many long bristles on underside; 4 and 5 a little swollen, 4 with many long bristles, 5 also bristled; length ratio of 2-5: 1.32-1.39 : 1.93-1.96 : 1.18-1.21 : 1.00. Proboscis 1.39 (1) length of forefemur. No lower mesepimeral bristles. Costal basal spot absent; cell R_2 1.18-1.33 (7) length of vein r_{2+3}. Foretarsomere 5 with 4 or more ventrobasal short curved setae. Anterior claw of foretarsus with a blunt-tipped median and a sharp laterobasal tooth; posterior claw with a basal tooth; anterior claw of midtarsus much longer than posterior claw, strongly curved in basal 0.5, almost straight in apical 0.5, with a blunt-tipped median and a sharp laterobasal tooth; posterior claw with a median tooth; both claws equal, with a sharp submedian tooth in hindtarsus. *Genitalia.* Tergum IX rather narrowly sclerotized in middle; lobes narrow, moderately sclerotized, wider than long, narrowly separated, each with 5-7 rather short setae. Sternum IX membranous excepting basal margin, with 5-7 bristles. Basistyle constricted in middle of tergal surface, sternally and laterally scaled, with a number of fine bristles on basal 0.67 of tergal surface, otherwise moderately bristled, long bristles laterally and apically; apical tergomesal lobe fairly large, subapical, with fine bristles except for most tergoapical part, several broadened short setae on mesal side; basal tergomesal lobe strongly mesally produced, appearing detached caudad, covered with prominent-based rather short bristles, most tergolateral one definitely stouter and longer than others, pigmented, curved about at middle; claspette stem pubescent, excepting apical 0.2, 1-3 short setae located on mesal surface at apex of pubescent area; filament shorter than stem, expanded into a thin unpigmented flap in basal 0.67 on convex side, with a small thin triangular expansion on concave side at base, apex hooked. Dististyle slender, 0.55 (1) length of basistyle, pubescent except for apex and base, with 2 short setae on convex side near apex, occasionally one seta on concave side; claw slender, straight. Tergite X well sclerotized; tergal cercal surface poorly sclerotized, 4-6 cercal setae on each side; paraproct well sclerotized laterally, strongly apically, apex unicuspid. Aedeagus weakly sclerotized, 1.69-1.84 (3) as long as wide excluding short basal process, tergally closed but with a large tergobasal orifice, sternally open, the opening constricted in middle.

LARVA (Fig. 85). (Description based on 2 whole mounted larvae from U.S.A.) *Head.* Width 1.15 mm; brown, 1.33 as wide as long; seta 1-C lightly pigmented, shorter than distance between bases; 4, 6-C anteriad of 7-C; 5-C posteriad of 7-C and tandem with or slightly mesad of 6-C, occasionally with secondary branches. Microsculpture of rather irregular reticulation formed by rows of oblong tubercles; smaller to equal tubercles scattered within each

mesh. *Antenna* 0.40-0.41 mm long, shorter than head, slightly apically infuscate, with scattered rather stout spinules on entire surface, many finer spinules on ventral surface; seta 1-A inserted at basal 0.38-0.42, with 6-9 barbed branches, not reaching apex of shaft. *Mandible* with 2 dorsal spines; ventral tooth with 2 slender lateral denticles; ventral blade scarcely reaching tip of VT_0; pectinate brush 5-6 haired. Piliferous process with labula longer than the broad anterior part. *Maxilla* with seta 1-Mx single. Mesostipes 1.4 times as long as wide, lateral surface denticulate, several strong spines on mesal margin in middle; pseudoartis not fused with cranium; equal twin stipital sensoria at about middle; 4-Mx slender. Lacinia with 5-Mx about on level of stipital sensoria; 6-Mx apparently strongly basally barbed. Palpostipes about 0.5 length of mesosteipes, only slightly narrowed apically; S_1 definitely larger than other palpal sensoria. *Mentum plate* with 32-35 teeth. *Thorax*. Integument spiculate. Seta 1-P of medium strength; 2-P distinctly more slender and shorter than 1-P; 3-P shorter than 2-P; 8-P very short; 12-P short and slender, though longer than 9, 10-P; 1-M shorter than 3-M. *Abdomen*. Integument spiculate. Seta 7-II 0.30-0.33 length of 6-II; 13-IV, V smooth or sparsely barbed. Comb scales 20-25 (18-25, after Carpenter and LaCasse 1955) in a patch; individual scales with a single, rather short, slender apical spine, laterobasally fringed with fine spicules, the apical spicules not more than 0.5 length of the apical spine. *Siphon* brown, narrowly darker along basal margin, with acus attached, broadest slightly distad of base, 2.76 times as long as wide, apex 0.66 width of greatest diameter; length 1.01-1.13 mm, index 3.00; microsculpture consisting of short rows of minute denticles; pecten reaching basal 0.45-0.48, of 16-18 dark brown, mostly evenly spaced teeth including 0-3 basal abortive ones, apical one or 2 teeth slightly more widely spaced, each tooth with 1-3 ventrobasal denticles; seta 1-S inserted beyond pecten at apical 0.46-0.48, smooth or weakly barbed, shorter than siphon diameter at insertion; 2-S near apex of siphon, extending slightly beyond it, shorter than apical pecten tooth. *Saddle* 0.36-0.40 mm long, rather narrowly incomplete, with short rows of minute spicules on entire surface, the spicules only slightly stronger towards apex; segment X with ventral unsclerotized area also spiculate; seta 1-X shorter than saddle; 4-X of 15 cratal and 3 precratal tufts, each tuft 4-8 branched. Anal gills apically tapering, 2.5 length of saddle.

SPECIMENS EXAMINED. UNITED STATES. 3♂, 10♀, 2 L (1 L: Lake Fork, Illinois, 14 V 1943, woodland pool, Ross; 1 L: Itasca St., Minnesota, 15 V 1957, clear water, Barr, USNM. 3♂, 10♀: Sand Point, Idaho, 3 VII 1917 - 21 VI 1921, Dyar).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido). NORTHERN HOLARCTIC REGION.

TAXONOMIC DISCUSSION. The male genitalia of one of Yamada's specimens (Engaru, Hokkaido, 25 VIII 1917, Yamada) identified as *sticticus* by him, was described and illustrated by LaCasse and Yamaguti (1950) as *Aedes (Ochlerotatus)* sp. (*A. sticticus* of Yamada), and Asanuma et al. (1952) as *Aedes (O.) sticticus*. These illustrations show a detached basal tergomesal lobe, one of the characteristics of *sticticus*, but the shape of the claspette filament does not quite agree with that of *sticticus*. Yamada's female specimens (Otomari, Sakhalin, 9 IX 1916, Nakagawa) described and illustrated by LaCasse and Yamaguti as *Aedes (Ochlerotatus)* sp. (*A. sticticus* of Yamada) may not be *sticticus*. Since Yamada (1927), there have been no reliable records of *sticticus* from Japan. Further investigation is necessary.

BIONOMICS. In North America, *sticticus* is primarily an early season floodwater mosquito. It is a persistent biter and is capable of dispersing

several kilometers (Carpenter and LaCasse 1955).

60. *AEDES (OCHLEROTATUS) COMMUNIS* (DE GEER)
(Figs. 86, 87, 214; Table 93)

Culex communis De Geer, 1776: 316 (♂, ♀, P, L). Type-locality: Europe.
Aedes (Ochlerotatus) communis: Asanuma, Kano and Takahasi, 1952: 35, Shirogane-onsen, Hokkaido, Japan.

FEMALE (Fig. 214). Wing length 4.6-5.0 mm (wild mosquitoes), 3.8-4.3 mm (reared mosquitoes). *Head.* Eyes narrowly separated above, rather broadly below. Vertex including interocular space covered with narrow curved, yellow scales, posteriorly with many erect forked, dark scales medially intermixed with yellow ones, sometimes yellow scales prevailing in most mesal area but dark ones always laterally present, occasionally all erect forked scales dark; eye margin more heavily covered with somewhat broader scales than those of middle of vertex; tempus covered with moderately broad, yellowish white scales; vertical bristles many, those on interocular space yellow, lateral ones black; several temporal bristles black. Clypeus pitch-black. Antenna: pedicel yellowish brown to black, with small pale lateral scales and dark short mesal bristles; flagellum 0.73 (1) length of proboscis; flagellomere 1 1.53-1.58 (2) length of Flm 2, with a few small pale scales ventrally. Palpus dark scaled, often with scattered pale scales, 0.20 (1) length of proboscis; segment 3 1.57-1.83 (2) length of 2; 4 0.09-0.17 (2) of 3. Proboscis dark scaled, 1.47 (1) length of forefemur. *Thorax.* Pronotal integument dark; anterior lobe with rather narrow yellowish white scales, bearing many dorsomesal dark bristles and ventrolateral yellow ones; posterior lobe dorsally with narrow or rather narrow, curved yellow scales, the scales ventrally gradating into moderately broad and paler ones, sometimes anterior scales dark; posteriorly and posterodorsally 5-10 mostly yellowish bristles. Scutum with integument dark, covered with bronzy yellow and pitch-brown narrow curved scales, the pitch-brown scales forming a pair of submedian narrow longitudinal stripes and another pair of posterior sublateral stripes, these dark stripes often ill-defined, sometimes obscure; prescutellar space roughly covered with rather narrow, curved yellowish white scales; acrostichal bristles developed, most scutal bristles black or dark brown, usually some yellowish brown bristles intermixed in supraalars. Scutellum with scales similar to those of prescutellar space and bearing many long dark bristles. Paratergite scaled. Pleura excepting mesomeron, metepisternum and metepimeron with patches of moderately broad (partly rather narrow), yellowish white or creamy white scales, sternopleural patch sometimes reaching cephalic angle, mesepimeral patch may or may not reach lower margin; pleural bristles yellow, many sternopleurals along posterior margin, 1-4 (most often 3) lower mesepimerals. *Wing.* Alula fringed with rather long narrow scales. Veins dark scaled; costa usually with a small basal spot of white scales, sometimes with scattered white scales distad of the spot. Halter knob dark, covered with small pale scales. *Legs.* Coxae brown, partly dark brown, each with a white scale patch; trochanters with white scales. Femora fringed with pale scales at tip; fore- and midfemora posteroventrally white scaled, occasionally some pale scales dorsally scattered on forefemur; hindfemur largely white excepting dorsal surface and apical 0.2; fore- and midtibiae each usually with an ill-defined streak of pale scales on posterior surface; tarsomere 1 often ventrally sprinkled with

pale scales; femora, tibiae and tarsi otherwise dark scaled. Midtarsomere 5 equal to or a little shorter than 4. Both claws equal in fore- and hindtarsi; anterior claw a little longer and less curved than posterior one in midtarsus; all claws unidentate. *Abdomen.* Tergum I with a patch of pale and/or dark scales; II-VII dark scaled, with basal bands of creamy white scales, the bands varying from totally reduced to occupying basal 0.33 of the tergum, laterally broadened especially on posterior segments. Sterna white scaled, each with an apical dark band.

MALE (Fig. 87). Wing length 4.9-5.5 mm (wild mosquitoes), 4.0-4.7 mm (reared mosquitoes). Antennal flagellum 0.60 (1) length of proboscis; flagellomere 12 1.27 length of Flm 13, both 0.99 of Flm 1-11. Palpus 1.07-1.10 (2) length of proboscis; length ratio of segments 2-5: 0.89-0.92 : 1.43-1.47 : 1.04-1.07 : 1.00. Lower mesepimeral bristles lacking or 1. Cell R_2 1.61-1.95 (2) length of vein r_{2+3}. Hindtarsomere 1 0.78-0.83 (2) length of tibia. Anterior claw of midtarsus slender and much longer than posterior one; all claws unidentate. *Genitalia.* Tergum IX with median sclerotized part quadrate, about 2.5 as wide as median length; lobes well sclerotized, nodular, variable in width, each with 3-9 stout setae of medium length, generally narrow lobes bearing fewer setae, and wide lobes bearing many. Sternum IX roughly hexagonal, shallowly bisinuate at apical margin in middle, with 6-12 bristles transversely arranged near apex. Basistyle cylindrical, a little arcuate, 4.9-6.6 as long as minimum width at middle, tergally covered with small bristles, laterally and ventrally with long bristles; mesal surface with numerous long hairs mesally directed and arching over sternal surface; apical tergomesal lobe prominent, rounded, with several small hairs and mesally directed bristles of moderate length at apex and on sternal surface; basal tergomesal lobe triangular in tergal view, rounded at apex, with a specialized dark seta on tergal surface and many bristles of moderate size on apical and sternal surfaces, and with a row of several curved bristles along sternalmost edge; claspette stem very long, slender, curved; filament fairly long, narrow, hooked at apex, with 2 fine ridges on convex side near base. Dististyle slender, well arcuate, 0.44-0.49 (9) length of basistyle, somewhat widened at middle, rugose above, minutely setose beneath; claw 0.20-0.27 (9) length of dististyle, slender, straight, bifurcate at apex. Paraproct strongly sclerotized, with a sharp hook at apex; 3-6 cercal setae. Aedeagus elongate ovate, more strongly narrowed apically than basally, 1.83-2.16 as long as wide, with a round tergobasal orifice, otherwise tergally closed, open sternally except at base which has a small process; apex rather deeply notched tergally, with minute teeth.

LARVA (Fig. 86). *Head.* Width 1.20-1.34 mm; brown, 1.27-1.34 as wide as long; front margin of labrum slightly concave; seta 1-C lightly pigmented, 0.65-0.79 (7) as long as distance between bases; 4,6-C a little anteriad of 7-C; 5-C usually single, occasionally with a few barbs, well posteriad of and tandem with or slightly mesad of 6-C; 7,10-C occasionally with secondary branches. Reticulate microsculpture formed by rows of minute tubercles, smaller tubercles within each mesh. *Antenna* 0.41-0.53 mm long, shorter than head, entirely dark or a little paler basally, rather sparsely and finely spinulate; seta 1-A inserted at basal 0.31-0.49, with 6-10 barbed branches, occasionally with secondary branches, about reaching apex of shaft. *Mandible* (3 dissected specimens) with fairly many slender dorsolateral microspines in basal 0.5. Cutting organ with 2 dorsal spines; lateral dorsal tooth simple to 4-cuspid, mesal dorsal tooth well developed, twice as long as lateral tooth, with one or more mesal denticles, the base mesally extending and bearing several acute denticles of various sizes; ventral tooth with 2 lateral denticles; VT_2 larger

than VT_1 and VT_3; 2 ventral blades, VB_1 stout, not reaching tip of VT_0, with fine mesal pectination; VB2 much shorter than VB_1, bilaterally pectinate; pectinate; brush of 5-7 fairly long, mesally pectinate hairs, most anterior hair bilaterally pectinate, slightly longer than VB_1. Piliferous process with labula longer than the broader anterior part. Mandibular hairs (8-9) + (13-15), hairs of anterior group apically barbed or frayed, hairs of posterior group more distinctly apically frayed. *Maxilla* (3 dissected specimens) with seta 1-Mx single. Mesostipes as long as or slightly longer than wide, with a few denticles on lateral surface; maxillary brush very dense; twin equal stipital sensoria distad of middle, without distinct basal ring; 4-Mx relatively short and slender. Lacinia with 5-Mx slightly distad or on level of stipital sensoria; 6-Mx strongly spiculate. Palpostipes strongly apically narrowed, excluding lateral artis 1.5 as long as broad, about 0.5 length of mesostipes; apex with 5 short palpal sensoria, S_1 stouter than others, $S_1 \geqq S_3 > S_2 = S_4 > S_5$ in length. *Mentum plate* with 27-35 teeth. *Thorax*. Seta 1, 12-P strong, 2, 3-P distinctly shorter and more slender than 1-P, smooth to distinctly barbed; 8-P short; 1-M shorter than 3-M; usually, 5-M, T single, 14-P and 2-T double. *Abdomen*. Seta 7-II 0.40-0.55 (x = 0.47) length of 6-II; 13-III-V strong; 1-IV, V of medium size, usually distinctly barbed, occasionally very weakly barbed or smooth; 1-VII smooth to distinctly barbed; 1-VIII often with secondary branches; 2-VIII usually free, occasionally on a common callus with 1-VIII; 12-II, 14-III, 1, 8, 14-IV, 3, 14-V, 2-VI, and 2, 7, 11-VII usually single; 6, 9-I, 6-II, 12, 13-IV and 6-VI usually double. Comb scales 28-81, usually more than 40, in a patch, individual scales rounded to elongate (most of the scales broad and rounded in specimens with comb scales fewer than 40), laterally and apically fringed with spicules, apical spicules stronger than lateral ones. *Siphon* brown, with acus attached, widest a little distad of base, 2.42-2.87 as long as wide, apex 0.61-0.68 width of greatest diameter; length 1.03-1.32 mm, index 2.62-3.31; microsculpture of short faint transverse ridges bearing minute spicules; pecten reaching basal 0.35-0.42, of 17-22 evenly spaced, dark brown teeth including 0-3 basal abortive ones; each tooth with several ventrobasal denticles; seta 1-S inserted beyond pecten at basal 0.44-0.49, a little longer than siphon diameter at insertion; 2-S proximal to apex of siphon, not reaching it, much shorter than apical pecten tooth. *Saddle* 0.46-0.58 mm long, covering dorsal 0.50-0.67 of the segment, with ventral margin usually irregular, broadly emarginate; segment X including saddle with short rows of minute spicules over entire surface, the spicules not markedly stronger towards apex; a free acus (occasionally divided) ventroproximad of saddle; seta 1-X shorter than saddle; 4-X of 15-18 cratal and 2-4 precratal tufts (19-21 tufts in total), cratal tufts 2-8 branched, precratal tufts 1-6 branched. Anal gills apically tapering, 1.3-3.5 length of saddle, dorsal gill usually slightly shorter than ventral one.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 84♂, 66♀; with associated skins (12 l, 12 p); 41 L, 3 l: Hokkaido (A-0190, A-0191, A-0211, A-0213, A-0218, A-1796).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido). NORTHERN HOLARCTIC REGION. BULGARIA. SYRIA.

BIONOMICS. In Hokkaido, *Ae. communis* inhabits the central mountain districts. The larvae live in temporal ground pools of melted snow; found associated with *Ae. punctor*, *Ae. intrudens* and *Ae. diantaeus*. They are apparently univoltine; females attack man both in the daytime and at night.

MEDICAL IMPORTANCE. This species has been found naturally infected with tularemia (Gutsevich et al. 1970).

61. *AEDES (OCHLEROTATUS) PUNCTOR* (KIRBY)
(Figs. 87, 88, 216; Table 94)

Culex punctor Kirby, 1837: 309 (A). Type-locality: Mackenzie River Valley, near Ft. Norman, Canada.
Aedes (Ochlerotatus) punctor: Takahasi, 1946: 45, Hokkaido, Japan.

FEMALE (Fig. 216). Wing length 4.3-5.4 mm (wild mosquitoes). *Head.* Eyes narrowly separated above and rather broadly below. Vertex including interocular space covered with narrow curved, golden brown or yellow scales, those on median line and eye margin usually paler; numerous erect forked, yellow scales on posterior part of vertex, occasionally a few dark ones laterally; tempus covered with broad pale yellow scales; median vertical bristles yellow, lateral ones dark; several temporal bristles black. Antenna: pedicel orange yellow, mesal surface infuscate, with pale small scales and dark small bristles; flagellum 0.82-0.88 (2) length of proboscis; flagellomere 1 1.38-1.44 length of Flm 2, basally yellowish, with a few pale small scales. Palpus dark scaled, sometimes with scattered pale scales, 0.19-0.20 (2) length of proboscis; segment 3 1.94-2.00 (2) length of 2; 4 0.08-0.15 of 3. Proboscis dark scaled, 1.36-1.40 (2) length of forefemur. *Thorax.* Pronotal integument dark; scaling variable; scales of anterior lobe varying from rather narrow curved, pale yellow to moderately broad, yellowish white ones; scales of posterior lobe varying from narrow curved, golden brown to broad white ones, generally, scales on anterodorsal part narrower, those on posteroventral part wider, and paler intermediate in-between; posterior lobe posteriorly and posterodorsally with 7-15 bristles. Scutum with integument dark, covered with narrow curved, dark bronzy brown and golden yellow scales, those on prealar and antescutellar areas more or less broader and paler, the rather dark bronzy brown scales usually forming a wide median or a pair of submedian longitudinal stripes, which are often shaded into lateral yellowish areas, sometimes obsolete; acrostichal bristles developed; acrostichals and anterior dorsocentrals dark, supraalars yellowish, most of other scutal bristles yellow or yellowish brown. Scutellum covered with narrow curved, pale yellow scales, bearing many yellow bristles. Paratergite scaled. All pleura excepting mesomeron, metepisternum and metepimeron with patches of moderately broad or broad, yellowish white or white scales, generally, scales of anterior pleura narrower and yellowish, those of posterior pleura more broader and whitish, sternopleural patch reaching cephalic angle, mesepimeral patch reaching or nearly reaching lower margin; pleural bristles yellow; lower mesepimerals 2-4. *Wing.* Alula with dark rather narrow scales. Veins dark scaled; base of costa dark scaled or with several pale scales. Halter knob fuscous, clothed with small pale golden scales. *Legs.* Coxae and trochanters with moderately broad, yellowish white scales. Femora fringed with pale scales at tip; fore- and midfemora posteriorly clothed with pale scales except on apex; hindfemur pale scaled except on apex and apical 0.50-0.67 of dorsal surface; verying amounts of pale scales sprinkled over dorsal surface of forefemur and anterior surface of midfemur, tibiae and tarsomeres 1, sometimes these pale scales forming a vague streak; femora, tibiae and tarsi otherwise dark scaled. Midtarsomere 5 equal to or a little shorter than 4. Claws equal and unidentate. *Abdomen.* Tergum I with a median patch of white scales; II-VII dark scaled, with basal bands of white scales, the bands usually a little narrowed mesally, broadened laterally, especially on posterior segments. Sterna covered with pale scales, intermixed

with a few dark ones, or each with a dark apical band.

MALE (Fig. 87). Wing length 4.9-5.3 mm (wild mosquitoes), 4.6 mm (a reared specimen). Antennal flagellum 0.65-0.70 (3) length of proboscis; flagellomere 12 1.11-1.22 length of Flm 13, both 1.01-1.11 of Flm 1-11. Palpus 1.05-1.13 (2) length of proboscis; length ratio of segment 2-5 0.99-1.00 : 1.43-1.57 : 1.11-1.20 : 1.00. Lower mesepimeral bristles 0-2. Costal basal spot usually lacking. Cell R_2 1.01-1.34 (3) length of vein r_{2+3}. Hindtarsomere 1 0.79-0.84 (3) length of tibia. Anterior claw of midtarsus slender, sinuate and much longer than posterior one; all claws unidentate. *Genitalia.* Tergum IX with median sclerotized part roughly quadrate; lobes well sclerotized, usually longer than wide, sometimes as long as wide, each with 4-11 rather short stout setae. Sternum IX rounded trapezoidal, with apex straight or slightly emarginate, bearing 10-23 bristles. Basistyle cylindrical, with tergal surface a little constricted at middle, 4.7-5.6 as long as width of tergal median narrowest part, bearing short tergal bristles, long sternal bristles and several very long sternal ones near apex; apical tergomesal lobe rounded, rather long, with short curved setae on sternal surface; basal tergomesal lobe well protrudent, densely bristles, the proximal tergalmost surface narrow, bearing only several bristles, the most tergolateral seta definitely stouter and darker than other bristles, the lower distal part extending to about middle of basistyle, densely covered with bristle-bearing prominent papillae; claspette stem rather short, curved, slightly tapering towards apex, pilose except for apical 0.25; filament short, pigmented, only slightly expanded at basal 0.33, convex side evenly rounded, apex slightly curved. Dististyle slender, curved at about apical 0.33, 0.50-0.58 length of basistyle, with a row of several setae in apical 0.33 on convex side, pilose from cuved portion back to near base on concave side; claw straight, slender, 0.17-0.21 length of dististyle. Paraproct strongly sclerotized, with a single apical tooth; 7-11 cercal setae. Aedeagus cylindrical, slightly constricted at middle, apical 0.5 barely narrower than basal 0.5, 2.06-2.47 as long as wide, with a round tergobasal orifice, otherwise closed tergally, open sternally except at base, which has a small process; apex with a deep round tergal notch, serrate on sternal margins.

LARVA (Fig. 88). *Head.* Width 1.27-1.42 mm; rather dark brown, 1.30-1.45 as wide as long; seta 1-C dark brown, usually smooth, occasionally with a few barbs, 0.79-1.21 as long as distance between bases; 4, 6, 7-C on approximately same level, or 4-C slightly anterior to others; 5-C slightly mesad of and well posteriad of 6-C, both rather stiff, usually double; 14-C usually single. *Antenna* 0.46-0.54 mm long, about 0.5 length of head, uniformly pigmented or slightly paler basally, spinulate, the spinules finer basally; seta 1-A inserted at basal 0.33-0.45, with 3-9 barbed branches, not reaching apex of shaft. *Mandible* with many slender dorsolateral microspines on basal half. Cutting organ with 2 dorsal spines, longer one extending beyond tip of VT-4; lateral dorsal tooth bicuspid, mesal dorsal tooth with a mesobasal denticle; ventral tooth with 2 lateral denticles; $VT_2 > VT_1 > VT_3$; 2 ventral blades, VB_1 rather stout, extending a little beyond tip of VT_0, with fine mesal pectination; VB_2 pale, short and narrow; pectinate brush 6-8 haired. Piliferous process with labula longer than the broad anterior part. Mandibular hairs (9-10) + (12-14); hairs of anterior group somewhat apically barbed or frayed; hairs of posterior group distinctly apically frayed. *Maxilla* with seta 1-Mx single, rather stiff. Mesostipes as wide as or slightly wider than long; lateral surface finely denticulate or smooth; pseudoartis not fused with postgena or occasionally apparently loosely fused with it; equal or subequal twin stipital sensoria distal to middle; 4-Mx lightly pigmented, slender, close to apex; 2-Mx proximad of level

of 4-Mx. Lacinia with 5-Mx a little distad of stipital sensoria; 6-Mx strongly barbed. Palpostipes 0.5 length of mesostipes, markedly narrowed in apical 0.5, very narrowly fused ventrobasally with mesostipes; apex with 5 short palpal sensoria, S_1 broad, $S_1 > S_3 > S_2 \fallingdotseq S_4 > S_5$ in length. *Mentum plate* with 24-29 (x = 26.4) teeth. *Thorax*. Seta 1-3-P rather strong; 2-P 0.85-1.06 length of 1-P; 3-P 0.71-0.90 length of 1-P, 0.80-0.97 length of 2-P; usually, 1-P double, 3-P single and 7-P triple; 5-P constantly single; 8, 12-P strong; 9, 14-P and 6-T usually single; 1-M slender, shorter than 3-M, most frequently (61%) double. *Abdomen*. Integument ventrally spinulate in middle on segment II-VIII and also laterally on VIII. Seta 6-I-III, VI single or double, 84%, 68%, 6% and 1% double respectively; 6-IV, V constantly single; 7-II 0.62-0.79 (x = 0.73) length of 6-II (0.49 in one exceptional specimen); 1-IV, V, VII, and 13-III-V strong; 1-VI rather long and stiff when single (or rarely double) (28%), short and slender when 2-7 branched (72%); 1, 2-VIII on a common callus; 2, 10, 12-I, 7-II, 8-III, 14-III-V, 13-IV, V, 3-VI, 11-VII and 2-VIII usually single. Comb scales 6-22 (x = 12.0), usually 7-16 in an irregular single or double row, individual scales thorn-shaped with a single strong apical spine, laterobasally fringed with fine spicules. *Siphon* dark brown, with acus attached, broadest distad of base, 2.10-3.00 as long as wide, apex 0.55-0.65 width of greatest diameter; length 1.08-1.31 mm, index 2.67-3.38; microsculpture of rather faint short rows of minute denticles; pecten reaching basal 0.36-0.42, of 17-25 (x = 20.1) dark brown, evenly spaced teeth including 0-5 basal abortive ones, sometimes a number of abortive teeth aggregated at base, each tooth with 1-5 (usually 3-4) ventral denticles; seta 1-S beyond pecten at basal 0.43-0.51, length subequal to width of siphon; occasionally (31%) an accessory siphonal seta subdorsally present in apical 0.5, often not paired, with 4 to more than 10 branches; 2-S usually not reaching apex of siphon, shorter than apical pecten tooth. *Saddle* 0.43-0.50 mm long, very narrowly incomplete, with acus, microsculpture similar to that of siphon; seta 1-X rather stiff, as long as or longer than saddle; 4-X of 16-21 cratal and 1-4 precratal tufts (19-22 in total), each tuft 2-7 branched in the former, 2-4 in the latter. Anal gills variable according to locality, 0.9-4.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 91♂, 17♀; with associated skins (6 l, 6 p); 45 L, 25 l: Hokkaido (A-0204, A-0205, A-0206, A-0207, A-0209, A-0210, A-0217, A-0218, A-0219, A-0220, A-1682, A-1794, A-1795, A-1796, A-1952, A-2280).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, ?Honshu). NORTHERN HOLARCTIC REGION. ALGERIA.

TAXONOMIC DISCUSSION. Only the Hokkaido population of Japanese *punctor* has been studied in all stages. Records of this species from Honshu need to be reconfirmed with larval material.

The Japanese population of the *punctor*-subgroup (Knight 1951) consists of 4 species: one has been known as *punctor;* the 2nd is *hokkaidensis*, a new subspecies of *hexodontus;* the 3rd, endemic *hakusanensis;* and the 4th, an undescribed species. Their mutual affinities and relations to continental populations have been almost totally neglected.

The male genitalia of Japanese *punctor* and *hexodontus hokkaidensis* agree with those of the North American *punctor-hexodontus* series, but are definitely different from those of the *punctodes-abserratus* series in having the basal tergomesal lobe undetached. *Aedes hakusanensis* and the undescribed species may belong to the 3rd series; their male genitalia are nearly identical with each other, but distinct from those of both the *punctor-hexodontus* and *punctodes-abserratus* series. *Aedes hexodontus hokkaidensis, hakusanensis*

and the undescribed species will be discussed separately.

Japanese *punctor* agrees fairly well with the "type *punctor* variety" (Knight 1951) of North American *punctor*. Adults are indistinguishable, but the larvae show some differences. Twenty larval characters were found to be useful for evaluation of the affinity of the species of the *punctor*-subgroup; they are: the branching of setae 5, 6-C, 3, 5, 8-P, 1-M, 7-II, 6-IV-VI and 13-V; the relative length of 1-M to 3-M, and 7-II to 6-II; the number of comb scales; the presence or absence of accessory subdorsal siphonal seta 1a-S; and completeness of the saddle. In 7 of these 20 characters, Japanese *punctor* is different from the "type *punctor* variety" (Table 10). The inconsistency in the saddle appears strongest, but 17% of North American specimens also had an incomplete saddle. Other differences appear to be minor. The "tundra variety" (Knight 1951) of

TABLE 10. Comparison of larval characteristics between the Japanese and North American populations of *Aedes (Ochlerotatus) punctor*.

Population	Japan (Hokkaido)			North America[1]		
Specimens examined	59			23 (USNM)		
	Range	x	Mode[2]	Range	x	Mode[2]
Seta 5-C	1-3	2.0	2	1-2	1.3	-
Seta 6-C	1-3	2.1	2	1-2	1.4	-
Seta 8-P	1-4	2.4	-	1-3	1.8	-
Seta 1-M	1-3	1.8	-	1-5	2.8	-
Comb scales	6-22[3]	12.0	-	9-18	13.8	-
Seta 1a-S[4]	41% present			Absent		
Saddle	Incomplete			83% complete		

[1]"Type *punctor* variety" (Knight 1951) from Anchorage-Fairbanks area of Alaska.

[2]Shown only when the frequency of the value is 80% or more.

[3]70 specimens examined.

[4]Accessory subdorsal siphonal seta.

North American *punctor* (6♂ and 6♀ from Umiat, Alaska, in USNM, were examined) is characterized by short, weak, 2-10 (x = 5.2) branched seta 1-M. This type has not been found in Japan. Seta 5-P is 2, 3 (usually 2) branched, while 1, 2 (usually 1) in "type *punctor* variety" and Japanese *punctor;* 7-II, 6-IV-VI and 13-V are 1, 2 branched and more often double than in "type *punctor* variety" and Japanese *punctor*. The saddle is always complete; 17% had seta 1a-S. No other differences were detected.

Pupae of Japanese *punctor* agree with Darsie's (1957) diagnosis of North American *punctor*.

Twenty-one larval specimens of British *punctor* (from the suburbs of London; BMNH) were examined. In setae 5, 6-C and 8-P, they agreed with Japanese

punctor; in the absence of 1a-S and the saddle is always complete, they agreed with typical *punctor* of North America. Seta 1-M is variable in length from 0.5 of 3-M to longer than it, while 1-M is always shorter than 3-M in Japanese and North American specimens. In 10 other characters, British *punctor* differ from both Japanese *punctor* and "type *punctor* variety" (Table 11). The British population appears to deviate more from North American "type *punctor* variety" than Japanese *punctor* does. Further study of European *punctor* will be necessary.

TABLE 11. Comparison of larval characteristics of 3 populations of *Aedes (Ochlerotatus) punctor*.

Population	Japan (Hokkaido)			North America[1]			England		
No. examined	59			23 (USNM)			21 (BMNH)		
	Range	x	Mode[2]	Range	x	Mode[2]	Range	x	Mode[2]
Seta 3-P	1-2	1.0+	1	1-2	1.0+	1	2-3	2.3	-
Seta 5-P	1 (constant)			1-2	1.1	1	1-3	2.0	-
Seta 1-M	1-3	1.8	-	1-5	2.8	-	1-2	1.1	1
Seta 7-II	1-2	1.1	1	1-2	1.0+	1	1-3	1.8	-
Seta 6-IV	1 (constant)			1 (constant)			1-2	1.9	2
Seta 6-V	1 (constant)			1 (constant)			1-2	1.9	2
Seta 13-V	1-2	1.0+	1	1 (constant)			1-2	1.7	-
Seta 6-VI	1-2	1.0+	1	1 (constant)			1-2	1.8	2
Comb scales	6-22[3]	12.0	-	9-18	13.8	-	10-32	16.6	-
7-II/6-II[4]	0.49-0.79 (x = 0.72)			0.53-0.85 (x = 0.71)			0.38-0.68 (x = 0.55)		
Saddle	Incomplete			83% complete			Complete		

[1]"Type *punctor* variety" (Knight 1951) from Anchorage-Fairbanks area of Alaska.

[2]Shown only when the frequency of the value is 80% or more.

[3]70 specimens examined.

[4]Length ratio of setae.

BIONOMICS. In Hokkaido, *Ae. punctor* is found in the central and northern mountainous areas. Larvae occur in temporary ground pools of melted snow, and frequently are associated with *Ae. communis*, *Ae. intrudens* and *Ae. diantaeus*, sometimes with *Ae. excrucians* and *Ae. esoensis*. They are apparently univoltine. Females are vicious day and dusk biters.

MEDICAL IMPORTANCE. Natural infections of tularemia have been found in *Ae. punctor* (Gutsevich et al. 1970).

62. *AEDES (OCHLEROTATUS) HEXODONTUS HOKKAIDENSIS* NEW SUBSPECIES*

(Figs. 89, 214; Table 95)

Aedes (Ochlerotatus) hexodontus: Suzuki, 1959: 291, Zenibako, Hokkaido, Japan.

FEMALE (Fig. 214). Wing length 4.3-4.7 mm (reared specimens). *Head.* Vertex including interocular space covered with narrow curved, pale yellowish scales, eye margin more densely scaled; many erect forked, yellowish brown scales on posterior part of vertex, often some dark ones laterally intermixed; tempus pale scaled; apparently about 10 or more yellowish brown to dark brown vertical bristles and 5-7 dark brown temporal bristles on each side. Clypeus dark brown. Antenna: pedicel yellowish brown, mesal surface dark brown, with small pale scales and fine bristles; flagellum 0.80-0.83 (2) length of proboscis; flagellomere 1 with pale scales on mesal side, 1.46-1.56 length of Flm 2. Palpus 0.18-0.21 (2) length of proboscis, dark scaled; segment 3 1.77-2.08 (2) of 2; 4 0.16 (1) length of 3. Proboscis 1.32-1.34 (2) length of forefemur, dark scaled, with several ventrobasal bristles. *Thorax.* Pronotal integument rather dark brown; anterior lobe covered with broad pale scales, bearing many yellow to yellowish brown bristles; posterior lobe anterodorsally covered with crescent-shaped yellowish or rather narrow flat scales, posteroventrally with broad white scales, occasionally dark scales also anteriorly present; posteriorly and posterodorsally 7-13 yellow to yellowish brown bristles. Scutum with integument dark brown, a little paler on margin, covered with narrow curved, pale yellowish brown and dark brown scales, the dark brown scales forming a pair of submedian stripes almost reaching prescutellar space, scutum unscaled at apex of these stripes; scales on prescutellar space whitish; all scutal bristles present, anterior bristles mostly dark brown, supraalar and prescutellar bristles mostly pale yellowish brown, some dark brown bristles usually present among supraalars. Scutellum with scales similar to those on prescutellar space, bearing more than 10 pale yellowish brown bristles on each lobe. Paratergite with pale broad scales on underside. Pleural integument rather dark brown; patches of pale broad scales on propleuron, postspiracular area, subspiracular area, lower flank of prealar knob, upper to posterior sternopleuron, mesepimeron and metameron; patch of sternopleuron reaching cephalic corner, that of mesepimeron fully or almost reaching lower margin; pleural bristles whitish to pale yellowish brown, many on propleuron, upper to posterior sternopleuron and upper mesepimeron, about 10 postspiraculars, 1-4 lower mesepimerals. *Wing.* Alula fringed with rather broad dark scales. Costa pale scaled from base to humeral cross vein, varying amounts of dark scales intermixed; veins otherwise dark scaled. Cell R_2 1.76-2.02 (7) length of vein r_{2+3}. Halter knob pale scaled. *Legs.* Coxae pale scaled, occasionally some dark scales intermixed on anterior surface of forecoxa. Femora with distinct pale apical fringe; forefemur covered with pale and dark scales on dor-

*The nominal subspecies, *Aedes hexodontus hexodontus* Dyar, 1916 does not occur in this region.

Aedes hexodontus Dyar, 1916: 83 (♂, ♀, L). Type-locality: Fallen Leaf, Lake Tahoe, California, United States.

DISTRIBUTION. NORTHERN HOLARCTIC REGION.

sal surface, pale scaled on posterior 0.67 of ventral surface; midfemur covered with pale and dark scales on anterior surface, pale scaled on posterior surface excepting apical part; hindfemur pale scaled except for apical 0.5 of dorsal surface and apical area; tibiae and tarsomeres 1 covered with dark and pale scales; femora, tibiae and tarsi otherwise dark scaled. Midtarsomere 5 longer than or as long as 4; hindtarsomere 1 0.71-0.74 (7) length of tibia. All claws equal, with a sharp submedian tooth. *Abdomen.* Tergum I with median patch of pale scales; II-VII dark scaled, with basal bands of pale scales, the bands evenly wide or narrowed mesally, extending apically in lateral part, often reaching apical margin on VII; VII with some pale scales on apical margin. Sterna II pale scaled, III-VII each pale scaled basally, dark scaled apically, the pale scaled area progressively broadened on posterior segments, VII often entirely pale scaled.

MALE. Wing length 3.8-4.6 mm. Antenna: flagellum 0.68-0.69 (2) length of proboscis; flagellomere 12 1.19-1.30 length of Flm 12, both 0.98-1.01 of Flm 1-11. Palpus 1.13-1.20 (2) length of proboscis; segments 4, 5 and apex of 3 a little swollen; apex of 3 and basal 0.5 of 4 with many long bristles, 5 and apical 0.5 of 4 also bristled; length ratio of 2-5: 0.94-1.00 : 1.53-1.56 : 1.09-1.13 : 1.00. Proboscis 1.37-1.49 (2) length of forefemur. Lower mesepimeral bristle absent. Cell R_2 1.13-1.44 (6) length of vein r_{2+3}. Hindtarsomere 1 0.76-0.84 (5) length of tibia. Anterior claw of midtarsus very long, much longer than posterior claw, sinuate; all claws unidentate. *Genitalia.* Tergum IX with median sclerotized part roughly quadrate; lobes well sclerotized, about as long as wide, moderately separated, each bearing 4-7 rather short, stout setae. Sternum IX oblong, with 6-10 bristles. Basistyle 4.3-4.9 times as long as tergal median narrowest width, laterally and sternally scaled, bristled over entire surface, long bristles laterally and apically; apical tergomesal lobe close to apex, rounded, scarcely bristled on tergal surface, with short bristles and short, somewhat broadened setae on mesal side; basal tergomesal lobe well protrudent, heavily bristled, the proximal tergalmost surface narrow, with only several bristles, the most laterotergal seta definitely stouter than other bristles, pigmented, curved distad of middle; the lower distal part extending to about middle of basistyle, densely covered with bristle-bearing prominent papillae; claspette stem curved, pubescent excepting apical 0.25, with one or 2 small prominent-based basal setae; filament lightly pigmented, only a little broadened in basal 0.67, apically narrowed, with apex hooked. Dististyle slender, curved in apical 0.33, 0.55 (1) as long as basistyle, pubescent on concave side except for basal and apical area, with 4-5 short setae in apical 0.33 on convex side; claw pigmented, straight, slender, about 0.2 length of dististyle. Tergite X well sclerotized; cercal tergal surface poorly sclerotized, 2-8 (5) cercal setae; paraproct well sclerotized laterally, strongly sclerotized apically, unicuspid at apex. Aedeagus weakly sclerotized, elliptic, widest at basal 0.25, a little constricted in middle, 2.25 (1) as long as broad, tergally closed but with a round apical notch and a large basal orifice, sternally open except at base, which has a short median process; sternomesal edge apically serrate.

LARVA (Fig. 89). *Head.* Width 1.33-1.37 mm (2); brown, 1.29-1.33 as wide as long; seta 1-C pigmented, 0.71-0.83 (3) as long as distance between bases, occasionally with a few barbs, rarely bifid at tip; 4, 6-C on about same level; 5-C well caudad of and slightly mesad of 6-C, 68% single; 6-C 73% single; 5, 6-C rather stiff when single; usually, 8-C double and 13-C single. *Antenna* 0.36-0.46 mm long, shorter than head, dark brown, spinulate; seta 1-A inserted at basal 0.39-0.50, not reaching apex of shaft, with 4-7 barbed

branches, occasionally with a few secondary branches. Cardinal seta 1-Mx single. No dissected specimen available for description of mandible and maxilla. *Mentum plate* with 26-29 teeth. *Thorax*. Setae 1-3-P rather strong; 2-P 0.76-0.99 length of 1-P, smooth or with a few barbs; 3-P 0.57-0.81 and 0.70-0.86 length of 1- and 2-P respectively; 8-P of medium strength; 12-P strong; 1-M slender, usually shorter than, occasionally length of 3-M; 3-M usually single or double, rarely triple; 4, 14-P and 5-M usually single; 4-M usually double. *Abdomen*. Integument ventrally spiculate in middle on segments II-VIII and also laterally on VIII. Setae 6-I-VI double or triple, 90%, 80%, 73%, 86%, 90%, and 93% double respectively; 7-II 0.53-0.77 (x = 0.64) length of 6-II; 13-III-V strong, 13-III single or double (71%), 13-IV single to triple (85% double), 13-V double (94%) or triple; I-IV, V rather strong, but shorter than 13-IV, V, single or double, 86% and 56% double respectively; 1-VI 2-5 branched, always slender; 7, 10, 12-I, 8, 14-III, 8, 14-IV, 3, 8, 14-V, 7, 14-VI, 11-VII and 14-VIII usually single; 3-I and 1-VII usually double. Comb scales 5-9 (x = 6.8) in a single row; individual scales thorn-shaped with a strong apical spine, laterobasally fringed with fine spicules; 25% of larvae having scales with apical spine double, 3.5% of scales with apical spine double. *Siphon* brown, with acus attached, widest at about basal 0.33, 2.67-2.75 (2) as long as wide, apex 0.57-0.58 (2) width of widest part; length 1.10-1.34 mm, index 2.95-2.98 (2); microsculpture of broken transverse ridges bearing extremely fine denticles; pecten reaching basal 0.30-0.43 of siphon, of 16-26 dark brown, evenly spaced teeth including 0-5 basal abortive teeth; each tooth with several ventrobasal denticles; 1-S inserted beyond pecten at basal 0.40-0.49 of siphon, longer than siphon diameter at insertion; 2-S rather stiff, not reaching apex of siphon, slightly shorter than apical pecten tooth; single or double accessory siphonal seta rarely (3.1%) present. *Saddle* very narrowly incomplete, 0.41-0.50 mm long, with acus; microsculpture similar to that of siphon, the spicules not markedly stronger apically; 1-X usually single, rather strong, longer than saddle, usually sparsely barbed; 4-X of 17-20 cratal and 0-2 precratal tufts (17-21 in total), cratal tufts 2-7 branched, precratal 2-4 branched. Anal gills apically tapering, 1.1-1.4 length of saddle.

TYPE-SERIES. Holotype male (#19124, A-1808-1) with associated slides of genitalia, wing, legs, larval and pupal skins: Ônuma-kôen, Hokkaido, Japan, 30 IV 1959, ground pool, Hattori. Paratypes: 3 males, 8 females with slides of associated skins (11 larval and 11 pupal), genitalia (3 males, 3 females), mouthparts (2 males, 2 females), wings and legs (2 males, 7 females); data same as holotype.

The holotype and one half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN TYPES. 2♂, 17♀, 9 L, 13 l: Hokkaido (A-0187, A-0222, A-1680, A-1780, A-1804, A-1808, A-2074, A-2272).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido).

TAXONOMIC DISCUSSION. No definite differences were detected in the adult structure including the male genitalia between Japanese *hokkaidensis* and North American "type *hexodontus* variety" of Knight 1951 (2♂, 9♀: Fallen Leaf, Lake Tahoe, Cal., 9-13, June 1916, Dyar; 1♀: Gold Lake Campus, Plumas Co., Cal., 20 July 1916, Dyar). However, some inconsistencies were noted in the larvae. Twenty-one specimens of "type *hexodontus* variety" from the United States (California, Colorado and Montana, 39-45°N; USNM) and 32 larvae of "tundra variety" of Knight 1951 (20 from Umiat, Alaska; 12 from Anchorage-Fairbanks area, Alaska and British Columbia; USNM) were

examined for comparison. Among the 20 diagnostic characters mentioned in the TAXONOMIC DISCUSSION of *Ae. punctor*, Japanese *hokkaidensis* appear to differ from "type *hexodontus* variety" and "tundra variety" in 12 characters each (Table 12). The most distinctive difference is that the saddle is always incomplete in *hokkaidensis*, always complete in North American *hexodontus*. Differences in setae 3-P, 6-IV-VI and 13-V appear to be significant for the species of this group. Pupae will be discussed in a separate publication; here, we mention only that the pupa of *hokkaidensis* cannot be determined as *hexodontus* by Darsie's (1957) diagnosis.

In North America, *Ae. hexodontus* is said to inhabit northern arctic tundra and also alpine meadows of southern mountainous districts. The southernmost known range is from California to Colorado, about 40° N latitude. At present, *hokkaidensis* is known only from the lowland districts of southern Hokkaido; larval specimens examined were collected at Nopporo (Hattori), Zenibako (Kanda), Shakotan (Sato) and Ônuma Kôen (Hattori). These localities are between 42-43° N. In Zenibako, larvae of *hokkaidensis* are most abundant in and around oak woods (Sato et al. 1973). In addition to the above morphological differences of the immature stages, this inconsistency in the habitat makes it more reasonable to treat Japanese *hexodontus* as a distinct subspecies, *hokkaidensis*.

Aedes hexodontus hokkaidensis is difficult to discriminate from *punctor*. This situation is similar to that in North America. The male genitalia appear indistinguishable. No definite diagnostic characters exist in the adults. However, some differences were found in the females. Some vertical erect dark scales more often occur laterally; several dark bristles are usually present among the supraalars (usually all bristles are yellowish in *punctor*) and the lower mesepimeral bristles are 1-8, usually 3 or more (2-4 in *punctor*). The pale scaling at the base of the costa is more developed, at least a distinct pale basal spot is always present; usually, pale scales are also scattered between the basal spot and the humeral cross vein, occasionally this area is entirely pale-scaled; while in *punctor*, it is entirely dark or has only a few pale scales, occasionally with a small pale basal spot. The pale scaling on the dorsal surface of the forefemur and the anterior surface of the midfemur is usually more developed than in *punctor*; the pale basal bands of the abdominal terga are more often evenly wide, while in *punctor*, they are more often narrowed mesad. As these female characters are highly variable in both species, none are definitely diagnostic.

Aedes hexodontus hokkaidensis may be differentiated from *punctor* by the branching of larval setae 3-P, 6-IV-VI and 13-V as mentioned in the foregoing key. Including these, *hexodontus hokkaidensis* is different from *punctor* in 15 characters among the 20 larval diagnostic characters used for the *punctor*-subgroup (Table 13). The number of comb scales appears to be the most reliable diagnostic character in North America. In Japan, this is not the case. The number of comb scales of Japanese *punctor* is more variable, 6-22. That of *hexodontus hokkaidensis* is restricted from 5 to 9. Of 70 specimens of Japanese *punctor*, 11.4% had 9 comb scales or less on each side; these specimens may be confused with *hexodontus hokkaidensis*. However, as 88.6% have 10 or more scales at least on one side, this character is still of some use for differentiating *punctor* from the complex.

Specific distinctness between *punctor* and *hexodontus* seems to have been generally accepted since Knight (1951). However, the diagnostic characters for a region are not always relevant to populations of other regions, e.g., Japanese *punctor* and *hexodontus* cannot be identified by a key for North American species; a key for this region is useless for British *punctor* and some North

American specimens; the difference in the point of bending of major setae of the basal tergomesal lobe and the pattern of microsetae on the basistyle as indicated by Dahl (1974) for Scandinavian specimens are not applicable to Japanese ones.* It should be evident that a worldwide revision of this group is desirable.

TABLE 12. Comparison of larval characteristics among the Japanese and North American populations of *Aedes (Ochlerotatus) hexodontus*.

Population	Japan			North America					
	hokkaidensis			Type *hexodontus* variety			Tundra variety		
No. examined	32			21 (USNM)			32 (USNM)		
Character	Range	x	Mode[1]	Range	x	Mode[1]	Range	x	Mode[1]
5-C	1-2	1.3	-	1-3	1.8	-	1-2	1.2	1
6-C	1-3	1.3	-	2-3	2.1	2	1-2	1.1	1
3-P	2-4	2.4	-	1-2	2.0	2	1-2	1.2	1
5-P	1-3	1.3	-	2-4	2.6	-	1-3	2.2	-
8-P	1-2	1.5	-	1-3	1.7	-	2-3	2.7	-
1-M	1-3	1.6	-	1-3	1.6	-	1-9	4.3	-
6-IV	2-3	2.1	2	1-2	1.6	-	1-3	1.3	-
6-V	2-3	2.1	2	1-2	1.6	-	1-2	1.3	-
13-V	2-3	2.1	2	1-2	1.3	-	1-2	1.3	-
6-VI	2-3	2.1	2	1-2	1.5	-	1-2	1.1	1
3-P/1-P[2]	0.57-0.81 (x = 0.65)			0.63-0.88 (x = 0.78)			0.65-1.02 (x = 0.86)		
3-P/2-P[2]	0.70-0.86 (x = 0.78)			0.86-0.98 (x = 0.91)			0.82-1.25 (x = 1.01)		
1-M	≦ 3-M, pigmented			≧ 3-M, pigmented			< 3-M, pale		
1a-S[3]	3% present			Absent			16% present		
Saddle	Incomplete			Complete			Complete		

[1]Shown only when the frequency of the value is 80% or more.

[2]Length ratio.

[3]Accessory subdorsal siphonal seta.

*Wood (1977) stated that North American larvae of *punctor* and *hexodontus* could be separated only by the length of the comb scales (< 0.08 mm in *punctor*, > 0.10 mm in *hexodontus*). He also raised the possibility that the so-called "tundra variety" of *hexodontus* may prove to be a separate taxon.

TABLE 13. Comparison of larval characteristics between *Aedes (Ochlerotatus) punctor* and *Ae. (Och.) hexodontus hokkaidensis*.

Species	*punctor*			*hexodontus hokkaidensis*		
No. examined	59			32		
Character	Range	x	Mode[1]	Range	x	Mode[1]
5-C	1-3	2.0	2	1-2	1.3	-
6-C	1-3	2.1	2	1-3	1.3	-
1-P	1-3	1.9	2	2-3	2.6	-
3-P	1-2	1.0	1	2-4	2.4	-
8-P	1-4	2.4	-	1-2	1.5	-
7-II	1-2	1.1	1	1-3	1.8	-
6-IV	1 (constant)			2-3	2.1	2
1-V	1 (constant)			1-2	1.6	-
6-V	1 (constant)			2-3	2.1	2
13-V	1-2	1.0^+	1	2-3	2.1	2
6-VI	1-2	1.0^+	1	2-3	2.1	2
Comb scales	6-22[2]	12.0	-	5-9	6.8	-
3-P/1-P[3]	0.71-0.90 (x = 0.83)			0.57-0.81 (x = 0.65)		
3-P/2-P[3]	0.80-0.97 (x = 0.91)			0.70-0.86 (x = 0.78)		
1a-S[4]	41% present			3% present		

[1]Shown only when the frequency of the value is 80% or more.

[2]70 specimens examined.

[3]Length ratio.

[4]Accessory subdorsal siphonal seta.

BIONOMICS. At present, *Ae. hexodontus hokkaidensis* is known only from southern lowland districts of Hokkaido as mentioned in the TAXONOMIC DISCUSSION. The larvae occur in temporary ground pools of melted snow. In Zenibako, larvae are usually found in clean water with a relatively low temperature in oak woods, occasionally also in water with a relatively high temperature around woods, being most often associated with *Ae. intrudens*, rarely with *Ae. excrucians* (Sato et al. 1973). The peak of the adult population occurs from the middle of May to the beginning of June; females attack man throughout the day, but are most active at dawn and dusk (Sato et al. 1974).

63. *AEDES (OCHLEROTATUS) HAKUSANENSIS* YAMAGUTI AND TAMABOKO
(Figs. 90, 91, 216; Table 96)

Aedes (Ochlerotatus) hakusanensis Yamaguti and Tamaboko, 1954: 414 (♂, ♀, P, L). Type-locality: Mt. Hakusan, Ishikawa Pref., Japan.

FEMALE (Fig. 216). Wing length 5.1-5.4 mm. *Head.* Eyes narrowly narrowly separated above and rather broadly below. Vertex including interocular space covered with narrow curved or crescent-shaped, pale ochreous scales, eye margin more densely scaled; numerous narrow erect forked scales over vertex, median scales yellowish brown, sometimes dark ones intermixed, lateral ones usually dark; tempus covered with broad pale ochreous scales; about 10 vertical bristles, mesal bristles yellowish, lateral ones dark; 5-7 dark temporal bristles. Clypeus blackish brown. Antenna: pedicel tawny yellow, mesal surface infuscate, with small pale scales and short dark hairs; flagellum 0.69-0.73 (5) length of proboscis; flagellomere 1 pale yellowish brown in basal 0.67, with small dark (occasionally pale) scales, 1.48-1.70 length of Flm 2. Palpus dark scaled, 0.17-0.18 (4) length of proboscis; segment 3 1.71-2.00 (5) length of 2; 4 papilliform. Proboscis dark scaled, 1.52-1.60 (4) length of forefemur. *Thorax.* Pronotal integument dark brown, both lobes covered with yellowish brown, narrow curved scales, those on lower part wider and paler; anterior lobe bearing more than 10 dark and yellowish brown bristles; posterior lobe bearing 10 or more dark and yellowish brown bristles posteriorly and often also posterodorsally. Scutum with integument dark brown, covered with yellowish brown narrow curved scales and with a pair of narrow median lines of rather dark brown narrow curved scales, the lines often ill-defined, sometimes indistinct, scales on supraalar area and prescutellar space broader and paler; acrostichal bristles developed; acrostichals, anterior dorsocentrals and about 10 or more irregularly scattered fossals dark brown, posterior dorsocentrals, prescutellars and supraalars pale yellowish brown, some brown to dark brown bristles also present among supraalars. Scutellum covered with scales similar to those of prescutellar space, each lobe bearing many pale yellowish brown bristles of various lengths. Paratergite with white broad scales. Pleural integument dark brown, pale brown on metapleuron; patches of yellowish white or white broad scales covering propleuron, upper 0.67 of postspiracular area, lower subspiracular area, lower prealar knob, upper and lower posterior sternopleuron, mesepimeron and metameron; upper sternopleural patch reaching anterior angle, mesepimeral patch reaching near lower margin. Pleural bristles pale, more than 10 each on propleuron, postspiracular area, prealar knob, sternopleuron, and upper mesepimeron; 1-3 lower mesepimerals. *Wing.* Alula fringed with dark narrow scales. Veins dark scaled; costa without a pale basal spot. Cell R_2 1.76-2.16 (5) length of vein r_{2+3}. Halter with pale scaled knob. *Legs.* Forecoxa pale scaled on mesoanterior surface and basal half, dark scaled on apical half of lateral surface; mid- and hindcoxae covered with broad pale scales. Femora with narrow pale yellowish apical fringe; forefemur pale scaled on posterior surface and posterior 0.67 of under side excepting apex, dorsally with a few scattered pale scales; midfemur pale scaled on posterior surface excepting apex; hindfemur pale scaled excepting apex and dorsal dark stripe, which is apically broadened, barely reaching base; femora, tibiae and tarsi otherwise dark scaled. Midtarsomere 5 a little shorter than 4; hindtarsomere 1 0.77-0.81 (5) length of tibia. Claws equal, each with a sharp

submedian tooth. *Abdomen.* Tergum I medially pale scaled; II-VII dark scaled, with basal bands of pale scales, these bands usually slightly narrowed mesally, laterally broadened and fused with laterobasal patches which become progressively larger on posterior segments, almost reaching apical margin on VII. Sternum II entirely pale scaled; III-VII broadly pale scaled basally, narrowly dark scaled apically, VII sometimes almost entirely pale scaled with scattered dark scales on apical half; VII rather poorly scaled.

MALE (Fig. 91). Wing length 5.1-5.4 mm. Vertex more narrowly covered with narrow curved scales than in female and broad-scaled area of tempus extending onto vertex; dark erect forked scales fewer than in female. Antenna: flagellum 0.66-0.69 (5) length of proboscis; flagellomere 12 1.09-1.25 (5) length of Flm 13, both 1.02-1.12 (5) of Flm 1-11. Palpus 1.03-1.07 (5) length of proboscis; segment 4 and apex of 3 heavily bristled; length ratio of 2-5: 0.81-0.89 : 1.32-1.57 : 1.00-1.05 : 1.00. Proboscis 1.63-1.75 (5) length of forefemur. Lower mesepimeral bristle usually lacking, rarely one. Cell R_2 1.26-1.42 (5) length of vein r_{2+3}. Hindtarsomere 1 0.79-0.88 (5) length of tibia. Anterior claw of midtarsus long, slender and sinuate; all claws unidentate. *Genitalia.* Tergum IX with median sclerotized part roughly quadrate; lobes well sclerotized, moderately separated, usually as long as wide, sometimes longer than wide; each bearing 4-9 rather short, stout setae. Sternum IX oblong, with 8-10 bristles. Basistyle straight on lateral and sternal mesal sides in tergal view, constricted at middle on tergal surface, 5.2-6.3 length of tergal median narrowest width, laterally and sternally scaled, bristled over entire surface, with long bristles laterally and apically; apical tergomesal lobe close to apex, rounded, scarcely bristled on tergal surface, with fine bristles and short, curved, rather broad setae on mesal surface; basal tergomesal lobe well protrudent, heavily bristled, the proximal tergalmost surface broad, bearing many bristles, the most laterotergal, pigmented, apically curved seta usually only a little stouter than the next, the lower distal part reaching about middle of basistyle, with scattered short bristles on weakly prominent papillae; claspette stem curved, narrowed in apical 0.25 in lateral view, pubescent except apical 0.25, with several short setae at base; filament poorly pigmented, only a little expanded in basal 0.33, then apically narrowed, with apex hooked. Dististyle slender, curved at about apical 0.33, 0.51-0.62 (8) length of basistyle, pubescent on concave side except for apical and basal areas, several short setae on convex side in apical 0.33, sometimes a few short setae on sternal surface; claw straight, slender, 0.16-0.21 (8) length of dististyle, pigmented. Paraproct strongly sclerotized apically, with single apical tooth; cercal setae 4-10. Aedeagus elliptic, slightly constricted in middle, length 2.03-2.33 (7) of width, poorly sclerotized, tergally closed but with a round apical notch and a large round tergobasal orifice, sternally open except at base which has a short median process, serrate on sternal mesal margin at apex.

LARVA (Fig. 90). *Head.* Width 1.25-1.34 mm; brown, 1.14-1.37 as wide as long; seta 1-C pigmented, often barbed, 0.72-0.81 (2) as long as distance between bases; 4, 6-C slightly anteriad of 7-C; 5-C posteriad of 7-C, slightly mesad of or tandem with 6-C, usually more slender than 6-C; 5, 6-C smooth or weakly barbed; usually 8, 10-C double and 13-C single. *Antenna* 0.46-0.52 mm long, shorter than head, moderately pigmented, becoming somewhat darker apically, spinulate; seta 1-A inserted at basal 0.37-0.47, with 4-10 barbed branches, not reaching apex of shaft; 5-A with an accessory sensorium on its proximal division. *Mandible* with rather many dorsolateral microspines on basal half. Cutting organ with 2 dorsal spines; lateral dorsal tooth 2- or 3-cuspid, mesal dorsal tooth larger, simple or with 1-4 mesal denticles and 1 or

2 mesobasal accessory denticles; ventral tooth with 1 or 2 lateral denticles VT-2 often obscure); $VT_2 > VT_1 > VT_3$; 2 ventral blades, VB_1 just reaching tip of VT_0, with fine mesal pectination, VB_2 short, with rather coarser mesal pectination; pectinate brush of 5-7 mesally pectinate hairs. Piliferous process with labula longer than the broader anterior part. Mandibular hairs (7-9) + (8-12); hairs of anterior group simple or apically barbed, hairs of posterior group distinctly apically frayed. *Maxilla* with 1-Mx single. Mesostipes slightly longer than wide, pseudoartis not fused or loosely fused with cranium; lateral surface tuberculated; equal twin stipital sensoria distad of middle, without distinct basal ring; 4-Mx close to apex, apically slender, lightly pigmented; 2-Mx proximad of level of 4-Mx. Lacinia with 5-Mx distad or on level of stipital sensoria; 6-Mx barbed. Palpostipes approximately 0.5 length of mesostipes, very narrowly and rather loosely fused ventrobasally with mesostipes, strongly narrowed in apical half; apex with 5 short palpal sensoria, S_1 stouter than others, $S_1 > S_3 \geq S_2 = S_4 > S_5$ in length. *Mentum plate* with 24-27 teeth. *Thorax*. Setae 1-3-P rather strong; 2-P usually (97%) single, 0.80-0.95 length of 1-P; 3-P 0.75-0.87 length of 1-P, 0.84-0.95 of 2-P; 5-P usually (95%) triple; 8-P of medium strength, usually triple; 12-P strong; 1-M usually single, fairly long, distinctly longer and stouter than 3-M, occasionally with a few barbs; usually, 5-M single and 2-T double. *Abdomen*. Integument ventrally spiculate in middle on segments II-VIII and also laterally on VIII. Setae 6-I-III double or triple, very rarely 4 branched in 6-I, 83%, 94% and 90% double respectively, 6-IV-VI consistently double, 6-V, VI smooth or with a few barbs; 7-II 0.45-0.56 (x = 0.49) length of 6-II, usually double; 1-IV, V, VII and 13-II-V strong, smooth or with a few barbs; 1-VI short to medium; 2-VIII free or on a common callus with 1-VIII; 2, 9-I, 3-II, 8-III, and 2, 7-VI usually single; 1-IV, V, VII, 3, 12-IV and 13-IV, V usually double. Comb scales 11-28, individual scales thorn-shaped with a single strong apical spine, laterobasally fringed with fine spicules. *Siphon* brown, with acus attached, usually slightly broadened distad of base, 2.59-3.26 as long as wide, apex 0.60-0.70 of widest diameter; length 1.10-1.30 mm, index 2.67-3.33; microsculpture of faint short rows of minute denticles; pecten reaching basal 0.38-0.45, of 22-33 evenly spaced, dark brown teeth including 1-6 basal abortive ones, occasionally one apical tooth a little more widely spaced than in others, each tooth with several ventral denticles; 1-S inserted beyond pecten at basal 0.44-0.51, longer than siphon diameter; 2-S at most just reaching apex of siphon, shorter than apical pecten tooth; no accessory siphonal setae. *Saddle* 0.40-0.46 mm long, very narrowly incomplete, with acus, microsculpture similar to siphon, but becoming a little more distinct towards apex; 1-X rather strong, longer than saddle, smooth or occasionally with a few barbs; 4-X of 18-20 cratal and 2-3 precratal tufts (20-22 in total), each tuft 2-8 branched. Anal gills 3.5-5.2 length of saddle, ventral gill usually slightly shorter.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 35♂, 30♀, 24 L, 5 l: Honshu (D-1182, D-1183).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu).

TAXONOMIC DISCUSSION. *Aedes hakusanensis* belongs to the 3rd series of *punctor*-subgroup, discriminated from both *punctor-hexodontus* and *punctodes-abserratus* series by the flat and broad proximal tergalmost surface of the basal tergomesal lobe of the basistyle. It is closer to *punctor* than to *hexodontus* in the female; dark scaling of the vertical erect scales is more developed, and pale scaling on the costa and fore- and midfemora is less developed than in *punctor*. In the larva, it differs from *punctor* in 16 characters (Table 14); the 2-6 branched seta 5-C, usually triple 5-P and strong 1-M

appear to be the more distinctive characters of *hakusanensis*. This species has been found only on Mt. Hakusan and Mt. Tateyama (Kamimura 1976), central Honshu. On Mt. Hakusan, the larvae are found at altitudes of 1,750-2,400 m (Tamaboko 1964, and our collection). It may be a relict species of the glacial epoch.

TABLE 14. Comparison of larval characteristics between *Aedes (Ochlerotatus) punctor* and *Ae. (Och.) hakusanensis*.

Species	*punctor*			*hakusanensis*		
No. examined	59			20		
Character	Range	x	Mode[1]	Range	x	Mode[1]
5-C	1-3	2.0	2	2-6	3.7	-
6-C	1-3	2.1	2	2-4	2.8	-
1-P	1-3	1.9	2	2-4	3.2	-
3-P	1-2	1.0+	1	2 (constant)		
5-P	1 (constant)			2-3	2.9	3
1-M	1-3	1.8	-	1-2	1.2	1
7-II	1-2	1.1	1	2-3	2.2	2
6-IV	1 (constant)			2 (constant)		
1-V	1 (constant)			1-3	2.0	2
6-V	1 (constant)			2 (constant)		
13-V	1-2	1.0+	1	1-3	2.0	2
6-VI	1-2	1.0+	1	2 (constant)		
Comb scales	6-22[2]	12.0	-	11-28	17.5	-
1-M	<3-M			>3-M		
7-II/6-II[3]	0.49-0.79 (x = 0.72)			0.45-0.56 (x = 0.49)		
1a-S[4]	41% present			Absent		

[1]Shown only when the frequency of the value is 80% or more.

[2]70 specimens examined.

[3]Length ratio.

[4]Accessory subdorsal siphonal seta.

BIONOMICS. The larvae of *Aedes hakusanensis* occur in temporary or permanent ground pools formed by melted snow. On Mt. Hakusan, adults are found at altitudes from 1,500 to 2,700 m; females are vicious day biters (Tamaboko 1964).

64. *AEDES (OCHLEROTATUS)* SP.
(Fig. 91)

FEMALE. Apparently indistinguishable from *punctor*.

MALE (Fig. 91). *Genitalia*. Almost identical with *hakusanensis*, but the proximal tergalmost surface of the basal tergomesal lobe a little narrower, and more strongly produced mesally.

LARVA. Unknown.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 4♂, 16♀: Hokkaido (A-0214, A-0215, A-0216).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido).

TAXONOMIC DISCUSSION. This unnamed species appears to belong to the *hakusanensis*-series of the *punctor*-subgroup, and cannot be identified to any described species. However, further discussion is not given here, due to the lack of immature stages.

BIONOMICS. Adult females were abundant in woods on a slightly elevated area in the lowlands of eastern Hokkaido; they are vicious day biters.

65. *AEDES (OCHLEROTATUS) INTRUDENS* DYAR
(Figs. 92, 93, 216; Table 97)

Aedes intrudens Dyar, 1919: 23 (A, E). Type-locality: White River, Ontario, Canada.

Aedes (Ochlerotatus) intrudens: Hattori, 1958: 4, Teine and Maruyama, Hokkaido, Japan.

FEMALE (Fig. 216). Wing length 4.4-5.2 mm (wild mosquitoes). *Head*. Eyes narrowly separated above and rather broadly below. Vertex including interocular space medially covered with narrow curved yellow scales and posteriorly with numerous erect forked yellow scales, scales of eye margin and often those on median line a little wider and paler; tempus covered with broad white or yellowish white scales; most of vertical bristles yellowish brown, several temporals black. Clypeus pitch-black. Antenna: pedicel orange yellow, mesal surface infuscate, with pale small scales and dark short bristles; flagellum 0.83-0.86 (3) length of proboscis; flagellomere 1 yellow at base, with pale small scales, 1.57-1.70 length of Flm 2. Palpus dark scaled, with scattered pale scales, 0.21-0.24 (3) length of proboscis; segment 3 1.69-2.13 (4) length of 2; 4 0.20-0.27 (4) of 3. Proboscis dark scaled, 1.31-1.42 (2) length of forefemur. *Thorax*. Pronotal integument dark; anterior lobe covered with broad yellowish white scales and bearing many yellow bristles; posterior lobe covered with narrow curved pale yellow scales anterodorsally and broad yellowish white scales posteroventrally, intermediate scales in-between, 8 to more than 10 yellow bristles along posterior margin. Scutum with integument dark, covered with narrow curved, bronzy yellow and pale yellow scales, the former scales often forming a pair of indistinct longitudinal median stripes, scales on lateral margins and prescutellar space a little wider and paler; acrostichal bristles developed; acrostichals and anterior dorsocentrals black, others mostly yellow or golden yellow. Scutellum covered with scales similar to those of sides of scutum, bearing dark bronzy or yellow bristles. Paratergite scaled. All pleural sclerites except mesomeron, metepisternum and metepimeron with patches of broad yellowish white or white scales; hypostigial spot usually absent,

occasionally a small spot or a few pale scales present; sternopleural patch not reaching cephalic angle, lower 0.25-0.33 of mesepimeron bare; all pleural bristles yellow, lower mesepimerals 0-4. *Wing*. Alula with rather narrow dark scales. Veins dark scaled; costa with or without scattered pale scales at base, rarely with a small basal spot of pale scales. Cell R_2 1.76-2.20 (3) length of vein r_{2+3}. Halter knob dark, clothed with pale scales. *Legs*. Coxae and trochanters with moderately broad or rather narrow yellowish white scales. Femora fringed with pale scales at tip; forefemur pale scaled on posterior 0.67 of ventral surface, dorsal surface usually with the same amount of or more pale scales than dark ones, occasionally almost entirely pale except apex; midfemur pale scaled on posterior surface except dorsoapically, anterior surface often with more pale scales than dark ones, occasionally almost entirely pale except apex; hindfemur pale scaled on both sides except apex. Tibiae and tarsomeres 1 clothed with dark and pale scales intermingled, generally dark scales prevalent on anterior surface and pale ones on posterior surface; tarsomeres 2-5 dark and sprinkled with pale scales. Midtarsomere 5 length of 4; hindtarsomere 1 0.73-0.78 (3) length of tibia. Claws equal or sometimes anterior claw a little larger than posterior one in fore- and midtarsi; all claws unidentate. *Abdomen*. Tergum I with a median patch of dirty pale brown scales; II-VII dark scaled, each with a basal band of white scales, the bands a little narrowed mesally or evenly broad, widened laterally especially on posterior segments. Sterna covered with white scales.

MALE (Fig. 93). Wing length 4.9-5.5 mm (wild mosquitoes). Antennal flagellum 0.75-0.78 (2) length of proboscis; flagellomere 12 1.13-1.17 (2) length of Flm 13, both 1.02-1.03 (2) of Flm 1-11. Palpus 1.16-1.18 (3) length of proboscis; length ratio of segments 2-5: 1.08-1.20 : 1.62-1.72 : 1.21-1.32 : 1.00. Proboscis 1.43-1.46 (3) length of forefemur. Cell R_2 1.00-1.16 (3) length of vein r_{2+3}. Hindtarsomere 1 0.85-0.89 (3) length of tibia. Anterior claw of midtarsus slender, sinuate, and much longer than posterior one; all claws unidentate. *Genitalia*. Tergum IX with trapezoidal median sclerotized part slightly narrowed basally; lobes rather short and wide, each bearing 6-10 stout setae of medium length. Sternum IX rounded trapezoidal, apically narrowed; apex widely and fairly deeply emarginate; 7-14 bristles near apical margin. Basistyle a little arcuate, 5.1-5.8 times width of tergal aspect at middle, with many tergal bristles only a few sternal bristles at apical 0.67, a dense tuft of sternoapical bristles; apical tergomesal lobe rounded, moderately protrudent, with bristles of medium length on sternal surface, continuous with these bristles a row of several setae arranged on tergomesal edge up to about middle of basistyle; basal tergomesal lobe consisting of a small umbonate tergal protuberance bearing a specialized long stout dark nearly straight seta, and a longitudinal hirsute mesal structure which extends to middle of basistyle and bears 2 subequal, specialized, stout arcuate dark setae at apex; claspette stem curved, with a setiferous projection mesally at middle, basal half pilose with 2 or 3 mesal setae; apical half glabrous; filament petiolate, triangularly expanded on convex side, curved at apex. Dististyle curved at about apical 0.4, swollen in basal half, 0.38-0.42 length of basistyle, covered with minute hairs, with a row of 2-4 setae on convex side at apical 0.4; claw slender, straight, 0.23-0.30 length of dististyle. Paraproct strongly sclerotized, with single or double apical tooth; 3-7 cercal setae. Aedeagus ovate, tergally closed, narrowly open sternally, with a large round tergobasal orifice; tergal surface with a strong ridge on each side; sternal opening wide at base and apex, constricted at middle; apex consisting of a pair of small lateral plates, with serrate apical margin.

LARVA (Fig. 92). *Head*. Width 1.14-1.34 mm; brown, 1.36-1.53 as wide

as long; front margin of labrum a little concave; seta 1-C pigmented, occasionally with a few barbs or bifid at tip, slightly longer than distance between bases; 4-C often dendritic; 4, 6, 7-C on about same level, 6-C slightly laterad and well anteriad of 5-C, most frequently double, stouter than 5-C; 13-C occasionally barbed. *Antenna* 0.48-0.62 mm long, shorter than head, a little arcuate, spinulate, slightly darker apically; seta 1-A inserted at basal 0.37-0.44, with 6-10 barbed branches, just reaching or not reaching apex of shaft; 2-A rather stiff, pigmented; 3-6-A short, less than 0.5 length of 2-A. *Mandible* (1 dissected specimen) with a number of dorsolateral microspines near base. Cutting organ with a single dorsal spine; apparently 2 dorsal teeth (lateral tooth seemingly ventrad of very dark mesal tooth and difficult to see), mesal tooth simple; a row of several pale acute accessory denticles from base of mesal tooth onto mesobasal surface of cutting organ; ventral tooth with one lateral denticle (VT-4); VT_2 larger than VT_1 and VT_3; ventral blade extending well beyond tip of VT_0, with fine mesal pectination; pectinate brush of 8 well developed mesally pectinate hairs, most anterior hair nearly as long as ventral blade. Piliferous process with labula longer than the broader anterior part. Mandibular hairs (7-8) + (11-12); hairs of distal group simple, hairs of proximal group frayed apically. *Maxilla* (1 dissected specimen) with 1-Mx usually single, rarely double. Mesostipes 1.3 as long as wide, with lateral surface sparsely denticulate; equal twin stipital sensoria at about middle, without distinct basal ring; 4-Mx rather stiff, pigmented. Lacinia with 5-Mx slender, slightly distad of stipital sensoria; 6-Mx basally thickened. Palpostipes strongly narrowed apically, exlcuding lateral artis 1.25 as long as wide, slightly more than 0.33 length of mesostipes; apex with ampulla and 5 palpal sensoria, S_1 thick, $S_1 \geq S_3 > S_2 \geq S_4 > S_5$ in length. *Mentum plate* with 25-29 teeth. *Thorax*. Setae 1, 8-P strong, 2, 3-P slender, less than 0.5 length of 1-P, occasionally barbed; 12>10>9-P in length; 14-P occasionally barbed; 1-M shorter than 3-M; 10-M stronger than 12-M; usually, 7-P 3 branched and 5-M 5 branched. *Abdomen*. Integument often with rather stout microspines ventrally between setae 13 on segments II-VI; VIII laterally and X entirely minutely spiculate, the spicules stronger at apex of X; 7-II 0.23-0.51 (x = 0.36) length of 6-II; 13-III occasionally barbed; 13-IV, V fairly strong, smooth to distinctly barbed; 1-VII smooth to distinctly barbed; 2-VIII usually on a common callus with 1-VIII, occasionally free; 12-II, 8-III, V, 13-V, 11, 14-VII, and 4-VIII usually single; 3-III, 6, 12-IV, and 4, 7-VII usually double. Comb scales 11-16 in an irregular single or double row, individual scales thorn-shaped with a single strong apical spine, laterobasally fringed with very fine spicules. *Siphon* brown, with acus attached, broadest a little distad of base, 2.89-3.40 as long as wide, apex 0.56-0.66 of broadest diameter; length 1.09-1.31 mm, index 3.04-3.46; microsculpture of imbricate-like short transverse ridges bearing minute denticles; pecten reaching apical 0.39-0.48, of 16-23 dark brown teeth, occasionally with a basal abortive tooth, apical 1-3 teeth detached, apparently simple, each with one large and 0-2 tiny ventral denticles; 1-S located at about apex of pecten at apical 0.41-0.49, smooth to distinctly barbed, a little longer than siphon diameter at insertion; 2-S a little proximad of apex of siphon, not reaching it, distinctly shorter than apical pecten tooth. *Saddle* 0.44-0.56 mm long, narrowly incomplete, with acus, often with a small lateral window, ventral margin usually entire or somewhat irregular posteriorly, rarely incised; 1-X shorter than saddle; 4-X of 16-23 cratal and 1-3 precratal tufts (18-25 in total), each 3-10 branched. Anal gills apically tapering, dorsal gill 0.81-1.23 length of saddle, ventral gill usually slightly shorter than dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 145♂, 45♀; with associated skins (3 l, 3 p); 14 L, 17 l: Hokkaido (A-0187, A-0188, A-0203, A-0206, A-0210, A-0218, A-0219, A-0220, A-1796, A-1803, A-1809, A-2079).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido). KAMCHATKA. KHABAROVSK. UKRAINE. NORTHERN EUROPE. SOUTHERN CANADA. NORTHERN UNITED STATES. ALASKA.

BIONOMICS. Apparently widely distributed in Hokkaido, occurring in both lowlands and mountain areas. Larvae are found in temporary ground pools formed by melted snow, frequently associated with *Aedes communis*, *Ae. punctor* and *Ae. diantaeus*. Larval habitats in other parts of its range include bogs, marshes, ditches, *Carex* swamps containing deep water and margins of small lakes (Carpenter and LaCasse 1955). Adult females are severe day biters. *Aedes intrudens* is univoltine.

66. *AEDES (OCHLEROTATUS) DIANTAEUS* HOWARD, DYAR AND KNAB (Figs. 93, 94, 214, 216; Table 98)

Aedes diantaeus Howard, Dyar and Knab, 1913: pl. 24, fig. 167; 1917: 758 (♂).
Type-locality: Dublin, New Hampshire, United States.
Aedes (Ochlerotatus) diantaeus: Sato and Tatewaki, 1959: 8, Hisagonuma, Hokkaido, Japan.

FEMALE (Figs. 214, 216). Wing length 4.6-5.0 mm (wild mosquitoes), 3.8 mm (reared mosquitoes). *Head.* Eyes narrowly separated above and broadly below. Vertex including interocular space covered with narrow curved, pale yellow scales, and posteriorly with erect forked, pale yellow scales medially and dark ones laterally; eye margin more heavily scaled; tempus covered with broad yellowish white scales; mesal vertical bristles yellow, lateral bristles dark; several temporals black. Clypeus black. Antenna: pedicel piceous, with small dark bristles and scales on mesal surface; flagellum 0.93 (1) length of proboscis; flagellomere 1 1.40 of Flm 2, without scales. Palpus dark scaled, 0.25 (1) length of proboscis; segment 3 1.59 length of 2; 4 0.17 of 3. Proboscis dark scaled, 1.60 (1) length of forefemur. *Thorax.* Pronotal integument dark; anterior lobe with pale rather narrow scales and bearing a few black and many yellow bristles; posterior lobe anterodorsally with narrow curved yellow scales, posteroventrally with moderately broad creamy white scales and intermediate scales in-between, bearing 7-9 (2) yellowish brown bristles near posterior margin. Scutum with integument dark, covered with narrow curved yellow scales and very narrow dark scales, the latter forming a fairly wide anterior longitudinal stripe and a pair of posterior sublateral stripes, the median stripe sometimes longitudinally divided by a narrow pale stripe; acrostichal bristles developed; all scutal bristles rather slender, acrostichals and dorsocentrals dark, others mostly yellow. Scutellum with yellow scales similar to those of scutum, bearing many rather long and slender yellow bristles. Paratergite scaled. All pleural sclerites excepting mesepimeron, metepisternum and metepimeron with patches of moderately broad or broad creamy white scales, which are more whitish on posterior pleura, the sternopleural patch not reaching cephalic angle; lower 0.25-0.33 of mesepimeron bare; pleural bristles rather slender, yellow; about 10 sternopleurals along upper to posterior margin; no lower mesepimerals. *Wing.* Alula with dark rather narrow scales. Veins dark scaled; costa dark throughout. Cell R_2 1.88 (1) length of vein r_{2+3}. Halter knob dark, covered with pale scales. *Legs.* Coxae and trochanters with creamy white

scales. Femora fringed with pale scales at tip; fore- and midfemora posteriorly and ventrally pale scaled excepting apex; hindfemur largely pale, the pale-scaled area extending to half way to apex on dorsal surface and nearly to apex on ventral surface; femora, tibiae and tarsi otherwise dark scaled. Hindtarsomere 1 0.82 (1) length of tibia. Anterior claw of foretarsus a little longer and less curved than posterior claw; all claws unidentate. *Abdomen.* Tergum I with pale or dark scales at middle; II-VII dark scaled, with laterobasal patches of pale scales, usually without pale basal bands, sometimes narrow basal bands connecting lateral patches on posterior segments. Sterna covered with pale scales, each with a dark apical band.

MALE (Fig. 93). Wing length 4.3-4.9 mm (wild mosquitoes), 3.8 mm (reared mosquitoes). Antennal flagellum 0.76-0.77 (2) length of proboscis; flagellomere 12 1.09-1.12 length of Flm 13, both 0.99-1.05 of Flm 1-11. Palpus 1.03-1.08 (2) length of proboscis; length ratio of segments 2-5: 1.27-1.28 : 1.88-2.11 : 1.23-1.24 : 1.00 (2). Proboscis 1.42-1.44 (2) length of forefemur. Cell R_2 1.18-1.35 (2) length of vein r_{2+3}. Hindtarsomere 1 0.81-0.83 (2) length of tibia. Anterior claw of midtarsus slender and much longer than posterior one; all claws unidentate. *Genitalia.* Tergum IX with median sclerotized part rather wide, trapezoidal, basally narrowed; lobes well sclerotized, narrowly separated, each bearing 10-13 stout setae of medium length. Sternum IX rounded trapezoidal, emarginate at apex, with 6-8 bristles. Basistyle stout, constricted in middle, swollen in apical half, length 3.1-3.4 times greatest width excluding lobes, laterally and sternally scaled, bristled, some very long sternoapical bristles, a fairly large and dense tuft of long mesally directed bristles mesosternally in apical half; apical tergomesal lobe rounded, well protrudent, bearing rather stout moderately long bristles on sternal surface; basal tergomesal lobe formed by a tergal umbonate protuberance bearing a specialized stout curved dark seta, and by a pale, hirsute mesal conical structure, reaching midlevel of basistyle, its apex with 2 unequal specialized stout dark curved setae; claspette stem short and stout, a little arcuate, with one or 2 small setiferous protuberances about at middle, pilose except apical 0.33; filament formed by a short petiole and very broad wing which has some subhyaline areas. Dististyle a little arcuate, 0.45-0.52 (3) length of basistyle, a little swollen basally, rugose above, covered with minute hairs, with some small setae near apex; claws slender, nearly straight, 0.16-0.22 (3) as long as dististyle. Paraproct stout, strongly sclerotized, with recurved apical tooth; cercal tergal surface pilose; 9-14 cercal setae. Aedeagus ovate, 1.72-1.77 (4) as long as wide, tergally closed, rather narrowly open sternally, with a large round tergobasal orifice; tergal surface with a distinct ridge on each side; sternal opening rounded at base then strongly constricted leaving a very narrow slit and again broadened apically; apex consisting of a pair of small lateral plates with serrate margin.

LARVA (Fig. 94). *Head.* Width 1.28-1.49 mm; brown, 1.33-1.53 as wide as long; apical margin of labrum a little concave; seta 1-C pigmented, slightly longer than distance between bases; 4-C on level or a little anteriad of 5-C; 6-C a little anterolaterad of 5-C; 13-C occasionally barbed. *Antenna* very long, slender, 1.01-1.18 mm long, longer than head, gradually infuscate towards apex, spinulate throughout; seta 1-A inserted at basal 0.44-0.52 (x = 0.47), with 2-6 barbed branches, usually about reaching apex of shaft; 1-6-A pigmented; 2-4-A subequal, 6-A longer than 5-A. *Mandible* (1 dissected specimen) with a number of dorsolateral microspines near base. Cutting organ with one dorsal spine and 2 simple dorsal teeth; a row of pale, rather slender accessory denticles from base of mesal dorsal tooth to mesobasal surface of cutting

organ; ventral tooth with 2 lateral denticles, VT-4 smaller than VT_0; VT_2 larger than $VT_{1,3}$; 2 ventral blades, VB_1 stout, extending beyond tip of VT_0, with fine mesal pectination, VB_2 much shorter than VB_1, with rather coarse mesal pectination; pectinate brush of 5 mesally pectinate hairs. Piliferous process with labula longer than the broader anterior part. Mandibular hairs (7-8) + ((5-7) + 8), hairs of anterior group simple or partly barbed, hairs of 2 posterior groups frayed apically. *Maxilla* (1 dissected specimen) with seta 1-Mx single or double. Mesostipes 1.33 as long as wide, with lateral surface smooth; rather slender, equal twin stipital sensoria slightly basal to middle, without basal ring; 4-Mx unpigmented. Lacinia with 5-Mx on level or slightly anteriad of stipital sensoria. Palpostipes strongly narrowed apically, excluding lateral artis 1.67 as long as broad, 0.4 length of mesostipes; apex with 5 palpal sensoria, $S_3 > S_1 > S_2 = S_4 > S_5$ in length. *Mentum plate* with 21-23 teeth. *Thorax*. Setae 1, 8-P strong; 2-P slender, at most 0.8 length of 1-P; 3-P less than 0.5 length of 1-P; 1-M shorter than 3-M; 1, 4, 9-P, 3-M and 12-T usually single. *Abdomen*. Seta 7-II 0.24-0.32 (x = 0.27) length of 6-II; 13-III quite variable, stiff when single, slender when branched, the branches varying from 2 to more than 10; 13-IV, V and 1-VII moderately strong; 13-IV and 1-V smooth to distinctly barbed; 2, 8, 10-III, 8-IV, 13, 14-V, and 0, 2-VII usually single; 6-I usually double; 2-VIII not on basal callus of 1-VIII. Comb scales 8-13 in an irregular double row; individual scales thorn-shaped with a strong apical spine, laterobasally fringed with spicules. *Siphon* brown, with acus attached, broadest a little distad of base, 2.94-3.30 as long as broad, apex 0.5-0.6 of broadest diameter; length 1.34-1.52 mm, index 3.31-3.74; microsculpture distinct, imbricate-like; pecten reaching basal 0.39-0.48, of 15-20 dark brown teeth including 0-2 basal abortive ones, 1-3 apical teeth detached, each tooth with one to several ventral denticles; 1-S inserted beyond pecten at apical 0.46-0.52, slightly longer than siphon diameter at insertion; 2-S pale and weak, at apical 0.09-0.13 of siphon, not reaching apex of siphon, much shorter than apical pecten tooth. *Saddle* 0.47-0.55 mm long, with acus, narrowly incomplete, usually incised on ventral margin, often with a lateral window, with short rows of minute denticles on entire surface, the denticles ventrobasally very weak, becoming dorsoapically distinct, ventral unsclerotized area of segment X also with minute denticles; 1-X shorter than saddle; 4-X of 15-19 cratal and 4-6 precratal tufts (21-23 in total), cratal tufts 5-11 branched, precratal tufts 3-8 branched. Anal gills apically tapering, dorsal gill 1.1-1.6 length of saddle, ventral gill a little shorter than dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 11♂, 2♀, 40 L: Hokkaido (A-0191, A-0203, A-0207, A-0210, A-0213, A-0218, A-0220, A-1796).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido). KHABAROVSK. PRYMORYE. SOUTHERN UKRAINE. NORTHERN CAUCASUS. NORTHERN EUROPE. NORTHERN UNITED STATES. CANADA.

BIONOMICS. In Hokkaido, *Ae. diantaeus* inhabits central and northeastern mountain regions. Larvae occur in temporary ground pools formed by melted snow, and are found associated with *Ae. communis*, *Ae. punctor* and *Ae. intrudens*. The larvae prefer sunlit portions of pools to shaded parts, where *Ae. communis* aggregates (Sato 1962). Adult females are severe day biters. Apparently univoltine.

SUBGENUS *FINLAYA* THEOBALD

Finlaya Theobald, 1903: 281. Type-species: *Culex kochi* Dönitz, 1901; New Guinea.

A polymorphic subgenus; small to rather large mosquitoes with scutum variably ornamented, tarsi banded or unbanded; larvae also variable in character.

FEMALE. *Head.* Eyes usually narrowly separated above, separated or contiguous below. Decumbent scales of vertex varied; erect forked scales often numerous, restricted to posterior margin to covering entire vertex; vertical bristles 4 to more than 10, temporals 4-7, usually one lower bristle detached. Antennal flagellum shorter than proboscis or nearly as long as it; flagellomere 1 1.2-1.8 length of Flm 2. Palpus usually short, not more than 0.33 length of proboscis, longer in some species not occurring in this region; segment 3 1.5-3.0 length of 2; 4 usually present, usually minute, papilliform, at most 0.2 length of 3. Proboscis dark scaled, usually longer than forefemur, usually about as long as or a little shorter than it in *japonicus*, with several ventrobasal bristles. *Thorax.* Anterior pronotal lobe variably scaled, with many bristles of variable sizes. Posterior pronotal lobe variably scaled, with bristles along posterior margin. Scutum covered with narrow scales, ornamentation quite variable; scutal bristles varied, acrostichals and anterior dorsocentrals sometimes absent, median fossals frequently absent. Scutellum with narrow or/and broad scales. Paratergite scaled or unscaled. Pleural scale patches moderately to well developed; propleuron, prealar knob, sternopleuron and mesepimeron always with scale patches; post- and subspiracular areas, and metameron with or without scale patches; pleural bristles usually well developed, lower mesepimeral bristles absent in most species, present in *togoi* (often absent in male) and *aureostriatus okinawanus* among the species in this region. Base of mesomeron well above that of hindcoxa. *Wing.* Veins dark scaled (spotted in *kochi* group not occurring in this region); cell R_2 1.6-4.6 length of vein r_{2+3}. *Legs.* Tarsi banded or unbanded; hindtarsomere 1 0.67-0.90 length of tibia. Fore- and midtarsal claw with a sharp median or submedian tooth; hindtarsal claw simple or toothed. *Abdomen.* Laterotergite pale scaled. Segment VIII slightly retractile. Seminal capsules variable in number.

MALE. Vertex and scutum sometimes differently scaled from female. Antennal flagellomere 12 longer than or as long as Flm 13, both usually shorter than, rarely as long as or even longer than Flm 1-11. Palpus 0.6 to about length of proboscis; segments 4 and 5 variable, often simple, $5<4<3$ in length. Cell R_2 relatively shorter than in female, 1.2-2.7 length of vein r_{2+3}. Foretarsomere 4 greatly shortened; 5 moderately to strongly modified, longer than 4, setiferous midventral process present or absent. Midtarsomere 4 moderately to strongly shortened; 5 weakly to moderately modified, longer than 4, setiferous midventral process absent. Anterior claw of foretarsus 2 toothed; that of midtarsus one or 2 toothed; posterior claw of fore- and midtarsi with a sharp submedian or subbasal tooth; hindtarsal claws equal, simple or toothed. *Genitalia.* Tergum IX with poorly to strongly differentiated lobes bearing bristles. Sternum IX with bristles. Basistyle long, usually laterally and sternally scaled, occasionally also tergally, bristled throughout, with mesal side

more or less membranous, without apical lobe, with or without basal tergomesal lobe; claspette composed of narrow stem and usually well developed filament. Dististyle slender, simple, rather short, 0.33-0.60 length of basistyle; claw apical or subapical, usually simple and long. Tergite X usually well sclerotized; cercal tergal surface usually membranous; cercal seta present; paraproct with apex of a strongly sclerotized recurved tooth. Aedeagus simple, not paired, weakly sclerotized, occasionally apically denticulate. Basal plate relatively small.

LARVA. Extremely variable. *Head* wider than long, seta 1-C moderately slender to stout; 4-C small to fairly well developed; 6-C on level of 7-C or anteriad of it. *Antenna* shorter than head, usually spinulate, sometimes smooth; seta 1-A branched or single; 5-A longer than 6-A. *Mandible* with microspines on dorsolateral surface about at middle to near base, without mandibular seta 1-Md. Mandibular comb of about 10 to 30 setiform teeth. Cutting organ moderately developed, with 2 dorsal spines ($DS_{1,2}$) or DS_2 undeveloped; 2 dark dorsal teeth, lateral tooth more or less smaller; accessory denticles mesad of mesal dorsal tooth variably developed; ventral tooth with one lateral denticle (VT-4) and usually 3 mesal denticles (VT_{1-3}), sometimes VT_3 reduced, one or 2 ventral blades ($VB_{1,2}$), length variable; pectinate brush usually well developed, hairs slender, longer or shorter than VB_1. Mandibular hairs with a few proximal hairs of distal group usually widely spaced, hairs of proximal group apically frayed. *Maxilla*. Mesostipes with lateral surface usually smooth, spicules of mesal margin slender to strong, masal area sometimes appearing to be detached (lacinial sclerite of Gardner et al. 1973) by the presence of a notch on mesodistal margin and that mesad of pseudoartis; stipital sensoria equal or subequal, thick or slender, with or without basal ring, location variable; ventral stipital seta 4-Mx variable in size and position, but always near apex. Lacinia with proximal lacinial seta 5-Mx about level of stipital sensoria; distal lacinial seta 6-Mx variable in shape; hairs of maxillar brush variable. Palpostipes shorter than mesostipes, usually slightly broadened basally, sometimes mesobasally fused with mesostipes; apex with ampulla and 4-5 palpal sensoria. *Mentum plate* triangular, teeth not very large. *Thorax*. Seta 13-P absent; 5-7-P, 5-10, 12-M, 7,9,10-T always strong; 1,2,4,12-P and 3-M sometimes well developed; 12-P usually longer than 9,10-P. *Abdomen*. Setae 6-I-VI and 7-I usually strong, 7-II variable, 1,13-III-V sometimes well developed. Comb scales variable. Siphon usually rather short, with acus attached or free; pecten well developed; 1-S at about middle to distad of it, usually distad of pecten (except *japonicus*); 2-S always small; no accessory siphonal setae. *Saddle* incomplete; 2-X branched, 3-X single, 4-X usually multibranched.

DISTRIBUTION. Worldwide.

TAXONOMIC DISCUSSION. As stated by Belkin (1962), *Finlaya* is "a large heterogenous assemblage of species." Attempts to divide this subgenus into groups by Edwards (1932) and Knight and Marks (1952), based chiefly on the adult ornamentation, did not always result in natural groupings. The male genitalia, especially the aedeagus, as well as the larva should be primarily considered for a more natural classification. The following grouping is proposed for the species of this region.

1. *Japonicus* group (*japonicus* and *koreicus*). Aedeagus broadly open in tergobasal 0.67 and sternoapical 0.75, without apical denticle, slightly constricted in apical 0.33. Basistyle without distinct basal tergomesal lobe. Larval setae 4-6-C anteriad of 7-C; 4-C small; 5,6-C subequal, multibranched. Antenna spiculate. Mandibular ventral tooth with VT_3. Maxillary mesostipes with mesal area detached; palpostipes mesobasally fused with mesostipes;

stipital sensoria distad of middle, without basal ring. Abdominal seta 7-II strong. Comb scales paddle shaped. Siphon with acus attached; pecten teeth unilaterally denticulate. Immatures in a wide variety of containers, but apparently essentially rock-hole inhabitants.

2. *Hatorii* group *(hatorii)*. Aedeagus apically expanded (bulbous in tergal view), with relatively small tergobasal opening, sternally open throughout except basal margin. Stipital sensoria at middle. Otherwise as in *japonicus* group. Rock-hole habitat.

3. *Togoi* group *(togoi* and *savoryi)*. Aedeagus apically narrowed, otherwise as in *hatorii* group. Palpostipes not fused with mesostipes at mesobasal portion. Other characters as in *japonicus* group. Brackish water rock-hole habitat.

4. *Seoulensis* group *(seoulensis* and *albocinctus)*. Aedeagus as in *togoi* group. At least seta 5-C caudad of 7-C; 4-C well developed. Mesostipes with detached mesal area not very distinct; palpostipes as in *togoi* group; stipital sensoria at middle, with basal ring. Seta 7-II small. Pecten teeth bilaterally spiculate. Otherwise as in *japonicus* group. Tree-hole habitat.

5. *Aureostriatus* group *(aureostriatus* and *kobayashii)*. Aedeagus as in *togoi* group. Basistyle with well developed basal tergomesal lobe. Setae 4-6-C at about level of 7-C or caudad of it, 6-C single, much longer than the multiple 5-C. Ventral tooth with VT_3 absent or very small. Mesostipes with mesal area not detached; palpostipes as in *togoi* group; stipital sensoria at middle, very slender. Seta 7-II short. Otherwise as in *japonicus* group. Tree-hole habitat.

6. *Koreicoides* group *(koreicoides)*. Aedeagus as in *togoi* group. Basistyle and maxilla as in *aureostriatus* group. Setae 4-6-C similar to *seoulensis* group. Seta 7-II rather short. Comb scales thorn-shaped, few in number. Otherwise as in *japonicus* group. Tree-hole habitat.

7. *Nipponicus* group *(nipponicus* and *nishikawai)*. Aedeagus apically denticulate, deeply emarginate tergoapically. Basistyle with basal tergomesal lobe poorly developed, with modified foliate large scales. A single seminal capsule. Setae 4-6-C and comb scales as in *koreicoides* group. Ventral tooth without VT_3. Maxilla as in *aureostriatus* group. Seta 7-II small. Siphon with acus free; pecten as in *japonicus* group. Tree-hole habitat.

8. *Oreophilus* group *(oreophilus)*. Aedeagus tergally closed, sternally open, basally narrow and apically broad. Seta 5-C single, caudad of 7-C; 6-C multiple; 4, 6-C on about level of 7-C. Antenna almost smooth. Stipital sensoria distad of middle, maxilla otherwise as in *aureostriatus* group. Seta 7-II weak. Otherwise as in *japonicus* group. Tree-hole habitat.

9. *Watasei* group *(watasei)*. Aedeagus similar to that of *oreophilus* group. Seta 4-C at about level of 7-C; 5, 6-C tandem, both single; 5-C caudad of 7-C. Hypostomal suture long, but terminating far laterally of posterior tentorial pit. Antenna smooth, mandibular cutting organ strong. Mesostipes with mesal area not detached; palpostipes mesobasally fused with mesostipes; stipital sensoria with basal ring, together with 2, 5-Mx close to apex. Seta 7-II short. Comb scales, acus and pecten teeth as in *japonicus* group. Three-hole habitat.

KEY TO SPECIES OF *AEDES (FINLAYA)*

FEMALE ADULT

1. Scutellar lateral lobes with narrow scales. 2
   All scutellar lobes with broad scales. 12

2(1). At least hindtarsus pale banded. 3
   Tarsi unbanded. 11

3(2). Tarsal bands basal. 4
   Tarsal bands articular at least in hindtarsus. 7

4(3). Scutum largely pale scaled. . . . . *albocinctus* (p. 340)
   Scutum yellow striped. 5

5(4). Paratergite with scales; subspiracular patch larger than postspiracular patch. . . . . *koreicoides* (p. 348)
   Paratergite usually without scales; subspiracular patch smaller than postspiracular patch or absent. 6

6(5). Pedicel usually with more dark scales than pale scales; posterior pronotal lobe usually without dark scales; subspiracular area usually without patch; hindtarsomere 4 usually without basal band, but often with one to a few pale basal scales. . . . . *japonicus* (p. 308)
   Pedicel usually with more pale scales than dark scales, often all scales pale; posterior pronotal lobe usually with a few broad dark scales; subspiracular area usually with patch; hindtarsomere 4 with a complete basal band. . . . . *koreicus* (p. 322)

7(3). Both paratergite and postspiracular areas with scales. 8
   Paratergite or postspiracular area, or both without scales. 9

8(7). Hindtarsomere 5 with pale basal band or entirely dark; lower mesepimeral bristles usually present; hindtarsal claw unidentate. *togoi* (p. 331)
   Hindtarsomere 5 entirely pale; lower mesepimeral bristles absent; hindtarsal claw simple. . . . . *hatorii* (p. 327)

9(7). Paratergite with scales; scutum broadly pale anteriorly. *seoulensis* (p. 337)
   Paratergite without scales; scutum otherwise. 10

10. Scutellar median lobe with both narrow and broad scales; postspiracular area without scales; metameron with scales. *aureostriatus* (p. 344)
   Scutellar median lobe with narrow scales only; postspiracular area with scales; metameron without scales. . . . . *kobayashii* (p. 341)

11(2). Postspiracular area with scales; hindtarsal claw unidentate. *savoryi* (p. 334)
   Postspiracular area without scales; hindtarsal claw simple. *oreophilus* (p. 361)

12(1). Paratergite with scales; tarsi with articular bands; abdomen with tufts of outstanding scales. . . . . *watasei* (p. 364)
Paratergite without scales; tarsi unbanded; abdomen without tufts of scales. 13

13(12). Scutal pale patch extending posterolaterally to wing root; abdominal tergum VIII with pale basal band. . . . . *nipponicus* (p. 351)
Scutal pale patch not extending beyond scutal angle posterolaterally; abdominal tergum VIII without pale basal band.
nishikawai (p. 356)

MALE GENITALIA

1. Aedeagus without teeth on tergoapical margin. 2
Aedeagus with slender teeth on tergoapical margin. 11

2(1). Aedeagus with a large round tergobasal orifice. 3
Aedeagus without tergobasal orifice, concave on tergobasal margin. 10

3(2). Basal tergomesal lobe absent or indistinct, without specialized seta. 4
Basal tergomesal lobe distinctly protrudent, or else with a specialized seta. 6

4(3). Aedeagus with broadest part in apical half, bulbous in tergal view.
hatorii (p. 327)
Aedeagus with broadest part in basal half. 5

5(4). Basistyle not mesally expanded on sternal side, without striated setae on sternomesal margin. . . . . *japonicus* (p. 308)
koreicus (p. 322)

Basistyle mesally expanded on sternal side at about basal 0.4, with many striated setae on sternomesal margin. . . . . *togoi* (p. 331)
savoryi (p. 334)

6(3). Basal tergomesal lobe not protrudent, with a single long seta. . . . 7
Basal tergomesal lobe distinctly protrudent, with 3 or more setae. . 8

7(6). Dististyle claw slightly more than 0.25 length of dististyle.
seoulensis (p. 337)
Dististyle claw 0.3-0.6 length of dististyle. . . . *albocinctus** (p. 340)

8(6). Basal tergomesal lobe with about 10 specialized blade-like setae as well as ordinary setae. . . . . *aureostriatus* (p. 344)
Basal tergomesal lobe with ordinary setae only. 9

*After Chow and Mattingly (1951); further study will be necessary for this species, as the difference from *seoulensis* given in the key is very slight.

9(8). Basal tergomesal lobe strongly protrudent, with a double row of many long setae; claspette filament not expanded; dististyle claw 0.4 length of dististyle. . . . . *koreicoides* (p. 348)
Basal tergomesal lobe only a little protrudent, with 3 setae; claspette filament expanded on convex side; dististyle claw 0.25 length of dististyle. . . . . *kobayashii* (p. 341)

10(2). Basistyle with tufted bristles on tergomesal margin near base; dististyle claw 0.5 length of dististyle. . . . . *oreophilus* (p. 361)
Basistyle without tufted bristles on tergomesal margin near base; dististyle claw 0.6 length of dististyle. . . . *watasei* (p. 364)

11(1). Claspette filament expanded on convex side; stem pilose in basal half. *nipponicus* (p. 351)
Claspette filament not expanded on convex side; stem pilose from base to near apex. . . . . *nishikawai* (p. 356)

LARVA

1. Pecten usually with one or more apical teeth detached, well developed and simple; seta 1-S within pecten. Comb scales apically rounded, apically and laterally fringed, 32-93 in a patch. *japonicus* (p. 308)
Pecten teeth evenly spaced; seta 1-S usually at apex of or beyond pecten. 2

2(1). Comb scales paddle-shaped, apically and laterally fringed, arranged in a patch; seta 4-C very small. 3
Comb scales thorn-shaped, with strong apical spine; seta 4-C well developed. 10

3(2). Seta 6-C equal to or shorter than 5-C, branched (single in *watasei*). 4
Seta 6-C much longer than 5-C, single. 9

4(3). Antenna distinctly spinulate; seta 1-A branched; 5, 6-C on about same level. 5
Antenna smooth or very minutely and sparsely spinulate; seta 1-A usually single (very rarely double); 5-C distinctly caudad of 6-C. 8

5(4). Siphon apically tapering, index 2.37-3.31; seta 1-S at apical 0.37-0.51, at most reaching about apex of siphon; 1-X on saddle. 6
Siphon subparallel-sided, index 1.70-2.30; seta 1-S at apical 0.16-0.28, extending far beyond apex of siphon; 1-X off saddle. . . . 7

6(5). Seta 1-M, T weak, not on sclerotized basal callus. . *koreicus* (p. 322)
Seta 1-M, T very stout, on sclerotized basal callus. *hatorii* (p. 327)

7(5). Mentum teeth 30-36; seta 3-VII longer and stouter than 4-VII; siphon with imbrication distinct. . . . . *togoi* (p. 331)
Mentum teeth 20-23; seta 3-VII shorter than 4-VII; siphon with imbrication very faint. . . . . *savoryi* (p. 334)

8(4). Seta 4, 6-C on about same level; 6-C 2-4 branched; 1-3-P not on sclerotized basal callus; 1-P distinctly longer than 3-P. *oreophilus* (p. 361)
Seta 4-C well behind 6-C; 6-C single; 1-3-P on sclerotized basal callus; 1-P about as long as 3-P. . . . . *watasei* (p. 364)

9(3). Comb scales 45-65; seta 13-III-V rather long, 2-4 branched. *aureostriatus* (p. 344)
Comb scales 28-38; seta 13-III-V short, 4-8 branched. *kobayashii* (p. 341)

10(2). Comb scales 35-59 in a patch; pecten teeth bilaterally fringed. . . 11
Comb scales 6-17 in a row; pecten teeth with ventrobasal denticles. 12

11(10). Seta 1-A 3-5 branched (after Chow and Mattingly 1951). *albocinctus* (p. 340)
Seta 1-A single. . . . . *seoulensis* (p. 337)

12(10). Seta 2-I very small, 1-2 branched; antenna long, slender in distal half; mandibular ventral tooth with VT_3. . . *koreicoides* (p. 348)
Seta 2-I stout, substellate, nearly as long as 1-I, 3-8 branched; antenna short; mandibular ventral tooth without VT_3. 13

13(12). Anal gill 1.2-1.7 length of saddle. . . . . *nipponicus* (p. 351)
Anal gill 0.5-0.7 length of saddle. . . . . *nishikawai* (p. 356)

67. *AEDES (FINLAYA) JAPONICUS* (THEOBALD)*

Culex japonicus Theobald, 1901d: 385 (♀). Type-locality: Tokyo, Japan.

DISTRIBUTION. PALAEARCTIC JAPAN. KOREA. RYUKYU ARCHIPELAGO. TAIWAN. SOUTH CHINA. HONG KONG.

*One or more subspecies do not occur in this region.

67A. *AEDES (FINLAYA) JAPONICUS JAPONICUS* (THEOBALD)
(Figs. 95, 97, 217, 218; Table 99)

Culex japonicus Theobald, 1901d: 385 (♀). Type-locality: Tokyo, Japan.
Aedes koreicus: Yamada, 1927: 569 (in part); Kamimura, 1976b: 209 (misidentification of Yamada).
Aedes (Finlaya) japonicus: LaCasse and Yamaguti, 1950: 151 (♂, ♀, L); Chu 1956: 42, Korea.
Aedes japonicus var. *tokushimaensis* Tanimura, 1952: 176 (A). Type-locality: Tokushima, Shikoku, Japan; Sasa and Kamimura 1971: 16 (syn.).
Aedes japonicus var. *bisanensis* Suzuki, Tanimura, Miyagawa and Murata, 1953: 9 (A). Type-locality: Tokushima, Shikoku, Japan; Sasa and Kamimura 1971: 16 (syn.).

FEMALE (Figs. 217, 218). Wing length 3.0-5.3 mm. *Head.* Eyes narrowly separated above, moderately below. Vertex covered with narrow curved, pale scales, with a pair of large submedian patches of narrow curved, dark scales; eye margin pale scaled; numerous erect forked scales over vertex, often (33/77) entirely dark, otherwise with variable numbers of pale scales mixed in median area (Table 15); tempus covered with broad white scales, with a patch of broad dark scales within pale area; 6-8 vertical bristles on each side, a few mesal ones yellowish brown, others dark; 4 dark temporal bristles on each side, an additional bristle far down on underside. Clypeus dark brown. Antenna: pedicel brown, mesal surface darker and covered with small broad scales, usually (85/99) with more dark scales than pale ones, rarely (3/99) more pale scales than dark ones (Table 19), several fine bristles in the scaled area; flagellum 0.72-0.84 (21) length of proboscis, flagellomere 1 1.25-1.58 (22) length of Flm 2, with dark scales except on narrow lateral surface. Palpus 0.25-0.29 (19) length of proboscis, dark scaled; segment 3 1.71-2.18 (20) length of 2; 4 usually very small, occasionally up to 0.2 length of 3. Proboscis 0.92-1.04 (20) length of forefemur. *Thorax.* Thoracic integument dark brown to blackish brown. Anterior pronotal lobe covered with broad white scales, occasionally, (9/83) most mesodorsally with a few crescent-shaped scales (Korean populations appear to have cresent-shaped scales more frequently than Japanese populations - Table 15); anteromesal bristles dark, posterolateral ones yellowish. Posterior pronotal lobe with 3-6 mostly yellowish bristles, usually posteroventrally covered with broad white scales and usually anterodorsally with crescent-shaped white or slightly yellowish and narrow curved, yellowish scales; in Japanese populations, broad scales more abundant than crescent-shaped and narrow scales (38/64), rarely narrow scales more frequent than broad and crescent-shaped scales (4/64); in Korean populations, usually more (23/26) crescent-shaped scales than broad and narrow scales (Table 15); dark scales rarely (8/109) (3/89, excluding Cheju Do population) present, apparently commoner (5/20) in Cheju Do population. Scutum covered with narrow curved, dark and yellowish brown scales, the yellowish brown scales forming a rather broad median stripe, anterior dorsocentral stripe, posterior dorsocentral stripe and supraalar patch; the median stripe often apparently double, bifurcate posteriorly along prescutellar margin, where the scales become paler; the posterior dorsocentral stripe just laterad of series of posterior dorsocentral bristles, extending anteriorly along scutal suture and almost reaching scutal angle; scales on anterior margin and below the supraalar patch just anteriad of wing base whitish;

all scutal bristles present, mostly dark brown, some of supraalars pale or yellowish brown, 5-10 fossals usually near lateral and posterior margins. Scutellum with narrow curved, dark scales on both lateral lobes; median lobe with narrow curved, dark and pale scales, often with rather broad dark scales on each side; each lateral lobe with 6-10 long dark bristles, median lobe with 4-8, all lobes usually with a few additional short yellowish bristles. Paratergite usually unscaled, rarely (5/85) with one or 2 pale broad scales. Pleura with patches of broad white scales on propleuron, postspiracular area, lower prealar knob, upper and lower-posterior sternopleuron, and upper mesepimeron; postspiracular patch well developed; subspiracular area usually unscaled, rarely (8/115) with 1-5 broad pale scales; pleural bristles pale brown or yellowish brown, many on prealar knob, upper to posterior sternopleuron and upper mesepimeron, 5-12 propleurals, 3-10 postspiraculars, no lower mesepimerals. *Wing*. Alula fringed with rather broad, dark scales. Costa usually (71/83) with ventrobasal pale or gray scales, often (52/83) forming a definite mark. Cell R_2 2.24-4.58 (36) length of vein r_{2+3}. Halter knob dark, lateroapically pale scaled, dark scaled otherwise. *Legs*. Forecoxa basally and apically pale scaled, dark scaled in-between; midcoxa basally pale scaled, apically dark scaled; hindcoxa pale scaled. Forefemur with a narrow basal band, ventroapical spot, narrow anterior streak and rather broad posteroventral streak of pale scales, the anterior streak extending from base to middle or before it, the posteroventral streak from base to about middle; midfemur with a narrow basal band and distinct apical band or dorsoapical spot of pale scales, and distinct apical fringe of dark scales, posterior surface pale scaled in basal half or a little more; hindfemur with a narrow basal band and rather broad apical band of pale scales, and distinct apical fringe of dark scales, pale scaled in approximately basal half excepting dorsal surface, this pale scaled area basally interrupted by a moderately broad subbasal band of dark scales, this band most frequently (69/87) complete or almost complete, very rarely (one specimen from Cheju Do) lacking, otherwise (17/87) incomplete (narrowly broken dorsally) (Table 16). Tibiae with a basal band of pale scales very often dorsally incomplete. Foretarsomere 1, midtarsomeres 1-2 and hindtarsomeres 1-3 with basal bands of pale scales; foretarsomere 2 and midtarsomere 3 often with basal bands of pale scales or some pale basal scales; hindtarsomere 4 usually (96/110) entirely dark scaled, occasionally (11/110) with some pale basal scales, rarely (3/110) with a complete basal band of pale scales (Table 16). Femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than or equal to 4; midtarsomere 5 equal to or shorter than 4; hindtarsomere 1 0.65-0.80 (25) length of tibia. Hindtarsal claw simple. *Abdomen*. Tergum I with median patch of dark scales; II-VIII dark scaled, with laterobasal patches of white scales, often with small mediobasal spots of pale scales on III-V or more segments. Sterna dark scaled, with lateroapically broadened basal bands of pale scales, the bands somewhat broader medially in anterior segments, II occasionally entirely pale scaled.

MALE (Figs. 97, 217). Wing length 2.5-4.0 mm. Antenna: pedicel usually glabrous, rarely with one to a few bristles or scales; flagellum 0.66-0.76 (14) length of proboscis; flagellomere 1 with scales, Flm 12 1.00-1.26 length of Flm 13, both 0.76-0.88 (14) length of Flm 1-11; palpus 0.86-0.97 (14; $x = 0.91$) length of proboscis, simple; segments 4, 5 and apex of 3 only moderately bristled; length ratio of 2-5; 1.29-1.74 (14) : 1.90-2.26 (14) : 1.10-1.33 (34) : 1.00. Proboscis 1.01-1.19 (13; $x = 1.09$) length of forefemur. Cell R_2 1.66-2.67 (41) length of vein r_{2+3}. Fore- and midtarsomere 4 very short; 5 modified, with several stout ventrobasal setae; foretarsomere 5 usually with a

poorly developed setiferous midventral process. Anterior claw of fore- and midtarsi with a blunttipped median and a sharp laterobasal tooth; hindtarsal claw simple. *Genitalia*. Tergum IX not sclerotized; lobes only slightly convex, moderately sclerotized and separated, each with 4-10 rather weak bristles. Sternum IX not sclerotized excepting basal border, with 1-6 bristles. Basistyle subcylindrical, 3.5-4.9 as long as wide, laterally and sternally scaled, tergally and sternally bristled, without outstanding long bristles, with 1-3 rather stout bristles on mesal side at apical 0.25-0.33, apical and basal lobes absent; claspette stem pubescent, with 2-4 short setae on mesal side; filament simple, evenly arcuate, shorter than stem. Dististyle slender, 0.50-0.66 (32) length of basistyle, curved in apical 0.33, with 1-4 (usually 2) short setae on convex side near apex, pubescent on sternal side in basal half; claw nearly straight, pigmented, shallowly bifurcate at apex, 0.17-0.25 (28) length of dististyle. Cercal tergal surface not sclerotized; 1-5 (usually 2-4) cercal setae on each side; paraproct with apex usually unicuspid, rarely bicuspid. Aedeagus elliptic and a little constricted distad of middle in tergal view, 1.61-2.18 (30; x = 1.83) as long as wide, broadest at basal 0.33-0.40, broadly open on tergal aspect in basal 0.67, subapical bridge usually indistinct; apex shallowly emarginate; sternal aspect open in apical 0.75.

LARVA (Fig. 95). (Description based on specimens from central Honshu.) *Head*. Width 0.95-1.11 mm; brownish-yellow or darker, 1.14-1.23 as wide as long; labrum concave; seta 1-C pigmented, moderately slender, curved mesad, separated by about 1.5 times their length; 4-6-C well cephalad of level of 7-C; 4-C very small, usually slightly cephalad or almost directly mesad of 5-C; 5, 6-C rather short, nearly on same level, 6-C slightly longer than 5-C; 8, 10, 14-C usually single. *Antenna* slightly bowed, 0.31-0.38 mm long, brownish, slightly paler basally, moderately spiculate, spicules sparser in distal half; seta 1-A 3-5 branched, smooth to lightly barbed, inserted at basal 0.51-0.61 (x = 0.56), not attaining tip of antenna; 2, 3-A subapical, relatively short. *Mandible* (3 dissected specimens) with 15-20 microspines of varying sizes; mandibular comb of 20-22 long broad-based teeth. Cutting organ with DS_1 pale, slender, DS_2 quite short, dark; both dorsal teeth uni- or bicuspid, or with mesal denticles; one or more small accessory denticles present; VT_{1-3} subequal, triangular; VT-4 slender, not attaining tip of VT_0; VB_1 relatively stout, dark, not attaining tip of VT_0, mesally pectinate on apical 0.75, the pectinations relatively coarse and blunt proximally, becoming finer distad; pectinate brush of 7-10 long (longer than VB_1) mesally pectinate hairs. Piliferous process with labula extending slightly beyond apex of anterior portion. Mandibular hairs (5-7) + 7, 12-14 in total. *Maxilla* (5 dissected specimens). Cardo narrowly fused with cranium through a strongly developed strip-like border; seta 1-Mx rather strong, dark, 1-4 branched. Mesostipes as long as or slightly shorter than wide, with mesal area broadly detached, marginal spicules strong, spine-like; pseudoartis separated or fused with cranium at apex; stipital sensoria at apical 0.20-0.25, without basal ring; 4-Mx rather strong, pigmented. Lacinia with 6-Mx relatively short, with elongate pectination on apical 0.67, somewhat basally expanded. Palpostipes 0.5-0.6 length of mesostipes, broad, about reaching level of 2-Mx, mesobasally fused with mesostipes; apex with 5 palpal sensoria, $S_1 > S_3 > S_2 \geq S_4 > S_5$ in length. *Mentum plate* with 23-27 teeth, median tooth about twice width of immediate flanking teeth. *Thorax*. Integument apparently lightly spiculate; seta 1-M usually smooth, occasionally lightly barbed; 4-M varying from smooth to fairly strongly barbed; 14-M and 13-T usually small and tufted, sometimes rather strong; 4-P, M usually single; 5, 14-P and 1-T usually double. *Abdomen*. Integument usually with some spiculation,

especially on ventral aspect of IV and V; setae 2, 7, 10, 12-I, 2, 7, 9, 11-II, 11-III, 5, 8, 12, 14-IV, 5, 7, 8, 12, 14-V, 2, 5, 14-VI, 3, 4, 13-VII, and 14-VIII usually single; 6, 13-I, 5, 6, 8-II, and 6-IV, V usually double; 11-I usually darker and stiffer than 9-13-I; 13-III-V stronger than respective setae 1; barbing quite variable on 1-IV-VI, 13-III, VII. Comb scales variable, usually broadly paddle-shaped, with fairly strong apical and subapical spicules and weaker lateral ones, 32-93 (usually 55-75) in a roughly triangular patch. *Siphon* fairly uniformly brownish, base not much darker; acus small, attached; index 2.90-3.50 (x = 3.19); microsculpture of short distinct transverse rows of small dark spicules; pecten attaining basal 0.61-0.78 (x = 0.69), of 14-31 dark teeth, each tooth with 2-4 denticles in basal 0.5, the basal 1-7 teeth usually reduced, the apical 1-4 teeth usually detached, enlarged, and smooth (occasionally with small denticles); seta 1-S longer than siphon diameter at insertion, inserted within pecten at basal 0.49-0.58 (x = 0.54), not attaining apex of siphon; 2-S slender, dark, subapical, usually about 0.5 length of apical pecten tooth. *Saddle* covering dorsal half of segment X, 0.30-0.37 mm long; microsculpture of short, transverse rows of spicules, the spicules becoming needle-like caudoventrally, and greatly enlarged caudodorsally, culminating in several strong spines between 1- and 2-X; 1-X usually single, 1.06-1.79 length of saddle; 2-X usually triple, branches subequal; 4-X of 11-13 (usually 12), 2-5 branched cratal tufts, occasionally basalmost tuft appearing detached from grid. Anal gills elongate-fusiform, subequal, dorsal gill usually 2.0-2.5, rarely 5.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 9♂, 32♀; with associated skins (8 l, 8 p), 52 L: Hokkaido (A-0025, A-0027, A-0028, A-0031, A-0033, A-0041, A-0185, A-0189, A-0202, A-1636, A-1673, A-1675, A-1787). 172♂, 302♀; with associated skins (86 l, 86 p), 109 L, 82 l: Honshu (B-0322, B-0325, B-0346, B-0365, B-0366, B-0370, B-0371, B-0372, B-0374, B-0375, B-0376, B-0382, B-1197, C-1160, C-1165, C-1166, C-1167, C-1168, C-1192, C-1581, C-1818, C-1821, C-2080, C-2082, C-2104, C-2105, C-2170, C-2171, D-0015, D-0017, D-0018, D-0019, D-0022, D-0051, D-0053, D-0055, D-0089, D-0386, D-0387, D-0389, D-0398, D-0402, D-0405, D-0741, D-0742, D-0743, D-0746, D-0749, D-0753, D-0811, D-1155, D-1156, D-1264, D-1265, D-1266, D-1278, D-2172, D-2173, E-1575, E-1576, E-1686, E-1687, E-1688, E-1689, E-1691, E-1692, E-2073, E-2083). 5♀, Shikoku (G-1277). 9♂, ♂♀, 8 l: Kyushu (H-0071, H-0074, H-0076, H-0077). 1♂, 5♀; with associated skins (4 l, 4 p), 2 L, 6 l: Yakushima (H-1148, H-1825). 11♀; with associated skins (4 l, 4 p), 1 L, 4 l: Tsushima (H-0547, H-2004, H-2013, H-2014). KOREA. 4♂, 7♀, with associated skins (6 l, 6 p), 4 L: Korean Peninsula (L-0830, L-0838, L-0839, L-0869, L-0879). 24♂, 28♀; with associated skins (7 l, 7 p), 7 L, 1 l: Cheju Do (M-0842, M-0846, M-0847, M-0852, M-0854, M-0856, M-0857, M-0861, M-0862, M-0877).

DISTRIBUTION. PALAEARCTIC JAPAN. (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula, Cheju Do).

67B. *AEDES (FINLAYA) JAPONICUS AMAMIENSIS* NEW SUBSPECIES (Fig. 218)

Aedes japonicus: Yamamoto, 1962: 24, Amami Ôshima, Ryukyu Archipelago.

FEMALE (Fig. 218). Cell R_2 2.55-4.00 (x = 3.32) length of vein r_{2+3}. Hindfemur with subbasal dark band usually (19/20) incomplete, rarely (1/20)

complete. Thoracic integument light brown to rather dark brown; posterior pronotal lobe usually (16/20) with more narrow curved yellowish scales than crescent-shaped paler ones, broad pale scales usually (16/20) present, but very few; subspiracular area often (7/20) with 1-3 broad pale scales; costa entirely dark scaled (11/20) or with only a few pale or gray ventrobasal scales; hindtarsomere 4 sometimes (5/20) with one or few pale basal scales.

LARVA. Seta 5-P always single in typical form, single (5/6) or double (1/6) in robust form; 7-P single or double, usually single (x = 1.21) in typical form, double in robust form. Dorsal anal gill distinctly longer than ventral gill.

TYPE-SERIES. Holotype male (#22325, I-0261-L1) with associated slides of genitalia, larval and pupal skins, Mt. Yuwan, Amami Ôshima, Ryukyu Archipelago, 3 VII 1970, tree hole, Mizusawa & Nishikawa. Paratypes: 42 males, 32 females with slides of 27 associated larval and pupal skins, genitalia (7 males, 3 females), mouthparts (6 males, 1 female), wings (10 males, 6 females) and legs (6 males, 4 females). 7 males, 2 females, with 7 associated larval and pupal skins (I-0241): Mt. Yuwan, 30 VI 1970, rock hole, Mizusawa & Nishikawa; 6 males, 7 females, with 4 associated larval and pupal skins (I-0250): Mt. Yuwan, 1 VII 1970, rock hole, Mizusawa & Nishikawa; 2 males, with 2 associated larval and pupal skins (I-0252): Mt. Yuwan, 1 VII 1970, man-made container, Mizusawa & Nishikawa; 1 male, 1 female, with 2 associated larval and pupal skins (I-0253): Mt. Yuwan, 2 VII 1970, tree hole, Mizusawa & Nishikawa; 1 female, with associated larval and pupal skins (I-0258): Mt. Yuwan, 3 VII 1970, ditch, Mizusawa & Nishikawa; 3 females (I-0261): Mt. Yuwan, 3 VII 1970, tree hole, Mizusawa & Nishikawa; 5 males, 2 females, with associated skins (1 larval and 1 pupal) (I-0276): Nishinakama, 7 VII 1970, gravestone, Mizusawa & Nishikawa; 11 males, 5 females, with 4 associated larval and pupal skins (I-0293): Yuwan, 12 VII 1970, rock hole, Mizusawa & Nishikawa; 8 males, 10 females, with 3 associated larval and pupal skins (I-0296): Yuwan, 12 VII 1970, rock hole, Mizusawa & Nishikawa; 2 males, 1 female, with 3 associated larval and pupal skins (I-0300): Yuwan, 12 VII 1970, tree hole, Mizusawa & Nishikawa.

The holotype and one half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN THE TYPES. RYUKYU ARCHIPELAGO. 65♂, 49♀; with associated skins (20 l, 20 p), 99 L, 15 l: Amami Gunto (I-0236, I-0241, I-0251, I-0252, I-0253, I-0261, I-0271, I-0276, I-0293, I-0294, I-0296, I-0297, I-0298, I-0300, I-0307, I-0312, I-1839, I-1862, I-1894).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami Gunto).

67C. *AEDES (FINLAYA) JAPONICUS YAEYAMENSIS* NEW SUBSPECIES (Fig. 218)

Aedes japonicus: Teller and Gentry, 1955: 45, Iriomote Is., Ryukyu Archipelago.

FEMALE (Fig. 218). Cell R_2 1.74-2.86 (x = 2.39) length of vein r_{2+3}. Hindfemur entirely pale scaled basally, rarely with only a few dark scales. Vertex always with more than 3, usually (18/20) with more than 10 pale erect forked scales, and very often (13/20) 0.33-0.67 of erect forked scales pale; antenna 0.67-0.77 (x = 0.72) length of proboscis; thoracic integument light

brown to rather dark brown; anterior pronotal lobe usually (19/20) with mesodorsal narrow scales, often (7/20) with more narrow scales than broad scales; posterior pronotal lobe usually (17/20) covered with narrow curved yellowish and crescent-shaped paler scales, and always with more narrow yellowish scales than crescent-shaped ones, occasionally (3/20) with a few posteroventral broad pale scales; subspiracular area without scales; costa very often (14/20) with a definite mark of pale ventrobasal scales, rarely (1/20) entirely dark; hindtarsomere 4 very often (21/39) with one or a few pale basal scales.

MALE. Aedeagus narrow, 1.81-2.31 (x = 2.05) as long as wide, with tergosubapical bridge distinct. Cell R_2 index 1.97-3.01 (x = 2.52), least of all the populations of *japonicus* and less by far than the next (Table 17). Palpus 0.79-0.81 (3; x = 0.80) length of proboscis; proboscis 1.17-1.21 (3; x = 1.19) length of forefemur (proboscis longer than in *j. japonicus* relative to palpus and forefemur).

TYPE-SERIES. Holotype male (#22326, K-1756-27) with associated slides of genitalia, larval and pupal skins, nr. Yonehara, Ishigaki Is., Ryukyu Archipelago, 13 XII 1973, tree hole, Mizusawa & Watanabe. Paratypes: 36 males, 29 females with slides of 22 associated larval and pupal skins, genitalia (7 males), mouthparts (5 males, 4 females, 4 larvae), wings (8 males, 8 females) and legs (6 males, 6 females). Paratypes from Ishigaki Is. - 1 male, 1 female, with 2 associated larval and pupal skins (K-0561): Yonehara, 18 XII 1970, tree hole, Mizusawa; 1 male, 5 females, with 1 associated larval and pupal skin (K-0568): Arakawa, 25 XII 1970, tree hole, Mizusawa; 1 male, 2 females, with associated skins (1 larval, 1 pupal) (K-0611): Arakawa Riv., 11 IV 1971, rock hole, Mizusawa & Nishikawa; 10 males, 1 female, with associated skins (2 larval, 2 pupal) (K-0627): Inoda, 18 IV 1971, rock hole, Mizusawa & Nishikawa; 6 males, 3 females, with associated skins (1 larval, 1 pupal) (K-0631): Inoda, 18 IV 1971, rock hole, Mizusawa & Nishikawa; 5 males, 3 females, with associated skins (6 larval, 6 pupal) (K-1754): nr. Yonehara, 13 XII 1973, tree hole, Mizusawa & Watanabe; 1 female, with associated larval and pupal skins (K-1756): nr. Yonehara, 13 XII 1973, tree hole, Mizusawa & Watanabe; 1 male, with associated larval and pupal skins (K-1772): nr. Yonehara, 3 V 1974, tree hole, Mizusawa & Watanabe; 1 male, with associated larval and pupal skins (K-2059): Yonehara, 5 XII 1974, tree hole, Mizusawa & Watanabe. Paratypes from Iriomote Is. - 3 males, 5 females, with associated skins (2 larval, 2 pupal) (K-0575): Foot of Mt. Goza, 22 XII 1970, rock hole, Mizusawa; 1 female, with associated larval and pupal skins (K-0577): Itokawa-rindo, 23 XII 1970, tree hole, Mizusawa; 5 males, 4 females, with associated skins (2 larval, 2 pupal) (K-0702): nr. Shirahama, 21 IV 1971, rock hole, Mizusawa & Nishikawa; 2 males, 3 females, with associated skins (1 larval, 1 pupal) (K-0914): Kambira-taki, 28 X 1971, rock hole, Mizusawa, Shinonaga & Kikuchi.

The holotype and one-half the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN THE TYPES. RYUKYU ARCHIPELAGO. 33♂, 29♀, 13 L, 2 l: Yaeyama Guntô (K-0135, K-0150, K-0152, K-0160, K-0161, K-0182a, K-0561, K-0565, K-0568, K-0573, K-0575, K-0577, K-0593, K-0594, K-0611, K-0627, K-0628, K-0629, K-0630, K-0631, K-0690, K-0701, K-0702, K-0721, K-0726, K-0727, K-0914, K-1038, K-1050, K-1053, K-1295, K-1350, K-1394, K-1412, K-1419, K-1754, K-1756, K-1772, K-1774, K-2059).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

TAXONOMIC DISCUSSION. *Aedes japonicus* was first described from Japan (Tokyo). Edwards (1922b) synonymized *Ae. eucleptes* Dyar, 1921, described from Canton, south China, with *japonicus*. Teller and Gentry (1955) recorded

it from Yaeyama. Lien (1962) sank *Ae. shintienensis* Tsai and Lien, 1950, of Taiwan, as a subspecies of *japonicus*. Yamamoto (1962) recorded *japonicus* from Amami Guntô. Knight (1968) attributed the population of Yaeyama Guntô to subspecies *shintienensis*. More recently, Miyagi (1971) treated *shintienensis* (misspelled as *shintiensis*) as a synonym of *japonicus*. It is also known from Korea (Chu 1956, etc.). Though it was recorded from Ussuri district by Stackelberg (1937), Gutsevich et al. (1970) stated that it was not found in the USSR. In continental China, it occurs only in the southern area (Mong 1955). Thus, *Ae. japonicus* is geographically divided into 2 major populations, one distributed in the Oriental region (south China, Taiwan and Yaeyama Guntô, the southernmost islands of the Ryukyu Archipelago, and another in the Palaearctic region (Palaearctic Japan and south Korea) and Amami Guntô, the northernmost islands of the Ryukyu Archipelago. A rather wide gap between the ranges of these major populations exists due to the absence of this species in north China and Okinawa Guntô, central Ryukyu Archipelago. Such distribution of *Ae. japonicus* suggests a complex history for this species; as expected, some distinct morphological differences were found among the geographically different populations, the differences among 3 southern populations (Taiwan, Yaeyama and Amami) are especially remarkable and not clinal. This species can be divided into 4 subspecies: *japonicus, amamiensis* new subspecies, *yaeyamensis* new subspecies and *shintienensis*.

The basis for differentiating these subspecies is chiefly in the adult characteristics as described above and discussed below. The larval characters also show differences among geographical populations, but they do not appear to distinctly define these subspecies. Larval specimens from Hokkaido, Honshu (Tokyo area and Mt. Ôdaigahara), Korea (including Cheju Do), Amami Ôshima, Yaeyama Guntô and Taiwan were examined. In all areas except Tokyo, 2 more or less distinct forms, arbitrarily labeled typical and robust, were found. The "robust" forms are distinguished primarily in having setae 14-M and 13-T stronger than 13-M, and in having many setae, especially 1-M, 1, 13-I and 13-II more strongly developed than in the typical forms. The robust forms also usually have more branches on many body setae, but the differences are usually not great. These 2 different forms were not present in the corresponding adult specimens, and occur in both sexes. Some results of the comparisons of various populations were obvious, such as finding the closest relationships between the Tokyo area and Mt. Ôdaigahara typical forms; and that the Yaeyama and Amami Ôshima typical forms were found more closely related to their respective robust forms than to any other populations. Others were not, such as finding the Yaeyama and Amami Ôshima populations more similar to Korean populations than to each other. Using 38 selected setae, the average total number of branches varied from 95.3 to 115.5 in typical forms: (Cheju Do< Yaeyama < Tokyo < Hokkaido < Ôdaigahara ≦ Amami Ôshima < Korean (Peninsula), 109.4 to 140.7 in robust forms: (Ôdaigahara < Yaeyama < Amami Ôshima < Cheju Do < Korean (Peninsula) < Hokkaido). Two typical larvae from Taiwan had an average of 91.3 branches, and 3 robust larvae 158.4. As rather few larvae of the robust form of other populations were examined, further study may be necessary. Although differentiation based on larval characters as seen above is more complicated than by adult ones, they indicate at least that the southern populations are not homogenous. The siphon index does not appear to be different between the typical and robust forms; it is definitely smaller in *amamiensis* than in the others, largest in *yaeyamensis* (Table 18).

Subspecies *japonicus*. This is one of the more common mosquitoes in Palaearctic Japan (Hokkaido, Honshu, Shikoku and Kyushu) and appears

morphologically fairly homogenous there. Knight (1968) stated that the basal extent of the median anterior white area of the hindfemur was apparently subject to much variation. It is true within the species. This character is here interpreted as the development of the dark subbasal band. This dark band is very broad in the populations of Taiwan *(j. shintienensis)* and continental China, totally lacking in the Yaeyama population *(j. yaeyamensis)*, distinct but frequently incomplete in the Amami population *(j. amamiensis)*, distinct and usually complete or almost complete in the Honshu-Shikoku-Kyushu populations, and similar to but a little more frequently incomplete than the lattermost in the Hokkaido population (Table 16). As this character is fairly constant within the populations, it may be a good subspecific character. The thoracic integument is, in general, dark. The R_2 index varies from 3.03 to 4.84 (36; $x = 3.83$) in the female, and 2.56 to 4.73 (42; $x = 3.33$) in the male. Certain characters show a somewhat clinal variation: vertical pale erect forked scales are fewer in northern populations (Table 15); broad pale scales on the posterior pronotal lobe (Table 15), ventrobasal costa (Table 16) and sternum VIII have a tendency to increase in northern populations; but these are not very clearly clinal. These characters are likely affected by temperature, thus, even in a single limited area, they are expected to differ by season and conditions of different larval habitats. Subspecies *japonicus* appears common in Cheju Do, but not so on the Korean Peninsula. On the posterior pronotal lobe, crescent-shaped scales were more abundant than broad and narrow scales in all 7 female specimens examined from the Korean Peninsula, and in 16 of 19 examined from Cheju Do; while broad scales were frequently commoner than crescent-shaped and narrow scales in both Hokkaido (19/28) and Honshu-Shikoku-Kyushu populations (19/36) (Table 15). No other remarkable differences were found between the populations of Palaearctic Japan and Korea. The Kyushu population appears to show wider variation in scaling.

Subspecies *amamiensis*. Although very common in Amami Ôshima, the Amami Ôshima population of *japonicus* has not been previously discussed. Within the approximate 10 important characteristics differentiating the geographical populations of *japonicus*, *j. amamiensis* agrees with *j. yaeyamensis* only in the light brown thoracic integument and the posterior pronotal lobe bearing more narrow curved yellowish scales than crescent-shaped or broad paler scales, and with *j. shintienensis* only in the scaling of the posterior pronotal lobe. It differs from these 2 southern populations in 8-9 characteristics. In several characters including the aedeagus, *j. amamiensis* agrees with *j. japonicus*, but still differs from it, in addition to the color of the thoracic integument and the scaling of the posterior pronotal lobe, in the highest average value of the female R_2 index, the least developed costal pale ventrobasal mark, more frequently incomplete dark subbasal band of the hindfemur, and the shorter siphon (Tables 15-18). The percentage occurrence of broad pale scales on the subspiracular area in *j. amamiensis* is highest among all the *japonicus* populations (Table 19). In the characters of subspiracular scales, hindfemur and hindtarsomere 4, *j. amamiensis* is closer to the Hokkaido than to the Kyushu population. Thus, they do not appear clinal. Scaling of the posterior pronotal lobe and ventrobasal costa appears somewhat clinal from Hokkaido to Amami Ôshima, but greater dissimilarities exist between Amami and Kyushu than between populations of Hokkaido-Kyushu. The larva of *j. amamiensis* is distinguished from the other subspecies by the smaller average value of the siphon index, unequal anal gills and most frequently by single setae 5, 7-P. Three specimens of *japonicus* with the typical *koreicus*-type of siphon found on Yakushima resemble *j. amamiensis* in having setae 5, 7-P single. Exclusive of

the siphon and anal gills, they may be separated from *j. amamiensis* by the following characters (values for *j. amamiensis* in parenthesis): setae 8-IV, V and 11-IV usually single (usually double); 14-IV and 5-VI usually, 1-V always double (always single, usually triple, frequently (64%) single respectively); 14-M 4-6 (usually 7-9) branched; 1-T 1-3 (3-4) branched; 4-II usually 4-5 (usually 6-7) branched; 13-III 3-4 (usually 1-2) branched. Though *j. amamiensis* is not as clearly defined as *j. yaeyamensis*, it may still deserve treatment as a distinct subspecies.

Subspecies *yaeyamensis*. This is common on Iriomote and Ishigaki Is. The basal entirely pale scaled hindfemur is the same as in *Ae. koreicus*, and quite different from all the other populations of *japonicus*, especially from Taiwanese *j. shintienensis*, in which the dark subbasal band is broadest among all the *japonicus* populations. It is intriguing that such extremes are found in these geographically close populations. The R_2 index shows an isolated average value in both male and female (Table 17). Tanimura (1952) suggested that the pale basal band of hindtarsomere 4 was related to a low-temperature condition of the larval site. Nakata (1962) and Miyagi (1972a) confirmed this experimentally in *j. japonicus*. The population of Hokkaido, the northernmost population, shows a higher percentage of occurrence of the pale basal scales or band than other populations of *j. japonicus* (Table 16). But, in *j. yaeyamensis*, a southern population, the percentage is even higher than in the Hokkaido population (Table 16), though they seldom form a definite basal band, and the pale scales are rather more lateral than dorsal. This observation is based on the examination of 39 specimens of 21 different collections from Yaeyama Gunt$\hat{o}$, and cannot be considered as accidental. *Aedes j. amamiensis* shows a similar tendency, but to a much lesser degree than *j. yaeyamensis*. Other factors, *e.g.* genetic, should be considered for these Ryukyuan populations. *Aedes j. yaeyamensis* is closely related to *j. shintienensis* with respect to the narrow aedeagus and the mesodorsal narrow-scaled anterior pronotal lobe. Pale erect forked scales of the vertex are most numerous in *j. yaeyamensis* (Table 15). Nine of the 20 females of *j. shintienensis* examined had 10 or more pale scales, others had 4-9. Knight (1968) found a similar situation for both populations. Thus, in this respect, *j. yaeyamensis* resembles *j. shintienensis*. Miyagi (1971), however, showed that 4 of 6 females of *j. shintienensis* examined had only 0-6 pale scales. The Taiwan population should be studied more extensively. The narrow curved yellowish scales on the posterior pronotal lobe are most developed, and in this character, it is close to *j. shintienensis* and *j. amamiensis* (this is a character common to these subtropical populations). *Aedes j. yaeyamensis* appears to be morphologically most distinct, and its isolation seems to be older than in any other population of *japonicus*. The similarity to *j. shintienensis* in the aedeagus, to which the highest taxonomical weight should be given among the morphological characteristics, suggests that *j. yaeyamensis* may have been derived from a common ancestral form with *j. shintienensis*, and seems to have no direct relation with the northern major population of *japonicus*.

Subspecies *shintienensis* (Fig. 218). This occurs in Taiwan. The aedeagus is narrow (Table 17) and the tergosubapical bridge is distinct. In this character and in the scaling of the anterior and posterior pronotal lobes, *j. shintienensis* resembles *j. yaeyamensis*. Contrarily, in the most developed subbasal band of the hindfemur, dark thoracic integument and female R_2 index, it is closer to *j. japonicus* than to *j. yaeyamensis*. It is evident that *j. shintienensis* is different from both the Yaeyama and the major northern populations.

We examined the type-male of *Ae. eucleptes* Dyar from Canton, South China,

TABLE 15. Comparison of adult characteristics of the subspecies and populations of *Aedes (Finlaya) japonicus*. (1).

Character		*japonicus*				*amami-ensis*	*yaeya-mensis*	*shinti-enensis*
		Korea[1]	Cheju	Hokk.[2]	H-S-K[3]			
	Specimens examined	4	20	21	32	21	20	20
Pale erect forked scales of vertex (female)	10+	-	5.0%	14.3%	21.9%	14.3%	90.0%	45.0%
	4-9	-	20.0	9.5	18.8	23.8	10.0	55.0
	1-3	25.0	30.0	33.3	21.9	38.1	-	-
	0	75.0	45.0	42.9	37.5	23.8	-	-
	Specimens examined	6	22	28	27	20	20	20
Scales of anterior pronotal lobe (female) B: broad C: crescent-shaped	B	50.0	72.7	100.0	100.0	90.0	5.0	-
	B>C	50.0	27.3	-	-	10.0	55.0	95.0
	B=C	-	-	-	-	-	-	-
	B<C	-	-	-	-	-	35.0	5.0
	Specimens examined	7	19	28	36	20	20	20
Scales of posterior pronotal lobe (female) B: broad C: crescent-shaped N: narrow	B>C+N	-	-	67.9	52.8	-	-	-
	B=C>N	-	-	10.7	8.3	-	-	-
	B=C=N	-	10.5	3.6	2.7	-	-	10.0
	C>B+N	100.0	84.2	14.3	25.0	-	-	-
	C=N>B	-	-	-	2.7	-	-	-
	N=B>C	-	-	-	-	-	-	10.0
	N>B+C	-	5.3	3.6	8.3	100.0	100.0	80.0

[1]Korean Peninsula.

[2]Hokkaido.

[3]Honshu, Skikoku and Kyushu.

TABLE 16. Comparison of adult characteristics of the subspecies and populations of *Aedes (Finlaya) japonicus*. (2).

Character		*japonicus*				*amami-ensis*	*yaeya-mensis*	*shinti-enensis*
		Korea[1]	Cheju	Hokk.[2]	H-S-K[3]			
	Specimens examined	5	19	27	32	20	20	20
Costal ventro-basal mark (female)	Long	20.0%	36.8	51.9	21.9	-	10.0	75.0
	Medium	-	26.3	22.2	37.5	-	60.0	25.0
	Very small	40.0	15.8	18.5	28.1	45.0	25.0	-
	Lacking	40.0	21.1	7.4	12.5	55.0	5.0	-
	Specimens examined	6	21	24	36	20	39	20
Subbasal band of hindfemur (female)	Complete	50.0	61.9	45.8	75.0	5.0	-	100.0
	Intermediate	-	14.3	25.0	16.7	40.0	-	-
	Incomplete	50.0	19.0	29.2	8.3	55.0	-	-
	Lacking	-	4.8	-	-	-	100.0	-
	Specimens examined	7	21	26	56	20	39	20
Basal band of hindtarsomere 4 (female)	Distinct	-	-	3.8	3.6	-	-	-
	Intermediate	-	4.8	26.9	5.4	25.0	53.8	-
	Lacking	100.0	95.2	69.2	91.1	75.0	46.2	100.0

[1]Korean Peninsula.

[2]Hokkaido.

[3]Honshu, Shikoku and Kyushu.

TABLE 17. Comparison of adult characteristics of the subspecies and populations of *Aedes (Finlaya) japonicus*. (3).

Character		*japonicus*				*amamiensis*	*yaeyamensis*	*shintienensis*
		Korea[2]	Cheju	Hokk.[3]	H-S-K[4]			
	Specimens examined	4	10	8	20	10	10	10
R_2 index[1]		2.91-4.16	3.11-4.73	2.56-4.10	2.65-4.08	3.02-3.93	1.97-3.01	2.66-4.16
(male)	x	3.46	3.60	3.27	3.20	3.36	2.52	3.34
	Specimens examined	7	9	10	10	10	10	10
R_2 index[1]		3.24-4.38	3.22-4.66	3.09-4.84	3.03-4.25	3.40-5.16	2.60-3.57	3.12-4.22
(female)	x	3.77	3.78	3.79	3.98	4.29	3.03	3.64
	Specimens examined	2	5	5	18	8	7	10
Aedeagus $\frac{\text{length}}{\text{width}}$		1.62-1.81	1.72-2.18	1.69-1.93	1.61-2.00	1.71-2.08	1.81-2.31	1.91-2.19
	x	1.72	1.87	1.84	1.83	1.81	2.05	2.06

[1] $R_2 \div (r_{2+3} \times \text{wing}) \times 100$. The values are effective in this discussion only, for the lengths of R_2 and r_{2+3} were measured by 4 x 10 lenses, and that of wing by 2.8 x 5.

[2] Korean Peninsula

[3] Hokkaido.

[4] Honshu, Shikoku and Kyushu.

TABLE 18. Siphon indices of the subspecies and populations of *Aedes (Finlaya) japonicus*.

Subspecies	Population	Specimens examined	Range	$\bar{x}$
japonicus	Hokkaido	13	3.04-3.90	3.50
	Honshu	29	2.90-3.75	3.39
	Korean Peninsula	4	2.99-3.64	3.34
	Cheju Do	7	2.69-3.65	3.15
amamiensis		33	2.58-3.05	2.85
yaeyamensis		12	3.41-4.03	3.69
shintienensis		4	3.12-3.65	3.44

one larva from Hong Kong and 10 larvae from Foochow, South China, in the collection of the USNM, and 2 males and one female from Hong Kong, one male from Kiukiang on the Yantze, and 5 larvae from Hong Kong, in the collection of the British Museum (Natural History). The aedeagus on the associated genitalia slide of the type-male of *eucleptes* was 1.72 as long as wide, it appears to be compressed; in a male from Hong Kong, it was 1.89 as long as wide. The subapical tergal bridge is distinct in both specimens. The scaling of the hindfemur is identical with that of *shintienensis* in all these adult specimens. A male from Hong Kong had a pale basal band on hindtarsomere 4, in the other respect, it does not appear to be different from *shintienensis*. The larvae were not studied in detail, however, in these specimens, with exception of a few specimens from Foochow, the detached apical pecten teeth are remarkably large and strong. Although *shintienensis* appears to be different from *eucleptes*, the above data are insufficient to conclude if they are identical. Further study is desirable.

BIONOMICS. Although *Ae. japonicus* is one of the more common mosquitoes in Japan, including the Ryukyus, its absence in Okinawa Guntô is difficult to explain. Larvae occur in a wide variety of natural and artificial containers, usually prefering shaded places and water containing rich organic matter; rock holes appear to be the most favored immature habitat for this species. They are found from early spring to autumn in central Japan. Adults live in forested areas and are day biters but are apparently reluctent to bite man. However, in the laboratory, they readily feed on chicks and mice but not on reptiles or amphibians (Miyagi 1972b). They overwinter as eggs in northeastern Japan and larvae in southwestern Japan (Kamimura 1976b).

MEDICAL SIGNIFICANCE. Chagin and Kondratiev (1943) reported an experimental transmission of Japanese encephalitis virus by this species (after Knight 1968), however, this may be a misidentification of *Ae. koreicus*. Yamada (1927) did not consider this species a likely intermediate host of *Wuchereria bancrofti*.

68. *AEDES (FINLAYA) KOREICUS* (EDWARDS)
(Figs. 96, 218; Tables 100, 101)

Ochlerotatus koreicus Edwards, 1917: 212 (♂, ♀). Type-locality: Korea.
Aedes (Finlaya) koreicus: LaCasse and Yamaguti, 1950: 156 (♂, ♀).

FEMALE (Fig. 218). Wing length 2.7-4.9 mm. *Head.* Eyes narrowly separated above, moderately below. Vertex covered with narrow curved pale scales, with a pair of large submedian patches of narrow curved dark scales, erect forked scales frequently (18/29) entirely dark, sometimes pale ones mixed in median area, eye margin more densely pale scaled; tempus covered with broad white scales, with a patch of broad dark scales close to eye; 7 to about 10 vertical bristles on each side, a few on interocular space yellowish brown, others dark; 4 dark temporal bristles on each side, an additional bristle far down on underside. Clypeus dark brown. Antenna: pedicel brown; mesal side dark, covered with small broad scales, most often (14/23) with more pale scales than dark ones, sometimes (8/23) all scales pale, rarely (1/23) dark scales more abundant than pale ones (Table 19), a few fine bristles intermixed; flagellum 0.73-0.76 (4) length of proboscis; flagellomere 1 1.50-1.62 (5) length of Flm 2, with dark scales except on narrow lateral surface. Palpus 0.24-0.26 (4) length of proboscis, dark scaled; segment 3 2.11-2.39 (5) length of 2, 4 at most 0.11 (5) of 3. Proboscis 1.03-1.06 (4) of forefemur. *Thorax.* Thoracic integument dark brown. Anterior pronotal lobe covered with broad white scales, occasionally with mesodorsal crescent-shaped scales; bristles mostly dark, some lateral ones yellowish brown. Posterior pronotal lobe covered with broad and crescent-shaped white scales, and usually with a few, sometimes many mixed dark scales (Table 19); bearing 4-7 mostly yellowish brown bristles. Scutum covered with narrow curved dark and yellowish brown scales, the yellowish brown scales forming a rather broad median stripe, narrow anterior dorsocentral stripe, posterior dorsocentral stripe and supraalar patch; the median stripe posteriorly bifurcate along prescutellar margin, where the scales become paler; the posterior dorsocentral stripe just laterad of series of posterior dorsocentral bristles, extending anteriorly along scutal suture and almost reaching scutal angle; scales on anterior margin and below the supraalar patch just anteriad of wing base whitish; all scutal bristles present, mostly dark brown, some of supraalars pale brown, 4-8 fossals usually near lateral and posterior margins. Scutellum with narrow curved dark scales on both lateral lobes; median lobe with rather broad dark scales on each side and narrow curved pale scales in-between; each lobe with 4-8 long dark bristles together with a few short yellowish ones. Paratergite usually unscaled, occasionally (4/29) with 1-4 white broad scales. Pleura with patches of broad white scales on propleuron, postspiracular area, subspiracular area, lower prealar knob, upper and lower-posterior sternopleuron, and upper mesepimeron; postspiracular patch well developed and always larger than subspiracular one; pleural bristles pale yellowish brown, many on propleuron, prealar knob, upper to posterior sternopleuron, and upper mesepimeron, 3-8 postspiraculars, no lower mesepimerals. *Wing.* Alula fringed with rather broad dark scales. Costa sometimes (2/8) with some ventrobasal pale scales in Cheju Do population. Cell R_2 2.45-2.97 (5) length of vein r_{2+3}. Halter knob pale lateroapically scaled, dark scaled otherwise. *Legs.* Forecoxa basally and apically pale scaled, dark scaled in-between; midcoxa laterally and basally pale scaled, anteroapically dark scaled, often entirely pale scaled; hindcoxa pale scaled.

Forefemur with narrow basal band, ventroapical spot, a narrow anterior streak, and a rather broad posteroventral streak of pale scales, the anterior streak extending from base to middle or before it, the posteroventral streak from base to middle or beyond it; midfemur with a narrow basal band and a distinct apical band of pale scales, and partial apical fringe of dark scales, posterior surface pale scaled in more than basal half; hindfemur with a broad apical band of pale scales, and partial apical fringe of dark scales, pale scaled in basal 0.6 on both anterior and posterior surfaces; tibiae usually with a small ventrobasal spot of pale scales; foretarsomeres 1 and 2, midtarsomeres 1-3 and hindtarsomeres 1-4 with pale basal bands, occasionally foretarsomeres 3 and 4, midtarsomere 4 and hindtarsomere 5 with incomplete pale basal bands or pale dorsobasal scales; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than or equal to 4, midtarsomere 5 shorter than or equal to 4, hindtarsomere 1 0.74-0.77 (5) length of tibia. Hindtarsal claw simple. *Abdomen*. Tergum I with median patch of dark scales, occasionally pale scales intermixed; II-VII dark scaled, with laterobasal patches of white scales, usually with small mediobasal spots of white scales on III-V or more segments, occasionally the spots developed into short basal bands but not fused with laterobasal patches; VIII usually with pale basal band. Sterna dark scaled, with lateroapically broadened basal bands of pale scales, the bands broader medially in anterior segments; II with pale scales also medially and apically; VIII pale scaled excepting unscaled apex.

MALE. Wing length 2.4-4.3 mm. Antenna: pedicel with a few scales and bristles in 2 slide mounted specimens examined; flagellum 0.71-0.72 (2) length of proboscis; flagellomere 1 with scales, Flm 12 1.26 length of Flm 13, both 0.81 length of Flm 1-11; palpus 0.82-0.88 (2) length of proboscis, simple; segments 4, 5 and apex of 3 only moderately bristled; length ratio of 2-5: 1.72-1,80 : 2.17-2.27 : 1.28-1.37 : 1.00 (2). Proboscis 1.17 (2) length of forefemur. Cell R_2 2.13-2.25 (2) length of vein r_{2+3}. Fore- and midtarsomere 4 very short; foretarsomere 5 modified, with several stout ventrobasal setae and a setiferous midventral process; midtarsomere 5 similar, but without midventral process; hindtarsomere 1 0.76-0.79 (2) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median and a sharp laterobasal tooth; hindtarsal claw simple. *Genitalia*. Tergum IX unsclerotized; lobes convex, moderately sclerotized, separated and produced, each with 7-10 rather weak bristles. Sternum IX unsclerotized excepting basal border, with 3-6 bristles. Basistyle subcylindric, 3.5-3.9 as long as wide, broadest in apical 0.25, laterally and sternally scaled, tergally and sternally bristled, without outstanding long bristles, with a stout thick bristle on mesal side at apical 0.25-0.33, apical and basal lobe absent; claspette stem pubescent, with 2-4 short setae on mesal side; filament simple, evenly arcuate, shorter than stem. Dististyle slender, 0.54-0.61 (7) length of basistyle, curved in apical 0.33, with 2 short setae on convex side near apex, pubescent on sternal side in basal half; claw nearly straight, pigmented, shallowly bifurcate at apex, 0.23-0.27 (7) length of dististyle. Cercal tergal surface not sclerotized; 2-4 cercal setae; paraproct with apex usually unicuspid, rarely bicuspid. Aedeagus elliptic and slightly constricted distal to middle in tergal view, broadest at basal 0.33-0.40, broadly open on tergal aspect in basal 0.67; apex shallowly emarginate; sternal aspect open in apical 0.75.

LARVA* (Fig. 96). *Head*. Width 1.02-1.20 mm; usually brownish-yellow

*Description based on typical specimens collected on Korean Peninsula. (cf. TAXONOMIC DISCUSSION).

or darker, 1.14-1.37 as wide as long; microsculpture somewhat more prominent than in *japonicus*, consisting of curved transverse rows of minute tubercles, appearing mesh-like laterally; labrum concave; seta 1-C pigmented, moderately slender, curved ventromesad, separated by about 1.33 times length; 4-6-C roughly on same level, well anteriad of 7-C; usually, 9,12-C double, 14-C single. *Antenna* bowed, 0.34-0.41 mm long, moderately spiculate; seta 1-A 2-4 branched, smooth to lightly barbed, inserted at basal 0.48-0.60 (x = 0.54), not attaining apex. *Mandible* and *maxilla* as in *japonicus*. *Mentum plate* with 19-26 teeth, median tooth about 1.5-2.0 width of immediate flanking teeth. *Thorax*. Integument apparently not spiculate; setae 5,14-P, and 2-M usually double; 7-P usually triple; 1-P and 9-T usually 3-4 branched; 14-M and 13-T usually small, tufted, occasionally rather strong. *Abdomen*. Integument with rows of extremely fine ventral spicules on II-VIII, and coarser ones laterally on VIII; setae 2,7-I, 2,8-II, 2,14-IV, 8-V, 4,7,14-VI, 1,13,14-VII and 1-VIII usually single; 3-I, 5,12-III and 6-IV usually double; barbing on 1-V, VIII, 13-IV, VII quite variable, ranging from nearly smooth to quite strong. Comb scales 30-72 (x = 54) in a roughly triangular patch; individual scales usually broadly paddle-shaped, apical spicules stronger than the lateral ones; sometimes, the strongest apical spicules subdivided. *Siphon* fairly uniformly brown, with an incomplete darker brown basal ring; 0.81-0.99 (x = 0.88) mm long, index 2.72-3.31 (x = 2.95); diameter usually noticeably less distad of insertion of seta 1-S; acus small, attached; microsculpture of short slightly curved transverse rows of minute spicules; pecten attaining basal 0.46-0.56 (x = 0.50), of 17-31 (x = 26.5) evenly spaced teeth, including 1-5 somewhat reduced basal ones, the apicalmost teeth sometimes a little larger than the others, but never detached, all teeth usually with 4-7 ventrobasal denticles; 1-S usually not quite attaining apex of siphon, about 1.33 times diameter of siphon at insertion, usually inserted just beyond apical pecten tooth at basal 0.49-0.56 (x = 0.53), 10% of those examined being inserted proximad of the apical pecten tooth; 2-S moderately slender, dark, subapical, usually 0.7-0.9 length of apical pecten tooth. *Saddle* covering dorsal half of segment X, 0.32-0.38 mm long; microsculpture of short, transverse rows of needle-like spicules, becoming larger caudad, culminating in several strong spines dorsad of seta 1-X, these spines sometimes subdivided; 1-X single, 1.00-1.35 saddle length; 4-X with 11-14 (usually 12), 2-7 branched cratal and 1-2, 1-5 branched precratal tufts. Anal gills elongate-fusiform, subequal, the dorsal gill 1.6-2.0 saddle length.

SPECIMENS EXAMINED. KOREA. 49♂, 124♀; with associated skins (1 l, 1 p), 80 L, 2 l: Korean Peninsula (L-0815, L-0817, L-0821, L-0823, K-0824, L-0826, L-0829, L-0839, L-0865, L-0868, L-0870, L-0872). 4♂, 9♀; with associated skins (1 l, 1 p), 6 L, 2 l: Cheju Do (M-0852, M-0854, M-0855, M-0862, M-0877).

DISTRIBUTION. KOREA (Korean Peninsula, Cheju Do). PRYMORYE. NORTH CHINA.

TAXONOMIC DISCUSSION. Some morphological differences were found between female adults collected on the Korean Peninsula and on Cheju Do. The vertical erect forked scales are usually (18/20) entirely dark in the mainland population, only one specimen had one pale scale and one other had 4 pale scales; while in the Cheju Do population, all 9 specimens examined had 1-10 pale scales, specimens having 1-3 pale scales were most frequent (6/9). The Cheju Do population had more crescent-shaped scales on the anterior pronotal lobe, though definitely fewer than broad scales, than in the peninsula population. These variations may be clinal variations.

Aedes koreicus is extremely closely related to *Ae. japonicus japonicus*. The ranges of variation of all the differentiating characteristics found in adults and larvae overlap. However, these characters show distinctly different tendencies of variation; viz., pedicel with usually (95.7%) more pale scales than dark scales in *koreicus*, while usually (87.9%) more dark scales than pale scales in *j. japonicus;* posterior pronotal lobe usually (89.2%) with dark scales in *koreicus*, usually (92.7%) without them in *j. japonicus;* subspiracular area usually (87.8%) with a distinct patch of pale scales in *koreicus*, 93.0% of *j. japonicus* lacking scales on it; costa usually (92.9%) entirely dark in *koreicus*, usually (84.5%) with ventrobasal pale or gray scales, often (62.6%) forming a distinct mark in *j. japonicus;* hindfemur almost always (97.4%) entirely pale basally in *koreicus*, almost always (98.9%) with a complete or incomplete dark subbasal band in *j. japonicus;* hindtarsomere 4 always with a distinct pale basal band in *koreicus*, usually (87.3%) entirely dark in *j. japonicus*. These are summarized in Tables 19-20. *Aedes koreicus* larvae always lack detached simple pecten teeth. This character was extremely rare (less than 1%) in specimens of *j. japonicus*, though they were found in Hokkaido, Honshu and Yakushima (an island off southern Kyushu). (The adults (females) from 3 individually reared larvae having the *koreicus*-type siphon - one each from Hakkoda Mts., northern Honshu; Akaishi spa, central Honshu; and Yakushima - were typical *j. japonicus*.) Some precratal tufts of 4-X usually occur in *koreicus*, in *j. japonicus*, specimens having precratal tufts were found in less than 5% of the Ôdaigahara population, only a few specimens lacking precratal tufts were found in robust *koreicus*. The apical spines on the saddle are of complex form in *koreicus*, usually simple in *japonicus*, though some specimens having subdivided apical spines are rarely found in the Hokkaido population of *japonicus*. In addition to this morphological evidence, they are sympatric at least in southern Korea including Cheju Do. Thus, they can be considered as fully distinct species in spite of the apparent identity of the male genitalia. Mating incompatibility between them reported by Miyagi and Lee (1975) appears an additional good reason to consider them as distinct. In Korea, *koreicus* seems to have adapted better to the urban environment than *japonicus*.

Like *japonicus*, the larvae of *koreicus* also appear to have typical and robust forms, the robust form is characterized by extreme development of setae 14-M and 13-T, many other setae also appear stronger and more heavily barbed in the robust form. A separate chaetotaxy table (Table 101) is presented for the robust form. The classical means of separating *koreicus* larvae from *japonicus* larvae mentioned above (pecten teeth, precratal tufts of 4-X and apical spines of saddle) are complicated by the occurrence of *"koreicus*-type" *japonicus* or *"japonicus*-type" *koreicus*. Therefore, some supplementary characters are presented to aid in the separation of typical and robust forms of *koreicus* and *japonicus:*

1. The following combination of characters of typical *koreicus* will separate them from typical *japonicus*, except for the typical form of *j. amamiensis:* setae 12-C and 3-I usually double, 1-I usually 4-6 branched, 8-II usually single, 7-III usually 3-4 branched and 7-V 2-4 branched. *Aedes japonicus amamiensis* is typified by having setae 5, 7-P usually both single, and 1-P, 8, 14-V usually double (usually 2-3, 3, 3-4, 1 and 1 branched respectively in *koreicus*); and in having the dorsal anal gill noticeably longer than the ventral gill (subequal in *koreicus* and most other *japonicus*).

2. Robust *koreicus* may be separated from robust *japonicus* by the following combination of characters: seta 13-T usually 2-5 branched and strongly barbed, 5-I 2-4 branched, 13-III usually 4-6 branched, 13-IV 4-7 branched, 2-X usually

4-5 branched and 1-S usually 6-7 branched; siphon length 0.74-0.81 (x = 0.79) mm, head length divided by siphon length: 1.01-1.11 (x = 1.07).

3. Three specimens of *japonicus* with the *koreicus*-type of siphon found on Yakushima can be immediately separated from *koreicus* by the single setae 5, 7-P. They also have seta 1-P double, 3-I single, 3-VIII 4-6 branched, 2-X triple and 15-18 (x = 16.3) pecten teeth (usually, 3-4, 2, 6-9, and 4 branched, respectively; 17-31 (x = 26.5) pecten teeth in *koreicus*).

TABLE 19. Comparison of female adult characteristics of *Aedes (Finlaya) japonicus* and *Ae. (Fin.) koreicus*. (1).

Character		*japonicus*				*koreicus*
		shinti-enensis	*yaeya-mensis*	*amami-ensis*	*japoni-cus*	
	Specimens examined	20	20	20	99	23
Scales of pedicel	P	-	-	-	-	34.8%
	P> D	15.0%	-	5.0%	3.0%	60.9
	P=D	15.0	-	5.0	9.1	-
P: pale	P< D	70.0	100.0%	85.0	85.9	4.3
D: dark	D	-	-	5.0	2.0	-
	Specimens examined	20	20	20	109	37
Dark scales of posterior pronotal lobe	Present	-	-	-	7.3	89.2
	Absent	100.0	100.0	100.0	92.7	10.8
	Specimens examined	20	20	20	115	41
Sub-spiracular scales	10+	-	-	-	-	29.3
	4-9	-	-	-	0.9	58.5
	1-3	-	-	35.0	6.1	12.2
	0	100.0	100.0	65.0	93.0	-
	Specimens examined	20	20	20	83	28
Costal ventro-basal mark	Long	75.0	10.0	-	34.9	-
	Medium	25.0	60.0	-	27.7	-
	Very small	-	25.0	45.0	22.9	7.1
	Lacking	-	5.0	55.0	14.5	92.9

TABLE 20. Comparison of female adult characteristics of *Aedes (Finlaya) japonicus* and *Ae. (Fin.) koreicus*. (2).

Character		*japonicus*				*koreicus*
		shinti-enensis	*yaeya-mensis*	*amami-ensis*	*japoni-cus*	
	Specimens examined	20	39	20	87	39
Subbasal band of hindfemur	Complete	100.0%	-	5.0%	62.1%	-
	Intermediate	-	-	40.0	17.2	-
	Incomplete	-	-	55.0	19.5	2.6%
	Lacking	-	100.0%	-	1.1	97.4
	Specimens examined	20	39	20	110	37
Basal band of hind-tarsomere 4	Distinct	-	-	-	2.7	100.0
	Intermediate	-	53.8	25.0	10.0	-
	Lacking	100.0	46.2	75.0	87.3	-

BIONOMICS. Common in Korea. Larvae occur in a wide variety of natural and artificial containers, more abundant in human-inhabited areas than *Ae. japonicus*. Adult females bite man and farm animals (Gutsevich et al. 1970).

MEDICAL IMPORTANCE. Experimental transmission of Japanese encephalitis virus by *Ae. koreicus* has been reported in the USSR (Gutsevich et al. 1970).

69. *AEDES (FINLAYA) HATORII* YAMADA
(Figs. 97, 98, 219; Table 102)

Aedes hatorii Yamada, 1921: 70 (♂). Type-locality: Taihoku, Taiwan; Yamada 1932: 223, Honshu, Japan.

Aedes (Finlaya) hatorii: LaCasse and Yamaguti, 1950: 166 (♂, ♀, L); Chu 1956: 42, Korea.

FEMALE (Fig. 219). Wing length 3.6-4.7 mm. *Head.* Eyes narrowly separated above, contiguous below. Vertex including interocular space covered with narrow curved pale scales, with a pair of submedian patches of narrow curved dark scales, some broad dark scales laterally in this patch; eye margin more densely pale scaled; many erect forked scales over vertex except on anterior margin, medially pale, laterally dark; tempus covered with broad pale scales, with a patch of broad dark scales within pale-scaled area; 7 to

about 10 vertical bristles including those on interocular space on each side, lateral ones dark, others yellowish brown; 4-5 dark temporal bristles on each side, and one bristle far down on underside. Clypeus rather dark brown. Antenna: pedicel testaceous, mesal side somewhat darker, densely covered with small scales, dark above and pale below, with at most one or 2 fine bristles; flagellum 0.73-0.82 (8) length of proboscis; flagellomere 1 1.37-1.68 length of Flm 2, with dark scales. Palpus 0.26-0.30 (8) length of proboscis, mostly dark scaled, apex pale scaled, a few pale scales basally intermixed; segment 3 1.81-2.43 (8) length of 2; 4 at most 0.12 length of 3. Proboscis 1.01-1.14 (8) length of forefemur. *Thorax*. Pronotal integument rather dark brown; anterior lobe covered with broad white scales, varying amount of dark scales on mesal 0.33, with dark mesal bristles, pale brown ones laterally; posterior lobe covered with broad white scales, with broad dark scales or unscaled on middle of posterior half, bearing 4-7 pale brown bristles, occasionally some of them dark. Scutum with integument dark brown, covered with narrow curved, dark brown and yellowish brown scales, the yellowish brown scales forming an indistinctly doubled median stripe, anterior and posterior dorsocentral stripes (the lattermost just laterad of series of posterior dorsocentral bristles) extending anterolaterally along scutal angle; the yellowish brown scales present also on anterior margin and prescutellar space except unscaled midposterior part, scattered on supraalar area just behind scutal suture, and forming a patch above wing base, the patch occasionally fused with posterior dorsocentral stripe; all scutal bristles present, mostly dark brown, some on anterior margin, supraalar area and prescutellar space pale brown. Scutellum with narrow curved, pale yellowish scales, each lobe with 6-13 mostly dark brown bristles, some shorter bristles yellowish brown. Paratergite with broad white scales. Pleural integument dark brown; patches of broad white scales on propleuron, postspiracular area, subspiracular area, lower prealar knob, upper and lower-posterior sternopleuron, upper mesepimeron, the upper mesepimeral patch almost divided; pleural bristles pale yellowish brown, many on propleuron, prealar knob, upper to posterior sternopleuron and upper mesepimeron, 2-8 postspiraculars, no lower mesepimerals. *Wing*. Alula fringed with narrow dark scales. Cell R_2 1.98-3.30 length of vein r_{2+3}. Halter knob dorsally dark scaled, ventrally pale scaled. *Legs*. Forecoxa laterobasally and anteroapically pale scaled, dark scaled in-between; midcoxa with a basal patch of white scales and an anteroapical patch of white and dark scales; hindcoxa white scaled. Femora with basal and apical bands of white scales, the apical bands of fore- and midfemora incomplete; that of hindfemur extending slightly ventroproximally; forefemur with a narrow pale streak on anterior side, and a broad pale streak on posterior half of ventral surface; midfemur with a narrow pale streak on anterior surface, posterior surface pale in basal 0.67, with a diffused pale streak in apical 0.33; hindfemur pale scaled in basal 0.67 of both anterior and posterior surfaces, pale area on anterior surface usually slightly longer, both pale areas apically narrowed. Tibiae with complete basal and incomplete apical bands; foretibia with a narrow pale streak on posterior surface. Fore- and midtarsi with one basal band and 2 articular bands of pale scales; the articular bands usually incomplete ventrally in foretarsus, usually complete in midtarsus; midtarsomere 3 occasionally with apical incomplete band; hindtarsus with one basal and 3 usually complete articular bands, hindtarsomere 5 entirely pale scaled. Femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than or equal to 4; midtarsomere 5 shorter than or equal to 4; hindtarsomere 1 0.68-0.74 length of tibia. Hindtarsal claw simple. *Abdomen*. Tergum I with a small median patch of

dark scales; II-VIII dark scaled, with laterobasal patches of pale scales; anterior terga with basal bands of pale scales, the bands usually fused with laterobasal patches. Sterna II-VII dark scaled, with mesally narrowed basal bands of pale scales, occasionally several pale apical scales; sternum VIII unscaled.

MALE (Figs. 97, 219). Wing length 2.5-4.0 mm. Antenna: pedicel glabrous; flagellum 0.63-0.71 (8) length of proboscis; flagellomere 12 1.00-1.22 length of Flm 13, both 0.84-1.11 of Flm 1-11. Palpus 0.96-1.00 (8) length of proboscis; segment 5 with a pale basal dorsolateral spot; apex of 3 turned upwards, with long bristles; 4 with long bristles; 5 with shorter bristles; length ratio of 2-5: 1.59-1.70 : 2.09-2.20 : 1.14-1.25 : 1.00 (8). Proboscis 1.15-1.33 (8) length of forefemur. Cell R_2 1.58-2.35 (8) length of vein r_{2+3}. Fore- and midtarsomere 4 very short; 5 with several stout ventrobasal setae, without midventral process; hindtarsomere 1 0.73-0.78 (8) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median and a sharp laterobasal tooth; hindtarsal claw simple. *Genitalia*. Tergum IX poorly sclerotized; lobes rounded, protrudent, with 8-15 medium-sized bristles. Sternum IX oblong, with 5-10 bristles. Basistyle cylindrical, 4.0-5.0 as long as midsternal width, laterally and sternally scaled, bristled throughout, no outstanding long bristles; basal tergomesal lobe poorly differentiated, only slightly convex and a little more densely bristled (more distinctly convex in 3 examples from Korea); claspette stem pubescent, with 3-5 short setae; filament about as long as stem, narrow, evenly arcuate, apex hooked. Dististyle slender, slightly basally broadened, 0.46-0.54 (7) length of basistyle, pubescent in basal half, with 2-3 short apical setae; claw nearly straight, bifurcate at tip, pigmented, 0.21-0.24 (7) length of dististyle. Cercal tergal surface membranous; 2-5 cercal setae on each side in middle; paraproct with apex uni- or bicuspid. Aedeagus bulbous in tergal view, markedly expanded in apical half, 1.40-1.83 (8) as long as broad, weakly sclerotized, tergally closed but with a large tergobasal orifice, apparently sternally open except on basal area; apex emarginate.

LARVA (Fig. 98). *Head*. Width 1.12-1.19 mm; fairly dark brown, 1.22-1.35 (x = 1.27) as wide as long; seta 1-C moderately slender, separated by 1.25-1.50 their length; 4-6-C anteriad of 7-C; 4-C small, fine, branched from basal 0.33, slightly caudad of 5-C; 5-7-C somewhat fan-shaped; 5-C rarely with a few fine barbs; 6-C nearly directly laterad of, and slightly longer than 5-C, sometimes with a few fine barbs; 9-C usually double; 10-C usually single; 14-C stiff, dark. *Antenna* slightly bowed, brownish, becoming apically darker, about 0.5 length of head, moderately spiculate, the spicules somewhat coarser and sparser in apical half; seta 1-A with 2-5 (usually 4-5) moderately barbed branches, inserted at basal 0.38-0.51 (x = 0.43), not attaining apex of shaft, 2,3-A subapical, 2-A about 0.20-0.25 length of shaft, often appearing subacute. *Mandible* with 12-20 microspines varying from small, pale and needle-like to fairly stout and dark; mandibular comb of 20-23 long, nearly straight, pigmented setiform teeth. Cutting organ with DS_1 relatively long and slender, DS_2 short; both dorsal teeth unicuspid, an accessory denticle bearing at least 8 pale elongate acute projections in a crown-like pattern; VT_{1-3} subequal, triangular; lateral denticles apparently absent; VB_1 strong, pigmented, nearly straight, not quite attaining tip of VT_0, with mesal pectination becoming shorter and finer distad; pectinate brush of 10-13 mesally long pectinate hairs. Piliferous process with labula at most slightly extending beyond apex of anterior portion. Mandibular hairs very long, (5-6) + (7-9), 12-15 in total. *Maxilla*. Cardo as in *japonicus;* seta 1-Mx strong, dark, usually bifurcate in basal 0.20-0.25, rarely single or triple, longer than 14-C, nearly attaining base of 2-Mx. Mesostipes 1.2-1.3 as long as wide, pear-shaped, with mesal area rather

broadly detached, marginal spicules stiff, but not spine-like; pseudoartis fused with cranium at apex; stipital sensoria at or somewhat distad of middle, without basal ring; 4-Mx rather strong, pigmented, distad of level of 2-Mx. Lacinia with 5-Mx somewhat distad of stipital sensoria; 6-Mx apparently bilaterally fringed; hairs of maxillary brush rather short and stiff. Palpostipes broad, 0.4 length of mesostipes, mesobasally fused with mesostipes, apex bearing 5 palpal sensoria, S_1 largest, S_2 much smaller, S_3 elongate, S_4 a little shorter than S_3; S_5 elongate. *Mentum plate* with 18-22 teeth, median tooth 1.67 as broad as immediate flanking teeth, lateralmost flanking teeth somewhat reduced. *Thorax*. Integument apparently smooth; setae 1-3-P on a common sclerotized callus, 1-P subequal to cranium in length, 3-P about 0.67 length of 1-P; sclerotized basal calli of 5, 6-P usually confluent; 8-P short, smooth to coarsely barbed; 1-M, T stoutly developed, arising from prominent sclerotized calli, usually double, 1-M 0.38-0.54 length of head, 1-T 0.29-0.51 length of 1-M; 9-T usually triple, subequal to 10-T; 12-T usually single. *Abdomen*. Except segment I, integument usually at least somewhat spiculate, especially so on VIII and on X ventrad of the saddle; seta 1-I similar to, but usually shorter than 1-T; 2-I-VII and 9-II-VI short, dark, relatively stout in appearance; 11-I, II, and 5-III, IV similar, but not quite as stiff; 2, 7, 13-I, 8-II, 12-III, IV, and 14-VII usually single; 11-II-V, 13-III, 4, 7, 8, 11-VI, 3, 10-VII usually double; 13-IV, V usually triple, well developed, but definitely shorter than 6-IV, V; 1, 3, 10-VII, and 5-VIII quite thick in proportion to length but apparently not stiff. Comb scales 55-85 ($x = 69.2$) in an oblong patch, individual scales broadly paddle shaped, apicolaterally fringed with short fine spicules. *Siphon* yellowish brown, with a dark brown incomplete basal ring; index 2.37-2.70, $x = 2.50$; acus attached, elongate; microsculpture of short transverse rows of minute spicules; pecten extending beyond middle, of 16-25 ($x = 21.1$) evenly spaced teeth, the basal 5-10 teeth usually somewhat reduced, the remaining teeth becoming progressively longer distad, each tooth with 3-7 ventrobasal denticles; seta 1-S inserted slightly distad and ventrad of pecten, subequal to or a little longer than siphonal diameter at insertion; 2-S dark, subapical, about 0.33 length of apical pecten tooth. *Saddle* covering 0.5 or less of segment X, 0.38-0.40 mm long, covered with short transverse rows of needle-like spicules, the spicules becoming more prominent caudad, culminating in a row of strong, dark acute spines on dorsocaudal margin; 1-X dark, rather stiff, usually single, 0.73-1.05 saddle length; 2-X 2.5-3.0 saddle length; 4-X of 12-13 (usually 12), 2-8 branched cratal tufts, the subcaudal hairs usually double and longest. Anal gills elongate, somewhat fusiform, subequal, usually 2.5-3.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 25♂, 30♀; with associated skins (6 l, 6 p), 29 L, 47 l: Honshu (C-1817, C-1902, C-1908, D-0004). KOREA. 7♂, 11♀; with associated skins (2 l, 2 p), 5 l: Korean Peninsula (L-0872, L-0879, L-0889). 21♂, 45♀, 2 l: Cheju Do (M-0842, M-0846, M-0852, M-0853, M-0861, M-0862, M-0877, M-0887, M-0888).

DISTRIBUTION. PALAEARCTIC JAPAN. (Honshu, Shikoku, Kyushu, Tsushima). KOREA (Korean Peninsula, Cheju Do). TAIWAN. SOUTH CHINA.

BIONOMICS. Rather common. Larvae occur in rock holes or rock pools, occasionally in artificial containers such as cement tanks. The peak of larval populations occur during July to September; eggs and mature larvae overwinter in central Honshu (Ebine 1969). Adult females feed on mice in the laboratory, but not on man (Kamimura 1976b).

70. *AEDES (FINLAYA) TOGOI* (THEOBALD)
(Figs. 99, 100, 220; Table 103)

Culicelsa togoi Theobald, 1907: 379 (♀). Type-locality: Osaka, Japan.
Aedes togoi: Yamada, 1927: 585, Fusan, Korea.
Aedes (Finlaya) togoi: Bohart and Ingram, 1946b: 66, Okinawa Is. and Ie Is., Ryukyu Archipelago; LaCasse and Yamaguti 1950: 161 (♂, ♀, L); Bohart 1956 (1957): 28, Chichijima, Ogasawara Isls.; Iwojima (on the ship between Iwojima and Agrihan Is.), Volcano Isls.

FEMALE (Fig. 220). Wing length 3.1-4.3 mm. *Head.* Eyes narrowly separated above. Vertex covered with white or slightly narrow curved yellowish scales on median line including interocular space, eye margin and a broad posterior area, with a pair of large anterior patches of narrow curved or crescent-shaped, dark scales; numerous dark erect forked scales over entire vertex, usually with some pale ones intermixed in median area; tempus covered with broad white scales above and below, with dark ones in-between; 8-13 vertical and 3-5 (usually 4) temporal bristles on each side, an additional bristle far ventrad, 2-3 most mesal vertical bristles yellowish, others dark. Clypeus dark brown. Antenna: pedicel brown, mesal surface darker and heavily covered with white scales, often dark scales intermixed; flagellum 0.60-0.67 (5) length of proboscis; flagellomere 1 1.67-1.79 length of Flm 2, with dark scales. Palpus 0.25-0.27 (5) length of proboscis, mainly dark scaled, with pale scales at apex of segment 3, often a few pale scales scattered dorsally and laterally; 3 1.75-2.05 (5) length of 2; 4 very small or lacking. Proboscis 1.07-1.14 (5) length of forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe covered with broad pale scales, usually with some dark scales in middle, with bristles mostly dark, fewer yellowish bristles laterally; posterior lobe densely covered with broad scales, pale on margins, dark at center; bearing 3-7 mostly yellowish brown bristles. Scutum with integument very dark brown, covered with narrow curved, dark and yellowish scales, the yellowish scales forming a double acrostichal stripe, anterior and posterior dorsocentral stripes, covering margin of prescutellar space and margin of scutum from anterior promontory to wing root, the anterior dorsocentral stripe free at posterior end, the posterior dorsocentral stripe extending anterolaterally along scutal suture; the yellowish scales on margins of scutum paler and a little broader; all scutal bristles present, very dark brown, fossal area including humeral margin with 7 to more than 10 (usually about 10 or more) scattered bristles. Scutellum covered with narrow curved, yellowish or whitish scales, each lobe bearing 5 to more than 10 (usually about 10 or more) long and medium dark bristles together with a few additional short yellowish ones. Paratergite with broad pale scales. Pleural integument brown to dark brown; patches of broad white scales on propleuron, postspiracular area, subspiracular area, lower prealar knob, upper and lower-posterior sternopleuron, and mesepimeron (covering upper 0.67); pleural bristles mostly yellowish, 7-12 propleurals, 3-7 postspiraculars, more than 10 prealars, sternopleurals and upper mesepimerals, 1-3 (very rarely 0) lower mesepimerals, often a few very narrow slender white scales present at anteroventral 0.33 around lower mesepimeral bristles. *Wing.* Alula fringed with dark, longer lanceolate and shorter round-tipped scales. Costa with pale scales ventrally at base. Cell R_2 1.62-2.31 length of vein r_{2+3}. Halter with knob pale and dark scaled. *Legs.* Forecoxa pale basally and anteroapically scaled, broadly dark scaled in-between;

midcoxa basally and mediolaterally pale scaled, anteroapically dark scaled; hindcoxa basally and apically pale scaled. Femora with apical fringe and very narrow basal band of pale scales; forefemur with a streak of pale scales on anterior surface usually extending from base to about apical 0.75, pale scaled on posterior half of ventral surface; midfemur with a similar anterior streak, pale scaled on basal half or more of posterior surface; hindfemur pale scaled on basal 0.60-0.67 of anterior, posterior and ventral surfaces. Tibiae with apical fringe and often with basal spot of pale scales. Foretarsomeres 1 and 2 with both basal and apical bands of pale scales, 3 with basal band and occasionally apical pale scales, 4 and 5 entirely dark, or often with basal band or basal pale scales, 4 rarely with apical pale scales; midtarsomeres 1 and 2 with both basal and apical bands, 3 and 4 with basal band and apical pale scales, the latter often lacking on 4, 5 entirely dark or with basal pale scales; hindtarsomeres 1-4 with both basal and apical bands, 5 with usually incomplete basal band; the apical tarsomeral bands often incomplete; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than 4, midtarsomere 5 equal to or slightly longer than 4; hindtarsomere 1 0.71-0.78 length of tibia. All claws unidentate. *Abdomen.* Tergum I with a median patch of dark scales, a few pale scales usually mixed; II-VII dark scaled, with laterobasal patches and narrow basal bands of white scales; the latter usually laterally continuous with the laterobasal patch, often incomplete or dorsally reduced; VIII with pale basal scales. Sterna II-VII dark scaled, with large laterobasal patches of white scales extending mesally to form complete or incomplete basal bands; II occasionally almost entirely pale scaled; VIII with pale basal scales. Seminal capsules 3.

MALE (Figs. 100, 220). Wing length 2.6-3.6 mm. Scutal yellowish stripes often ill defined; in one specimen, yellowish scales spread over almost all the scutum. Flagellum 0.57-0.61 (4) length of proboscis, flagellomere 12 1.06-1.21 (5) length of Flm 13, both 0.76-0.83 (5) of Flm 1-11. Palpus 0.73-0.81 (5) length of proboscis, with 2 articular bands of pale scales on joints 3-4 and 4-5; segments 4 and 5 with bristles of moderate length and number; length ratio of 2-5: 0.95-1.17 : 1.34-1.50 : 1.18-1.26 : 1.00 (5). Proboscis 1.21-1.34 (5) length of forefemur. Lower mesepimeral bristles usually lacking in the populations of Honshu (9/10), Mikura Is. (14/16) and Ogasawara Is. (10/10), often absent (6/10) in Cheju Do population, rarely absent (1/10) in Yaeyama population. Cell R_2 1.30-2.00 times as long as vein r_{2+3}. Fore- and midtarsomere 4 short; 5 weakly modified, with a few stout ventrobasal setae; hindtarsomere 1 0.74-0.81 length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median and a sharp laterobasal tooth; hindtarsal claw with sharp median tooth. *Genitalia.* Tergum IX with lobes sclerotized, a little protrudent and rather approximated, together forming an apically emarginate, transverse median lobe, 0.22-0.28 (x = 0.25) as wide as basistyle length; each lobe bearing 10-16 medium-sized bristles. Sternum IX subquadrate, with 5-9 bristles of varying lengths, occasionally with 1-2 scales. Basistyle triangularly expanded mesally on sternal aspect at about basal 0.4, 2.3-2.9 as long as wide including the sternal expansion, scaled except on mesal side, bristled except on basal 0.67 of lateral surface, this unbristled area tergally expanded at base and sternally in basal half, sternal mesal margin bearing many long striated setae, some striated setae intermixed among ordinary bristles at apex and on mesal side of tergal surface; apical lobe absent; basal tergomesal lobe undifferentiated; claspette stem short, hirsute; filament semicircular, of about even width, moderately pigmented, apex slightly hooked. Dististyle slender, slightly narrowed toward apex, 0.49-0.59 (x = 0.53) length of basistyle, slightly arcuate, minutely

ciliate on proximal portion, with one or 2 small setae near apex; claw slender, 0.16-0.22 length of dististyle, pigmented. Cercal tergal surface unsclerotized; 2-4 cercal setae; paraproct with apex usually unicuspid, occasionally bicuspid. Aedeagus acorn-shaped or oblong, 2.04-2.47 (x = 2.25) as long as wide, tergally closed in apical half, with a large tergobasal opening, sternally open.

LARVA (Fig. 99). *Head.* Width 0.94-1.18 mm; rather dark brown, 1.1-1.3 as wide as long; labrum not concave; seta 1-C rather slender, slightly shorter than distance between bases, often frayed at apex; 4-6-C on same level, anterior to 7-C; 6-C well laterad of and usually with fewer branches than 5-C; 10, 14-C usually single. *Antenna* usually dark brown, 0.26-0.36 mm long, shorter than head, slightly curved in apical 0.25, spinulate, spinules very few and fine in distal part, numerous and stronger in proximal part; 1-A inserted at apical 0.33-0.52, usually not reaching apex of shaft, with 2-6 rather stiff, simple branches. *Mandible* with a number of needle-like simple microspines. Cutting organ with long slender seta DS_1 and short DS_2 (DS_1 appearing to be the most mesal tooth of mandibular comb); dorsal teeth fairly large, lateral tooth bicuspid, mesal tooth with one or 2 mesal denticles, a row of several small accessory denticles; VT_{1-3} equal, VT-4 not reaching apex of VT_0; VB_1 not reaching apex of VT_0, VB_2 a little shorter than VB_1, very slender; pectinate brush about 8 haired. Mandibular hairs 12-14. *Maxilla.* Cardo as in *japonicus;* seta 1-Mx single. Mesostipes 1.0-1.2 as long as wide, with mesal area rather broadly detached, marginal spicules short, strong, spine-like; pseudoartis separated from cranium; stipital sensoria thick, at distal 0.33, without basal ring; 4-Mx slender, pigmented. Lacinia with 5-Mx somewhat distad of stipital sensoria; 6-Mx thick, barbed; hairs of maxillary brush rather short and stiff. Palpostipes moderately broad, 0.4-0.5 length of mesostipes, without mesobasal fusion with mesostipes; apex with 5 palpal sensoria, $S_3 > S_1 > S_4 > S_2 > S_5$ in length. *Mentum plate* with 30-36 (x = 33.1) small teeth. *Thorax.* Prothoracic setae rather slender; seta 8-P very small; 11-M, T usually single. *Abdomen.* Seta 6-I usually triple; 7-I, II usually double, more slender and shorter than 6-I, II respectively; 10, 12-I, 14-III, IV, 3, 8, 12-V, 3-VI, 7-VII and 2-VIII usually single; 3-I, II, 12-III, 4-IV and 6-VI usually double; 3-VII always single, fairly strong, barbed and distinctly longer and stouter than usually double 4-VII; 13-VII moderate to stiff; 5-VIII stout with very acute apices and fine barbs, not frayed. Comb scales 64-167 (x = 86.4) in a patch, individual scales rounded at apex, somewhat fan-shaped, evenly fringed with spicules. *Siphon* short, usually dark brown, with acus attached, surface with distinct imbrication; length 0.54-0.72 mm, index 1.75-2.30; pecten reaching a little distad of middle to apical 0.33, of 18-27 closely spaced, dark brown, long teeth, occasionally with a few abortive teeth at base, each tooth with several ventrobasal denticles; seta 1-S located beyond pecten at apical 0.19-0.28, longer than width of siphon; 2-S subapical, relatively stout, shorter than apical pecten tooth, extending beyond apex of siphon. *Saddle* covering only dorsal aspect of segment X, 0.40-0.53 mm long, apex with varying number of small spines, usually very few or none in Ogasawara population; imbrication developed toward apex, each with a few fine spicules; seta 1-X off saddle, usually single, equal to or slightly shorter than saddle; 4-X of 12-14 tufts, usually all on grid, each with 5-15 branches. Anal gills very short.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 15♂, 4♀, 39 L: Honshu (C-2174, D-0007, D-0022, Laboratory colony of 406th Medical Laboratory, originated in Manazuru and Jogashima, Kanagawa Pref.). 16♂, 9♀; with associated skins (4 l, 4 p), 19 L, 21 l: Izu Shichitô (C-1535). KOREA. 21♂, 29♀; with associated skins (5 l, 5 p), 3 L, 4 l: Cheju Do (M-0864). RYUKYU ARCHI-

PELAGO. 73♂, 78♀; with associated skins (20 l, 20 p), 22 L, 9 l: Yaeyama Guntô (K-0929, K-1766, K-1767, K-1768, K-1769, K-1770, K-2047, K-2048). OGASAWARA ISLS. 13♂, 11♀; with associated skins (6 l, 6 p), 8 L, 3 l (N-1181).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Izu Shichitô, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Pen., Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). OGASAWARA ISLANDS. ?VOLCANO ISLANDS. SOUTHERN KURILE ISLANDS. SAKHALIN. SOUTH PRYMORYE. NORTH AND SOUTH CHINA. TAIWAN. MARCUS ISLAND. THAILAND (Koh Samui Is.). MALAYA. BRITISH COLUMBIA.

BIONOMICS. Common in coastal regions throughout Japan including the Ryukyus. Larvae usually occur in tidal pools or rock pools of salt or brackish water, also occasionally in containers with fresh water. Adult females bite man throughout the day. They also feed on reptiles and amphibians in the laboratory (Miyagi 1972b). Autogenous strains have been reported (Tadano 1977). Adult females are capable of dispersing over long distances (Wada 1975).

As with many species of mosquitoes, nectar appears to be an important energy source. Experiments in Japan indicate considerable differences in survival of *togoi* fed on various flowers, with greater longevity of those feeding on flowers of woody plants (chestnut, privet, etc.) than those on herbaceous plants (Harada et al. 1972).

MEDICAL SIGNIFICANCE. *Aedes togoi* has been found a natural vector of *Brugia malayi* which occurs, in Japan, only on Hachijô-kojima, a very small island in Izu-Shichitô (Sasa et al. 1952). It is also an excellent experimental intermediate host for *Wuchereria bancrofti*, *Dirofilaria immitis*, etc. Transmission of the virus of Japanese encephalitis by this species was experimentally demonstrated and natural infections were also found (Gutsevich et al. 1970; Kamimura 1976b).

71. *AEDES (FINLAYA) SAVORII* BOHART
(Figs. 100, 101, 221; Table 104)

Aedes (Finlaya) savoryi Bohart, 1956 (1957): 31 (♀). Type-locality: Chichijima, Ogasawara Isls.

FEMALE (Fig. 221). Wing length 2.7-3.8 mm. *Head.* Eyes narrowly separated above. Vertex including interocular space covered with narrow curved or crescent-shaped, pale yellowish scales, denser along median line and eye margins, a few narrow dark scales on submedian area; dark erect forked scales over entire vertex, a few scales at middle sometimes pale; tempus covered with broad pale yellowish scales, a patch of broad dark scales close to eye. Clypeus dark brown. Antenna: pedicel testaceous, with small dark scales and hairs on mesal side; flagellum 0.60-0.67 (5) length of proboscis; flagellomere 1 with dark small scales on mesal side, 1.44-1.53 length of Flm 2. Palpus 0.20-0.21 (5) length of proboscis, dark scaled; segment 3 1.48-2.25 length of 2; 4 less than 0.1 length of 3. Proboscis 1.17-1.28 (5) length of forefemur. *Thorax.* Anterior pronotal lobe with integument dark brown, covered with broad pale yellowish scales, bearing mostly dark bristles, several bristles on lower part pale; posterior pronotal lobe with integument brown, covered with broad pale and dark scales, the dark scales forming

an ill defined patch within pale-scaled area, sometimes both pale and dark scaled intermixed, bristles of posterior margin 4-9, dark or yellowish brown. Scutum with integument brown, covered with narrow curved, dark scales and narrow curved or crescent-shaped, golden yellow scales, the golden yellow scales forming a double acrostichal stripe, anterior dorsocentral stripes, continuous curved stripes from humeral margins through scutal sutures to posterior dorsocentral stripes, a somewhat diffuse horseshoe-shaped stripe along edge of prescutellar bare space, and ill-defined supraalar patches which almost reach scutal suture, the stripe along humeral margin often interrupted before scutal angle. Scutellar lobes covered with narrow curved or crescent-shaped golden yellow scales, each bearing 4-9 long dark bristles together with several medium or small bristles. Paratergite with broad pale scales. Pleural integument brown to dark brown; patches of broad pale scales on propleuron, postspiracular area, subspiracular area, lower prealar knob, upper sternopleuron, lower-posterior sternopleuron, upper and middle mesepimeron; most of pleural bristles pale yellowish brown, some stout bristles on propleuron and sternopleuron dark, 5-8 propleurals, 2-6 postspiraculars, about 10 or more rather dark prealars, 7-11 sternopleurals, about 10 or more upper mesepimerals, no lower mesepimerals. *Wing*. Alula fringed with rather narrow scales. Cell R_2 1.81-2.18 (5) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Forecoxa scaled on anterolateral surface, basally pale and otherwise dark; mid- and hindcoxae each with a patch of broad pale scales. All femora with distinct pale apical fringe; forefemur pale scaled on ventral surface, the pale area narrowly visible on both sides of dorsal surface; midfemur pale scaled on lower posterior surface in basal half; hindfemur pale scaled on basal 0.50-0.67 except dorsally; tibiae with rather indistinct pale apical fringe; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than 4; midtarsomere 5 equal to or slightly longer than 4; hindtarsomere 1 0.83-0.89 (5) length of tibia. All claws with a submedian sharp tooth. *Abdomen*. Terga dark scaled; II-VII with laterobasal spots of white scales, the spots visible from above but usually not forming complete bands except on VII. Sterna basally pale scaled and apically dark scaled. Segment VIII poorly scaled.

MALE (Figs. 100, 221). Wing length 2.2-2.6 mm (reared specimens). Most of erect forked scales on vertex yellowish brown. Antenna: pedicel bare; flagellum 0.56-0.57 (3) length of proboscis; flagellomere 12 1.09-1.20 (4) length of Flm 13, both 0.67-0.73 (4) of Flm 1-11. Palpus 0.65-0.67 (3) length of proboscis; length ratio of 2-5: 1.04-1.20 : 1.50-1.77 : 1.00-1.27 : 1.00 (4). Cell R_2 1.35-1.77 (4) length of vein r_{2+3}. Fore- and midtarsomere 4 short; 5 weakly modified, with a few stout ventrobasal setae; hindtarsomere 1 0.81-0.92 (4) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median tooth and a sharp laterobasal tooth; hindtarsal claw with a sharp submedian tooth. Abdominal terga usually with almost complete pale basal bands; VIII pale scaled. *Genitalia*. Tergum IX with lobes weakly sclerotized, a little protrudent and approximated, together forming a small, apically emarginate, transverse median lobe, 0.20-0.23 (6; x = 0.22) as wide as basistyle length; each lobe bearing 5-8 medium-sized bristles (more than 10 - Wada et al. 1973). Sternum IX quadrate, with 4-8 bristles of varying lengths. Basistyle triangularly expanded on sternal aspect at about basal 0.4, 2.2-2.7 as long as wide including the sternal expansion, scaled except on mesal side, bristled except on basal 0.67 of lateral surface, this unbristled area tergally expanded at base and sternally on basal half; sternal mesal margin bearing many long striate setae, some striate setae also present at apex and on mesal

surface of tergal side intermixed with ordinary bristles; basal tergomesal lobe undifferentiated, represented by a slightly more densely bristled area near base, some bristles of this area slightly thicker than others; claspette stem short, hirsute, with one or 2 small setae near apex; filament strongly curved, of about even width, moderately pigmented, with pointed apex, reaching about level of apex of sternal expansion. Dististyle slightly narrowed toward apex, 0.56-0.62 (5; x = 0.60) length of basistyle, a little arcuate, minutely ciliate on proximal portion, with 2 or 3 small setae near apex and often another small seta at about basal 0.25; claw slender, 0.19-0.22 (4) length of dististyle, pigmented. Paraproct with apex unicuspid; 2-5 cercal setae on each side. Aedeagus oblong or acorn-shaped, 1.90-2.26 (6; x = 2.02) as long as wide, sternally open, tergally closed in apical half, with a large tergobasal opening.

LARVA (Fig. 101). *Head.* Width 0.82-1.03 mm; rather dark brown, 1.2-1.4 as wide as long; apical margin of labrum not concave, seta 1-C rather slender, usually simple, length subequal to distance between bases; 4-6-C anteriad of 7-C; 4-C usually slightly posterior to 5-C; 5, 6-C on same level; 6-C well laterad of and usually with fewer branches than 5-C; usually, 8-C single and 15-C double. *Antenna* 0.26-0.36 mm long, shorter than head, slightly arcuate, light brown to dark brown, sparsely spiculate throughout, spicules finer in basal area; seta 1-A inserted at about middle of shaft, not reaching apex of shaft, with 2-5 rather stiff simple branches. *Mandible* with a number of needle-like microspines. Cutting organ with a long slender DS_1 and short DS_2 (DS_2 appearing to be the most mesal tooth of mandibular comb); dorsal teeth fairly large, lateral tooth bicuspid, mesal tooth with 2 or 3 mesal enticles, a row of several small accessory denticles; VT_{1-3} subequal, VT-4 not reaching apex of VT_0; VB_1 rather slender, just reaching apex of VT_0; pectinate brush 6-8 haired. Piliferous process with labula extending a little beyond apex of anterior part. Mandibular hairs 14-17. *Maxilla.* Cardo as in *japonicus;* seta 1-Mx single. Mesostipes 1.3-1.4 as long as wide, with mesal area rather broadly detached, some of the marginal spicules spine-like; pseudoartis separated from cranium; stipital sensoria slightly distad of middle, thick, without basal ring; 4-Mx slender, pigmented. Lacinia with 5-Mx slightly distad of stipital sensoria; 6-Mx thick, barbed; hairs of maxillary brush rather short and stiff. Palpostipes rather narrow, 0.4 length of mesostipes, without mesobasal fusion with mesostipes; apex with 5 palpal sensoria, $S_3 > S_1 > S_4 > S_2 > S_5$ in length. *Mentum plate* with 20-23 (x = 21.4) small teeth. *Thorax.* Prothoracic setae rather slender; setae 9-P and 12-M usually single; 1, 7, 8-P and 1, 2-M usually double; 8-P very small; 5-P and 4-T usually triple; 3-T usually with 5 branches. Abdomen. Seta 6-I usually 4 branched, 7-I, II a little more slender and shorter than 6-I, II respectively; 3-I, 11-III, 7-VI, and 14-IV, V usually single; 7-I, 3-IV, 4, 5-VI and 5-VII usually double; 3-VII slender, shorter than always single 4-VII; 13-VII fine to moderate; 5-VIII stiff, with very acute apices, often frayed at or near apex. Comb scales 42-69 (x = 59.8) in a patch, individual scales rather narrow, parallel, rounded at apex, evenly fringed with spicules. Siphon short, with acus attached, surface with imbrication very faint, almost smooth; length 0.41-0.52 mm, index 1.70-2.10; pecten extending to apical 0.32-0.45 of siphon, of 16-20 closely spaced, long dark brown teeth, 0-5 basal teeth abortive, each with 3-5 ventrobasal denticles; seta 1-S located beyond pecten at apical 0.16-0.27, longer than width of siphon; 2-S subapical, shorter than apical pecten tooth, extending beyond apex of siphon. *Saddle* covering only apical half of dorsal surface; length 0.25-0.34 mm; apex laterally with many short dark spines; spiculiferous imbrication distinct only near apex; seta 1-X slightly shorter than saddle; 4-X of 12-14 tufts, usually all on grid, each with

5-11 branches. Anal gills very short.

SPECIMENS EXAMINED. OGASAWARA ISLS. 29♂, 39♀; with associated skins (16 l, 16 p), 42 L, 19 l: (N-1171, N-1175, N-1179, N-1507, N-1509, N-1510, N-1515, N-1556, N-1557, N-1566).

DISTRIBUTION. OGASAWARA ISLANDS.

BIONOMICS. Apparently common in the Ogasawa islands. Larvae are found in brackish water rock holes or pools on the coast, associated with *Ae. togoi,* however, they do not appear to utilize artificial containers as does *togoi* (Wada et al. 1973). Adult females attack man from dawn to sunset (Wada et al. 1973; Takahashi 1973).

72. *AEDES (FINLAYA) SEOULENSIS* YAMADA
(Figs. 102, 103, 222; Table 105)

Aedes seoulensis Yamada, 1921: 61 (♀). Type-locality: Seoul, Korea.

FEMALE (Fig. 222). Wing length 2.3-2.7 mm (reared specimens); 3.75 mm (wild specimens, after Yamada 1921). *Head.* Vertex mostly and tempus entirely covered with broad pale scales; narrow curved, pale scales and erect forked, pale scales covering posterior part, this area extending a little anteriorly at middle; eye margin with narrow curved, pale scales. Clypeus dark. Antenna: pedicel yellowish brown to dark brown, with small hairs and small pale scales on mesal side; flagellum 0.97 (1) length of proboscis; flagellomere 1 with some pale scales, 1.35 length of Flm 2. Palpus dark scaled, 0.26 (1) length of proboscis; segment 3 1.75-1.89 length of 2; 4 minute. Proboscis 1.16 (1) length of forefemur. *Thorax.* Pronotal integument dark brown, both lobes covered with narrow or rather narrow curved, white scales, sometimes with a few broad white scales on lower part; anterior-pronotal bristles dark and pale yellowish brown; posterior-pronotal bristles 4-5, mostly dark. Scutum with integument blackish brown, covered with narrow curved, silvery white scales on anterior half and narrow curved, dark scales on posterior half, white scaled area extending posteriorly to level of wing base laterally, posterior margin of this white area concave; prescutellar bare space bordered with narrow curved, pale scales. Acrostichal bristles lacking except for apical 3 pairs of pale yellowish brown bristles; anterior dorsocentrals lacking in anterior half except for a lateroapical group of several yellowish brown bristles; usually one stout dark humeral present; posterior dorsocentrals, prescutellars and supraalars dark. Scutellum roughly covered with somewhat narrow curved, pale yellowish scales, each lobe bearing 4-5 long dark bristles together with several small ones. Paratergite with broad white scales. Pleural integument dark brown; patches of broad white scales on propleuron, subspiracular area, lower prealar knob, upper and midposterior sternopleuron and upper 0.67 of mesepimeron; pleural bristles pale yellowish brown, 5-7 propleurals, 2-3 postspiraculars, about 7 prealars, more than 10 sternopleurals, 7-9 upper mesepimerals, no lower mesepimerals. *Wing.* Alula fringed with narrow dark scales. Costa with a basal spot of pale scales. Cell R_2 1.96-2.33 (3) length of vein r_{2+3}. Halter with pale scaled dark knob. *Legs.* Fore- and midcoxae each with a patch of pale scales; hindcoxa with or without a small pale scale patch. Forefemur pale scaled posteroventrally on basal 0.67; midfemur pale scaled on basal 0.67 of posterior surface; hindfemur pale scaled on basal 0.67; fore- and midtibiae with a streak of pale scales on posterior surface; foretarsomeres 1-3 pale scaled on posterior surface, each with a pale basal

band, 1 also with a pale apical band; midtarsomeres 1-3 pale scaled on posterior surface, each with a pale basal band, 1 and 2 also with pale apical bands, sometimes 1 and 2 almost entirely pale scaled; hindtarsomeres 1-3 with pale basal bands, 1 and 2 also with apical ones; the pale scales on legs somewhat dull-yellowish; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than 4; midtarsomere 5 longer than or as long as 4; hindtarsomere 1 0.72-0.73 (3) length of tibia. Hindtarsal claw simple. *Abdomen.* Terga dark scaled; II-VII with pale basal bands which are mesally narrowed and laterally broadened, often interrupted at middle on posterior segments, VII with a few pale brown scales at apex. Sternum II pale scaled, III-VI with broad basal bands of pale scales, and with pale scales at apex, the pale scales increasing toward posterior segments, VII mostly pale scaled; sterna otherwise dark scaled.

MALE (Figs. 103, 222). Wing length 2.2-2.4 mm (reared specimens). Antenna: flagellum 0.81-0.86 (1) length of proboscis; flagellomere 12 1.21-1.25 length of Flm 13, both 0.82-0.88 of Flm 1-11. Palpus 1.04 (1) length of proboscis; segments 4 and 5 bristled; length ratio of 2-5: 2.75-2.81 : 3.13-3.31 : 1.31 : 1.00 (1). Proboscis 1.27 (1) length of forefemur. Cell R_2 1.68-2.30 (2) length of vein r_{2+3}. Fore- and midtarsomere 4 very short; 5 modified, with several stout ventrobasal setae; hindtarsomere 1 0.75-0.79 (2) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median and a sharp laterobasal tooth; hindtarsal claw simple. *Genitalia.* Tergum IX with lobes well sclerotized, wider than long, a little protrudent, each bearing 2-5 rather fine setae of medium length. Sternum IX subquadrate, bearing 4-5 bristles, usually 2 of them long and stout. Basistyle cylindrical, 3.0-3.9 as long as wide, bristled over entire surface, sternally and laterally scaled, tergal surface with only a few scales; basal tergomesal lobe not protrudent, represented by a group of a number of closely set bristles on less sclerotized subbasal area, one of the bristles extremely long and stout; claspette stem pilose, of about even width in tergal view, reaching about middle of basistyle, bearing several short setae; filament slender, falciform, of about even width in basal 0.67, slightly longer than stem. Dististyle slender, curved at apical 0.25, 0.50-0.51 (2) length of basistyle, with scattered minute setae on concave side and a few short setae near apex on both convex and concave sides; claw pigmented, 0.27-0.29 (2) length of dististyle. Paraproct with apex uni- or bicuspid; cercal setae 2-4. Aedeagus cylindrical, weakly sclerotized, 1.98-2.28 (3) as long as wide; tergal aspect closed in apical half, with a large round orifice in basal half; sternal aspect open, narrowly in apical half and widely in basal half; base with a small median process.

LARVA (Fig. 102). *Head.* Width 0.78-0.82 mm (3); usually light brown, 1.15-1.25 (3) as wide as long; seta 1-C yellowish, usually apically frayed, separated by 0.65-0.82 times length; 4-C well developed and strongly barbed, though somewhat weaker than 5-7-C; 5-C well caudad of 4, 6-C; 6-C about on level of 7-C, slightly cephalad of 4-C; 8-C usually single, lightly barbed; 10-C usually double; barbing on 9, 10-C varying from fairly weak to moderately strong; 11-C substellate; 15-C strongly developed, often extending beyond apical margin of labrum. *Antenna* 0.37-0.45 mm long, 0.6 length of head, basally light brown, becoming indistinctly apically darker, slightly bowed, moderately spiculate, spicules needle-like, becoming sparser apically; seta 1-A single, lightly barbed, inserted at basal 0.61-0.74 ($x = 0.65$), exceeding apex of antenna; 2-6-A apical. *Mandible* (described from whole-mounted larvae and larval skins) with a number of simple microspines of varying sizes. Cutting organ with DS_1 nearly attaining apex of VT_0; lateral dorsal tooth apparently bi-

or tricuspid, mesal dorsal tooth apparently 3-4 cuspid; VT_0 deeply notched near base of VT_1, slightly concave apicomesally; VT-4 broad based, becoming acute, not attaining apex of VT_0; VT_{1-3} acutely triangular, subequal; VB_1 extending well beyond apex of VT_0, with mesal pectinations relatively strong and coarse, becoming slightly weaker apically; pectinate brush of apparently 6 or fewer mesally pectinate hairs. Piliferous process with labula not extending beyond apex of anterior portion. Mandibular hairs (4-6) + (5-8), 10-13 in total. *Maxilla* (described from whole-mounted larvae and larval skins). Cardo apparently as in *japonicus;* seta 1-Mx 2-5 branched, strong, usually exceeding apex of palpostipes. Mesostipes somewhat longer than wide; pseudoartis separated from cranium; stipital sensoria each apparently with a small basal ring; 4-Mx pale, nearly apical. Lacinia with 5-Mx at level of stipital sensoria. Palpostipes less than 0.5 length of mesostipes, somewhat mesally rugose; apparently bearing 5 apical palpal sensoria. *Mentum plate* with 14-18 teeth, the median tooth twice as broad as immediate flanking teeth, occasionally bifid. *Thorax.* Setae 9-P, 4-M and 5-T usually single; 4-T usually double; 1, 14-M, 1, 13-T usually strongly developed, substellate; 13-M and 8-T similar but smaller. Several weaker setae, such as 0, 2, 9, 10, 12-P, 3, 4-M, and 2, 12-T, with varying numbers of relatively long slender barbs; only 11-P-M-T completely barbless. *Abdomen.* Setae 2-I, 2, 3, 8, 9, 12-II, 2-4, 8, 12-III, 3, 4, 9, 12, 14-IV, 12, 14-V, 2, 9, 14-VI, 11, 14-VII and 14-VIII usually single; 11-I laterad of 12-I; 1-III, V with one branch much longer than the other; 6-III, IV and 11-II-VI usually double; 3-VIII usually 5 branched, weaker than 5-VIII; 1-I, II, 13-II-V, and to a lesser extent, 1-IV, VI, 13-VI, 6, 8-VII well developed with relatively thick barbed branches, often appearing substellate; other more slender setae, such as 3-II-VI, 4-II-IV, VI, 7-VI, 8-II, III, VI, and 12-VII with varying numbers of relatively long slender barbs. Comb scales 36-59 (x = 46.4) in a broadly triangular patch, individual scales with a rather strong apical spine and fine lateral spicules, the latter becoming slightly stronger distad. *Siphon* brownish, slightly darker at extreme base (no distinct basal ring) and distad of seta 1-S, fairly evenly tapered from base to apex, with a small narrowly attached acus; length 0.61-0.76 (x = 0.71) mm, index 2.39-2.87; microsculpture of short, transverse rows of extremely minute spicules; pecten reaching basal 0.48-0.55 (x = 0.52), of 18-28 (x = 22.5) bilaterally denticulate, evenly spaced teeth, the apical denticles stronger than the lateral ones, 1-S inserted beyond pecten at basal 0.54-0.63 (x = 0.59), not reaching apex of siphon; 2-S slender, nearly apical, about 0.5 length of apical pecten tooth. *Saddle* covering dorsal 0.5 of segment X, usually erose on lateral margin, with numerous needle-like spicules occurring singly or in short transverse rows, becoming stronger dorsocaudad, some spicules off saddle; seta 1-X strong, 1.2-1.6 saddle length, inserted in a small unsclerotized area near caudal margin; 2-X with branches unequal; 4-X of apparently 7-10 cratal and 0-2 precratal tufts, the tufts 2-5 branched. Anal gills usually blunt; dorsal gill 1.4-2.0 saddle length, ventral gill shorter than to subequal to dorsal gill.

SPECIMENS EXAMINED. KOREA. 10♂, 10♀; with associated skins (8 l, 8 p), 3 L, 4 l: Korean Peninsula. (L-1482, L-2114, L-2115).

DISTRIBUTION. KOREA (Korean Peninsula). NORTH CHINA.

BIONOMICS. Apparently not common in Korea. Larvae are found in tree holes. Females bite man during the daytime (Yamada 1921).

73. *AEDES (FINLAYA) ALBOCINCTUS* (BARRAUD)

Finlaya albocincta Barraud, 1924: 1002 (♂, ♀). Type-locality: Solon, Western Himalayas.

Aedes (Finlaya) albocinctus: Bohart, 1959: 196, Shirahama and Nakara River, Iriomote Is., Ryukyu Archipelago.

FEMALE. (Description based on a single specimen.) Wing length 3.1 mm. *Head.* Vertex largely covered with broad pale scales, with a pair of rather large patches of broad dark scales within pale-scaled area, also with some narrow pale scales posteromedially and on median line to the middle or more anteriorly; tempus covered with broad pale scales, with a spot of broad dark scales in the pale-scaled area close to eye; erect forked, tawny yellow scales on posterior part of vertex, anteriorly a few dark erect scales; apparently 4 vertical and 4 temporal bristles on each side, one bristle on underside. Antenna: pedicel testaceous, mesal surface infuscate, with small broad pale scales; flagellum shorter than proboscis. Palpus slightly less than 0.25 proboscis, dark scaled. Proboscis longer than forefemur. *Thorax.* Pronotal integument brown; anterior lobe covered with broad pale scales, with bristles brown; posterior lobe with narrow pale scales, apparently bearing 5 brown bristles. Scutum with integument rather dark brown, covered with narrow white scales over anterior 0.75 (slightly before level of wing root) and narrow dark scales on posterior 0.25 except the bare middle of prescutellar space; acrostichal, anterior dorsocentral and fossal bristles absent except for some on anterior margin; posterior dorsocentral, supraalar and prescutellar bristles well developed, bronze-brown. Scutellum with integument pale brown, with narrow dark scales, some yellowish scales also present; bristles brown, 7 on each lateral lobe and 6 on median lobe. Paratergite bare. Pleural integument brown, sub- and postspiracular areas slightly darker; patches of broad pale scales on propleuron, subspiracular area, lower prealar knob, upper sternopleuron, caudal middle sternopleuron, and mesepimeron; pleural bristles pale brown, more than 10 each on propleuron, prealar knob, sternopleuron and upper mesepimeron, 9 postspiraculars, no lower mesepimerals. *Wing.* Costa with pale scales at base. Halter knob pale scaled. *Legs.* Forecoxa pale scaled on anterior surface, with some dark scales mixed; midcoxa with a patch of pale scales; hindcoxa unscaled. Forefemur with pale basal band and a large pale ventroposterior patch extending from base to about middle; midfemur with pale basal band, pale scaled ventroposteriorly in basal half, this pale area extending to apical 0.25 on ventral surface; hindfemur pale in basal half. Hindtibia with pale basal band ventrally broader. Foretarsomere 1, midtarsomeres 1-2, and hindtarsomeres 1-3 with pale basal bands. Femora, tibiae and tarsi otherwise dark. *Abdomen.* Tergum I medially dark scaled, with some pale scales laterally mixed; II-VII dark scaled, with laterobasal patches of pale scales, II-V each with a narrow pale basal band connected with laterobasal patches. Sternum II pale scaled; III-VII basally and medioapically pale scaled, brown scaled otherwise. Segment VIII dark scaled.

Males and immature stages are unknown from this region.

SPECIMEN EXAMINED. RYUKYU ARCHIPELAGO. 1♀: Yaeyama Gunto (Shirahama, Iriomote Is., 17 XI 1951, biting, Bohart, USNM).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Gunto). CHINA (Yunnan). INDIA (Western Himalayas).

BIONOMICS. This is a very rare species in the Ryukyus. Since Bohart

(1959), no one has obtained this species from the Ryukyu Archipelago. Immature stages are unknown in this region. Larvae have been found in tree holes in the Himalayas (Barraud 1934) and Yunnan (Chow and Mattingly 1951).

74. *AEDES (FINLAYA) KOBAYASHII* NAKATA*
(Figs. 103, 104, 223; Table 106)

Aedes kobayashii Nakata, 1956: 135 (♂, ♀, P, L): Type-locality: Mt. Kurama, Kyoto Pref., Japan; Barrett 1969: 15; National Forest, Kyongki Prov., Korea.

Aedes (Finlaya) christophersi: Hara, 1959: 226; Nakata 1962: 58 (misidentification of Hara).

FEMALE (Fig. 223). Wing length 2.9-3.1 mm (3.8-4.2 mm, Kobayashi 1959). *Head.* Vertex covered with narrow curved, pale yellow scales and fairly long, pale yellow erect forked scales; tempus with a spot of broad dark scales, the spot bounded by short stripes of broad pale scales above and below; at least 5 vertical and 5 temporal bristles on each side, 2,3 median ones golden brown, others dark. Clypeus dark brown. Antenna: pedicel dirty yellow, infuscate and with a few small hairs on mesal side; flagellomere 1 1.40-1.47 (1) length of Flm 2, with dark scales on mesal side. Palpus 0.17 length of proboscis, dark scaled; segment 3 2.0 (1) length of 2; 4 0.11 of 3. Proboscis longer than forefemur. *Thorax.* Pronotal integument light brown; anterior lobe with lanceolate or crescent-shaped pale scales, and pale yellowish brown bristles. Posterior lobe anterodorsally, with narrow curved, pale scales, slightly wider posteroventral scales, and 3-5 posterior bristles. Scutum covered with narrow curved, dark golden yellow and pale golden yellow scales; the golden yellow scales forming a large anteromedian patch anteriorly extending in an acrostichal and a pair of anterior dorsocentral short stripes, posteriorly in a pair of narrow but distinct posterior dorsocentral stripes, and laterally in a pair of triangular presutural patches; golden yellow scales also forming a pair of postsutural patches and a stripe bordering anterior and lateral margins of prescutellar space; the pale golden yellow scales covering margin of scutum from apex to supraalar area; all scutal bristles developed excepting median fossals, dark on disk, yellowish- or golden-brown on margins. Scutellum with narrow curved dark scales intermixed with a few pale yellow ones; each lobe bearing 4-7 long dark bristles together with 1-4 small ones. Paratergite unscaled. Pleura light or dark brown; patches of broad white scales on propleuron, postspiracular area, posterior margin of subspiracular area, lower flank of prealar knob, upper and lower posterior sternopleuron, and upper mesepimeron, the lattermost patch often divided; pleural bristles pale yellowish brown, about 10 propleurals, 2 or 3 postspiraculars, about 10 or more prealars, more than 10 sternopleurals, several upper mesepimerals, no lower mesepimerals. *Wing.* Alula fringed with rather broad dark scales. Cell R_2 2.3-2.6 length of vein r_{2+3}. Halter with knob dark, covered with pale scales intermixed with dark ones. *Legs.* Coxae pale scaled. Femora with white apical fringe; fore- and midfemora each with a basally broadened streak of pale scales on posteroventral surface; hindfemur largely pale scaled

*After the manuscript was submitted, Danilov (1977, Parazitologiya 11: 181) synonymized this species with *Ae. (Fin.) alektorovi* Stackelberg, 1943, Bull. Ent. Res. 34: 311 (♂). Type-locality: Kamenush-ka, district Shkotovo, Ussuri Land, southeastern Siberia.

except dorsal surface, the pale-scaled area apically narrowed. Tibiae with a few pale scales at base and apex. Foretarsomere 1 with an incomplete pale basal band; midtarsomere 1 with a complete pale basal band, 2 with an incomplete pale basal band or entirely dark; hindtarsomere 1 with a complete pale basal band, 1-4 with pale articular bands, 4 with an incomplete pale apical band, 5 dorsally pale or entirely dark; femora, tibiae and tarsi otherwise dark scaled. Length ratio of fore- and midtarsomeres 4 and 5 variable; hindtarsomere 1 0.75 length of tibia. Hindtarsal claw simple. *Abdomen.* Tergum I with a small spot of pale scales at middle; II-VII dark-scaled, with laterobasal spots of white scales; VIII dark scaled. Sterna II-VII broadly pale scaled basally and narrowly apically, dark scaled in-between; VIII dark scaled.

MALE (Figs. 103, 223). Wing length 2.6-3.3 mm. Antennal flagellomere 12 length of Flm 13, both together equal to length of Flm 1-11. Palpus 0.95 (1) length of proboscis; segments 4 and 5 slender and bearing few bristles; length ratio of 2-5: 3.00 : 3.63 : 1.38 : 1.00. Proboscis 1.15 (1) length of forefemur. Cell R_2 2.03-2.18 (2) length of vein r_{2+3}. Fore- and midtarsomere 4 very short; foretarsomere 5 modified, with several stout ventrobasal setae and a setiferous midventral process; midtarsomere 5 weakly modified, with fewer stout ventrobasal setae; hindtarsomere 1 0.76 (1) length of tibia. Anterior claw of foretarsus with a blunt-tipped submedian and a sharp laterobasal tooth; anterior claw of midtarsus with only a blunt-tipped submedian tooth; hindtarsal claw simple. Abdominal segment VIII pale scaled. *Genitalia.* Tergum IX with lobes moderately separated, well sclerotized and protrudent, each bearing 3-4 medium sized setae. Sternum IX subquadrate, membranous, with 4 bristles. Basistyle cylindrical, slightly incurved, 6.4-6.7 as long as narrowest tergal middle width, covered tergally with small bristles, laterally and ventrally with long bristles, laterally and laterosternally scaled; basal tergomesal lobe small, only slightly protrudent, bearing 3 setae, upper one small, lower 2 large and stout. Claspette stem long, slender, curved, reaching about middle of basistyle, sternally pilose on basal half, bearing 4 small bristles, one at base, other 3 in middle; filament narrow in basal half, expanded in apical half, with apex pointed. Dististyle 0.43-0.45 (1) length of basistyle, arcuate in apical 0.33, pilose on concave side, with 2,3 small setae near apex; claw slender, 0.26 (1) length of dististyle. Cercal setae 2 on each side; paraproct with apex unicuspid. Aedeagus ovate, 1.77 (1) as long as wide, with a round tergobasal opening, widely open on sternal aspect, slightly emarginate tergally at apex.

LARVA (Fig. 104). (Described from 2 whole-mounted specimens from Korea, excepting mandible and maxilla.) *Head.* Width 1.07-1.12 mm; brownish, 1.15 as wide as long; integument smooth or nearly so; seta 1-C relatively slender, curved mesad, separated by about 1.5 their length; 4-C sometimes dendritic, slightly cephalad of 6-C; 5-C caudomesad of 6-C, about 0.75 length of cranium; 6-C very long, at least 1.25 length of cranium, on level of 7-C; 7-C less than 0.5 length of 5-C, not attaining insertion of 1-A; 11-C stronger than 13-C. *Antenna* about 0.5 mm long, slightly arcuate in basal half, light brown, sparsely spiculate, most spicules on lateral aspect of basal half; seta 1-A 1-3 branched, well barbed, inserted at basal 0.51-0.57, about attaining tip of antenna; 2-A about 0.29 length of shaft. *Mandible* (1 dissected specimen from Japan) with several microspines simple, extremely fine; mandibular comb of 12, 13 rather slender teeth, lateral half of them weaker and subplumose. Cutting organ with DS_1 pigmented, nearly reaching apex of VT_0, DS_2 apparently extremely short or reduced; dorsal teeth broken but apparently similar to those of *aureostriatus,* accessory denticle fairly large, bi- or tricuspid; ventral tooth rather short, VT_1 larger than VT_2, VT_3 absent, VT_4 apically slender, not

reaching apex of VT_0; VB_1 extending beyond apex of VT_0, mesal pectination extremely fine; pectinate brush 7, 8 haired. Piliferous process strongly protrudent, with labula extending well beyond apex of anterior portion, PPH_5 a remarkable long straight row of prominent-based hairs. Mandibular hairs 6 + 6. *Maxilla* (1 dissected specimen from Japan). Cardo with point of fusion with cranium slightly broader and sclerotized strip rather weaker than in *japonicus;* seta 1-Mx single, weak. Mesostipes 1.4 as long as wide, peach-shaped, without detached mesal area, only one or 2 marginal spicules strong and spine-like, others rather stiff or slender; pseudoartis separated from cranium; stipital sensoria at middle, slender, without basal ring; 4-Mx weak, pale. Lacinia with 5-Mx at level of stipital sensoria; hairs of maxillary brush long and slender. Palpostipes rather narrow, nearly 0.5 length of mesostipes, without mesobasal fusion with mesostipes; $S_3 > S_1 > S_4 > S_2$ in length, S_5 apparently very narrow and short. *Mentum plate* nearly as long as broad, with 22-23 teeth, the median tooth subacute, somewhat nipple-shaped, about 3.0-4.0 as broad as nearest flanking teeth, lateral teeth much more widely spaced, more acute, becoming larger laterad before again becoming smaller. *Thorax.* Seta 8-P lightly barbed if single, otherwise smooth. *Abdomen.* Setae 6-I, II only slightly more than 0.5 length of cranium, 6-II shorter than 6-I; 11-I very small; 13-III relatively small; 1-IV, V longer than 6-IV, V; 8-VII multibranched, but not dendritic; 5-VIII slightly shorter than 4-VIII. Comb scales 32-38 in a triangular patch, individual scales broadly rounded at apex, laterally and apically fringed with spicules. *Siphon* brownish with a darker basal ring, indistinctly apically darker, tapering gradually from basal 0.33; length 1.19 mm, index 4.30-4.36; acus attached; microsculpture indistinct, consisting of a series of very short transverse ridges bearing minute spicules; pecten reaching basal 0.45-0.49, of 22-25 evenly spaced sharp teeth, including 0-2 abortive basal teeth, the larger teeth with 2-3 subacute denticles on basal 0.33; seta 1-S inserted just distad of pecten at basal 0.53-0.55, 1.25-1.50 length of siphon diameter at insertion; 2-S slender, subapical, 0.6 length of apical pecten tooth. *Saddle* 0.38 mm long; microsculpture consisting of groups of 1-7 needle-like spicules, becoming dorsocaudally more prominent; seta 1-X barbed when single, otherwise smooth, 0.74-0.94 saddle length; 2-X about 4.5 saddle length; 4-X of 6-8 cratal and 2-3 precratal tufts, all tufts 2-4 branched, the most caudal cratal tufts being the longest.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 1♀: Hokkaido (A-1805, A-1806). 3♂, 4♀; with associated skins (2 l, 2 p), 2 l: Honshu (B-2069, D-1186, E-2071, E-2086). KOREA. 11♂, 11♀; with associated skins (10 l, 10 p), 7 L: Korean Peninsula (L-0554, L-0821, L-0822, L-0875, L-1485, L-1965, L-2095, L-2096, L-2097, L-2098).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). KOREA (Korean Peninsula).

BIONOMICS. One of the rarer species in Japan, apparently commoner in Korea. Larvae are found in tree holes, and associated with *Orthopodomyia anopheloides, Aedes japonicus, Ae. nipponicus, Ae. galloisi, Ae. flavopictus* and *Tripteroides bambusa;* adult females have become engorged on human blood in the laboratory (Nakata 1959).

75. *AEDES (FINLAYA) AUREOSTRIATUS* (DOLESCHALL)*

Culex aureostriatus Doleschall, 1857: 385 (♀). Type-locality: Amboina Island, Moluccas.

DISTRIBUTION. PALAEARCTIC JAPAN (Yakushima). RYUKYU ARCHIPELAGO. TAIWAN. PHILIPPINES. ?HAINAN ISLAND. MALAYA. INDONESIA. INDIA. SRI LANKA. MOLUCCAS. NEW GUINEA.

75A. *AEDES (FINLAYA) AUREOSTRIATUS OKINAWANUS* BOHART (Figs. 105, 106, 224; Table 107)

Aedes (Finlaya) okinawanus Bohart, 1946: 39 (♂, ♀, L). Type-locality: Okuma, Okinawa Is., Ryukyu Archipelago; Kamimura 1968: 18-9, Yakushima, Japan.
Aedes (Finlaya) aureostriatus subspecies *okinawanus:* Lien, 1968c: 225.

FEMALE (Fig. 224). Wing length 2.7-4.1 mm. *Head.* Eyes very narrowly separated above and below. Vertex with a posteriorly widened median line of narrow curved or crescent-shaped, golden white scales, and a pair of submedian patches of broad dark scales, eye margin with narrow curved, golden white scales; posteriorly numerous pale yellowish brown to dark brown erect forked scales; tempus pale scaled, with a rather irregular spot within pale area; 4-6 vertical and as many temporal dark bristles on each side. Clypeus very dark brown. Antenna: pedicel tawny brown, mesally infuscate, with a few small dark bristles; flagellomere 1 with dark scales, 1.25 length of Flm 2. Palpus dark scaled, 0.2 length of proboscis. Proboscis longer than forefemur. *Thorax.* Anterior pronotal lobe covered with broad white scales, with mesal bristles long and dark, lateral bristles fine and brown; posterior pronotal lobe anterodorsally covered roughly with narrow curved, golden yellow scales, posteroventrally with moderately broad, white scales, and intermediate scales in-between, bearing less than 10 bristles. Scutum with integument blackish brown, covered with narrow curved dark scales, with following stripes of narrow curved, pale golden yellow scales: an acrostichal stripe bifurcating posteriorly along margins of the bare prescutellar space, anterior dorsocentrals, posterior dorsocentrals extending anterolaterally along scutal suture, and marginals from anterior termination of anterior dorsocentrals to supraalar area, anterior dorsocentrals posteriorly free, marginals often confluent with anterolateral extension of posterior dorsocentrals at scutal angle, scales of marginals somewhat broader and paler; all scutal bristles present, mostly blackish brown, supraalars rather fine and bronze-yellow. Scutellar lobes covered with usually narrow, sometimes rather broad, dark scales and often also narrow pale golden scales; each lobe bearing several long and a few small bristles. Paratergite usually unscaled, rarely with white scales. Pleural integument dark brown, patches of white broad scales on propleuron, subspiracular area, lower prealar knob, upper and lower-caudal sternopleuron, mesepimeron and metameron, 2 sternopleural patches usually narrowly con-

*The nominal subspecies does not occur in this region. One or more subspecies do not occur in this region.

nected; pleural bristles rather fine, golden or pale yellow, lower mesepimerals 3-9 on midanterior part, and often one or 2 additional bristles on lower-posterior part. *Wing*. Alula fringed with dark narrow scales. Costa with a small spot of pale scales or several scattered pale scales at base. *Legs*. Forecoxa with moderately broad both white and dark scales, mid- and hindcoxae with white scales. Forefemur with a narrow basal band, a short anterobasal streak, and a basally broadened posteroventral streak of white scales, the lattermost reaching base and apex; midfemur with a narrow basal band and apical fringe of white scales, posterior side largely white scaled; hindfemur with a ventrally widened white apical band, white scaled in basal 0.67, apical dark area extending basally on dorsal surface as a narrow streak but not reaching base. Tibiae with dorsally incomplete pale basal bands, sometimes obsolete on fore- and midtibiae. Midtarsomere 1 with a white basal band. Hindtarsomere 1 with a complete or incomplete white apical band; 2 with a complete basal and an incomplete apical white band; 3 with a complete or incomplete white basal band, usually without apical band, sometimes an incomplete one present; 4 usually with an incomplete pale basal band, usually without apical band, rarely with an incomplete one; 5 dorsally with white or pale gray scales, sometimes entirely dark. Femora, tibiae and tarsi otherwise dark scaled. Fore- and midtarsal claws usually equal, sometimes anterior claw a little larger; hindtarsal claw simple. *Abdomen*. Tergum I with a median patch of dark scales; II-VI dark scaled, with laterobasal patches of white scales, the patches sometimes mesally extending to form very narrow basal bands on posterior segments; VII with a white basal band. Sternum II mainly pale scaled, IV-VII basally pale scaled, apically dark scaled; VIII dark scaled.

MALE (Figs. 106, 224). Wing length 2.0-3.0 mm. Vertical median line of pale narrow scales wider than in female, dark spot of tempus often absent. Palpus 0.7 length of proboscis; a few rather long bristles on segments 4, 5 and apex of 3. Lower mesepimeral bristles fewer than in female. Foretarsomere 4 very short; 5 modified, with several stout ventrobasal setae; midtarsomere 4 a little shortened; 5 weakly modified. Anterior claw of fore- and midtarsi with a blunt-tipped median tooth and a sharp laterobasal tooth; hindtarsal claw simple. *Genitalia*. Tergum IX with lobes prominent, well sclerotized, each bearing 3-8 stout setae. Sternum IX transverse-hexagonal, emarginate on apical margin at middle, with 4-11 bristles. Basistyle subcylindric, 3.7-4.7 as long as median sternal width, laterally and sternally scaled; tergal surface with several long laterobasal bristles and somewhat tufted apical bristles; sternal surface densely bristled along mesal margin, sparsely otherwise; basal tergomesal lobe composed of a prominent triangular tergal portion and an elongate mesal process, the former with a row of stout setae along posteromesal edge, a few scattered bristles on posterolateral flank, and a semicircular row of bristles along tergoanterior edge, the lattermost continuous with a row of 11, 12 leaf-like transparent modified setae along mesal and apical margins of mesal process which lies upon claspette; apical lobe absent; claspette stem rather stout, fairly long, pilose, with 3 subapical and 0, 1 small basal setae; filament twisted, apically broad. Dististyle 0.52-0.59 (9) length of basistyle, somewhat arcuate, slightly broadened in basal half, sparsely pubescent on concave side, with a few minute setae near apex; claw 0.17-0.20 (9) length of dististyle. Paraproct with apex uni- or bicuspid; 2 cercal setae on each side. Aedeagus oval, 1.46-1.78 (9) as long as wide, tergally notched at apex, with an ovate tergobasal orifice, sternal aspect widely open from basal 0.3 to apex.

LARVA (Fig. 105). *Head*. Width 0.90-1.03 mm; 1.07-1.32 as wide as long; setae 4, 6-C about on level of or slightly caudad of 7-C; 5-C mesocaudad

of 6-C; 6-C very long; 11-C moderately strong. *Antenna* 0.42-0.51 mm long, 0.5-0.6 length of head, sparsely spiculate, most spicules on basolateral aspect, only 1-3 spicules in distal part; seta 1-A inserted at middle of antenna, reaching about apex of shaft, usually single, occasionally bifid. Mouthparts similar to those of *kobayashii*. *Mandible* with a few simple microspines; mandibular comb of 12, 13 slender teeth, lateral half of them weaker and subplumose. Cutting organ with DS_1 not reaching tip of VT_0, DS_2 undeveloped; dorsal teeth apparently basally fused forming a large broad-based tooth, apex 4, 5 cuspid; accessory denticles bi- or tricuspid; ventral tooth with VT_1 larger than VT_2, VT_3 absent or very small, VT-4 apically slender, reaching apex of DS_1; VB_1 extending well beyond apex of VT_0, pectination extremely fine; VB_2 hair-like; pectinate brush 8-10 haired. Piliferous process strongly produced, with labula extending beyond apex of anterior part, PPH_5 straight and remarkably long. Mandibular hairs (6-8) + (6-9), 13-16 in total. *Maxilla*. Cardo as in *kobayashii;* seta 1-Mx single or double, weak. Mesostipes peach-shaped, 1.4-1.5 as long as wide, with mesal area not detached, marginal spicules stiff but not spine-like; pseudoartis separated from cranium; stipital sensoria about at middle or proximad of middle, very slender, without basal ring; 4-Mx weak, about on level of 2-Mx. Lacinia with 5-Mx on level of or slightly distad of level of stipital sensoria, 6-Mx longer than 4-Mx, apparently smooth; hairs of maxillar brush long and slender. Palpostipes 0.33 length of mesostipes, rather narrow, without mesobasal fusion with mesostipes; $S_3 > S_1 > S_4 > S_2$ in length, S_5 indistinct. *Mentum plate* broader than long, with 21-25 teeth, median tooth much stronger than flanking teeth; lateral teeth much more widely spaced, more acute than closely spaced mesal teeth. *Thorax*. Seta 7-P usually 3 branched. *Abdomen*. Seta 1-III, IV usually single, 6-I usually 3 branched, 6-II usually double. Comb scales 45-65, individual scales broadly paddle shaped, fringed with subequal spicules. *Siphon* with acus small; index 3.14-4.41; pecten of 23-28 evenly spaced teeth, each with several denticles; seta 1-S located beyond pecten. *Saddle* spiculate, especially dorsocaudally; seta 1-X usually 3 branched; 4-X with 10 cratal tufts, each tuft with 7-11 branches. Dorsal anal gill usually 1.0-1.5 saddle length, about 2.0 length of ventral gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♀: Yakushima (H-0087). RYUKYU ARCHIPELAGO 48♂, 60♀; with associated skins (10 l, 10 p), 67 L, 9 l: Amami Guntô (I-0238, I-0245, I-0246, I-0247, I-0248, I-0249, I-0252, I-0253, I-0254, I-0255, I-0261, I-0263, I-0272, I-0276, I-0277, I-0278, I-0280, I-0281, I-0283, I-0286, I-0287, I-0289, I-0291, I-0299, I-0302, I-0303, I-0304, I-0305, I-0307, I-0309, I-1828, I-1830, I-1831, I-1833, I-1837, I-1858, I-1884, I-1890). 7♂, 26♀; with associated skins (2 l, 2 p), 30 L, 2 l: Okinawa Guntô (J-0413, J-0431, J-0432, J-0463, J-0468, J-0487, J-0498, J-0505, J-0507, J-0510, J-0518, J-0531, J-0533, J-0535, J-0538, J-0806, J-0904).

DISTRIBUTION. PALAEARCTIC JAPAN (Yakushima). RYUKYU ARCHIPELAGO (Amami and Okinawa Guntô).

75B. *AEDES (FINLAYA) AUREOSTRIATUS TAIWANUS* LIEN
(Fig. 224)

Aedes (Finlaya) okinawanus: Bohart, 1959: 196, Ishigaki and Iriomote Is., Ryukyu Archipelago.

Aedes (Finlaya) aureostriatus taiwanus Lien, 1968c: 223 (♂, ♀, P, L).
Type-locality: Mashihshih, Taiwu, Pingtung Hsien, Taiwan; Tanaka, Saugstad and Mizusawa, 1973: 284, Ishigaki and Iriomote Is., Ryukyu Archipelago.

ADULT (Fig. 224). Lower mesepimeral bristles absent; pleural patches of broad white scales slightly more developed, upper and lower-caudal sternopleural patches usually fused together.

LARVA. Branching of setae 7-P and 1-II-IV somewhat different (Table 21).

TABLE 21. Comparison of larval characteristics between *Aedes (Finlaya) aureostriatus taiwanus* and *Ae. (Fin.) a. okinawanus*.

	taiwanus			*okinawanus*					
Locality	Yaeyama			Okinawa			Amami		
Specimens examined	21			31			64		
Seta	Range	x	Mode (%)	Range	x	Mode (%)	Range	x	Mode (%)
7-P	2	-	-	2-4	2.9	3 (87.3)	2-3	2.9	3 (87.4)
1-II	2-3	2.2	2 (78.0)	1-3	1.3	1 (66.7)	1-3	1.9	2 (72.3)
1-III	1-3	2.0	2 (96.7)	1-2	1.1	1 (91.4)	1-2	1.1	1 (89.6)
1-IV	1-2	1.9	2 (94.3)	1-2	1.1	1 (91.4)	1-2	1.1	1 (94.7)

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 19♂, 29♀; with associated skins (3 l, 3 p), 35 L, 3 l: Yaeyama Guntô (K-0126, K-0135, K-0136, K-0151, K-0159, K-0161, K-0182a, K-0183, K-0184, K-0574, K-0580, K-0584, K-0693, K-0720, K-0726, K-0727, K-0732, K-0780, K-0791, K-0793, K-0794, K-0796, K-0918, K-0933, K-1012, K-1049, K-1076, K-1127, K-1234, K-1338, K-1344, K-1348, K-1369, K-1384, K-1392, K-1415, K-1416, K-1588, K-1750, K-2043, K-2057). TAIWAN. Holotype ♂, Allotype ♀, 13 Paratypes: Mashishih (650 m), Taiwu, Pingtung Hsien, 22 XI 1963, tree hole, Lien & Lin; 2♂, 2♀; with associated skins (3 l, 3 p) (Nanao, Ilan Hsien; Fanlu, Chiai Hsien; Hsiulin, Hualien Hsien).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô). TAIWAN.

TAXONOMIC DISCUSSION. *Aedes (Finlaya) aureostriatus aureostriatus* was described from Amboina. We have not seen any typical or topotypical specimens, but examined 5 males, 3 females and 3 larval skins from Philippines. This may be the nominate subspecies. Adults of subspecies *okinawanus* differ from these Philippine specimens in that the scutal golden stripes are markedly narrower and paler, the mesepimeron bears 3-9 bristles on its mid-anterior portion and also often 1,2 additional bristles on its lower posterior part; the pale basal bands of the abdominal terga and the pale articular bands of the hindtarsus are less developed. The male holotype, female allotype, 13 paratypes of subspecies *taiwanus* (Mashishih, 650 m, Taiwu, Pingtung Hsien,

22 XI 1963, tree hole, Lien and Lin, TPMRI) and additional 2 males, 2 females with associated skins (3 larval and 3 pupal) from Taiwan were examined. These as well as specimens from Yaeyama are identical to *okinawanus* in scaling, but they have no mid- and lower-mesepimeral bristles as in specimens from Philippines. The lower mesepimeral bristles rarely exist in species of the subgenus *Finlaya*. It is interesting that the presence of absence of these setae should be found within a species as a subspecific character.

Some differences were noted in the adults among populations. The vertical erect forked scales which are usually yellowish-brown in *okinawanus* from Okinawa and *taiwanus* from Yaeyama; always have dark scales intermixed (the dark ones often more abundant than pale ones) in *okinawanus* from Amami-Ôshima; and the broad pale scales on the posterior pronotal lobe that are always present in the Amami-Ôshima population are often (about 50%) absent in the Okinawa population and usually present in the Yaeyama population.

BIONOMICS. Common in Amami Ôshima and Okinawa Is., less abundant in Yaeyama. Larvae are found usually in tree holes, and occasionally fern and bamboo stumps, rock holes, gravestones, or other artificial containers. Associated species in Yaeyama are *Orthopodomyia anopheloides*, *Culex bicornutus*, *Aedes watasei*, *Ae. riversi*, *Ae. albopictus*, *Ae. flavopictus* and *Tripteroides bambusa*. Adult females are day biters. This species is apparantly either not particularly attracted to light or associated with urban habitats; as a 3-year study (1970-2) found *Ae. aureostriatus* (or *a. okinawanus*) to comprise less than 1.8% of *Aedes* collected at U. S. air bases on Okinawa (Biery and Burns 1973c), and absent on Taiwan (Biery 1973).

76. *AEDES (FINLAYA) KOREICOIDES* SASA, KANO AND HAYASHI
(Figs. 106, 107, 225; Table 108)

Aedes koreicoides Sasa, Kano and Hayashi, 1950: 627 (♂, ♀). Type-locality: Jozankei, Hokkaido, Japan.

FEMALE (Fig. 225). Wing length 3.5-3.8 mm. *Head.* Eyes very narrowly separated above and below. Vertex with paired anterosubmedian patches of narrow curved, dark scales and median line of rather narrow white scales, covered posteriorly with rather narrow or crescent-shaped pale scales and laterally with broad pale scales; eye margin and interocular space with curved pale scales; tempus covered with broad pale scales, with a variable patch of broad dark scales above; many long erect forked scales over vertex, median ones pale yellowish brown, lateral ones dark; usually 5 vertical bristles on each side, mesal one or 2 yellowish brown, others dark; usually 5 dark temporal bristles on each side. Clypeus dark brown. Antenna: pedicel yellowish brown, infuscate on mesal half, with a mesoapical clump of small dark scales; flagellum nearly length of proboscis; flagellomere 1 with several dark laterobasal scales. Palpus 0.20-0.25 length of proboscis, dark scaled. Proboscis slightly longer than forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe with a patch of broad silvery white scales, bearing yellow to brown bristles; posterior lobe covered with crescent-shaped, pale yellow scales except for lower area, posteroventrally with broader white scales, bearing 4-6 yellowish brown bristles. Scutum with integument dark brown, covered with narrow curved dark scales, with following narrow stripes of narrow curved, pale yellow scales: median stripe reaching prescutellar space,

rather incomplete anterior dorsocentral stripes just mesad of series of anterior dorsocentral bristles, posterior dorsocentral stripes just laterad of series of posterior dorsocentral bristles, extending anterolaterally along scutal suture, and a horseshoe-shaped stripe on margins of prescutellar space; margins also with narrow curved or crescent shaped pale yellow scales; all scutal bristles present, long, brown, some supraalars yellowish; fossal area usually with 2,3 bristles along humeral margin, 2,3 on level of scutal angle and one or 2 near posterior margin. Scutellum with integument brown, lateral lobes with narrow curved dark scales, median lobe with narrow curved pale medial scales and dark lateral ones; each lateral lobe with 6-8 long, mostly brown bristles, median lobe with 5-7 such bristles; each with a few additional fine hair-like bristles. Paratergite with broad silvery white scales. Pleural integument dark brown; patches of broad silvery white scales on propleuron, subspiracular area, lower prealar knob, upper sternopleuron, lower-posterior sternopleuron and mesepimeron; postspiracular area usually with only a few pale scales, occasionally forming a patch, the patch always smaller than subspiracular patch; pleural bristles yellowish brown, more than 10 propleurals and sternopleurals, 5-8 postspiraculars, 8 to more than 10 prealars, 7-9 upper mesepimerals, no lower mesepimerals. *Wing*. Alula fringed with rather broad dark scales. Cell R_2 2.0-2.2 length of vein r_{2+3}. Halter with knob mainly gray, partly dark scaled. *Legs*. Coxae light brown; forecoxa scaled on anterior surface, basally and mesoapically pale, dark otherwise; mid- and hindcoxae each with a patch of white scales. Fore- and midfemora with pale basal band and pale posteroapical fringe, pale scaled posteroventrally toward base; hindfemur with pale apical fringe, pale scaled in basal half except dorsal surface. Tibiae with pale basal spots on both anterior and posterior surfaces. Foretarsomeres 1 and 2 with usually incomplete pale basal bands; mid- and hindtarsomeres 1-4 with pale basal bands, that of 4 usually ventrally interrupted but extending dorsally to about middle of the segment, that of midtarsomere 4 occasionally reduced. Femora, tibiae and tarsi otherwise dark scaled. Hindtarsomere 1 0.75 length of tibia. Hindtarsal claw simple (after Sakakibara and Omori 1962). *Abdomen*. Tergum I with median patch of dark scales; II-VII dark scaled, with laterobasal patches of white scales, the patches progressively larger on posterior segments; occasionally dorsobasal spots or bands of white scales present. Sternum II pale scaled, III-VII basally pale scaled, apically dark scaled.

MALE (Figs. 106, 225). Wing length 2.8-3.3 mm. Vertical dark patches smaller. Antennal flagellum 0.8 (1) length of proboscis; flagellomere 12 1.14 (1) of Flm 13; both together 0.87 of Flm 1-11. Palpus 0.92 (1) length of proboscis; segments 4 and 5 with short bristles; length ratio of 2-5: 3.1 : 3.6-3.7 : 1.4-1.5 : 1.0. Proboscis 1.16 (1) length of forefemur. Scutal pale stripes broader and more distinct; postspiracular scales occasionally lacking. Cell R_2 2.18-2.59 (4) length of vein r_{2+3}. Tarsomeral pale bands less developed, those on foretarsomere 2 and midtarsomere 4 lacking or rudimentary. Foretarsomere 4 greatly shortened, 5 modified, with several rather stout ventrobasal setae; midtarsomere 4 slightly shortened, 5 weakly modified; hindtarsomere 1 0.76-0.81 (4) length of tibia. Anterior claw of fore- and midtarsi with a blunt tipped median and a sharp laterobasal tooth; hindtarsal claw simple. Abdominal terga III-VI often with dorsobasal bands or spots of white scales, the bands occasionally connected with laterobasal patches. *Genitalia*. Tergum IX with lobes well sclerotized, each with 2-6 rather slender setae. Sternum IX trapezoidal, with 2-4 bristles. Basistyle cylindrical, 4.2 as long as narrowest width, tergally covered with short bristles in middle, long lateral

and apical bristles, and medium-sized mesosternal bristles, laterally and sternally heavily scaled; sternomesal side of apex with tufted bristles; basal tergomesal lobe conspicuous, mesally then tergally protrudent, with wide base, apically narrowed, a double row of long curved setae on mesal side of apical part, many short bristles covering other parts. Claspette stem strongly curved, short, just extending beyond basal tergomesal lobe, pilose, with several small setae; filament long, widest about apical 0.33, slightly narrowed toward base, with pointed apex, basally directed and lying upon basal tergomesal lobe. Dististyle slender, arcuate, 0.6 length of basistyle, with 2 small setae near apex; claw slender, straight, 0.4 length of dististyle. Cercal setae 3, 4 on each side; paraproct with apex unicuspid. Aedeagus cylindrical, slightly less than twice as long as wide, slightly constricted at middle, tergally closed, sternally open, notched at apex and with a circular orifice tergally at base.

LARVA (Fig. 107). (Described from 4 mounted skins). *Head.* Apex of labrum nearly straight; seta 1-C pale, slender, longer than distance between bases; 4-C of medium size, a little posteromesad of 6-C, barbed as strongly as 5, 6-C; 5-C caudad of 4-C and slightly mesad of 6-C; 6-C anteriad of 7-C, stouter than 5-C; 7-C occasionally with secondary branches; 11-C as well developed as 4-C; 13-C occasionally barbed. *Antenna* 0.56-0.66 mm long, nearly as long as distance between bases of seta 7-C, curved, dark brown, basally pale, finely spiculate, more sparsely towards apex; 1-A inserted at basal 0.4 to middle, with 5-7 barbed branches (3-7, Sakakibara and Omori 1962), reaching apex of shaft, occasionally slightly shorter; 2-A 0.20-0.25 length of shaft; 3-A 0.33-0.50 length of 2-A; 5-A with proximal division thick and pigmented, distal division translucent. *Mandible* with a number of slender microspines. Cutting organ with DS_1 strong, reaching only slightly before apex of VT_0; DS_2 short; lateral dorsal tooth bicuspid; mesal dorsal tooth apically strongly bifurcate, with 2, 3 denticles on internal side of the furcation; at least one acute accessory denticle; ventral tooth with VT_{1-3} acutely triangular, $VT_2 > VT_1 > VT_3$; VT-4 apically slender; VB_1 extending far beyond apex of VT_0; pectinate brush 7-8 haired. Piliferous process strongly protrudent, with labula usually not extending beyond apex of anterior part; PPH_5 a remarkable long straight row of 22, 23 evenly spaced hairs. *Maxilla.* Cardo as in *japonicus*, but sclerotized strip slightly less strong; seta 1-Mx short, single, rather stiff. Mesostipes longer than wide, with mesal area not detached; pseudoartis separated from cranium; stipital sensoria at or slightly proximad of middle, moderately slender; 4-Mx short, weak. Lacinia with 5-Mx at about level of stipital sensoria, 6-Mx longer than 4-Mx, apparently thick; hairs of maxillary brush long and slender. Palpostipes 0.4 length of mesostipes, rather narrow, without mesobasal fusion with mesostipes; $S_3 > S_1 > S_2 \geq S_4 > S_5$ in length. *Mentum plate* with 21-23 teeth, median tooth much larger than submedian teeth, most lateral teeth widely spaced. *Thorax.* Seta 2-P subequal to 1-P in length, longer than 3-P; 8, 14-P occasionally barbed; 10-P shorter than or equal to 12-P. *Abdomen.* Setae 1-I, II stronger than 2-I, II; 7-II less than 0.5 length of 6-II; 1-IV, V and 13-III-V rather strong; 13-III and 1-IV occasionally barbed. Comb scales 6-11 (up to 17, Sakakibara and Omori 1962) in an irregular row, individual scales thorn-shaped with a single strong apical spine, laterobasally fringed with fine spicules. *Siphon* dark brown, with acus attached; length 0.76-1.01 mm; index 2.9-3.3 (after Sakakibara and Omori 1962); microsculpture consisting of broken transverse ridges, each ridge bearing several extremely small denticles; pecten reaching basal 0.36-0.44 of siphon, siphon, of 15-19 dark brown, evenly spaced teeth including 1-6 basal abortive ones, each tooth with several ventrobasal denticles; seta 1-S inserted beyond

ventrobasal denticles; seta 1-S inserted beyond pecten at basal 0.41-0.49, 0.4 length of siphon, longer than siphon diameter; 2-S nearly as long as apical pecten tooth. *Saddle* 0.28-0.40 mm long, covering dorsal 0.67 of the segment, with microsculpture similar to that of siphon, apically spiculate; seta 1-X subequal to saddle in length; 2-X 0.6 length of 3-X; 4-X of 7-9 cratal and 1, 2 precratal tufts (9-10 tufts in total), cratal tufts 3-5 branched, precratal 2-4 branched.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♀: Hokkaido (Utoro, 27 VIII 1963, net, Kamimura, KKCOL). 5♂, 2♀; with associated skins (4 l, 4 p): Honshu (2♀: Mt. Ohdaigahara, Nara Pref., 22 VII 1965, tree hole, Sakakibara, KKCOL. B-0346, B-0364, D-0091, D-0748).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Yakushima).

BIONOMICS. Rare species. Larvae occur in tree holes. Ono (1969) reported that *koreicoides* usually hibernates as an adult.

77. *AEDES (FINLAYA) NIPPONICUS* LACASSE AND YAMAGUTI (Figs. 108, 109, 226: Table 109)

Aedes (Finlaya) niveus: Edwards, 1921b: 318 (in part); Tokio, Japan.
Aedes albolateralis: Yamada, 1927: 576 (in part); Korea.
Aedes (Finlaya) niveus nipponicus LaCasse and Yamaguti, 1948: 79 (♂, ♀, L). Type-locality: Maizuru, Yodo and Wakayama, Honshu; Fukuoka, Nagasaki and Kagoshima, Kyushu, Japan.
Aedes (Finlaya) nipponicus: LaCasse and Yamaguti, 1950: 146 (♂, ♀, L).
Aedes (Finlaya) nippononiveus Sasa and Nakahashi, 1952: 258 (♂, ♀, L). Type-locality: Ōimachi, Tokyo, Japan; Nakata 1962: 51-4 (= *nipponicus* = *niveus*).

Descriptions based on Japanese specimens.

FEMALE (Fig. 226). Wing length 2.8-4.1 mm. *Head.* Eyes narrowly separated above. Vertex covered with broad scales, the scales usually (27/33) dark except on eye margin, occasionally (4/33) majority of the scales pale (often somewhat grayish or brownish), rarely (1/33) entirely pale; eye margin and tempus covered with broad pale scales, this pale border on eye margin expanding a little posteriorly at middle and also anteriorly onto interocular space; numerous erect forked, yellowish brown scales on posterior margin of vertex, occasionally a few dark brown ones intermixed, several erect forked scales anteriorly on each side; 6-9 vertical and 3 temporal bristles on each side, one additional bristle far ventrad. Antenna: pedicel very dark brown, mesally with a number of short dark hairs; flagellum 0.85-0.88 (9) length of proboscis; flagellomere 1 1.30-1.45 length of Flm 2, with a few dark scales. Palpus 0.19-0.22 length of proboscis, dark scaled; segment 3 1.80-2.25 length of 2; 4 at most 0.14 length of 3, occasionally lacking. Proboscis 1.11-1.21 length of forefemur. *Thorax.* Pronotal integument very dark brown; anterior lobe with broad white scales, bearing mostly brownish bristles; posterior lobe posteriorly with white subtranslucent broad scales, and dark crescent-shaped and/or broad scales posteriorly near dorsal margin, bearing 3-7 ($\bar{x}$ = 4.9) brown to blackish brown bristles. Scutum with integument blackish brown, with a pair of large anterolateral patches of narrow curved or crescent-shaped white scales; the patches continuous with each other on anterior promontory (only very narrowly interrupted by a pair of unscaled anterior

extremities of dorsocentral lines), posterolaterally reaching wing base; prescutellar space always with a pair of lines of narrow curved pale scales along lateral margin of bare space, and very often (19/30) with additional short sublateral lines of pale scales, occasionally most of scales before scutellum pale; scutum otherwise covered with narrow curved or crescent-shaped dark scales; scutal bristles dark brown, acrostichal bristles absent except for a few anterior ones, anterior dorsocentrals restricted to anterior margin, a few most anterior bristles of posterior dorsocentral series apparently lacking, 1-3 humerals anteriorly along the margin, no other bristles on fossal area, prescutellars and supraalars developed. Scutellum covered with broad dark and/or pale scales; most frequently (19/30) dark scales more abundant than pale ones, sometimes (6/30) *vice versa*, occasionally all scales dark or pale; median lobe with 5-8, each lateral lobe with 3-8 long brassy brown bristles together with several additional short ones. Paratergite unscaled. Pleura dark brown, large patches of broad white scales on propleuron, upper sternopleuron (reaching cephalic angle), lower-posterior sternopleuron, lower prealar knob, and mesepimeron, patches on sternopleuron usually narrowly separated; 5 to more than 10 yellowish brown propleural bristles; 2-6 dark or light brown postspiraculars, usually more than 10 prealars and sternopleurals, 4 to more than 10 pale yellow upper mesepimerals, no lower mesepimerals, markedly long bristle on midposterior sternopleuron slightly above level of ventral margin of mesepimeron. *Wing*. Alula fringed with dark rather narrow scales. Cell R_2 1.78-2.86 (22) length of vein r_{2+3}. Halter knob basally dark scaled, apically pale scaled. *Legs*. Coxae with anterolateral patch of white scales; fore- and midcoxae with anteroapical dark scales. Forefemur with a streak of pale scales on the narrow basal anterior surface, pale scaled on ventral surface from base to near apex, this pale area apically narrowed, expanding onto the narrow posterior surface in basal half; midfemur pale scaled on basal 0.67 of posterior surface, this pale area expanding onto dorsal surface at base, apically narrowed, extending to apex in a narrow streak on ventral surface; hindfemur pale scaled in basal 0.67-0.75, this pale area slightly shorter on posterior surface; femora otherwise, tibiae and tarsi dark scaled. Foretarsomere 5 equal to or slightly longer than 4; hindtarsomere 1 0.67-0.76 (15) length of tibia. Hindtarsal claw simple. *Abdomen*. Tergum I with a median patch of dark scales; II-VIII dark scaled, with distinct laterobasal patches of white scales, these patches on V-VIII extending dorsally toward middle and usually forming a basal or subbasal band, that on V often incomplete (21/30) or lacking (2/30), that of VI rarely (2/30) incomplete, occasionally (5/30) IV with an incomplete band. Sternum II mainly pale scaled, III-VII basally pale scaled and apically dark scaled, pale basal areas progressively narrower in posterior segments; VIII apically unscaled. *Genitalia*. Only one seminal capsule developed.

MALE (Figs. 109, 226). Wing length 2.3-3.5 mm. Vertical and scutal pale scaling more developed than in female, vertex often entirely pale, scutal pale patches usually broadly fused anteriorly forming a single large pale area, but posterior margin of this pale area always deeply concave. Antenna: pedicel with only 1 or 2 hairs; flagellum 0.70-0.79 (3) length of proboscis; flagellomere 12 1.10-1.22 (4) length of Flm 13, both together 0.78-0.88 (4) of Flm 1-11. Palpus 0.92-0.94 (3) length of proboscis, segment 4 and apex of segment 3 with long bristles; length ratio of 2-5: 2.57-2.88 : 2.86-3.68 : 1.14-1.28 : 1.00 (4). Proboscis 1.29-1.32 (3) length of forefemur. Cell R_2 1.48-1.90 (12) length of vein r_{2+3}. Foretarsomere 4 greatly shortened, 5 modified, with several stout ventrobasal setae; midtarsomere 4 only a little shortened, 5

poorly modified; hindtarsomere1 0.69-0.80 (12) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped submedian and a sharp laterobasal tooth; hindtarsal claw simple. *Genitalia.* Tergum IX sclerotized in middle; lobes rather small, well sclerotized, moderately protrudent and rather narrowly separated; each with 2-7 (most often 3, 4) dark stout setae. Sternum IX trapezoidal, with 2 (rarely 3) bristles. Basistyle subparallel-sided in basal half, slightly narrowed from middle to apex in tergal view, 3.2-4.5 as long as wide, with mesal membrane complete, scaled except for extreme base and tergal mesal surface, with a group of outstanding large and small broad scales and some long striated bristles on sternomesal surface in apical half, bristled except for extreme base and a narrow longitudinal sublateral area on each tergal and sternal surface; basal tergomesal area densely bristled; long bristles of tergobasal area usually simple, occasionally one to a few bristles slightly broadened and striated; basal tergomesal lobe (sclerotized ridge of Knight 1946) of a poorly protrudent narrow sclerotized area, with about 10 or more short simple bristles, occasionally apical 2 bristles isolated; claspette stem slender, tergally curved pilose in basal half, with one short seta near base and 2 about at middle; filament nearly length of stem, with apex very acute, slightly expanded medially on convex side, this expanded portion transparent and apparently thin. Dististyle slender, 0.34-0.39 length of basistyle, slightly curved near apex, pilose on concave side in basal 0.67, with 2 short setae near apex, one each on convex and concave side; claw pigmented, long and slender, 0.59-0.64 (8) length of dististyle, apex shallowly bifurcate. Cercal tergal surface membranous; 2, 3 (rarely 1) cercal setae on each side; paraproct with apex unicuspid, rarely unequally bicuspid. Aedeagus cylindrical, slightly constricted distad of middle in tergal view, 1.81-2.07 (8) as long as wide excluding short mediobasal process; tergal aspect with a round large basal orifice, apical semicircular emargination and fringed with a number of slender teeth on each side of apical tergal margin; sternal aspect narrowly open from base to apical 0.25, then apically broadly open; mesal edges of sternal wall thickened, occasionally touching or overlapping in middle.

LARVA (Fig. 108). *Head.* Width 0.73-0.91 mm; brownish, 1.07-1.17 as wide as long; front margin of labrum nearly straight; no microsculpture discernible at 400X; seta 1-C strongly curved mesoventrad, 1.19-1.37 (x = 1.26) as long as distance between bases in 9 specimens from Honshu, 0.91-1.17 (x = 1.01) in 3 specimens from Korea; occasionally rudimentary 2-C present; 4-C well developed, mesad of and between 5, 6-C; 6-C well cephalad and slightly laterad of 5-C, a little cephalad of 7-C; 8-C usually double; 14-C rather stiff; 15-C rather long. *Antenna* 0.35-0.48 mm long, slightly bowed, brown, slightly paler at base and apex, spiculate, the spicules very fine, almost hair-like at extreme base, becoming progressively stouter distad; seta 1-A 6-13 branched, well barbed, exceeding apex, inserted at basal 0.44-0.55 (x = 0.47) of shaft; 2, 3-A subapical, 4-6-A apical, 3-A at least 0.67 length of 2-A. *Mandible* with 13-20 needle-like microspines of various sizes; mandibular comb of 25-28 long teeth. Cutting organ with DS_1 extending to or just beyond apex of VT_0; dorsal teeth bicuspid; accessory denticle a strongly sclerotized, rather large process bearing many denticles on apex; ventral tooth with VT_1 larger than VT_2, VT_3 absent; VT-4 acute, not reaching apex of VT_0; VB_1 slightly exceeding apex of VT_0, apically attenuated, finely pectinate on mesal margin, VB_2 much smaller and paler; pectinate brush of 7-10 hairs, distal hairs longer than VB_1. Piliferous process with labula not exceeding anterior portion; PPH_5 a long slightly arcuate row of 13-24 (usually 14-17) hairs. Mandibular hairs (4-7) + (5-9), 10-14 in total. *Maxilla.* Cardo rather broadly

fused with cranium mesobasally; seta 1-Mx 1-4 branched, rather stiff, well pigmented, sometimes longer than palpostipes, especially when single. Mesostipes 1.5 as long as wide, with mesal area not detached, but with a slight notch on mesal margin distad of middle, marginal spicules stiff, but not spine-like; pseudoartis not fused with cranium; stipital sensoria moderately slender, inserted at about middle, lacking basal ring, proximal sensorium slightly larger than the other; 4-Mx subapical, fairly strong, pigmented, rarely double. Lacinia with 5-Mx about at level of or slightly distad of stipital sensoria; 6-Mx very broad, with many long barbs, almost brush-like, shorter than 4-Mx; hairs of maxillary brush moderately long. Palpostipes 0.25-0.33 length of mesostipes, basally broadened, without mesobasal fusion with mesostipes; apex bearing 5 palpal sensoria, $S_3 > S_1 > S_2 \geq S_4 > S_5$ in length. *Mentum plate* high crowned, with 19-24 teeth; median tooth 2.0-3.0 as broad as immediate flanking teeth; a few laterobasal teeth much more widely spaced. *Thorax.* Setae 6-P and 2-M, T usually single; 4, 14-P usually double; 5-T rather stiff; 14-M usually unbarbed or lightly barbed, but sometimes strongly barbed; many of the more slender setae, such as 4, 9, 10, 12-P, and 3, 13-T with markedly variable barbing, the more usual case being the presence of a few relatively long but inconspicuous barbs. *Abdomen.* Integument lightly spiculate ventrally in a somewhat imbricate pattern, especially noticeable on posterior segments and laterally on VII and VIII; 2-I, II and 9-II-VI rather stiff; 12-I, 9, 11-II, 2, 11, 12-III, 11, 12-IV, 2, 11-V, 11, 14-VI and 2-VII usually single; 6-VI usually double; 11-I stronger than 13-I; many setae, including 1-V, VII, 2, 4-I, 5, 6, 9-VII, and 13-I-VII with barbing usually present, sometimes absent; others, such as 1-I, III, IV, VI, 2, 8-II, 4-V, 5-IV, VI, 7-III, VI, VII and 12-VII usually not barbed, but sometimes with a few barbs. Comb scales 8-12 (usually 10) in a single slightly curved row, individual scales thorn-shaped, with a strong apical spine and basally progressively smaller laterobasal spicules. *Siphon* dark brownish, slightly inflated near middle, with acus free; length 0.67-0.92 mm, index 2.83-3.51 (x = 3.24); microsculpture of well separated, nearly straight transverse short ridges, more distinct basally, apically absent; pecten attaining basal 0.35-0.44 (x = 0.40), of 12-21 (x = 16.0) evenly spaced teeth, including 0-4 reduced basal ones, each usually with one strong ventral denticle and several smaller ventrobasal denticles, occasionally with several extremely fine dorsobasal denticles or spicules; seta 1-S inserted just beyond pecten at basal 0.43-0.49 (x = 0.47), longer than siphon diameter; 2-S slender, subapical, about 0.8 length of apical pecten tooth. *Saddle* covering dorsal 0.50-0.75 of X, 0.27-0.36 mm long; ventral margin somewhat erose; microsculpture similar to that of siphon; apex with a number of subdorsal spines of various sizes, the largest spine shorter than apical pecten tooth; 1-X 0.7-1.2 saddle length; 4-X of 7, 8 (usually 8), 2-5 branched tufts; grid incomplete, more frequently consisting of transverse bars only, often basal 1, 2 tufts without bar. Anal gills somewhat fusiform, the dorsal gill longer, 1.4-1.7 saddle length, the ventral gill sometimes almost cordate, 0.5-0.6 length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 3♀; with associated skins (1 l, 1 p), 1 L: Hokkaido (A-0041, A-0042). 17♂, 49♀; with associated skins (12 l, 12 p), 5 L, 10 l: Honshu (B-0067, B-0342, B-0343, B-0344, B-0345, B-0350, B-0358, C-0744, C-1908, C-2104, C-2175, C-2176, C-2279, D-0051, D-0089). 2♂, 3♀; with associated skins (2 l, 2 p): Izu Shichito (C-1524, C-1531, C-1533). 2♂, 1♀; with associated skins (1 l, 1 p): Kyushu (H-0080). KOREA. 16♂, 35♀; with associated skins (1 l, 1 p), 19 L, 2 l: Korean Peninsula (L-0550, L-0551, L-0552, L-0553, L-0556, L-0821, L-0822,

L-0825, L-0828, L-0865, L-0872, L-0874, L-2025).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Izu Shichitô, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula). SOUTH PRYMORYE.

TAXONOMIC DISCUSSION. The adults of the Korean population of this species differ in some respects from the Japanese population. The scutal pale patches in the female are usually (18/20) more broadly fused anteriorly forming a single large pale area, occasionally the posterior margin of this pale area at middle reaches the level of the scutal angle. These pale patches or the pale area appear fairly constant in both Japanese and Korean populations. In the male, this pale area is more developed than in the female, its posterior margin at middle is usually behind the level of the scutal angle, thus the margin is only shallowly concave. The prescutellar space in the female usually has only a pair of white lines, only occasionally (4/20) are there indistinct sublateral lines. The male palpus is 0.91-1.00 (5) as long as the proboscis, and the aedeagus is 1.93-2.27 (6) as long as wide. More material of the Korean population should be studied in order to determine if it is a valid subspecies. Larvae of the Korean population appear nearly identical with those of Japan. However, a few robust specimens, distinguished primarily in having setae 14-M and 13-T well developed and strongly barbed, and several other setae more strongly barbed than usual, were found in the Korean population, but not in the Japanese population. The 3 robust and 9 typical Korean specimens are compared in Table 22.

TABLE 22. Comparison of two Korean larval forms of *Aedes (Finlaya) nipponicus*.

Seta	Robust form (3 specimens)	Typical form (9 specimens)
1-M	5-9 (x = 7.33), moderately to strongly barbed	3-7 (x = 4.67), smooth to weakly barbed
14-M	Strongly barbed, larger than 13-M	Usually smooth to weakly barbed, smaller than 13-M
1-T	Moderately barbed	Unbarbed
13-T	Strongly barbed	Barbing variable
1-I	Moderately to strongly barbed	Usually smooth or weakly barbed
7-I	83% single	24% single
11-I	6-9 (x = 7.67)	4-7 (x = 5.44)
13-V	4-7 (x = 5.20), strongly barbed	3-5 (x = 3.86), barbing variable
Dorsal anal gill length ÷ saddle	1.1-1.2	1.4-1.8

BIONOMICS. Not very common throughout Japan. Larvae are found usually in tree holes, occasionally in bamboo stumps, rock holes or small artificial containers. Females are day biters.

78. *AEDES (FINLAYA) NISHIKAWAI* NEW SPECIES
(Figs. 109, 110, 227; Table 110)

Aedes (Finlaya) nipponicus: Kamimura, 1968: 18, 19; Amami Ôshima and Tokunoshima, Ryukyu Archipelago

FEMALE (Fig. 227). Wing length 2.6-3.2 mm. *Head.* Eyes very narrowly separated above. Vertex covered with broad dark scales except on eye margin, occasionally paler grayish brown scales laterally mixed; eye margin and tempus covered with broad pale scales, this pale border on eye margin expanding a little posteriorly at middle and also anteriorly onto interocular space; numerous erect forked blackish scales on posterior margin of vertex, a few brownish ones sometimes intermixed, a few erect forked scales anteriorly on each side; 6-8 vertical and 4 temporal bristles on each side, an additional one ventrad. Clypeus dark brown. Antenna: pedicel dark brown, with a number of short dark mesal hairs; flagellum 0.76-0.78 (4) length of proboscis; flagellomere 1 1.28-1.44 (4) length of Flm 2, with dark scales on mesal side. Palpus 0.18-0.19 (3) length of proboscis, dark scaled; segment 3 1.63-1.95 (5) of 2; 4 at most 0.15 length of 3, occasionally lacking. Proboscis 1.09-1.16 (4) length of forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe with broad white scales and dark bristles; posterior lobe with broad or rather dark scales on dorsal margin and a few broad pale posteroventral scales, bearing 7-12 dark bristles. Scutum with integument blackish brown, with a pair of anterolateral patches of narrow curved or crescent-shaped white scales, the patches not extending mesally beyond supposed dorsocentral line, nor posteriorly beyond scutal angle on lateral margin, only slightly sublaterally produced posteriorly beyond scutal suture; scutum otherwise covered with narrow curved or crescent-shaped dark scales; scutal bristles blackish, acrostichals absent except for a few anterior ones, anterior dorsocentrals restricted to anterior margin, a few most anterior bristles of posterior dorsocentral series apparently lacking; 2-5 humerals anteriorly along the margin, no other bristles on fossal area, prescutellars and supraalars developed. Scutellar median lobe covered with broad white scales; lateral lobe with broad pale and dark scales in variable ratios, most frequently (5/12) entirely pale; median lobe with 4-6 and each lateral lobe with 3-6 long dark bristles together with some additional short ones. Paratergite unscaled. Pleural integument brown to dark brown, large patches of broad white scales on propleuron, upper sternopleuron (almost reaching cephalic angle), lower sternopleuron, lower prealar knob, and mesepimeron; 7 to more than 10 brown and dark propleural bristles, 4-12 usually dark propleural bristles, 4-12 usually dark postspiraculars, about 10 or more prealars and sternopleurals, 6 to more than 10 upper mesepimerals, no lower mesepimerals, a markedly long bristle on midposterior sternopleuron a little above level of lower margin of mesepimeron. *Wing.* Alula fringed with rather narrow dark scales. Cell R_2 1.73-2.50 length of vein r_{2+3}. Halter knob dark scaled, occasionally apical scales appearing pale. *Legs.* Coxae with anterolateral patch of white scales. Forefemur with a rather ill-defined broad streak of pale scales on ventral surface, narrow anterior surface entirely dark scaled or with an indication of a pale streak; midfemur ventrally pale scaled in basal 0.6 of posterior surface, this pale area basally broadened, but usually not expanding onto dorsal surface; hindfemur pale scaled in basal 0.67-0.75 on anterior surface, 0.60-0.67 on posterior surface, this pale area always shorter on posterior surface; femora otherwise, tibiae and tarsi dark scaled. Fore-

tarsomere 5 as long as or slightly longer than 4; hindtarsomere 1 0.68-0.75 length of tibia. Hindtarsal claw simple. *Abdomen.* Tergum I with median patch of dark scales, with several sublateral pale scales; II-VII dark scaled, with distinct laterobasal patches of white scales, these patches on V-VII dorsally extending to form basal or subbasal bands, which are usually incomplete and occasionally (2/12) reduced on V, incomplete (9/12) or complete (3/12) on VI, and usually complete on VII; VIII entirely dark scaled. Sternum II pale scaled; III-VII dark scaled, with basal bands of pale scales; VIII apically unscaled. *Genitalia.* Only a single seminal capsule developed.

MALE (Figs. 109, 227). Wing length 2.3-2.5 mm (2). Scaling apparently similar to that of female. Antenna: pedicel with only a few hairs; flagellum 0.71 (1) length of proboscis; flagellomere 12 1.18-1.19 (2) length of Flm 13, both together 0.84-0.96 (2) of Flm 1-11. Palpus 0.76-0.77 (2) length of proboscis, apices of segments 4 and 5 with a few long bristles; length ratio of 2-5: 2.64-2.81 : 3.43-3.62 : 1.43-1.48 : 1.00 (2). Proboscis 1.30-1.37 (2) length of forefemur. Cell R_2 1.41-1.85 (3) length of vein r_{2+3}. Foretarsomere 4 greatly shortened; 5 modified, with several stout ventrobasal setae; midtarsomere 4 slightly shortened, 5 poorly modified; hindtarsomere 1 0.70-0.76 (4) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped submedian and a sharp laterobasal tooth; hindtarsal claw simple. *Genitalia.* Tergum IX sclerotized in middle; lobes rather small, well sclerotized, moderately protrudent, rather narrowly separated; each with 2-4 pigmented stout setae. Sternum IX trapezoidal, with 2-4 bristles. Basistyle subcylindrical, slightly apically narrowed, 3.5-4.5 as long as wide, with mesal membrane complete, scaled except extreme base and tergal mesal surface, with a group of outstanding large and small broad scales and some long striated bristles on sternomesal surface in apical half, occasionally with long lanceolate scales intermixed, bristled except for extreme base and a narrow longitudinal sublateral area on each tergal and sternal surface; basal tergomesal area densely bristled; long bristles on tergobasal area usually simple, occasionally one or 2 bristles appearing striated but not broadened; basal tergomesal lobe (sclerotized ridge of Knight 1946) of a poorly protrudent narrow sclerotized area, with 5-8 short simple bristles in an ill-defined double row; claspette stem slender, tergally curved, pilose from base to near apex, with one short seta near base and 2 about at middle; filament slender, about length of stem, falciform, only slightly broadened in middle, without flattened expansion, appearing pale on convex margin in middle in lateral view, with weak striation, apex pointed. Dististyle slender, 0.36-0.39 (3) length of basistyle, slightly curved near apex, pilose on concave side in basal 0.67, with 2 short setae near apex, one each on convex and concave side; claw pigmented, long and slender, 0.54-0.65 (2) length of dististyle, apex shallowly bifurcate. Cercal tergal surface not sclerotized; 1,2 cercal setae on each side; paraproct with apex unicuspid. Aedeagus cylindrical, slightly constricted distad of middle in tergal view, 1.93-1.97 (2) as long as wide excluding short mediobasal process; tergal aspect with a large round basal orifice, apical semicircular emargination and fringed with a number of slender teeth on each side of apical tergal margin; sternal aspect narrowly open from base to apical 0.25, then broadly open apically; mesal edge of sternal wall thickened.

LARVA (Fig. 110). *Head.* Width 0.80-0.86 mm; brown, 1.14-1.18 as wide as long; front margin of labrum straight; seta 1-C slender, curved, 1.1-1.5 as long as distance between bases; 2-C rudimentary or absent; 4, 6-C anteriad of 7-C; 4-C well developed; 5-C about on level of 7-C; 6-C a little laterad of 5-C; 11-C well developed; 13-C usually single; 14-C rather stiff; 15-C rather

well developed, usually double. *Antenna* 0.38-0.44 mm long, brown, somewhat paler at apex and base, curved inward, spiculate, the spicules fine and almost hair-like at extreme base; seta 1-A with 9-15 barbed branches, inserted at basal 0.44-0.52, extending beyond apex of shaft; 2,3-A subapical, subequal, a little longer than 4-A; 5-A with an accessory sensorium on its basal division. *Mandible* (described from mounted larvae and larval skins) with a number of microspines. Cutting organ with DS_1 fairly long, scarcely reaching apex of VT_0; accessory denticle a strongly sclerotized mesal process bearing many denticles on its anterior surface; ventral tooth with VT_1 distinctly larger than VT_2, VT_3 absent; VT-4 fairly long and acute, not reaching apex of VT_0; PPH_5 well developed as a conspicuous row of about 20 tubercle-based hairs. *Maxilla* (described from mounted larvae and larval skins). Cardo rather broadly fused with cranium, seta 1-Mx rather stiff, 2-6 (usually 2 or 3) branched; mesostipes fairly long, pseudoartis not fused with cranium; 4-Mx long and stout; 6-Mx with strong lateral branches; palpostipes short, with S_3 longest. *Mentum plate* high crowned, with 18-21 teeth, the median tooth 2.0-3.0 as broad as immediate flanking teeth, laterobasal teeth widely spaced. *Thorax*. Setae 3,8-P substellate; 5,14-P usually double; 11-M,T moderately developed; 5-T rather stiff. *Abdomen*. Integument mostly smooth; segment VIII laterally and a few posterior segments ventrally with extremely fine spicules; seta 11-I mesad of 12-I and stronger than 13-I; 2-I,II and 9-II-VI rather stiff; 5-II-VII usually stronger than respective setae 3; 13-II,VI not dendritic; 12-I, 9,12-II, 9,11-III 2,9, 12-IV, 8,9,11,14-V, 11-VI, 2,10-VII usually single; 8-II and 6-V,VI usually double; 5-V,VI usually triple. Comb scales 10-14 (x = 11.2) in a single row; individual scales thorn-shaped, with a strong apical spine laterobasally fringed with fine spicules. *Siphon* dark brown, with acus free, broadest at about middle, distinctly apically narrowed in apical 0.33, 2.63-3.36 as long as wide, apex 0.53-0.59 width of widest part, base only slightly narrower than the widest part; length 0.68-0.83 mm, index 2.83-3.83 (3); microsculpture of short weak transverse ridges, becoming apically indistinct; pecten reaching basal 0.40-0.54 (x = 0.45), slightly curved dorsad at apex, of 12-23 (x = 16.7) evenly spaced, very dark brown teeth, including a few basal abortive teeth; each tooth usually with a rather strong submedian ventral denticle and often 1,2 additional minute ventrobasal denticles, occasionally with a minute dorsal denticle; seta 1-S inserted beyond pecten at basal 0.47-0.58 (x = 0.52), longer than siphon diameter; 2-S very slender, slightly shorter than apical pecten teeth. *Saddle* with ventral margin irregularly notched; microsculpture consisting of short spiculiferous transverse ridges; apex with stouter spicules and subdorsolateral spines of various sizes, the largest spine shorter than apical pecten teeth; seta 1-X 0.6-1.2 as long as saddle; 2-X usually triple; 4-X of 7-8 (usually 8), 2-4 branched tufts; grid incomplete, consisting of transverse sclerotized bars only, usually basalmost tuft without bar. Anal gills ovoid or acorn-shaped, dorsal gill 0.52-0.72 length of saddle, ventral gill very short, 0.54-0.71 length of dorsal gill.

TYPE-SERIES. Holotype male (#19798, I-1843-x) with slides of associated genitalia, wing and legs, Mt. Yuwan, Amami Ôshima, Ryukyu Archipelago, 25 VII 1974, tree hole, Saugstad & Mizusawa. Paratypes: 4 males, 13 females, 6 larvae, 2 larval skins;with slides of associated skins (7 larval and 7 pupal), genitalia (2 males, 3 females), heads (2 males, 1 female), mouthparts (2 males, 5 females), wings (3 males, 12 females) and legs (3 males, 11 females), in total. 3 females (I-0248): Mt. Yuwan, 1 VII 1970, tree hole, Mizusawa & Nishikawa; 1 male, 1 larva (I-0253): Mt. Yuwan, 2 VII 1970, tree hole, Mizusawa & Nishikawa; 1 female with larval and pupal skins (I-0260): Mt. Yuwan,

3 VII 1970, tree hole, Mizusawa & Nishikawa; 1 female with associated larval and pupal skins, 1 larva (I-0278): Nishinakama, 8 VII 1970, tree hole, Mizusawa & Nishikawa; 2 larvae (I-0279): Nishinakama, 8 VII 1970, tree hole, Mizusawa & Nishikawa; 1 female (I-0303): Mt. Yuwan, 1 VII 1970, net, Mizusawa & Nishikawa; 3 females (I-0304): Mt. Yuwan, 2 VII 1970, net, Mizusawa and Nishikawa; 2 males with associated skins (1 larval and 1 pupal), 2 larvae (I-1832): Mt. Yuwan, 24 VII 1974, tree hole, Saugstad &Mizusawa; 1 male, 2 females with associated skins (3 larval and 3 pupal), 2 larval skins (I-1834): Mt. Yuwan, 24 VII 1974, tree hole, Saugstad & Mizusawa; 2 females with associated skins (1 larval and 1 pupal) (I-1890): Mt. Yuwan, 4 VIII 1974, tree hole, Mizusawa.

The holotype and one half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami Guntô).

TAXONOMIC DISCUSSION. *Aedes nishikawai* appears most closely allied to *nipponicus* LaCasse and Yamaguti, 1948, from Japan and Korea, especially in the strong resemblance of their male genitalia. Differences between them are as follows: the claspette stem is more extensively covered with minute hairs (nearly to apex) in *nishikawai* than in *nipponicus* (up to about middle); the filament is simple in *nishikawai,* with a moderate transparent expansion on the convex side in *nipponicus;* the basal tergomesal lobe bears 5-8 bristles in *nishikawai* (3 specimens), about 10 or more in *nipponicus* (15 specimens). Male *nishikawai* can also be distinguished from *nipponicus* by the shorter palpus (0.76-0.77 length of proboscis in *nishikawai,* 0.91-1.00 in *nipponicus*) and the divided small scutal pale area (a single large anterior pale area reaching the wing root posterolaterally in *nipponicus*). Female *nipponicus* may be discriminated from nipponicus by the divided small scutal pale area (the pale area continuous on the anterior promontory and extending to the wing root posterolaterally in *nipponicus*), the entirely dark scaled prescutellar space and abdominal tergum VIII (prescutellar scales always pale and a pale basal band on tergum VIII present in *nipponicus*). Differences between the larvae of these 2 species are shown in Table 23. Three robust specimens of *nipponicus* from Korea and one of *nishikawai* were omitted from the table; the latter agreed quite closely with the former, except for the dorsal anal gill length (0.7 length of saddle in *nishikawai,* 1.1-1.2 in *nipponicus*). The female of *nishikawai* resembles *inermis* Colless, 1958, from Singapore, and *omorii* Lien, 1968a, from Taiwan, in the small divided scutal anterolateral pale area, but may be distinguished from these 2 species in that the propleuron has 7 to more than 10 bristles, the posterior pronotal lobe has a few posteroventral broad pale scales, the scutellar median lobe is entirely pale scaled and both lateral lobes always have pale scales, though dark scales often occur; in *inermis* and *omorii,* the posterior pronotal lobe and scutellar lobes are dark scaled; the propleural bristles are 4-6 in *inermis,* apparently 6 in *omorii.* In the male genitalia, *nishikawai* is easily discriminated by the simple claspette filament (with a well developed transparent expansion on convex side in both *inermis* and *omorii*), and the basal tergomesal lobe has 5-8 ordinary bristles in an ill-defined double row (a line of 4 long setae in *inermis,* a line of 6 long stout setae in *omorii*). The tergal apex of the aedeagus is deeply emarginate, having a number of rather slender teeth on each side of this emargination in *nishikawai;* being rounded, bearing several small teeth in *inermis,* and having only one large and 2 small teeth on each side of the emargination in *omorii.* In the larva, *nishikawai* differs from *inermis* in the free acus, 2-4 branched seta 1-X, and the anal gills at most 0.75 length of saddle (the acus attached to the siphon,

1-X single, and the anal gills 1.5-5.0 as long as the saddle in *inermis*), and from *omorii* in the almost smooth integument (conspicuously spiculate in *omorii*).

Aedes gnapathi Colless, 1958, from Malaya, also has a divided scutal pale area, but this species lacks the prealar patch of pale scales. *Aedes nishikawai* also resembles *mohani* Knight, 1969, from India, in having a divided scutal pale area in both male and female, but can be separated from it in the male by the short palpus (0.76-0.77 length of proboscis in *nishikawai*, approximately equal to it in *mohani*), the bidentate midtarsal anterior claw (unidentate in *mohani*); in the female, by the erect forked, yellowish brown scales on the vertex, pale scaling on the posteroventral posterior pronotal lobe and scutellar median lobe, and entirely dark scaled abdominal tergum VIII (erect forked scales on vertex, and scales on posteroventral posterior pronotal lobe and scutellum are dark, and abdominal tergum VIII has a pale basal band in *mohani*); in the larva, by 9-13 branched seta 5-C, 2-3 branched 10-C and 2-3 (more frequently 2) branched 6-I, II (15-24, 4-5, and 3-4, respectively, in *mohani*).

TABLE 23. Comparison of larval characteristics of the typical forms between *Aedes (Finlaya) nipponicus* and *Ae. (Fin.) nishikawai*.

Character	*nipponicus* (17)*		*nishikawai* (9)*	
Seta 15-C	Strongly barbed		Weakly to moderately barbed	
Seta 2-II > 1-II in the number of branches	23.3%		90.9%	
Dorsal anal gill ÷ saddle length	1.2-1.7 (7)*		0.5-0.7 (6)*	
	Branches	$\bar{x}$	Branches	$\bar{x}$
Seta 11-P	2-4	2.8	3-6	4.9
Seta 14-M	3-10	6.2	7-13	9.4
Seta 4-II	4-9	6.3	7-12	8.5

*Specimens examined.

BIONOMICS. Apparently fairly common in Amami Guntô. Larvae were obtained from tree holes.

79. *AEDES (FINLAYA) OREOPHILUS* (EDWARDS)
(Figs. 111, 112, 228; Table 11)

Ochlerotatus oreophilus Edwards, 1916: 357 (♀). Type-locality: Gharia, Murree Hills, Western Himalayas.

Aedes (Finlaya) bunanoki Sasa and Ishimura, 1951: 103 (♂, ♀, P, L). Type-locality: Bonjusan, Aomori Pref., Japan; Stone 1961: 40, Korea; Nakata 1962: 54-8 (syn.).

FEMALE (Fig. 228). Wing length 3.0-4.7 mm. *Head.* Vertex covered with broad dark scales, with a rather wide median line of crescent-shaped white scales, eye margin with narrow curved white scales; erect forked scales over median to posterior area, mostly dark, pale yellow ones intermixed; tempus covered with broad white scales, with a spot of broad dark scales; vertical bristles on interocular space bronze-brown, others blackish; usually 4 blackish temporals on each side. Clypeus dark brown. Antenna: pedicel testaceous, mesal surface infuscate, with a few small dark bristles; flagellomere 1 1.42-1.67 (3) length of Flm 2, with dark scales. Palpus 0.23-0.28 (3) length of proboscis, dark scaled; segment 3 1.77-3.17 (3) length of 2; 4 at most 0.2 of 3. Proboscis slightly longer than forefemur. *Thorax.* Anterior pronotal lobe covered with broad white scales, with bristles dark and pale yellow; posterior pronotal lobe covered with broad white scales except margin around dorsoposterior corner, with 7, 8 bristles. Scutum with integument dark, covered with narrow blackish brown and golden white scales, the narrow golden white scales forming the following stripes: a median stripe bifurcating posteriorly along margins of the bare prescutellar space, a pair of dorsocentral stripes almost reaching posterior margin, and a pair of sutural stripes mesally confluent with dorsocentrals and laterally reaching scutal angle, also margins from lateroapical angle to supraalar area bordered with paler and slightly broader narrow golden white scales; all scutal bristles developed, bristles on disc blackish, those on margins bronze-yellow. Scutellum with narrow golden white scales on lateral lobe and middle of median lobe, and dark ones laterally on median lobe, each lobe with several long and a few short bronze-yellow bristles. Paratergite with broad white scales. Pleural integument very dark brown; patches of broad white scales on propleuron, subspiracular area, lower prealar knob, upper and lower-caudal sternopleuron, and mesepimeron; pleural bristles rather fine, pale yellowish brown, many on propleuron, prealar knob, sternopleuron and upper mesepimeron, no lower mesepimerals. *Wing.* Alula fringed with narrow dark scales. Costa with several pale scales at base. Halter knob mesally dark scaled, laterally pale scaled. *Legs.* Coxae with patches of moderately broad white scales. Forefemur with a short basal streak on anterior surface, a long stripe on posterior surface, and a triangular ventroapical spot of white scales; midfemur pale scaled on basal 0.67 of posterior surface, with an incomplete apical band of white scales, apex with dark fringe; hindfemur pale scaled, with a broad dark band distad of middle; femora otherwise, tibiae and tarsi dark scaled. Foretarsomere 5 length of 4, midtarsomere 5 usually shorter than 4, sometimes same length. Hindtarsal claw simple. *Abdomen.* Tergum I with a median patch of dark scales; II-VIII dark scaled, II-VII with laterobasal patches of white scales, sometimes with small mediobasal spots; VIII basally white scaled. Sterna dark scaled, with basal bands of pale scales, VIII without apical scales.

MALE (Figs. 112, 228). Wing length 3.1-3.5 mm. Vertex and tempus

covered with broad white scales except for median line of crescent-shaped white scales, some crescent-shaped creamy scales posteromedially scattered, erect forked scales mostly yellow. Antennal flagellum 0.65-0.73 (3) length of proboscis. Palpus 0.81-0.86 (3) length of proboscis, with many rather long bristles on segments 4, 5 and apex of 3; length ratio of 2-5: 2.41-2.50 : 3.08-3.14 : 1.19 : 1.00 (2). Proboscis 1.19-1.33 (3) length of forefemur. Scutal scales all golden white. Scutellar lobes with scales similar to those of scutum. Foretarsomere 4 greatly shortened, 5 strongly modified, with several stout setae on ventrobasal swelling, and a midventral setiferous process; midtarsomere 4 moderately shortened, 5 moderately modified. Anterior claw of fore- and midtarsi with a blunt-tipped median and a sharp laterobasal tooth; hindtarsal claw simple. Laterobasal patches of abdominal terga extending dorsomesad, often forming narrow complete or incomplete basal bands. *Genitalia.* Tergum IX with median sclerotized portion very narrow; lobes convex, each bearing 1-5 rather stout setae. Sternum IX with a pair of medioapical bristles. Basistyle cylindrical, 4.9-6.0 as long as wide, laterally and sternally dark scaled, with a patch of laterobasal white scales, bristled throughout, long sternoapical bristles, bristles on basal tergomesal edge stouter and denser, rather tufted (undifferentiated basal tergomesal lobe); somewhat dissimilar thicker rather tufted bristles on sternomesal edge distad of middle; claspette stem pilose, with 2 short mesal setae; filament distinctly longer than stem, narrow, curved at middle, then apically tapering. Dististyle 0.33-0.35 (4) length of dististyle, somewhat swollen in basal half, pubescent on concave side, with a few small setae near apex; claw slender, 0.45-0.48 (4) length of dististyle. Cercal setae 3, 4 on each side; paraproct with apex unicuspid. Aedeagus cylindrical, 2.46-2.91 (4) as long as wide, tergal surface basally and apically concave, sternal aspect very narrowly open towards base and very broadly open towards apex.

LARVA (Fig. 111). *Head.* Width 0.9-1.1 mm; 1.0-1.2 as wide as long; seta 1-C stout, slightly shorter than distance between bases; 4, 6-C anterior to 7-C; 5-C posterior to 7-C, longer than 6-C; 5, 6-C tandem or 5-C a little mesad of 6-C. *Antenna* 0.32-0.48 mm long, shorter than head, pigmented, becoming progressively paler in apical half, smooth, or sparsely and very minutely spinulate; seta 1-A single, inserted at middle to apical 0.4 of shaft, reaching or nearly reaching apex of shaft. *Mandible* (1 dissected specimen) with simple but rather stout microspines; mandibular comb of about 20 slender teeth. Cutting organ with DS_1 long and stout, apparently short DS_2 present; lateral dorsal tooth appearing tricuspid, mesal dorsal tooth with 1, 2 denticles on mesal side; ventral tooth with VT_{1-3} equal in size; VT-4 apparently stout; VB_1 stout, coarsely pectinate, reaching apex of VT_0 or extending slightly beyond it; pectinate brush 5, 6 haired. Mandibular hairs 6 + 12, hairs of posterior group apically frayed. Piliferous process with labula barely extending beyond apex of anterior part. *Maxilla* (1 dissected specimen). Cardo as in *japonicus;* seta 1-Mx single, moderately stiff and long. Mesostipes 1.3 as long as wide, mesal area not detached, many spine-like short strong spicules on mesal margin up to near apex; lateral surface with a few indistinct denticles; pseudoartis separated from cranium; stipital sensoria at apical 0.25-0.33, without basal ring; 4-Mx at about level of 2-Mx, slender, moderately long. Lacinia with 5-Mx at level or distad of stipital sensoria; 6-Mx subequal to 4-Mx. Palpostipes nearly 0.5 length of mesostipes, without mesobasal fusion with mesostipes; apex with 5 palpal sensoria, $S_3 > S_1 > S_4 > S_2 > S_5$ in length. *Mentum plate* with 15-21 (x = 18.0) subequal teeth. *Thorax.* Seta 1-P smooth or very weakly barbed; 8-P rather stiff; 13-T rather stiff and substellate. *Abdomen.* Setae

1-I-V, 11-I and 5-II, III somewhat stiff and substellate; 13-III-V distinctly longer and stouter than other setae of segment I-VII except for 6-I-VI and 7-I. Comb scales 24-38 (x = 30.0) in a patch; individual scales medium to long, parallel-sided, rounded at apex, evenly fringed with spicules. *Siphon* widening a little towards middle, with acus attached, brown with apical 0.20-0.25 pale; index 2.5-3.0; pecten reaching about middle of siphon, of 19-25 (x = 21.7) evenly and closely spaced teeth including 1-5 basal abortive ones, each tooth with a main ventral denticle and a number of minute ones; seta 1-S inserted at middle to apical 0.4 of siphon at apex or slightly distad of pecten, as long as width of siphon at insertion; 2-S slightly shorter than apical pecten tooth, extending beyond apical margin of siphon. *Saddle* covering dorsal 0.6-0.8 of segment X, incised on ventral margin, spinulate on dorsal half of apical margin; seta 1-X shorter than saddle; 4-X of 8-11 cratal and 2-4 precratal tufts (11-13, usually 12, in total), each tuft 2-4 branched, precratal one sometimes single. Anal gills elongate-ovate, with narrowly rounded apex; dorsal gill about equal to saddle or at most 1.5 saddle length; ventral gill distinctly shorter than dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 77♂, ♂20♀; with associated skins (72 l, 72 p), 54 L, 4 l: Honshu (B-0319, B-0320, B-0321, B-0326, B-0327, B-0328, B-0329, B-0330, B-0331, B-0332, B-0333, B-0334, B-0335, B-0337, B-0339, B-0342, B-0344, B-0345, B-0346, B-0347, B-0348, B-0350, B-0351, B-0352, B-0357, B-0358, B-0359, B-0360, B-0361, B-0364, B-0365, B-0366, B-0367, B-0368, B-0370, B-0371, B-0379, B-0385, B-1196, C-2317, D-0091, D-1199, E-1577).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). KOREA. INDIA.

TAXONOMIC DISCUSSION. Hara (1959) recorded a Himalayan species, *oreophilus*, from Japan; Nakata (1962) synonymized Japanese *bunanoki* with *oreophilus*. Their identifications were apparently based only on Barraud's short description (1934). We studied 2 males, 2 females and 5 4th instar larvae from the Krol Mountains, near Solan, West Himalayas (VII. 1930, Barraud; BMNH). No obvious differences were detected in the adults including the male genitalia. Larvae appear to be essentially identical, though some inconsistent characters were found. Here, then, both are treated as a single taxon. The discontinuous distribution of this species may possibly be associated with deforestation in continental China.

The inconsistent larval characters are as follows: The body setae of the 5 Himalayan specimens are stiffer, branched and often more stellate than Japanese specimens. Somewhat greater differences occur in 4 abdominal setae, extent of the pecten, number of the pecten teeth and position of 1-S (Table 24). Differences in the pecten and the position of seta 1-S are especially distinct and they may be of subspecific value. However, these characters must be evaluated with more Himalayan material.

TABLE 24. Comparison of larval characteristics between Japanese and Himalayan specimens of *Aedes (Finlaya) oreophilus*.

Character	Japan (30 specimens)			Himalayas (5 specimens)		
	Range	x	Mode (%)	Range	x	Mode (%)
Seta 1-II	2-3	2.9	3 (83)	3-7	4.4	-
Seta 4-II	4-8	5.6	5 (57)	3-5	4.1	-
Seta 1-III	2-3	2.7	3 (73)	3-7	4.3	-
Seta 1-V	2-3	2.7	3 (73)	4-9	4.9	4 (60)
Pecten teeth	19-25	21.7	-	12-20	15.4	-
Apex of pecten	basal 0.45-0.53 of siphon			basal 0.32-0.43 of siphon		
Seta 1-S	basal 0.52-0.59 of siphon			basal 0.40-0.49 of siphon		

BIONOMICS. Apparently fairly common in mountain beech woods in Honshu. Larvae occur in tree holes, rarely in rock holes with water containing fallen leaves. Adult females are day biters.

80. *AEDES (FINLAYA) WATASEI* YAMADA
(Figs. 112, 113, 229: Table 112)

Aedes watasei Yamada, 1921: 64 (♀). Type-locality: Ômura, Kyushu, Japan.
Aedes (Finlaya) sp. in *gubernatoris* group: Bohart and Ingram, 1946b: 69, Shana Wan, Okinawa Is., Ryukyu Archipelago.
Aedes (Finlaya) feegradei: Bohart, 1953: 185, Okinawa and Ishigaki Is., Rhykyu Archipelago.
Aedes (Finlaya) watasei: LaCasse and Yamaguti, 1950: 171 (♀).

FEMALE (Fig. 229). Wing length: 2.3-3.6 mm. *Head.* Vertex covered with broad, bluish-tinged dark scales; tempus and eye margin covered with broad white scales, the white-scaled area slightly produced posteriorly at middle and sometimes forming a short median line but never reaching posterior margin; many posterior erect forked dark scales and a few lateral ones on vertex; usually 5 vertical and 4 temporal dark bristles on each side, the most mesal vertical bristle very long and stout. Antenna: pedicel testaceous to piceous, with a few small bristles and scales on mesal side; flagellum 0.83-0.86 (2) length of proboscis; flagellomere 1 1.39-1.48 (2) length of Flm 2, with dark scales. Palpus 0.22-0.24 (2) length of proboscis, dark-scaled; segment 3 1.59-1.80 (2) of 2; 4 at most 0.13 of 3. Proboscis 1.18-1.20 (2) length of forefemur. *Thorax.* Anterior pronotal lobe covered with broad white scales, bristles mostly dark, lateral ones brownish; posterior pronotal lobe with a large patch of broad white scales on lower posterior part, bearing 2-4 dark bristles. Scutum with integument pitchy black, covered with narrow dark scales, a large transverse oblong patch of narrow white scales occupying anterior 0.25, posterior margin of the patch concave or slightly produced posteriorly at middle and on both sides, a pair of transverse supraalar patches of narrow white scales extending dorsally to near line of posterior dorsocentral bristles; acro-

stichal, anterior dorsocentral and fossal bristles absent, other scutal bristles developed, blackish with bronzy reflection. Scutellum with integument paler than scutum, each lobe covered with a mixture of broad dark and pale scales, with several long and several short dark bronzy bristles. Paratergite with broad white scales (paratergal patch continuous with supraalar patch). Pleural integument pitch-brown; patches of broad white scales on propleuron, lower prealar knob, upper and lower-caudal sternopleuron and upper mesepimeron; about 10 yellow propleural bristles, a few yellowish brown postspiraculars; about 10 prealars, some yellowish brown and some dark; about 20 yellowish brown sternopleurals, several fine yellow upper mesepimerals, no lower mesepimerals. *Wing*. Alula fringed with moderately broad dark scales. Costa with a small basal spot of pale scales. Halter knob clothed with dark scales intermixed with pale ones. *Legs*. Forecoxa covered basally and mesoapically with white scales, anteromedially with dark scales; mid- and hindcoxae with patches of white scales. Forefemur broadly or narrowly white scaled on basal 0.60-0.67 of ventral aspect (the pale area not reaching base), sometimes with a short white stripe basally on anterior side, occasionally a few pale scales scattered basally on dorsal surface; midfemur white scaled on basal 0.60-0.67 of ventral margin of anterior surface to posterior surface, with an often dorsally incomplete white apical band, apex with dark fringe; hindfemur with a very broad white subbasal band extending to about middle, and a narrow white apical band, apex with dark fringe. Foretibia with an anteriorly incomplete white apical band; midtibia with a small white dorsosubapical spot. Mid- and hindtarsomere 1 with a white basal band; midtarsomeres 1 and 2 with a ventrally incomplete white articular band; hindtarsomeres 1 and 2 with an often complete broader white articular band. Foretarsomere 5 longer than 4. Hindtarsal claw usually simple, sometimes with a small median tooth. *Abdomen*. Tergum I with a median patch of dark scales; II-VII covered with dark scales, with laterobasal patches of white scales; VIII with mediobasal white and dark scales; V-VII with a tuft of outstanding dark dorsal scales. Sterna basally white scaled and apically dark scaled; III-VII with a tuft of outstanding dark scales, the tuft small or occasionally indistinct on III, becoming larger on posterior sterna; VIII without scales.

MALE (Figs. 112, 229). Wing length 2.3-2.7 mm. Generally, white-scaled areas more developed than in female. Vertex with a distinct median line of broad white scales, dark-scaled area smaller, erect forked scales dirty yellow. Antennal flagellum 0.79 (1) length of proboscis; flagellomere 12 1.14 length of Flm 2, both together 0.86 of Flm 1-11. Palpus 0.9 (1) length of proboscis, relatively few long bristles on segments 4, 5 and apex of 3; length ratio of 2-5: 3.06 : 3.58 : 1.32 : 1.00. Proboscis 1.26 (1) length of forefemur. Scutal white patch larger, occupying anterior 0.33-0.50, posterior margin posteriorly extending in a median and 2 sublateral projections; antealar patch dorsally extending and connected with posterior dorsocentral stripe of white scales; prescutellar arch of white scales present. Scutellum with more white than dark scales. Foretibia with a posteroventral white streak; all white markings of legs more distinct than in female. Fore and midtarsomeres 4 very short; foretarsomere 5 strongly modified, with several stout setae on ventrobasal swelling, and a midventral setiferous process; midtarsomere 5 weakly modified. Anterior claw of fore- and midtarsi with blunt-tipped median tooth and a sharp laterobasal tooth; hindtarsal claw simple. Tufts of outstanding scales on abdomen slightly more pronounced. *Genitalia*. Tergum IX with sclerotized median area very narrow; lobes widely separated, moderately prominent, each bearing 2-6 stout setae. Sternum IX with 2, 3 medioapical

bristles. Basistyle cylindrical, 4.9-6.4 as long as tergal width, laterally and sternally scaled, bristled throughout, bristles on tergal surface becoming shorter and finer towards apex, bristles on median sternomesal margin dense, somewhat specialized, each of uniform diameter from base to near apex. Claspette stem short, glabrous excepting pilose base bearing a mesal seta; filament narrow, very long, curved, slightly hooked at apex. Dististyle rather stout, 0.33-0.39 (5) length of basistyle, slightly arcuate, pubescent on concave side; claw 0.50-0.55 (4) length of dististyle. Paraproct with apex unicuspid; cercal setae 2 on each side. Aedeagus cylindrical, 2.00-2.74 (6) as long as wide, tergal aspect closed, more or less apically and basally concave; sternal aspect narrowly open towards base and widely open towards apex.

LARVA (Fig. 113). *Head.* Width 0.78-0.90 mm; fairly uniform light brown, rounded, 1.10-1.27 as wide as long; seta 1-C stout, apex subacute, strongly ventromesally curved, separated by about 1.5 their length; 4-C directly caudad of 6-C, slightly cephalad of 7-C, well cephalad and slightly mesad of 5-C, a little closer to 6-C than to 5-C; 5-C 1.3 length of 6-C, 0.5 length of cranium; 7-C usually double, much weaker than 5, 6-C; 11-C weak; 12-C subequal to 11-C, 11, 12-C often appearing dendritic when 5 or more branched. *Antenna* 0.22-0.25 mm long, about 0.33 length of head, uniformly light brown, nearly straight, smooth, of fairly uniform diameter throughout; seta 1-A usually single, rarely double, inserted at apical 0.31-0.45 (x = 0.36), reaching apex of shaft. *Mandible* (2 dissected specimens) with about 15-20 small simple microspines; mandibular comb with 8 teeth, mesal teeth long, strongly curved at base. Cutting organ relatively larger than in other species of *Finlaya* of this region, with DS_1 fairly long and stout, DS_2 apparently rather long; mesal dorsal tooth with a small subbasal denticle, lateral dorsal tooth unicuspid; a small triangular accessory denticle; ventral tooth with $VT_3 > VT_1 > VT_2$; VT-4 very stout, triangular; VB_1 stout, nearly attaining tip of VT_0, finely pectinate on mesal margin; pectinate brush of at least 3 very slender hairs, each about 0.67 length of VB_1. Piliferous process wide, with labula extending slightly beyond apex of anterior part. Mandibular hairs 9-11. *Maxilla* (2 dissected specimens) somewhat modified. Cardo small, mesobasally fused with cranium through a rather thick sclerotized strip; seta 1-Mx moderately long, usually single, rarely double. Mesosteipes 1.4 as long as wide, with lateral surface rather strongly sclerotized, apparently narrowly fused with cardo at base, with mesal area not detached, mesal margin with numerous rather short, strongly denticulate, short spine-like spicules in distal 0.67; pseudoartis attached to cranium; stipital sensoria close to apex, proximal sensorium slightly longer than distal one, both with basal ring; 2-Mx just laterad of maxillary brush; 4-Mx subapical, moderately long, slender, pale. Lacinia with 5-Mx close to apex; 6-Mx shorter than 4-Mx, simple; hairs of maxillary brush short and very stiff. Palpostipes rather long, 0.6 length of mesostipes, rather narrow, only slightly broadened basally, mesobasally fused with mesostipes through a narrow, well sclerotized ventral bridge; apex with 4 palpal sensoria, S_5 apparently absent or extremely small. *Mentum plate* with 13-15 strong teeth, the median tooth bluntly rounded, flanking teeth subequal in size. *Thorax.* Setae 1-3-P arising from a common callus, 8-P usually dendritic when more than 5 branched; 1-T occasionally rather strong, with a sclerotized basal callus. *Abdomen.* Setae 1-I-IV and 6-I, II usually triple; 1, 6-VI usually double; 6-III-VI moderately long; 7, 9-VII, when single, thicker than other small setae on VII; 3-VIII more than twice length of 1-VIII; 5-VIII fairly stiff, usually 4-branched, slightly longer than 1-VIII. Comb scales 35-60 (x = 48.3) in a triangular patch, the individual scales broadly paddle-shaped, apically and laterally fringed with

fine spicules, the apical spicules longer, but not noticeably stouter than the lateral spicules. *Siphon* brown except for paler apical 0.17, very gradually tapering from base to middle, more strongly from middle to apex, the surface smooth or nearly so; acus attached, rather weakly developed; length 0.68-0.84 mm, index 2.4-3.1 (x = 2.9); pecten reaching basal 0.45-0.52 (x = 0.48), of 10-17 evenly spaced strong teeth, each tooth with a large subacute denticle at basal 0.25, and 2 or more smaller denticles proximad; 0-4 small abortive teeth basad of main pecten teeth; seta 1-S subequal to siphon diameter at insertion, just ventrodistad of apical pecten tooth at basal 0.53-0.58 (x = 0.55); 2-S subapical, about 0.67-0.75 length of apical pecten tooth. *Saddle* 0.30-0.34 mm long, with short transverse rows of very fine spicules, the spicules becoming dorsocaudally stronger, several small, tooth-like spines on caudal margin dorsad of seta 1-X; 1-X inserted near ventrocaudal margin, fairly stiff and dark; 4-X usually of 6-8 cratal and 2, 3 precratal hairs, the cratal hairs 2-5 branched, the precratal hairs shorter and 2, 3 branched. Anal gills fusiform, about twice as long as wide; dorsal gill 0.8-1.1 length of saddle, ventral gill 0.50-0.67 length of dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 7♂, 18♀; with associated skins (5 l, 5 p), 8 L: Amami Guntô (I-0239, I-0245, I-0246, I-0253, I-0255, I-0256, I-0259, I-0261, I-0283, I-0289, I-0304, I-0307, I-1831, I-1833, I-1843). 1♀, 2 L: Okinawa Guntô (2 L: Shana Wan, Okinawa Is., 24 IX 1945, bamboo stump, Bohart, USNM. 1♀: J-0414). 16♂, 21♀; with associated skins (3 l, 3 p), 3 L, 1 l: Yaeyama Guntô (6♂, 5♀: Yarabu Pen., Ishigaki Is., X 1951, tree hole, Bohart; 1♂-genitalia slide, 2 L: Yarabu Pen., Ishigaki Is., 1 XI 1951, tree hole, Bohart; 1 l: Yarabu Pen., Ishigaki Is., 51 L, 9 l, tree hole, Bohart, USMN. K-0159, K-0561, K-0796, K-0800, K-0918, K-0931, K-0932, K-0933, K-0937, K-0972, K-1021, K-1750, K-1774).

DISTRIBUTION. PALAEARCTIC JAPAN (Kyushu, Yakushima). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô).

TAXONOMIC DISCUSSION. Bohart (1953) recorded *Ae. (Fin.) feegradei* Barraud, 1934, from Okinawa and Ishigaki Is. This species was described from Burma. We examined 2 syntype specimens (male and female; Rangoon, Burma, VII. 1930, C. S. Feegrade; BMNH). Unfortunately they were in poor condition, the abdomen missing in both specimens; consequently, the genitalia could not be studied. The following differences in scaling were noted in the head and thorax of the female: Scaling on the posterior pronotal lobe is more extensive, reaching the dorsal margin (restricted to a moderate sized midposterior patch in *watasei*). There were no pale scales on the scutellum, but the scales of the apical margin of the median lobe were rubbed off (pale scales always present in *watasei*, but in some specimens, they appear only on apical margin of the median lobe). Halter knob is entirely dark scaled (a variable number of pale scales always present in *watasei*). The white scaled area on the ventral surface of forefemur is shorter, reaching only basal 0.4 (0.60-0.67) in *watasei*); that of the posterior surface of the midfemur reaching middle (0.60-0.67 in *watasei*); the white apical band of the hindfemur is slightly broader than in *watasei*. Development of these pale scaled areas is variable in *watasei*, and should be expected in *feegradei*.

Thus, the significance of these differences cannot be determined without examination of further material of *feegradei*. We therefore refrain from making any conclusion about the synonymy of these 2 species. We examined 6 males (with one associated genitalia slide) and 5 females from Ishigaki Is., identified as *feegradei* by Bohart and kindly sent by him to the USNM for our study. They were found to agree with *watasei* and not with the type-specimens

of *feegradei*. Larval specimens identified as *feegradei* by Bohart (2 from Okinawa, 3 from Ishigaki Is.) were also identical with *watasei*.

BIONOMICS. Rare in Kyushu, not very common in the Ryukyu Archipelago. Larvae were usually collected from tree holes and they were once obtained from a rock hole on Amami Ôshima. They are also reported to occur in vases of cut bamboo, water-holding concavities of gravestones and bamboo stumps (Kamimura 1976b). In Yaeyama, they were found associated with *Ae. aureostriatus* and various *Ae. (Stegomyia)* species. Adult females are day biters.

SUBGENUS *STEGOMYIA* THEOBALD

Stegomyia Theobald, 1901a: 235. Type-species: *Culex fasciatus* Fabricius; Antilles.

Small to medium-sized dark mosquitoes with clearly white banded tarsi; scutum ornamented with white scales. Larvae with relatively small rounded head and short siphon.

FEMALE. White patches formed by broad or narrow scales usually with silvery tinge. *Head*. Vertex covered with broad decumbent scales; erect forked scales restricted to posterior part of vertex; usually the most ventral temporal bristle detached. Antennal flagellum shorter than to about as long as proboscis; pedicel covered with broad white scales except dorsally or dorsolaterally, usually also with a narrow ventral interruption. Palpus 0.20-0.25 length of proboscis, dark scaled, with fairly large dorsoapical patch of white scales, a few pale scales occasionally intermixed among dark scales. Proboscis dark scaled, with several ventrobasal bristles. *Thorax*. Bristles of posterior pronotal lobe 1-7, arranged in a row along posterior margin. Scutum variously ornamented with pale scales; scutal bristles dark; acrostichal bristles absent except one or 2 anterior pairs, dorsocentral bristles rather few; fossal area without bristles on median part, posterior fossals often absent, prescutellars and supraalars developed. Scutellum covered with broad flat scales, the scales mostly white, median lobe usually with broad dark apical scales. Mesepimeral bristles absent except occasionally in *flavopictus*. Base of mesomeron slightly above that of hindcoxa. *Wing*. Alula fringed with small rather broad, dark scales; veins dark scaled; costa with white basal spot or a few basal pale scales. *Legs*. Femora with pale apical fringe or patch. Tarsi basally white banded. Claws equal, those of hindtarsus always simple. *Abdomen*. Laterotergite heavily white scaled; segment VIII retractile; seminal capsules 3, usually one larger than other 2.

MALE. Antennal flagellum 0.67-0.90 length of proboscis, flagellomeres 12 and 13 together 0.66-0.95 length of Flm 1-11. Palpus apically upturned, 0.80-1.10 length of proboscis, with only several short bristles on segments 4, 5 and apex of 3; 2 with ventrally incomplete white subbasal band, 3-5 with white basal bands which are dorsally incomplete on 4 and 5. Both claws of hindtarsus equal and simple. *Genitalia*. Sternum IX without bristles, usually moderately sclerotized laterally and basally. Claspette well developed, with numerous bristles on expanded apical surface, with some bristles specialized; neither apical nor basal tergomesal lobe present. Dististyle simple, with claw. Tergite X usually well sclerotized; no cercal setae; paraproct apically rounded in lateral view, without apical tooth. Aedeagus composed of a pair of well

sclerotized lateral pieces, with many tergoapical teeth, tergobasally and sternally open, tergoapically closed.

LARVA. *Head.* Brownish, rounded; labrum nearly straight; seta 1-C slender; 4-C with slender radiating branches, usually slightly anteriad of 6-C, both anteriad of antennal base; 5-C far posterior to and nearly tandem with or a little laterad of 6-C; 8-C anteriad of 9-C. *Antenna* less than 0.5 length of head, smooth; 1-A single, short. *Mandible.* A number of usually simple, rather stout dorsolateral microspines near base; 1-Md present, single or double. Cutting organ with 2 dorsal spines, both reaching about base of VT-4, lateral spine longer; 2 dorsal teeth, ventrolateral tooth smaller, simple, dorsomesal tooth usually with one mesal denticle; ventral tooth with VT-4 spiniform, not reaching apex of VT_0; VT_{1-3} equal or subequal, each usually with a small secondary anterobasal denticle; usually a few accessory denticles at base of ventral tooth on mesal surface; 2 ventral blades, VB_1 stout, not reaching apex of VT_0, VB_2 much smaller, both with mesal pectination; pectinate brush of 3-5 bilaterally pectinate hairs, distalmost hair longest, longer than VB_1. Piliferous process with labula usually not extending beyond the broader anterior part; $PPH_{3,5}$ not distinctly differentiated. Mandibular hairs barbed, proximal hairs apically frayed. *Maxilla.* Cardo narrowly triangular, well sclerotized, free from cranium, seta 1-Mx always branched. Mesostipes a little longer than wide; pseudoartis well developed, apically fused with cranium; parartis reduced; stipital sensoria distal to middle, equal or subequal, somewhat separated from each other, without basal ring; seta 2-Mx short, sublaterally on dorsoanterior margin; seta 4-Mx near ventroapical margin, very long, longer than palpostipes. Lacinia with mesobasal corner strongly sclerotized; seta 5-Mx on a very prominent socket about level of stipital sensoria or anterior to them; seta 6-Mx difficult to see. Palpostipes cylindric, about 0.50-0.67 length of mesostipes, not basally swollen, mesobasally connected with mesostipes; palpal sensoria moderately developed, S_5 shortest; ampulla present. *Mentum plate* triangular, with many small teeth. *Thorax.* Setae 0-P, 13,14-M, and 13-T not dendritic; 11-M, T often moderately developed; 0,3,8-P, 1,13, 14-M, 1,4,5,8,13-T often stiff and stellate. *Abdomen.* Seta 12-I absent; 13-II, VI not dendritic; 1-I-VIII, 2-I-VII, 5-I-VII, 6,8-VII, 7-II-VI, 9-II-VII and 13-I-VII often stiff and stellate; 2-VIII distant from 1-VIII; comb scales usually in a single row, occasionally an additional row present in *riversi;* individual scales thorn-shaped with a strong apical spine. *Siphon* brownish, with base narrowly darker, without acus, index less than 4, usually 2,3; pecten teeth usually evenly spaced; each tooth with one to several ventrobasal denticles, and often one or a few dorsobasal denticles especially in proximal teeth; seta 2-S subapical, extending beyond apex of siphon, longer than apical pecten tooth. Seta 4-X 8-10; grid complete or incomplete, 1,2 proximal tufts of 4-X occasionally off grid.

DISTRIBUTION. Southern Palaearctic region, up to Sakhalin and Prymorye to the north in East Asia; Oriental region; Australian region; Pacific islands; Ethiopian region.

TAXONOMIC DISCUSSION. Species of the subgenus *Stegomyia* in this region are divided into 2 groups, the *scutellaris* group and *aegypti* group. They will be discriminated by the following characteristics in addition to those mentioned in the keys.

Scutellaris group. Costal basal white spot distinct. Male fore- and midtarsomere 4 rather long, foretarsomere 5 1.12-1.52 and midtarsomere 5 1.11-1.42 length of their respective tarsomere 4; basistyle more slender; dististyle longer, 0.77-0.96 length of basistyle.

Aegypti group. Costal basal white spot poorly developed. Male fore- and midtarsomere 4 shorter, foretarsomere 5 1.51-1.74 and midtarsomere 5 1.43-1.64 length of their respective tarsomere 4; basistyle wider, dististyle shorter, 0.58-0.77 length of basistyle.

KEYS TO SPECIES OF *AEDES (STEGOMYIA)*

FEMALE ADULT

1. Scutum with a conspicuous single white anteromedian stripe; eyes rather broadly separated above (more broadly than below); palpal segment 3 1.4-2.2 length of 2 (*scutellaris* group). 2
Scutum without a single anteromedian stripe; eyes narrowly separated above (more narrowly than below); palpal segment 3 0.9-1.2 length of 2 (*aegypti* group). 5

2(1). Postspiracular area with white patch; claws of fore- and midtarsi unidentate; scutum with anterolateral white stripe. *galloisi* (p. 376)
Postspiracular area without white patch; claws of fore- and midtarsi simple; scutum without anterolateral stripe. 3

3(2). White patches on side of thorax forming 2 distinct parallel transverse stripes; abdominal terga without dorsobasal bands, with laterobasal patches extending posterodorsally, and on posterior segments forming incomplete or complete subbasal bands. . . . . *riversi* (p. 372)
White patches on side of thorax not forming distinct parallel transverse stripes; abdominal terga with both dorsobasal bands and laterobasal or laterosubbasal patches. 4

4(3). Scutum with a patch of narrow curved or crescent-shaped slightly yellowish to yellowish brown scales in front of, to above wing-root; one posterior fossal bristle; hindtarsomere 4 with basal 0.67-0.83 entirely white. . . . . *flavopictus* (p. 386)
Scutum with a patch of broad white scales in front of wing-root; no posterior fossal bristle; hindtarsomere 4 with basal 0.60-0.67 white. . . . . *albopictus* (p. 380)

5(2). Clypeus with scales; scutum with submedian stripes; claws of fore- and midtarsi unidentate. . . . . *aegypti* (p. 396)
Clypeus without scales; scutum without submedian stripes; claws simple. 6

6(5). Posterior pronotal lobe and paratergite without white patches; femora unspotted; tibiae unbanded. . . . . *wadai* (p. 400)
Posterior pronotal lobe and paratergite with white patches; fore- and midfemora white spotted; tibiae white banded. *chemulpoensis* (p. 403)

MALE GENITALIA

1. Paraproct without median sternomesal process; tergum IX with apical margin convex or medially produced (*scutellaris* group). 2
Paraproct with median sternomesal process; tergum IX with apical margin medially concave (*aegypti* group). 5

2(1). Claspette reaching at most middle of basistyle; tergum IX with apical margin simply medially convex. 3
Claspette reaching at least apical 0.33 of basistyle. 4

3(2). Aedeagus broadened from base toward apex; median part of tergum IX only pilose; claspette only slightly apically expanded in lateral view. . . . . *riversi* (p. 372)
Aedeagus constricted in middle, the broadest part usually in basal 0.25-0.40; median part of tergum IX tuberculate; claspette strongly apically expanded in lateral view. . . . . *galloisi* (p. 376)

4(2). Tergum IX with broad median lobe, its apical margin serrate; bristles on mesoapical surface of claspette short. . . . *flavopictus* (p. 386)
Tergum IX with strongly produced median process; bristles on mesoapical surface of claspette rather long. . . *albopictus* (p. 380)

5(1). Tergum IX with lobes triangular and strongly produced; dististyle swollen distad of middle; claspette reaching apical 0.1-0.2 of basistyle. . . . . *aegypti* (p. 396)
Tergum IX with lobes rounded, only a little produced; dististyle apically tapering; claspette reaching apical 0.33-0.40 of basistyle. 6

6(5). Claspette with apical expanded surface elongate in tergal view. *wadai* (p. 400)
Claspette with apical expanded surface rounded. *chemulpoensis* (p. 403)

LARVA

1. Comb scales evenly fringed laterobasally with fine spicules; seta 1-Md well developed, usually double, each 2-7 branched (*scutellaris* group)*. 2
Comb scales with several unequal strong laterobasal denticles; seta 1-Md very fine, more frequently single, 1,2 branched. (*aegypti* group). 8

2(1). Species from Palaearctic region. 3
Species from Ryukyu Archipelago and Ogasawara Is. 6

*Species of the *scutellaris* group cannot always be identified by this key. Consult descriptions, taxonomic discussions and chaetotaxy tables for each species.

3(2). Setae 2-VII and 9-VI usually with 5 or more branches, 5-III, VI usually with 6 or more branches. 4
Setae 2-VII and 9-VI usually 1, 2 branched, 5-III, VI usually 1-3 branched; saddle incomplete. 5

4(3). Setae 4, 14-P 1, 2 and 2, 3 branched respectively; saddle usually complete. . . . . *galloisi* (p. 376)
Setae 4, 14-P 3-18 and 4-16 branched respectively; saddle incomplete. *flavopictus* (in part) (p. 386)

5(3). Seta 6-C usually single; ventral anal gill usually shorter than dorsal gill. . . . . *riversi* (in part) (p. 372)
Seta 6-C usually double; ventral anal gill usually as long as dorsal gill. . . . . *albopictus* (in part) (p. 380)

6(2). Setae 6, 10-C usually single; comb scales with apical spine usually shorter than base, with lateral fringe more distinct, extending to middle or more of apical spine, some of the scales often apically furcate and basally fused. . . . . *riversi* (in part) (p. 372)
Seta 6-C usually double; comb scales with apical spine as long as or longer than base, with lateral fringe usually fine and restricted to base of apical spine. 7

7(6). Seta 10-C usually single; ventral anal gill usually as long as dorsal gill. . . . . *albopictus* (in part) (p. 380)
Seta 10-C usually double; ventral anal gill usually shorter than dorsal one. . . . . *flavopictus* (in part) (p. 386)

8(1). Most proximal seta 4-X very short, barbed, 3-6 branched; 3-P and 1-I-VII 9-16 branched. . . . . *chemulpoensis* (p. 403)
Most proximal seta 4-X of moderate length, smooth, 2, 3 branched; 3-P and 1-I-VII 1-5 branched. 9

9(8). Setae 8, 14-P and 2-VI, VII 3, 4, 2-4 branched and single respectively. *aegypti* (p. 396)
Setae 8, 14-P and 2-VI, VII 8-11, 6-15 and 3-7 branched respectively. *wadai* (p. 400)

81. *AEDES (STEGOMYIA) RIVERSI* BOHART AND INGRAM
(Figs. 114, 115, 230; Table 113)

Aedes (Stegomyia) riversi Bohart and Ingram, 1946a: 50 (♂, ♀, L). Type-locality: Chizuka, Okinawa Is., Ryukyu Archipelago.
Aedes riversi: Omori and Ito, 1961: 152, Tsushima Is., Japan.

FEMALE (Fig. 230). Wing length 2.5-3.8 mm. *Head.* Eyes rather broadly separated above, moderately below. Vertex covered with broad dark scales, with a rather broad median stripe of broad white scales, the stripe extending onto interocular space; many dark, erect forked scales; tempus covered with broad white scales, with a stripe or an anterior spot of broad dark scales within pale area; 4-5 vertical and 4 (rarely 5) temporal dark bristles on each side. Clypeus without scales. Antenna: flagellum 0.77-0.91

(17) length of proboscis; flagellomere 1 1.26-1.51 (17) length of Flm 2, with dark scales. Palpus 0.18-0.22 (17) length of proboscis; segment 3 1.41-1.83 (17) of 2; 4 lacking or extremely small. Proboscis 0.99-1.14 (14) length of forefemur. *Thorax*. Pronotal integument dark brown; anterior lobe covered with broad white scales, bearing 8 to more than 10 mostly dark bristles; posterior lobe dorsally covered with narrow curved dark scales, posteroventrally with a transverse patch of broad white scales, bearing 2-4 usually dark bristles. Scutum with integument dark brown to nearly black, covered with narrow curved dark scales, with a single, long, rather broad, anterior median stripe of narrow curved white scales, and short, fine prescutellar and posterior dorsocentral stripes of narrow curved white to yellow scales, the prescutellar stripe usually connected anteriorly with anterior median stripe, posteriorly bifurcate and extending along sides of prescutellar bare space; a curved short stripe of white broad scales on supraalar margin; 1-6 (usually 2,3) humeral bristles, one posterior fossal. Scutellum with each lobe bearing 4-9 long dark and medium-sized bristles together with a few short ones. Paratergite with a linear patch of broad white scales, the patch together with pronotal and supraalar patches forming a long transverse stripe. Pleural integument brown to dark brown, patches of broad white scales on propleuron, upper sternopleuron, lower-posterior sternopleuron, upper and lower mesepimeron; propleural, upper sternopleural (linear) and upper mesepimeral patches forming a long transverse stripe parallel to the pronotal-supraalar stripe; lower mesepimeral patch reaching lower 0.13-0.17 of mesepimeron, separated from or narrowly connected with upper mesepimeral patch; subspiracular area bare (62%) or with broad white scales (38%); 4-8 yellowish brown or pale propleural bristles, 1-9 yellowish brown or dark postspiraculars, 8 to more than 10 yellowish brown or dark prealars, 1,2 upper and 4-10 mostly yellowish brown posterior sternopleurals, 3-10 pale upper mesepimerals. *Wing*. Cell R_2 1.64-2.47 (25) length of vein r_{2+3}. Halter knob dark scaled. *Legs*. Forecoxa basally and apically white scaled, dark scaled in-between; midcoxa with basal white scales, some apical dark scales; hindcoxa with a patch of white scales. Forefemur with narrow pale basal band, white apical fringe and a short rather indistinct pale basal streak on narrow anterior surface, pale scaled in posterior 0.67 of ventral surface; midfemur with white apical spot, pale scaled on most of posterior surface; hindfemur with white apical spot, pale scaled on anterior, ventral and posterior surfaces, the pale areas reaching apical 0.17-0.25 on anterior and ventral surfaces, and about 0.5 on posterior surface, dorsal surface pale only at base. Fore- and midtarsomeres 1 and 2 with usually ventrally incomplete basal bands of white scales, band of foretarsomere 2 usually a little more developed than that of midtarsomere 2, rarely the latter obsolete, tarsomere 3 rarely with pale basal scales; hindtarsomeres 1-4 with basal bands of white scales, the bands of 1-4 occupying basal 0.20-0.33 (usually 0.25), 0.25-0.33 (usually 0.33) 0.4-0.5 (usually slightly less than 0.5) and 0.50-0.75 (usually 0.67) of each tarsomere, hindtarsomere 5 usually entirely white scaled, occasionally with a few ventroapical dark scales. Femora, tibiae and tarsi otherwise dark scaled. Hindtarsomere 1 0.66-0.75 (20) length of tibia. Claws simple. *Abdomen*. Tergum I covered with dark scales, occasionally a few pale scales intermixed; II-VI dark scaled, with laterobasal patches of white scales, the patches extending more or less posterodorsally, on IV-VI (rarely also III) visible from above, often forming an incomplete subbasal band, usually these subbasal bands more developed in posterior segments and occasionally complete on V and VI, VII with incomplete or complete subbasal band. Sterna II-VI with basal pale bands, the bands tending to be laterally subbasal on posteri-

or segments.

MALE (Figs. 115, 230). Wing length 2.1-3.0 mm. Antennal flagellum 0.68-0.75 (18) length of proboscis; flagellomere 12 0.90-1.17 (18) length of Flm 13, both together 0.71-0.87 (18) of Flm 1-11. Palpus 0.86-0.97 (17) length of proboscis, ratio of lengths of 2-5: 1.00-1.42 : 1.06-1.47 : 1.10-1.18 : 1.00 (19). Proboscis 1.18-1.29 (17) times as long as forefemur. Cell R_2 1.46-2.00 (25) length of vein r_{2+3}. Fore- and midtarsomere 4 2.6 (2) as long as wide; foretarsomere 5 1.12-1.25 (5) length of 4; midtarsomere 5 1.11-1.27 (5) of hindtarsomere 1 0.68-0.78 (21) length of tibia. Anterior claw of fore- and midtarsi with blunt-tipped submedian tooth, posterior claw simple. Dorsal pale scaling on abdominal terga III-VI in general a little more developed than in female, VII with lateral patches usually not forming subbasal band, VIII entirely dark; sternum VIII pale scaled, with narrow dark apical fringe. *Genitalia*. Tergum IX moderately sclerotized; median part with apical margin convex, evenly rounded or truncate in middle 0.33, pilose; lateral lobes small, not very prominent, with 2-6 short bristles. Basistyle slender, slightly basally broadened on sternal side, 3.4-4.4 (18) as long as wide, laterally and sternally scaled; with about 10 or more short bristles on tergomesal surface basad of middle, long lateral bristles, short to medium sternal bristles; claspette reaching basal 0.40-0.52 (18) of basistyle, slightly broadened vertically toward apex, with 5-7 rather short, broad setae on its mesoapical margin, and numerous bristles on its apical surface, these bristles progressively longer tergally, and often a few most tergal bristles markedly longer than others. Dististyle slender, 0.84-0.94 (19) length of basistyle, somewhat broadened and curved at apex, striated, pilose in apical half, with minute slender setae near apex, 4 to nearly 10 on convex side and 2-5 on concave side; claw subapical, often slightly curved, pigmented, 0.17-0.20 (19; x = 0.19) length of dististyle. Cercal tergal surface apparently membranous; paraproct weakly sclerotized, without median sternomesal process. Aedeagus apically widened, with about 10 strong spines on each side of apex, 1.38-1.79 (x = 1.61) as long as wide including spines, tergoapically closed, tergobasally and sternally open, tergobasal opening reaching apical 0.33 at middle.

LARVA (Fig. 114). *Head*. Width: 0.65-0.90 mm; 0.99-1.10 (x = 1.04) as wide as long; seta 1-C 0.69-0.89 length of distance between bases; usually 6, 10-C single and 12-C double. *Antenna* 0.23-0.31 mm long, brownish, apically paler; 1-A inserted at apical 0.35-0.49 (20; x = 0.43). *Mandible* with twin setae 1-Md well developed, each 2-4 branched; dorsomesal dorsal tooth occasionally with 2 mesal denticles; pectinate brush 3-5 haired; mandibular hairs (2-3) + (4-6), 7-9 in total. *Maxilla* with seta 1-Mx 2-8 branched, frequently sparsely barbed; lateral surface of mesostipes smooth or with a few small spines; lacinia and palpostipes as in *albopictus*. *Mentum plate* with 20-25 teeth. *Thorax*. Usually 2, 5, 11-M and 11-T single. *Abdomen*. Seta 7, 9-I, 9-II, 2, 4, 8-IV, 4-V, 6, 7, 14-VI, 3, 14-VII usually single; 8-II and 6-V usually double; 4, 6-I, 5-IV, 1, 5-V and 1, 5, VI usually triple; 1-VII 1.43-2.55 (30; x = 1.68) as long as antenna. Comb scales 7-20 (155; x = 11.3) including abortive scales of additional row when present, usually closely spaced; median scales with apical spine usually shorter than length of base; lateral fringe of spicules stronger than in *albopictus*, *flavopictus downsi* and *f. miyarai*, usually extending to middle of apical spine or beyond it, often (56% of 155 specimens examined) some of scales 2-4 apically furcate; occasionally some of scales fused with each other at base; occasionally an additional row of short or abortive scales present at base of ordinary row. *Siphon* usually slightly swollen basal to middle, 2.14-2.57 as long as wide, apex 0.48-0.62 width of widest part, length 0.60-0.81 mm, index 2.35-2.68; micro-

sculpture usually weak, of short transverse ridges, apically obsolete; pecten reaching basal 0.36-0.48 (20) of siphon, of 7-17 (20; $x = 12.5$) teeth; seta 1-S located beyond pecten at basal 0.41-0.57 (20), about length of or shorter than width of siphon at insertion. *Saddle* incomplete, 0.24-0.29 mm long, with weak microsculpture of short transverse ridges; apex with fine spicules; seta 4-X of 8 cratal hairs, 2 proximal hairs shorter, first hair usually, 2nd hair frequently double, very rarely triple, otherwise single, 3rd to 8th hairs single, rarely 3rd hair double. Anal gills parallel-sided, broadly rounded apically, 1.3-3.0 length of saddle; ventral gill usually shorter than (0.6-0.9; 19; $x = 0.87$) dorsal gill, rarely (1/20) length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 14♂, 30♀, 6 l: Cape Sata, Kyushu (H-0079, H-0080). 1♀: Yakushima (H-0083). RYUKYU ARCHIPELAGO 87♂, 113♀; with associated skins (57 l, 57 p), 25 L, 11 l: Amami Guntô (I-0237, I-0240, I-0242, I-0243, I-0244, I-0245, I-0246, I-0248, I-0252, I-0253, I-0255, I-0256, I-0261, I-0267, I-0268, I-0270, I-0271, I-0275, I-0276, I-0277, I-0278, I-0280, I-0281, I-0282, I-0283, I-0286, I-0287, I-0288, I-0289, I-0290, I-0298, I-0299, I-0300, I-0302, I-0303, I-0304, I-0305, I-0307, I-0309, I-0310, I-1830, I-1831, I-1832, I-1833, I-1837, I-1839, I-1841, I-1842, I-1851, I-1853, I-1865, I-1866, I-1868, I-1869, I-1877, I-1884, I-1887). 38♂, 74♀; with associated skins (5 l, 5 p), 61 L, 1 l: Okinawa Guntô (J-0408, J-0420, J-0421, J-0424, J-0426, J-0427, J-0428, J-0432, J-0439, J-0443, J-0444, J-0446, J-0447, J-0448, J-0450, J-0451, J-0452, J-0461, J-0463, J-0468, J-0472, J-0484, J-0487, J-0500, J-0512, J-0515, J-0518, J-0519, J-0527, J-0535, J-0708, J-0711, J-0712, J-0903, J-1133, J-1208, J-1257, J-1258, J-1260, J-1262, J-1291). 313♂, 258♀; with associated skins (39 l, 39 p), 21 L, 24 l: Yaeyama Guntô (K-0110, K-0119, K-0120, K-0122, K-0123, K-0130, K-0133, K-0135, K-0136, K-0137, K-0145, K-0147, K-0148, K-0151, K-0152, K-0159, K-0160, K-0161, K-0170, K-0173, K-0174, K-0175, K-0177, K-0181, K-0183, K-0184, K-0561, K-0563, K-0564, K-0565, K-0568, K-0569, K-0570, K-0573, K-0574, K-0579, K-0580, K-0582, K-0583, K-0584, K-0629, K-0630, K-0631, K-0634, K-0637, K-0724, K-0727, K-0728, K-0761, K-0768, K-0773, K-0792, K-0799, K-0801, K-0906, K-0912, K-0913, K-0917, K-0918, K-0919, K-0925, K-0970, K-1043, K-1050, K-1078, K-1112, K-1215, K-1244, K-1297, K-1324, K-1328, K-1337, K-1338, K-1344, K-1417, K-1458, K-1462, K-1587, K-1738, K-1750, K-1751, K-1758, K-1762, K-1763, K-1772, K-1774, K-1775, K-1776, K-1777, K-1778, K-2032, K-2036, K-2046, K-2052, K-2053, K-2056, K-2057, K-2058).

DISTRIBUTION. PALAEARCTIC JAPAN (Kyushu, Yakushima, Tsushima). RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô).

TAXONOMIC DISCUSSION. Bohart (1959) stated that the Yaeyama population might be a subspecies of the Okinawan form, as the larvae were not found in rock holes. While larvae in Yaeyama were chiefly found in tree holes, they also occur, though rather rarely, in rock holes. In Okinawa, they were found much more frequently in rock holes than in tree holes. In Amami, they are much more frequently in tree holes than in rock holes. A collection from Yakushima was made from a man-made container, another from Cape Sata, Kyushu mainland, at a tree hole. Morphologically they appear homogenous; a minor difference was found only in the larva, *viz.*, the percentages of occurrence of apically furcate comb scales. There were no specimens having such comb scales among 6 larval skins from Cape Sata; 18.8% of 37 larvae from Amami Ôshima, 85.1% of 74 larvae from Okinawa Is., and 38.6% of 44 larvae

from Yaeyama Guntô had one or more furcate comb scales. They are treated here as a single taxon. *Aedes riversi* has also been recorded from Danjo Guntô, Gotô Rettô and Tsushima, islands off northwestern or northern Kyushu. Their occurrence in Danjo Guntô and Gotô Rettô will need confirmation as to whether or not they have become established. If they have become established, their morphological modification as well as that of the Tsushima population might be interesting to study. Taxonomic problems may occur in relation with closely allied species, *alcasidi* Huang from Taiwan (det. Lien) and Philippines, *malayensis* Colless from Vietnam to Singapore, and *scutellaris* (Walker) from the Papuan subregion. Huang (1972) indicated that the claspette of *alcasidi* had distinctly longer setae on the apicotergal area, and the modified setae at the center of the sternoapical margin, while in *riversi*, there were no distinctly longer setae and the modified setae were located closer to the sternal angle than to the tergal angle. One specimen from Philippines we examined was found exactly identical with Huang's figure of *alcasidi*. Out of 12 dissected claspette specimens from Cape Sata, Amami, Okinawa and Yaeyama, 8 had a few distinctly longer setae at the apicotergal angle. The position of the modified setae is rather difficult to tell, because of the very poorly defined sternoapical angle owing chiefly to the poor sclerotization of this area. Some from Okinawa appear identical with Huang's figure of *riversi*, but variations occur; some specimens, especially from Amami and Yaeyama appearing closer to *alcasidi* than to the Okinawa type of *riversi*. Thus, these 2 claspette characters can hardly be considered definite specific characters. We examined a good series of specimens of *alcasidi* (det. Lien) from Taiwan at the U. S. Naval Medical Research Unit No. 2. They appear to be extremely close to *riversi*. Colless (1962) conducted a crossing experiment between *scutellaris* and *malayensis* obtaining F_2 progeny. As *Aedes riversi* and *alcasidi* so closely resemble *scutellaris* and *malayensis* morphologically, and these 4 species are allopatric, they might be considered local forms of a single species. As suggested by Lien et al. (1974), further hybridization study will be necessary to clarify their taxonomic status. It is very difficult to discriminate the larvae of *riversi* from those of *albopictus*, *flavopictus downsi* and *f. miyarai* (see discussions for each of above species.)

BIONOMICS. Very common throughout the Ryukyu Archipelago, rare in the Kyushu district. As already noted by Bohart (1959), larval habitats vary between Okinawa and Yaeyama. Of the 15 collections from Okinawa Is., 11 (73%) were obtained from rock holes, and only 3 (20%) from tree holes; of 25 collections from Yaeyama Guntô, only 3 (12%) from rock holes, and 21 (84%) from tree holes. In Amami Ôshima, the situation is closer to Yaeyama Guntô; of 37 collections, only 6 (16%) were obtained from rock holes, 21 (57%) from tree holes and the remainder (27%) from a bamboo stump and various artificial containers. One collection in Okinawa was obtained from an artificial container, one in Yaeyama from a fern stump. They very often occur with *Ae. albopictus* and *Ae. flavopictus*. Adult females are vicious day biters.

82. *AEDES (STEGOMYIA) GALLOISI* YAMADA
(Figs. 115, 116, 231; Table 114)

Aedes galloisi Yamada, 1921: 47 (♂, ♀). Type-locality: Sapporo, Hokkaido, Japan.

Aedes (Stegomyia) galloisi: LaCasse and Yamaguti, 1950: 122 (♂, ♀); Lee 1971: 725, Kwang Nung, Kyongki Do, Korea.

FEMALE (Fig. 231). Wing length 3.0-4.6 mm. *Head.* Eyes rather broadly separated above, moderately below. Vertex covered with broad dark scales, with a rather wide median stripe of broad white scales, the stripe extending onto interocular space; many pale brown erect forked scales; eye margin with rather broad to narrow pale scales; tempus covered with broad white scales, the pale scaled area divided by a wide stripe of broad dark scales; 4-6 vertical and 5 temporal dark bristles on each side. Clypeus without scales. Antenna: flagellum 0.84-0.88 (4) length of proboscis; flagellomere 1 1.37-1.45 (4) length of Flm 2, with a few dark scales, occasionally pale scales also present. Palpus 0.20-0.25 (4) length of proboscis; segment 3 1.50-1.74 (4) of 2; 4 usually present, very small, at most 0.17 length of 3. Proboscis 1.03-1.07 (4) length of forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe covered with broad white scales, bearing more than 10 mostly dark bristles; posterior lobe covered anteriorly and dorsally with crescent-shaped creamy scales, broad white scales otherwise, with 3,4 dark bristles, occasionally 1,2 bristles yellowish. Scutum with integument blackish brown, covered with narrow curved dark and white scales, the white scales forming median, anterolateral and posterior dorsocentral stripes; the median stripe slightly narrowed posteriorly, then bifurcate and extending along lateral margins of prescutellar space, reaching posterior margin; the anterolateral stripe extending from anterior margin along humeral margin to scutal angle, then mesally curved along scutal suture and confluent with posterior dorsocentral stripe located just laterad of series of posterior dorsocentral bristles, the anterolateral stripe occasionally broadened and covering most of fossal area; patches of slightly yellowish, rather broad crescent-shaped scales on lateral border behind scutal angle and above wing-root, both patches barely connected sublaterally to each other, a patch of broad white scales between them, just before wing-root on lateral border; 1-3 humeral bristles, occasionally one posterior fossal present. Scutellar median lobe with 4, 5 long dark bristles and each lateral lobe with 5-8 long and medium dark bristles, each lobe with a few additional short bristles. Paratergite with moderate-sized patch of broad white scales. Pleural integument dark brown, well developed patches of broad white scales on propleuron, subspiracular area, postspiracular area, upper sternopleuron, lower-posterior sternopleuron and mesepimeron, a small patch on metameron, subspiracular area usually with additional small dorsal patch; prealar knob usually with a few white scales; pleural bristles yellowish brown, 6-9 propleurals, 3-6 postspiraculars, more than 10 prealars, one upper sternopleural, 2-6 posterior sternopleurals, and 2-7 upper mesepimerals. *Wing.* Cell R_2 1.67-2.41 (6) length of vein r_{2+3}. Halter knob with dark and pale scales. *Legs.* Coxae with anterolateral white scales; midcoxa with varying amount of apical dark scales. Forefemur with white apical fringe and short basal pale streak on narrow anterior surface, pale scaled on ventral surface, this pale area apically narrowed, basally broadened and expanded onto narrow posterior surface; midfemur with white apical spot, pale scaled on ventral surface and in basal half of posterior surface; hindfemur with white apical patch, pale scaled in basal 0.67-0.75 on both anterior and posterior surfaces, the pale area dorsally shortened and ventrally lengthened but usually not reaching apex. Fore- and midtarsomeres 1 and 2, and all hindtarsomeres with basal bands of white scales; rarely basal band of foretarsomere 2 lacking, and midtarsomere 3 with a few pale basal scales; basal band of hindtarsomeres occupying about basal 0.5 on 3, 0.67-0.90 on 4 and 5; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 shorter than or as long as 4; hindtarsomere 1 0.65-0.72 (5) length of tibia. Claws of

fore- and midtarsi unidentate. *Abdomen.* Tergum I covered with dark scales, occasionally pale scales medially intermixed; II-VII dark scaled, with narrow basal bands and fairly large laterobasal patches of white scales, the basal bands not connected with the laterobasal patches, occasionally incomplete medially and lacking on II. Sterna II-VI basally white scaled and apically dark scaled, 2, 3 anterior segments also medioapically with pale scales; VII dark scaled, occasionally with a few pale scales intermixed; VIII with some basal pale scales and scattered brownish scales.

MALE (Figs. 115, 231). Wing length 2.6-3.3 mm. Antenna: flagellum 0.73-0.82 (4) length of proboscis, flagellomere 12 1.02-1.12 (4) length of Flm 13, both together 0.79-0.83 (4) of Flm 1-11. Palpus 0.92-0.97 (4) length of proboscis, ratio of lengths of segments 2-5: 1.05-1.43 : 1.05-1.36 : 1.04-1.30 : 1.00 (4). Proboscis 1.16-1.21 (4) length of forefemur. Cell R_2 1.74-2.23 (4) length of vein r_{2+3}. Foretarsomere 5 1.34-1.52 (4) times length of 4; midtarsomere 5 1.24-1.37 (4) of 4; hindtarsomere 1 0.68-0.72 (4) length of tibia; anterior claw of fore- and midtarsi with blunt-tipped submedian tooth, posterior claw with sharp submedian tooth. Abdominal tergum VII with a small mediobasal spot of white scales, VIII dark scaled; sternum VII with basal band of white scales. *Genitalia.* Tergum IX well sclerotized; median part with apical margin convex, evenly rounded or truncate in middle 0.33, the surface covered with tubercles; lateral lobes small, not prominent, with 2-6 short bristles. Basistyle slightly basally broadened on sternal side, 3.4-4.1 (5) as long as wide, laterally and sternally scaled, with about 10 or more short bristles tergomesally basad of middle, long lateral bristles, short to medium-sized sternal bristles; claspette reaching basal 0.43-0.48 (5) of basistyle, apex tergally expanded, the apical surface densely bristled, bristles on tergoapical angle longer and denser, about 15 rather stout, prominent based setae on mesoapical margin except for tergoapical angle. Dististyle slender, 0.82-0.91 length of basistyle, slightly broadened and curved at apex, striated, pilose on convex side, with short slender setae, 4-8 apically on convex side and 3-6 subapically on concave side; claw subterminal, straight, pigmented, 0.17-0.21 (x = 0.19) length of dististyle. Cercal tergal surface with a narrow weakly sclerotized part on each side; paraproct moderately sclerotized, without median sternomesal process. Aedeagus rather strongly constricted in middle, 1.31-1.59 (5; x = 1.48) as long as wide, with basal broadest part at basal 0.25-0.40 and usually broader than apical broadest part including spines, tergoapically closed, tergobasally and sternally open; apex with about 15 strong spines on each side.

LARVA (Fig. 116). *Head.* Width: 0.84-0.94 mm; 1.06-1.12 as wide as long; seta 1-C shorter than distance between bases; 11, 14-C rather stiff and stellate; 12, 15-C usually double; 13-C usually single. *Antenna* 0.30-0.32 mm long, rather dark brown, pale at apex; seta 1-A inserted at apical 0.33-0.46 (10; x = 0.40). *Mandible* with twin setae 1-Md well developed, each 3-5 branched; pectinate brush 3, 4 haired; mandibular hairs 2+1+(4-5), 7-8 in total. *Maxilla* with seta 1-Mx 5-10 branched, stiff; lateral surface of mesostipes with or without a few small spines; lacinia and palpostipes as in *albopictus;* 3-Mx single or apically bifid. *Mentum plate* with 19-25 teeth. *Thorax.* Setae 0, 3, 8, 11-P, 1, 13, 14-M, 1, 4, 5, 8, 13-T stiff and stellate; 11-M-T stiff, 7-P and 2-M usually single; 14-P most frequently double, occasionally (27%) triple; 3-T usually (93%) single, rarely double; 9-M usually 3 branched. *Abdomen.* Setae 1, 2, 5, 11, 13-I; 1, 2, 5, 7, 9, 13-II-VI; 1, 2, 5, 6, 8, 9, 13-VII; and 1, 5-VIII stiff and stellate. Seta 4-I always single, rather stiff; 8-VI usually single; 3-VIII usually 9-13 branched. Comb scales 7-10, usually 8, closely

spaced, with a fine lateral fringe of spicules. *Siphon* rather dark brown, usually broadest in middle, 2.63-3.33 as long as wide, apex 0.50-0.63 of widest part of siphon; length 0.88-1.01 mm, index 3.02-3.70; microsculpture of weak short transverse ridges, apically obsolete; pecten reaching basal 0.35-0.42 (9) of siphon, of 7-15 teeth; seta 1-S located beyond pecten at basal 0.43-0.50 (9), somewhat stellate, longer than width of siphon. *Saddle* usually complete, occasionally narrowly incomplete, 0.26-0.31 mm long, with weak microsculpture of short transverse ridges; apex dorsolaterally with progressively longer fine spicules; seta 1-X on apical margin of saddle, stiff and stellate, subequal to saddle in length; 4-X of 6 cratal and 2 precratal hairs, cratal hairs single, precratal hairs shorter, usually double, occasionally single. Anal gills parallel-sided, broadly rounded at apex, 2.5-3.1 as long as saddle; ventral gill subequal to dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 46♂, 47♀; with associated skins (8 l, 8 p), 14 L, 7 l: Hokkaido (A-0025, A-0026, A-0041, A-1632, A-1640, A-1641, A-1670, A-1788, A-1951, A-2275). 1♂, 1♀; with associated skins (2 l, 2 p): Honshu (C-2317).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). KOREA (Korean Peninsula). NORTHEAST CHINA. PRYMORYE. KHABAROVSK. SAKHALIN. WEST SIBERIA (Tomsk and Novosibirsk regions, ?accidental introduction-Gutsevich et al. 1970).*

TAXONOMIC DISCUSSION. As usual for the species of *Stegomyia* of this region, there is no difficulty in identifying the adult. The larvae of *galloisi* may be confused with *flavopictus flavopictus*, but may be discriminated from it by the characteristics shown in Table 25.

In middle Korea, a species closely related to *Ae. (Stegomyia) galloisi* occurs**; may be a local form of *galloisi*. It will be described by Dr. Lien.

BIONOMICS. Common in Hokkaido, rare in Honshu. Larvae are found most frequently in tree holes, including stumps. They sometimes occur also in bamboo stumps, flower pots in cemeteries and stone vases. Females are day biters. Pestryakova et al. (1975) stated that *galloisi* needed more warmth than other *Aedes*, the females did not oviposit before late July in their study area in western Siberia.

*Pestryakova et al. (1975) found *galloisi* in 4 consecutive years (1970-73) in the Tomsk region, so if it was an accidental introduction, it now appears established.

**After the submission of the manuscript, Danilov and Filippova (1978) described a new species, *Ae. (Stg.) sibiricus*, from Siberia. This species appears to be almost identical to this Korean species.

TABLE 25. Comparison of larval characteristics between *Aedes (Stegomyia) galloisi* and *Ae. (Stg.) flavopictus flavopictus*.

Seta	Branches	*galloisi*	*flavopictus*	Seta	Branches	*galloisi*	*flavopictus*
4-P	1	65.0%	-	3-T	1	93.3%	-
	2	35.0	-		2	6.7	16.7%
	3	-	3.3%		3	-	53.3
	4-18	-	96.7		4-5	-	30.0
9-P	1	100.0	20.0	4-I	1	100.0	16.7
	2	-	45.0		2	-	50.0
	3-7	-	35.0		3	-	33.3
14-P	2	73.3	-	4-II	1	100.0	20.0
	3	26.7	-		2	-	55.0
	4	-	6.7		3	-	25.0
	5-16		93.3	Saddle complete		92.3*	0**

Specimens examined: 20 *galloisi* and 30 individually reared *flavopictus*.

* 26 specimens examined.
**76 individually reared specimens examined.

83. *AEDES (STEGOMYIA) ALBOPICTUS* (SKUSE)
(Figs. 117, 118, 232; Table 115)

Culex albopictus Skuse, 1894: 20 (♀). Type-locality: Calcutta, India.
Stegomyia scutellaris: Theobald, 1901d: 298, Japan.
Aedes albopictus: Miyao, 1931: 566, Okinawa Is., Ryukyu Archipelago; Yokoo, 1944: 49, Suwon, Kyongki Do and Cheju Do, Korea.
Aedes (Stegomyia) albopictus: LaCasse and Yamaguti, 1950: 111 (♂, ♀, L); Bohart 1956 (1957): 57, Chichijima and Hahajima, Ogasawara Isls.

FEMALE (Fig. 232). Wing length 2.5-3.8 mm. *Head.* Eyes rather broadly separated above, moderately below. Vertex covered with broad dark scales, with median stripe of broad white scales, the stripe extending onto interocular space; many erect forked scales dark; eye margin with a line of broad pale scales, the line usually not reaching temporal pale area; tempus covered with broad white scales, the pale scaled area divided by a stripe of broad dark scales; 4, 5 vertical and 4 temporal dark bristles on each side. Clypeus without scales. Antenna: flagellum 0.93-1.03 (5) length of proboscis; flagellomere 1 1.28-1.47 (5) length of Flm 2, with dark scales. Palpus 0.23-0.26 (5) length of proboscis; segment 3 1.64-1.73 of 2; 4 very small or lacking. Proboscis 0.92-1.02 (5) length of forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe covered with broad white scales, bearing about 10 or

a few more mostly dark bristles; posterior lobe anteriorly and dorsally with narrow curved, dark scales, with a patch of posteroventral broad white scales, bearing 1-3 dark bristles. Scutum with integument blackish brown, covered with narrow curved dark scales, with a single long, rather broad, posteriorly narrowed, anterior median stripe of narrow curved white scales, and short fine prescutellar and posterior dorsocentral stripes of narrow curved, slightly pale yellowish scales, the prescutellar stripe connected or not connected anteriorly with anterior median stripe, posteriorly bifurcate and extending along sides of prescutellar bare space; a patch of broad white scales close to lateral margin just before wing root, and a smaller patch of rather narrow white scales above wing-root; 1-4 humeral bristles, no posterior fossals. Scutellar lateral lobe with 4-7 long or medium-sized dark bristles; median lobe with 4, 5 long or medium-sized dark bristles; each lobe with a few additional fine bristles. Paratergite with a fairly large patch of broad white scales. Pleural integument dark brown, well developed patches of broad white scales on propleuron, subspiracular area, upper sternopleuron, lower-posterior sternopleuron and mesepimeron; 3-6 pale brown propleural bristles, 1-4 pale or dark postspiraculars, 6-12 dark prealars, 1, 2 upper sternopleurals, 2-5 pale posterior sternopleurals, 2-8 pale upper mesepimerals. *Wing*. Cell R_2 1.91-2.53 length of vein r_{2+3}. Halter knob dark scaled. *Legs*. Forecoxa basally and apically white scaled, dark scaled in-between; midcoxa basally white scaled and apically dark scaled; hindcoxa white scaled. Forefemur with white apical fringe and short basal pale streak on narrow anterior surface, pale scaled in posterior half of ventral surface, this pale area basally broadened onto narrow posterior surface; midfemur with white apical spot and often with short narrow pale streak (occasionally broken) ventrally on anterior surface, pale scaled on posterior surface, the pale area apically narrowed, almost reaching apex; hindfemur with white apical patch, pale scaled on basal 0.75 or slightly more on anterior surface, basal 0.5 or slightly more on posterior surface. Foretibia usually and midtibia occasionally with a rather indistinct ventral pale streak. Fore- and midtarsomeres 1 and 2 with basal bands of white scales, 3 often with pale basal scales or dorsobasal spot of white scales; hindtarsomeres 1-3 with basal bands of white scales, 4 with basal 0.60-0.67 white scaled, 5 usually entirely white, occasionally with tip dark; femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 shorter than or subequal to 4; hindtarsomere 1 0.61-0.65 (5) length of tibia. Claws simple. *Abdomen*. Tergum I dark scaled; II-VI dark scaled, with rather large laterobasal patches and basal bands of white scales, the laterobasal patches moving progressively up to the middle of the segments in posterior segments, the basal bands laterally broadened (more strongly broadened than in *flavopictus*), often medially incomplete, not connected with laterobasal patches; VII with a mediobasal and midlateral spots of white scales. Sternum II usually pale scaled, III-VI dark scaled, with transverse bands of white scales, usually basal on III and IV, subbasal on V and median on VI.

MALE (Figs. 118, 232). Wing length 2.4-3.0 mm. Antenna: flagellum 0.8-0.9 (8) length of proboscis; flagellomere 12 0.89-1.19 (8) length of Flm 13, both together 0.72-0.81 of Flm 1-11. Palpus 1.01-1.10 (8) length of proboscis, ratio of lengths of segments 2-5: 1.00-1.14 : 1.08-1.29 : 0.96-1.16 : 1.00. Proboscis 1.10-1.14 (4) length of forefemur. Cell R_2 1.67-2.38 (5) length of vein r_{2+3}. Foretarsomere 5 1.19-1.29 (4) length of 4; midtarsomere 5 1.12-1.29 (5) of 4; hindtarsomere 1 0.64-0.70 (5) length of tibia; anterior claw of fore- and midtarsi with blunt-tipped submedian tooth, posterior claw simple. Abdominal tergum VII without mediobasal patch, VIII dark scaled, with a few scattered pale scales; sternum VIII with basal band of white scales. *Genitalia*.

Tergum IX well sclerotized; median part strongly produced into an apically rounded process; lateral lobes small, subconical, with 4-9 short bristles. Basistyle basally broadened on sternal side, 2.5-2.8 (9) as long as wide, laterally and sternally scaled, with about 10 short bristles on tergomesal surface basad of middle, long bristles laterally, and short to medium-sized bristles sternally; claspette reaching about apical 0.33 of basistyle, apical expanded portion longitudinal, its mesoapical surface heavily covered with rather long bristles, about 10 longer and stouter bristles on sternoapical to mesal margin. Dististyle slender, 0.80-0.86 (6) length of basistyle, somewhat broadened and curved at apex, rather weakly striated, pilose on convex side in apical half, with 6 to about 10 minute setae on each convex and concave side near apex; claw subterminal, straight, pigmented, 0.15-0.18 (6) length of dististyle. Cercal sternal surface with a narrow, moderately sclerotized area on each side; paraproct without median sternomesal process. Aedeagus slightly constricted in middle, with about 10 stout spines on each side of expanded apex, 1.56-1.90 as long as apical widest part including spines, tergally closed in apical half, tergobasally and sternally open; sternal opening narrow at base, apically broadened.

LARVA (Fig. 117). *Head.* Width 0.75-0.90 mm; 1.01-1.10 (x = 1.05) as wide as long; seta 1-C 0.68-1.02 (5) as long as distance between bases; usually 8,10-C single, 6,7,15-C double and 11-C triple. Antenna 0.26-0.32 mm long, brownish; seta 1-A inserted at apical 0.34-0.52 (x = 0.42). *Mandible* with twin setae 1-Md well developed, each usually 2-5 branched, rarely single, 9 branched in one specimen; dorsomesal dorsal tooth occasionally with 2 mesal denticles; pectinate brush 3-5 haired; mandibular hairs usually (2-3) + 1 + (5-7), 8-10 in total. *Maxilla.* Seta 1-Mx 2-5 branched, usually sparsely barbed. Mesostipes about 1.33 as long as wide, lateral surface with a few small spines or almost smooth. Lacinia with an outstanding stout simple spine and several apically branched stout hairs on mesal margin; 5-Mx on about level of stipital sensoria. Palpostipes about 0.67 length of mesostipes; $S_3 \geqq S_1 > S_2 = S_4 > S_5$ in length. *Mentum plate* with 21-25 teeth. *Thorax.* Setae 5,6-P, 2,7-M usually single; 7-P and 9-T usually double; 1-P, 6-M and 4-T usually triple; 7-T usually 4 branched. *Abdomen.* Seta 1-II, 4-III-V, 6-VI, 14-III,IV,VI, VIII usually single, 8-II and 2-X double, and 6-I and 8-VII triple; 1-VII 0.96-1.71 (20; x = 1.27) as long as antenna. Comb scales 8-12 (20; x = 9.2), median scales with apical spine usually length of or longer than length of base; lateral fringe of spicules usually very fine and basally restricted, in specimens of Palaearctic Japan slightly stronger and extending more distad but not beyond middle of apical spine. *Siphon* usually slightly swollen basal to middle, 2.17-2.64 as long as wide, apex 0.49-0.59 of widest part, length 0.64-0.86 mm, index 2.30-2.92; microsculpture of weak short transverse ridges, apically obsolete; pecten reaching basal 0.34-0.49 (20) of siphon, of 7-19 (20; x = 11.8) teeth; seta 1-S located beyond pecten at basal 0.45-0.59 (20), about length of or shorter than width of siphon at insertion. *Saddle* incomplete, 0.23-0.31 mm long; with weak microsculpture of short transverse ridges; apex with fine spicules; seta 4-X of 8 (rarely 6) cratal hairs, usually single, most proximal hair occasionally double. Anal gills parallel-sided, broadly apically rounded, 1.7-5.0 length of saddle; ventral gill usually length of dorsal gill, occasionally slightly shorter (up to 87% of dorsal gill).

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 57♂, 69♀; with associated skins (45 l, 45 p), 12 L, 6 l: Honshu (C-1544, C-1581, C-1822, C-2082, C-2103, C-2104, C-2105, D-0011, D-0021, D-0047, D-0048, D-0049, D-0050, D-0057, D-0058, D-0059, D-0061, D-0101, E-2099). 2♀; with associated skins

1 l, 1 p): Izu Shichitô (C-1533, C-1534). 1♂, 3♀: Shikoku (G-1277). 7♂, 14♀; with associated skins (2 l, 2 p): Kyushu (H-0073, H-0315, H-0317, H-0318). 9♂, 26♀: Yakushima (H-0082, H-0083, H-0084). 6♂, 9♀; with associated skins (7 l, 7 p): Tsushima (H-0549, H-2004, H-2005). KOREA. 6♂, 12♀; with associated skins (1 l, 1 p): Korean Peninsula (L-0824, L-0829, L-0834, L-0835, L-2024). 10♂, 3♀, 1 L: Cheju Do (M-0849, M-0852). RYUKYU ARCHIPELAGO. 9♂, 29♀; with associated skins (21 l, 21 p), 8 L, 2 l: Amami Guntô (I-0250, I-0258, I-0264, I-0266, I-0267, I-0268, I-0270, I-0271, I-0274, I-0275, I-0282, I-0283, I-0301, I-0307, I-0310). 38♂, 54♀; with associated skins (4 l, 4 p), 5 L, 2 l: Okinawa Guntô (J-0409, J-0412, J-0414, J-0415, J-0416, J-0425, J-0435, J-0456, J-0463, J-0465, J-0466, J-0467, J-0468, J-0470, J-0471, J-0484, J-0487, J-0498, J-0522, J-0525, J-0529, J-0533, J-0534, J-1257, J-1923, J-2287). 55♂, 63♀; with associated skins (8 l, 8 p), 2 L: Yaeyama Guntô (K-0110, K-0111, K-0119, K-0120, K-0122, K-0133, K-0140, K-0141, K-0152, K-0174, K-0177, K-0177a, K-0179, K-0561, K-0568, K-0734, K-0735, K-0906, K-0919, K-0924, K-0926, K-0927, K-1020, K-1026, K-1069, K-1078, K-1111, K-1420, K-1421, K-1589, K-1599, K-1603, K-2046, K-2070). OGASAWARA ISLS. 47♂, 23♀; with associated skins (11 l, 11 p), 50 L, 25 l: (N-1176, N-1177, N-1178, N-1179, N-1506, N-1507, N-1509, N-1553, N-1554, N-1556, N-1557, N-1558, N-1562, N-1565, N-1719).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Izu Shichitô, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). OGASAWARA ISLANDS. NORTH AND SOUTH CHINA. ORIENTAL REGION. AUSTRALIAN REGION. MARIANA ISLANDS. HAWAIIAN ISLANDS. FRENCH SOMALILAND. MALAGASY.

TAXONOMIC DISCUSSION. Identifications of *Ae. albopictus*, *flavopictus* and *riversi* are quite easy in the adult stage, but very difficult in the larval stage. Huang (1972) discussed Southeast Asian species of the *scutellaris* group including the above 3 species of the Ryukyu Archipelago and Palaearctic Japan. The larvae of these species, however, cannot always be identified by her key and diagnostic characters, as the larvae are highly variable.

Aedes albopictus is the commonest species of this subgenus in this region, and sympatric with *riversi* from Kyushu to Yaeyama; with *flavopictus flavopictus* in Honshu, Shikoku and Kyushu, *f. downsi* in Amami and Okinawa and *f. miyarai* in Yaeyama. The following discussions are based on individually reared specimens unless otherwise stated.

Huang (l.c.) stated that, in *albopictus*, seta 1-VII is usually 4, sometimes 3 branched, and always much shorter and stronger (less than 2.0 length of 5-VII); in *riversi*, 1-VII usually has 2 (2,3) long branches (at least 2.5 length of 5-VII). Out of 20 specimens of *albopictus* from the Ryukyus and Palaearctic Japan, 1-VII was 2 branched in 8 specimens, 3 branched in 6, and 4 branched in 6. The relative length of 1-VII to 5-VII was 1.74-3.04 (10; $\bar{x}$ = 2.58). This wide variation appears partly due to the variable length of 5-VII. A comparison with the length of the antenna seems to be more reliable; it was 0.96-1.71 (20; $\bar{x}$ = 1.33). In *riversi*, 1-VII was 2,3 branched in equal ratios (20); relative length of 1-VII to 5-VII 1.91-3.48 (10; $\bar{x}$ = 2.88), to antennal length 1.43-2.55 (30; $\bar{x}$ = 1.68). All values overlap with each other to a considerable degree, so complete discrimination appears impossible. In the Ryukyu Archipelago, the shape of comb scales mentioned in the foregoing key and description of *riversi* may be the most reliable diagnostic character, but the difference is so slight that careful examination will be necessary. In specimens of *albopictus* from Palaearctic Japan, the lateral fringe of spicules of the comb scales tends to be

more developed than in those from the Ryukyus, but in Palaearctic Japan, *riversi* has been found in only a few peripheral areas of the Kyushu district. Apically bi- or multifurcate and basally fused comb scales are apparently attributed to *riversi* only; the furcate comb scales were found in none of 6 mounted larval skins (not individually reared, but associated adults were all *riversi*) from Cape Sata, 18.9% of 37 specimens from Amami Ôshima, 85.1% of 74 from Okinawa Is. and 38.6% of 44 from Yaeyama (all of the preceding included whole mounted larvae). The occurrence of fused comb scales is much less frequent. Seta 6-C is single in 10% and double in 90% (30) of *albopictus;* single in 93.3% and double in 6.7% (30) of *riversi*. The ventral anal gill is more frequently (75%) (20) equal to the dorsal gill in *albopictus*, the shortest ventral gill was 0.9 of the dorsal; while in *riversi* it is usually (95%) (20) shorter than the dorsal gill, the average length is 0.8 of the dorsal gill. These characters may also be used in species diagnoses, but in a limited degree.

The larvae of *flavopictus flavopictus* are usually distinguished from *albopictus* in having stiffer stellate body setae, but examples of *f. flavopictus* having the least stiff setae are similar to those of *albopictus* having the stiffest setae. Kano (1949) stated that these species were separable by the number of the branches of setae 1, 5-VIII, *viz.*, they were 2-4 branched in *albopictus*, and 6-16 and 6-15 (-20?) branched respectively in *f. flavopictus*. Our evaluation of these 2 setae with 30 examples of *albopictus* from 18 localities, and as many examples of *f. flavopictus* from 14 localities confirmed that they might be used as secondary diagnostic characters, though 5 branched 1-VIII and 6 branched 5-VIII were found in not more than 10% of studied larvae of both species. We found that the range of the branching of 8 setae not mentioned by Kano (l.c.) barely overlapped between these species. These are shown in Table 26. Accurate identification may be obtained by taking all 8 of these setae together with 1, 5-VIII into consideration. Huang (1972) used the complete saddle of *f. flavopictus* as a specific diagnostic character. Actually, the saddle is incomplete in *f. flavopictus* (cf. TAXONOMIC DISCUSSION OF *Ae. flavopictus*).

The Ryukyuan subspecies of *flavopictus, downsi* and *miyarai,* are by far more difficult to discriminate from *albopictus*. Huang (l.c.) regarded seta 2-VII as a definite diagnostic character, saying that it was 3, 4 branched in *downsi* (including our *miyarai*) and usually single (1, 2) in *albopictus*. Our evaluation was that the seta is 1-3 branched in both *albopictus* and *flavopictus downsi,* 1-4 branched in *f. miyarai;* single and double in 96.7% (30) of *albopictus,* 59% (19) of *f. downsi* and 60% (20) of *f. miyarai*. Thus, branching of seta 2-VII cannot be a diagnostic character. In fact, no definite diagnostic characters were detected. Only 10-C and the relative length of the dorsal and ventral anal gills may be utilized in a limited degree. Seta 10-C was single in 96.7%, double in 3.3% of *albopictus* (30), always double in *f. downsi* (19), and double in 95% and triple in 5% of *f. miyarai* (20). The relative length of the ventral gill to the dorsal gill varied from 0.9 to 1.0 (x = 1.0) in *albopictus* (20) (1.0 in 75% of the specimens); 0.8-1.0 (x = 0.9) in *f. downsi* (19) (1.0 in only 10%) and 0.7-0.9 (x = 0.8) in *f. downsi* (20). Some setae, such as 0-P, 13-T, 1, 2, 5, 9 and 13 of the abdomen, have a certain extent of unoverlapped areas in the range of branching (*vide* chaetotaxy tables). Even utilizing these characters in combination, complete separation of *albopictus* from *f. downsi* or *f. miyarai* still may not be always possible.

TABLE 26. Comparison of the number of setal branches of the larvae of *Aedes (Stegomyia) albopictus* and *Ae. (Stg.) flavopictus flavopictus*.

Seta	Branches	*albo-pictus*	*flavo-pictus*	Seta	Branches	*albo-pictus*	*flavo-pictus*
2-IV	1-2	96.7%	-	5-IV	2-3	100.0%	-
	3	3.3	-		4	-	-
	4	-	53.3%		5-13	-	100.0%
	5-8	-	46.7	5-VI	1-3	93.3	-
2-V	1	70.0	-		4	6.7	-
	2	30.0	-		5	-	20.0
	3	-	3.3		6-12	-	80.0
	4-8	-	96.7	9-VI	1-2	90.0	-
2-VI	1-2	93.3	-		3	10.0	-
	3	6.7	-		4	-	13.3
	4	-	26.7		5-11	-	86.7
	5-8	-	73.3	1-VIII	2-3	50.0	-
2-VII	1-2	96.7	-		4	40.0	-
	3	3.3	-		5	10.0	3.3
	4	-	13.3		6	-	3.3
	5-8	-	86.7		7-19	-	93.3
5-III	3	96.7	-	5-VIII	2-4	80.0	-
	4	3.3	-		5	13.3	-
	5	-	16.7		6	6.7	3.3
	6-12	-	83.3		7	-	20.0
					8-22	-	76.7

Specimens examined: 30 individually reared for each species.

BIONOMICS. Very common throughout Japan including the Ryukyu Archipelago, excluding northern districts. The larvae occur in a wide variety of natural containers including tree holes, bamboo and fern stumps, leaf-axils, etc., and various types of small artificial containers in human dwelling areas. A study utilizing ovitraps in Kamakura City found *albopictus* eggs to comprise nearly 74% of the 34,000 eggs collected (Moriya 1974). They are often found associated with *Orthopodomyia anopheloides*, *Ae. japonicus*, *Ae. riversi*, *Ae. flavopictus* and *Tripteroides bambusa*. Adult females are vicious day biters.

MEDICAL IMPORTANCE. *Aedes albopictus* has been known as a vector of dengue fever in this region. Japanese encephalitis virus has been isolated from wild-caught females (Hurlbut and Nibley 1964), but the authors think the validity of this isolation is doubtful. The role of this species in the epidemiology of this disease is not certain (Yamamoto 1971). Huang (1972) listed vertebrate pathogens associated with *albopictus*. Suenaga and Itoh (1973) found *Dirofilaria immitis* larvae in 3.2% of *albopictus* collected in urban areas and in 5.5% from rural areas in the vicinity of Nagasaki.

84. *AEDES (STEGOMYIA) FLAVOPICTUS* YAMADA

Aedes flavopictus Yamada, 1921: 52 (♂, ♀). Type-locality: Shiba, Tokyo, Japan.

DISTRIBUTION. PALAEARCTIC JAPAN. KOREA. PRYMORYE. RYUKYU ARCHIPELAGO.

84A. *AEDES (STEGOMYIA) FLAVOPICTUS FLAVOPICTUS* YAMADA (Figs. 118, 119; Table 116)

Aedes flavopictus Yamada, 1921: 52 (♂, ♀). Type-locality: Shiba, Tokyo, Japan. Also recorded from Korea (Keijo and Kanko).
Aedes (Stegomyia) flavopictus: LaCasse and Yamaguti: 1950: 116 (♂, ♀, L).

FEMALE. Wing length 2.6-4.0 mm. *Head.* Eyes rather broadly separated above, moderately below. Vertex covered with broad dark scales, with rather broad median stripe of broad white scales, the stripe extending onto interocular space; eye margin with a line of broad pale scales, the line usually not reaching temporal pale area; many erect forked scales, usually dark, occasionally yellowish brown ones intermixed, rarely all scales yellowish brown; tempus covered with broad white scales, with rather broad stripe or anterior spot of dark scales within pale area; 4-6 vertical and 4 temporal dark bristles on each side. Clypeus without scales. Antenna: flagellum 0.80-0.87 length of proboscis, flagellomere 1 1.21-1.46 length of Flm 2, with small dark scales. Palpus 0.19-0.22 length of proboscis; segment 3 1.56-2.19 of 2; 4 lacking or very small, occasonally developed up to 0.17 length of 3. Proboscis 1.01-1.13 length of forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe covered with broad white scales, bearing about 10 or more mostly dark bristles, a few lateral bristles yellowish; posterior lobe anteriorly and dorsally with narrow curved dark scales, posteroventrally with a patch of broad white scales, bearing 3-5 dark bristles. Scutum with integument blackish brown, covered with narrow curved dark scales, with a single, long, rather broad, posteriorly narrowed, anterior median stripe of narrow curved white scales, and short fine prescutellar and posterior dorsocentral stripes of narrow curved slightly yellowish scales, the prescutellar stripe usually not connected anteriorly with anterior median stripe, posteriorly bifurcate and extending along sides of prescutellar bare space, a patch of crescent-shaped slightly yellowish scales laterally just in front of to above wing root; 2-5 humeral bristles, one posterior fossal. Scutellar median lobe with 3-6, lateral lobe with 6-9 long and medium-sized bristles, each lobe with a few additional short bristles. Paratergite with well developed patch of broad white scales. Pleural integument dark brown, well developed patches of broad white scales on propleuron, upper sternopleuron, lower posterior sternopleuron and mesepimeron, mesepimeral patch reaching lower 0.25-0.33 of mesepimeron, subspiracular area usually with white scales, most frequently 1-3, often 4-10, occasionally lacking or more than 10; pleural bristles yellowish or pale brown, 4 to about 10 propleurals, 2-7 postspiraculars, 7 to more than 10 prealars, 1,2 upper sternopleurals, 3-8 posterior sternopleurals, 3-8 upper mesepimerals, lower mesepimeral usually absent, occasionally one very fine bristle present. *Wing.* Cell R_2 1.77-2.56 length of vein

r_{2+3}. Halter knob pale scaled. *Legs*. Forecoxa basally and apically white scaled, dark scaled in-between; midcoxa basally white scaled, apically dark scaled; hindcoxa white scaled. Forefemur with white apical fringe and short pale basal streak on narrow anterior surface, pale scaled in posterior 0.67 of ventral surface, this pale area broadened basally onto narrow posterior side; midfemur with white apical spot, pale scaled on posterior and ventral surfaces, the pale area apically narrowed on posterior surface; hindfemur with apical white patch, pale scaled in basal 0.67-0.75 on anterior surface (0.6 in specimens from Mikura Is., Izu Shichitô), 0.5 or slightly more on posterior surface, about 0.33 on dorsal surface, up to apex on ventral surface. Fore- and midtibiae usually with rather obscure pale streak on ventral surface. Fore- and midtarsomeres 1 and 2 with basal bands of white scales, 3 often with basal white scales, occasionally with a definite basal band in midtarsus; hindtarsomeres 1-3 with basal bands, 4 with basal 0.67-0.83 pale scaled, the pale area shorter ventrally (pale in basal 0.8-0.9, occasionally up to apex in specimens from Mikura Is., Izu Shichitô), 5 with very narrow dark tip or entirely pale. Femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 shorter than or equal to 4; hindtarsomere 1 0.67-0.76 length of tibia. Claws simple. *Abdomen*. Tergum I dark scaled; II-VII with rather large laterobasal patches of white scales, the patches tending to slightly become distal on 2 or 3 posterior segments; II-VI with narrow basal bands of white scales, the bands only slightly laterally broadened, usually not connected with laterobasal patches, occasionally reduced in middle, often reduced on II; VII with a mediobasal patch. Sternum II pale scaled, usually with sublateral apically dark patches; III-VI with pale basal bands, apically dark scaled, the basal band tending to become slightly distal on one or 2 posterior segments; VII usually entirely dark scaled, occasionally (15.8%) with a few pale scales.

MALE (Fig. 118). Wing length 2.4-3.3 mm. Antenna: flagellum 0.67-0.77 (9) length of proboscis, flagellomere 12 0.91-1.24 length of 13, both together 0.70-0.85 of Flm 1-11. Palpus 0.91-1.03 length of proboscis, ratio of lengths of segments 2-5: 0.98-1.27 : 1.10-1.36 : 1.00-1.27 : 1.00. Proboscis 1.16-1.24 (8) times as long as forefemur. Cell R_2 1.81-2.50 length of vein r_{2+3}. Foretarsomere 5 1.19-1.29 (5) length of 4; midtarsomere 5 1.15-1.22 (5) length of 5; hindtarsomere 1 0.70-0.80 length of tibia; anterior claw of fore- and midtarsi with blunt-tipped submedian tooth, posterior claw simple. Abdominal tergum VII with or without mediobasal patch; VIII dark scaled; sternum VIII with basal band of white scales. *Genitalia*. Tergum IX well sclerotized; median part well produced into a single large lobe, its apical margin broadly rounded and rather irregularly serrate; lateral lobes small, convex, each with 4-9 rather short bristles. Basistyle rather narrow, basally broadened on sternal aspect, 2.8-3.7 as long as wide, laterally and sternally scaled, with more than 10 short bristles on tergomesal surface just basad of middle, long lateral and sternoapical bristles, small to medium-sized sternal bristles on mesal to apical area; claspette reaching apical 0.19-0.27 of basistyle, apical expanded portion longitudinal, its mesoapical surface densely covered with rather short bristles, with a row of as long broad blade-like setae on the sternal margin. Dististyle slender, 0.82-0.96 length of basistyle, somewhat broadened and curved at apex, striated, pilose on convex side in apical half, with 3-5 minute setae on each convex and concave side near apex; claw subterminal, straight, pigmented, 0.14-0.17 length of dististyle. Cercal tergal surface with a narrow weakly sclerotized area; paraproct without median sternomesal process. Aedeagus slightly constricted in middle, with more than 10 stout spines on each side of expanded apex, 1.54-1.80 as long as wide including

spines, tergally closed in apical half, tergobasal opening extending to apical 0.4 at middle, sternal opening narrow at base and apically broadened.

LARVA (Fig. 119). Body setae usually stiffer and with more branches than in *albopictus, flavopictus downsi, f. miyarai* and *riversi,* but less so than in *galloisi.* Head. Width: 0.80-0.99 mm; 1.10 (1) as wide as long; seta 1-C 0.68-0.81 (5) length of distance between bases; usually, 5, 13-C single and 12, 15-C double; 11, 14-C usually rather stiff. *Antenna* 0.26-0.33 mm long, rather dark brown, apically paler; seta 1-A inserted at apical 0.40-0.49 (x = 0.45). *Mandible* with 1-Md usually double, rarely single, well developed, usually stiffer than in *albopictus, riversi, f. downsi* and *f. miyarai,* each 3-7 branched; microspines of dorsolateral surface usually stouter than in the other species of the *scutellaris* group of this region; hairs of pectinate brush 3, 4; mandibular hairs (2-3) + (4-7), 7-10 in total, often a proximal hair of the distal group detached. *Maxilla* with seta 1-Mx 4-12 branched, usually stouter and more strongly barbed than in *albopictus, riversi, f. downsi* and *f. miyarai;* lateral surface of mesostipes smooth or with a few small spines; lacinia and palpostipes as in *albopictus. Mentum plate* with 20-25 teeth. *Thorax.* Usually, 5, 10-P and 11-T single, 7-P and 9-T double; 0, 4, 8, 11-P, 11, 13, 14-M, 1, 4, 5, 8, 13-T usually rather stiff; 11-P fairly well developed. *Abdomen.* Setae 11-II, 7, 14-VI usually single; 11-I, 1, 2, 5, 9, 13 on I-VI, 2, 5, 8, 9, 13-VII, and 1, 5-VIII usually rather stiff; 1-VII 0.83-1.24 (30; x = 1.06) length of antenna. Comb scales 7-10 (20; x = 9.1), median scales with apical spine usually length of or longer than length of base, lateral fringe of spicules distinct, often extending to near middle of apical spine. *Siphon* usually slightly swollen basal to middle, 2.33-2.81 as long as wide, apex 0.49-0.65 of widest part; length 0.71-0.99 mm, index 2.35-3.19 microsculpture of weak short transverse ridges, apically obsolete; pecten reaching basal 0.34-0.46 (20) of siphon, of 6-14 (20; x = 8.9) teeth; seta 1-S located beyond pecten at basal 0.44-0.55 (20), length of or shorter than siphon diameter at insertion. *Saddle* incomplete, 0.22-0.33 mm long, with weak microsculpture of short transverse ridges; apex with usually progressively longer laterodorsal fine spicules; seta 2-X usually double; 4-X of 8 usually single cratal hairs, 2 proximal hairs shorter and occasionally double. Anal gills 1.8-3.8 length of saddle, parallel-sided, broadly rounded at apex; ventral gill usually length of dorsal gill, occasionally shorter, 0.9 length of dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 39♂, 32♀; with associated skins (4 l, 4 p), 5 L, 6 l: Hokkaido (A-1640, A-1643, A-1651, A-1654, A-1670, A-1788, A-1909). 58♂, 80♀; with associated skins (74 l, 74 p), 8 L, 17 l: Honshu (B-0341, B-0351, B-0360, B-0380, C-2107, D-0047, D-0048, D-0051, D-0057, D-0101, E-2071, E-2073, E-2083, E-2088, E-2089, E-2090, E-2100). 6♀: Kyushu (H-0076). 5♂, 2♀: Tsushima (H-2004, H-2014). KOREA. 60♂, 47♀; with associated skins (2 l, 2 p): Korean Peninsula (L-0815, L-0819, L-0821, L-0822, K-0824, L-0825, L-0828, L-0829, K-0833, L-0834, L-0865, L-0866, L-0868, L-0872, L-0873, L-0874, L-0876). 1♂, 1♀; with associated skins (1 l, 1 p): Cheju Do (M-0848, M-0854). 44♂, 41♀; with associated skins (17 l, 17 p), 39 L, 23 l: Mikura Is., Izu Shichitô (C-1523, C-1524, C-1526, C-1527, C-1528, C-1530, C-1531, C-1532, C-1533, C-1534).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsushima, Izu Shichitô). KOREA (Korean Peninsula, Cheju Do). SOUTH PRYMORYE.

84B. *AEDES (STEGOMYIA) FLAVOPICTUS DOWNSI* BOHART AND INGRAM (Fig. 233; Table 117)

Aedes (Stegomyia) downsi Bohart and Ingram, 1946a: 51 (♂, ♀, L). Type-locality: Chizuka, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 233). Wing length 2.3-3.6 mm. *Head.* Vertical bristles 3, 4 (usually 4), temporal bristles 4, 5 (usually 5). Antennal flagellum 0.85-0.95 length of proboscis, flagellomere 1 1.02-1.36 (13) length of Flm 2. Proboscis 0.97-1.09 (13) length of forefemur. Palpus 0.24-0.25 (11) length of proboscis, segment 3 1.59-2.08 (11) of 2. *Thorax.* Posterior pronotal bristles 2-5. Narrow curved scales forming 3 yellowish scutal posterior stripes; narrow curved or crescent-shaped scales forming a yellow to yellowish brown supraalar patch. Subspiracular area usually without scales, occasionally with a few broad pale scales (Table 28). Pleural bristles: 4-8 propleurals, 2-7 postspiraculars, 9 to more than 10 prealars, 9 to more than 10 prealars, 1, 2 upper sternopleurals, 4-9 posterior sternopleurals, 3-9 upper mesepimerals. *Wing.* Cell R_2 1.52-2.36 (20) length of vein r_{2+3}. *Legs.* Hindfemur pale scaled usually on basal 0.6 on anterior surface. Hindtarsomere 4 with basal 0.75-0.90 (usually 0.80-0.83 in specimens from Amami Ôshima, 0.9 in specimens from Okinawa Is.) pale scaled; 5 with very narrow dark tip to entirely pale. Hindtarsomere 1 0.66-0.72 (11) length of tibia. *Abdomen.* Sternum VII usually entirely dark scaled, occasionally (12.5%) with a few pale scales.

MALE (Fig. 233). Wing length 2.0-2.9 mm. Antennal flagellum 0.64-0.74 (5) length of proboscis; flagellomere 12 0.98-1.22 (8) length of Flm 12, both together 0.66-0.79 (8) of Flm 1-11. Palpus 0.88-0.98 (6) length of proboscis; ratio of lengths of segments 2-5: 1.04-1.32 : 1.22-1.54 : 1.08-1.26 : 1.00. Proboscis 1.16-1.39 (5) length of forefemur. Cell R_2 1.52-2.28 (20) length of vein r_{2+3}. Hindtarsomere 1 0.72-0.75 (7) length of tibia. *Genitalia.* Claspette reaching apical 0.08-0.19 (19) of basistyle, its stalk and lateral arms in lateral view narrower than in *f. flavopictus.* Claw of dististyle 0.14-0.18 (16) length of dististyle. Aedeagus 1.71-2.11 (13) as long as wide including spines.

LARVA. In general, body setae more slender and with less branching than in *f. flavopictus,* and similar to those of *albopictus* and *riversi. Head.* Width: 0.65-0.85 mm; 0.92-1.01 (x = 0.98) as wide as long; seta 1-C 0.77-1.06 (12) length of distance between bases; 6, 7, 12-C usually double, 11-C usually triple. *Antenna* 0.24-0.30 mm long, seta 1-A inserted at apical 0.41-0.54 (x = 0.47). *Mentum plate* with 21-27 teeth. *Thorax.* Seta 2-P, M usually single, and 3-P and 9-T double. *Abdomen.* Setae 7-I, 8, 14-III and 14-VI usually single; 8-VI usually double; 5-II, IV, V, 7-IV and 9-VI usually triple; 13-IV usually 4 branched; 1-VII 1.07-2.26 (19; x = 1.63) length of antenna. Comb scales 6-10 (19; x = 8.4), apical spine usually longer than in *riversi,* lateral fringe of spicules finer than in *riversi* and usually restricted to base. *Siphon* 2.25-2.73 as long as wide, apex 0.50-0.63 of widest part, length 0.57-0.83 mm, index 2.54-3.12; pecten reaching basal 0.37-0.54 (20) of siphon, occasionally one apical tooth detached, and located close to seta 1-S or beyond it; 1-S usually located beyond pecten at basal 0.48-0.60 (20), usually 4 branched; 2-S 1-3 branched. *Saddle* incomplete, 0.21-0.29 mm long. Anal gills 1.2-4.5 as long as saddle, ventral gill usually shorter than dorsal gill (0.77-1.00 (20; x = 0.86) length of dorsal gill).

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 16♂, 23♀; with associated skins (16 l, 16 p), 14 L, 2 l: Amami Gunto (I-0246, I-0266, I-0268, I-0277, I-0278, I-0279, I-0283, I-0289, I-0303, I-0304, I-0305, I-0309, I-1831,

I-1832, I-1834, I-1835, I-1837, I-1843, I-1851, I-1854, I-1886). 16♂, 24♀; with associated skins (3 l, 3 p), 17 L, 1 l: Okinawa Guntô (J-0408, J-0432, J-0456, J-0463, J-0468, J-0480, J-0482, J-0487, J-0498, J-0506, J-0507, J-0508, J-0509, J-0510, J-0527, J-0535, J-0717, J-0902).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami and Okinawa Guntô).

84C. *AEDES (STEGOMYIA) FLAVOPICTUS MIYARAI* NEW SUBSPECIES (Fig. 233; Table 118)

Aedes downsi: Teller and Gentry, 1955: 45, Iriomote Is., Ryukyu Archipelago.

FEMALE (Fig. 233). *Head.* Vertical bristles 4, 5 (usually 4), temporal bristles 4. Antennal flagellum 0.78-0.88 length of proboscis; flagellomere 1 1.27-1.48 (5) length of Flm 2. Proboscis 1.04-1.07 (5) length of forefemur. Palpus 0.20-0.24 length of proboscis; segment 3 1.53-1.76 (5) of 2. *Thorax.* Posterior pronotal bristles 2-4. Scutal scaling similar to that of *flavopictus downsi,* but scales of supraalar patch slightly paler. Subspiracular area most frequently with 1-3 broad pale scales, occasionally with a definite patch, often without scales (Table 28). Pleural bristles: 6-8 propleurals, 2-6 postspiraculars, 8 to more than 10 prealars, 1, 2 (4 in one specimen) upper sternopleurals, 6-10 posterior sternopleurals, 5-11 upper mesepimerals. *Wing.* Cell R_2 1.37-2.00 length of vein r_{2+3}. *Legs.* Hindfemur pale scaled usually in basal 0.67 on anterior surface. Hindtarsomere 4 usually with basal 0.9 pale, occasionally entirely pale; 5 usually entirely pale, occasionally (12.0%) with narrow ventral dark tip. Hindtarsomere 1 0.67-0.73 (8) length of tibia. *Abdomen.* Sternum VII often (42.9%) with pale scales.

MALE (Fig. 233). Antennal flagellum 0.66-0.75 (5) length of proboscis; flagellomere 12 0.95-1.12 (5) length of Flm 13, both together 0.69-0.81 (5) of Flm 1-11. Palpus 0.92-0.95 (5) length of proboscis; length ratio of segments 2-5: 1.02-1.15 : 1.15-1.35 : 1.00-1.22 : 1.00. Proboscis 1.17-1.26 (5) length of forefemur. Cell R_2 1.45-1.83 length of vein r_{2+3}. Hindtarsomere 1 0.72-0.73 (5) length of tibia. *Genitalia.* Claspette reaching apical 0.20-0.29 (11) of basistyle, its stalk and lateral arms in lateral view narrower than in *f. flavopictus.* Claw of dististyle 0.17-0.20 length of dististyle. Aedeagus 1.58-1.98 (11) as long as wide including spines.

LARVA. Almost identical with *f. downsi. Head.* Width: 0.76-1.13 mm; 1.03-1.12 (x = 1.07) as wide as long; seta 1-C 0.76-1.13 length of distance between bases; usually, 13-C single, 6, 10, 12-C double, and 11-C triple. *Antenna* 0.25-0.32 mm long; seta 1-A inserted at apical 0.37-0.53 (x = 0.45). *Mentum plate* with 23-29 teeth. *Thorax.* Usually, seta 5-P single, 7-P and 9-T double, and 6-M triple. *Abdomen.* Setae 6, 7-VI usually single; 5, 7-IV, 5-V and 9-VII usually triple; 1-VII 1.34-1.79 (13; x = 1.57) length of antenna. Comb scales 8-12 (20; x = 10.2), apical spine usually longer than in *riversi,* lateral fringe of spicules usually slightly stronger than in *f. downsi,* in most developed case, extending to middle of apical spine. *Siphon* 2.06-3.02 as long as wide, apex 0.48-0.57 of widest part; length 0.63-0.89 mm, index 2.06-3.02; pecten reaching basal 0.37-0.51 (20) of siphon, of 7-19 (20; x = 11.6) teeth; seta 1-S located beyond pecten at basal 0.47-0.61 (20). *Saddle* incomplete, 0.24-0.31 mm long. Anal gills 1.3-2.7 (20) length of saddle, ventral gill 0.7-0.9 (20; x = 0.8) as long as dorsal gill.

TYPE-SERIES. Holotype male (#22323, K-0638-18) with associated slides of genitalia, larval and pupal skins: Mt. Banna, Ishigaki Is., Ryukyu Archi-

pelago 22 IV 1971, tree hole, Mizusawa & Nishikawa. Paratypes: 39 males, 41 females with slides of associated skins (16 larval and 16 pupal), genitalia (3 males), mouthparts (3 females), wings (3 males, 4 females) and legs (3 males, 4 females). Paratypes from Ishigaki Is. - 17 males, 16 females; with associated skins (4 larval and pupal) (K-0566): Yonehara, 18 XII 1970, leaf axil, Mizusawa; 2 males, 5 females with associated skins (1 larval and 1 pupal) (K-0567): Mt. Banna, 19 XII 1970, leaf axil, Mizusawa; 2 males, 7 females with associated skins (1 larval and 1 pupal) (K-0638): Mt. Banna, 22 IV 1971, tree hole, Mizusawa & Nishikawa; 9 males, 5 females with associated skins (2 larval and 2 pupal) (K-1399): Mt. Maeshi, 15 XII 1972, leaf axil, Mizusawa & Imamura; 7 males, 6 females with associated skins 6 larval and 6 pupal) (K-1411): nr. Yonehara, 20 XII 1972, leaf axil, Mizusawa & Imamura. Paratypes from Iriomote Is. - 2 males, 1 female with associated skins (1 larval and 1 pupal) (K-0573): Foot of Mt. Goza, 22 XII 1970, tree hole, Mizusawa; 1 female with associated skins (1 larval and 1 pupal) (K-2034): Itokawarindô, 30 XI 1974, tree hole, Mizusawa & Tamamori.

The holotype and one-half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN THE TYPES. RYUKYU ARCHIPELAGO. 65♂, 67♀; with associated skins (17 l, 17 p), 52 L, 8 l: Yaeyama Guntô (K-0110, K-0120, K-0122, K-0135, K-0136, K-0148, K-0152, K-0154, K-0157, K-0174, K-0180, K-0181, K-0182a, K-0183, K-0561, K-0568, K-0579, K-0580, K-0583, K-0584, K-0637, K-0646, K-0720, K-0723, K-0726, K-0727, K-0777, K-0906, K-0910, K-0915, K-1297, K-1307, K-1353, K-1389, K-1445, K-1454, K-1456, K-1459, K-1587, K-1597, K-1599, K-1612, K-1749, K-1751, K-1752, K-1754, K-2061).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

TAXONOMIC DISCUSSION. *Aedes (Stegomyia) downsi,* originally described as a distinct species from Okinawa Is., was sunk to a subspecies of *flavopictus* by Bohart (1953); Huang (1972) elevated it again to a species. Her discussion of *downsi* appears accurate as far as specimens from Okinawa are concerned. However, more local and individual variations occur. The specific key characters of the male genitalia given by her are: the length-width ratio of the basistyle is 2.5, the apical angle of the claspette reaches 0.8 of the basistyle, and the claspette has the stalk and lateral arms rather slender in *downsi;* while these characters are 3.0, 0.75 and widened, respectively, in *flavopictus*. The length-width ratio of the basistyle is not a good character owing to its width varying with the degree of sclerotization and mounting technique. Measurements obtained from fully sclerotized, not compressed, carefully mounted, symmetrical specimens, are shown in Table 27. However, a wide variation is still seen in each population. Specimens from Amami and Okinawa are almost identical, those from Yaeyama have the narrowest basistyle, and Palaearctic specimens intermediate. The extent of the claspette is apparently a good diagnostic character. These measurements are given in Table 28. Specimens from Amami and Okinawa are also identical in this character; the claspette of Yaeyama specimens is distinctly shorter than that of Amami and Okinawa, and agrees with that of Palaearctic specimens. The shape of the claspette in lateral view appears to show a slight difference. Great care is required in mounting the claspette, as even a subtle inclination of specimens and any pressure given to specimens may considerably change their shape. Only fully sclerotized examples can be used for study. The stalk and lateral arms appear slightly narrower in specimens from Amami, Okinawa and Yaeyama than in those from Honshu; 2 specimens from Mikura Is., Izu Shichitô, off the Pacific coast of

TABLE 27. The length-width ratio of the basistyle of *Aedes (Stegomyia) flavopictus*.

Locality (Subspecies)	No. examined	Range	$\bar{x}$
Palaearctic Japan and Korea *(f. flavopictus)*	10	2.8-3.7	3.3
Amami Ôshima *(f. downsi)*	6	2.6-3.4	3.0
Okinawa Is. *(f. downsi)*	10	2.9-3.4	3.1
Yaeyama Guntô *(f. miyarai)*	12	3.3-4.0	3.6

TABLE 28. Comparison of adult characteristics of the 3 subspecies of *Aedes (Stegomyia) flavopictus*.

Subspecies		*f. flavopictus*	*f. downsi*	*f. miyarai*
Distribution		Palaearctic	Amami-Okinawa	Yaeyama
Claspette apex from basistyle apex	No. examined	10	19	11
	Range	0.19-0.27	0.08-0.19	0.20-0.29
	$\bar{x}$	0.24	0.15	0.25
Aedeagus length-width ratio	No. examined	10	13	11
	Range	1.54-1.80	1.71-2.11	1.58-1.98
	$\bar{x}$	1.69	1.96	1.74
Claw-dististyle ratio	No. examined	10	16	10
	Range	0.14-0.17	0.14-0.18	0.17-0.20
	$\bar{x}$	0.16	0.16	0.18
Female antenna-proboscis ratio	No. examined	10	10	10
	Range	0.80-0.87	0.85-0.95	0.78-0.88
	$\bar{x}$	0.84	0.90	0.82
Female palpus-proboscis ratio	No. examined	10	11	10
	Range	0.19-0.22	0.24-0.25	0.20-0.25
	$\bar{x}$	0.20	0.25	0.23
Number of subspiracular scales (female)	No. examined	61	39	25
	0	11.4%	85.5%	34.0%
	1-3	42.1	14.5	46.8
	4-10	35.1	-	19.1
	11+	11.4	-	-

central Honshu, about 34° N, were intermediate or rather closer to the Ryukyu form than the Honshu form.

The subspiracular scaling, the extent of the white scaled area of the anterior surface of the hindfemur, and of hindtarsomere 4 were used as specific key characters of the adults by Huang. It is true that the population of Palaearctic Japan and Korea of *flavopictus* usually has scales on the subspiracular area, and the populations of Amami and Okinawa usually do not. However, 11.4% of Palaearctic *flavopictus* did not have scales, and 14.5% of the Amami-Okinawa population had a few scales. The Yaeyama population is intermediate, 34.0% had no scales 46.8% with 1-3 scales and 19.1% with a small but definite patch (Table 28). The white scaled area of the anterior surface of female hindfemur is shortest in the Okinawa population (usually 0.6), intermediate in Amami (0.60-0.75) and Yaeyama (usually 0.67), longest in the Palaearctic population (0.67-0.75). The white area of female hindtarsomere 4 is shortest in the Palaearctic population (0.67-0.80), progressively increasing in the southern populations, usually 0.9-1.0 in Yaeyama. The population of Mikura Is., was found to have the white scaling of the hindlegs agreeing with that of the Okinawa population.

It should be clear from the above diagnosis that these 6 adult characters used in keys by Huang cannot be the basis for treating the populations of the Ryukyu Archipelago as a single distinct species, *downsi*.

The narrow curved or crescent-shaped scales forming a supraalar patch on the scutum in the female are pale, only slightly yellowish or creamy in the Palaearctic population, distinctly yellowish in the populations of the Ryukyus, darkest (brownish) in Amami, and apparently progressively paler in Okinawa and Yaeyama, though the difference is very slight. The white scaling of female hindtarsomere 5 varies among populations as shown in Table 29. In the Mikura population, ventral dark scaling of hindtarsomere 5 is more developed than in the other populations, often reaching the apical 0.33-0.50.

Female sternum VII is usually entirely dark in the Palaearctic, Amami and Okinawa populations, while 42.9% (21 examined) of the Yaeyama specimens had pale scales. In addition to above characteristics, the length-width ratio of the aedeagus, claw-dististyle ratio, female antenna-proboscis ratio, and female palpus-proboscis ratio show some differences among populations. They are demonstrated in Table 28. As the Amami and Okinawa populations are identical with each other, the data are combined in the table.

TABLE 29. The white scaling of female hindtarsomere 5 of *Aedes (Stegomyia) flavopictus*.

Subspecies	*f. flavopictus*		*f. downsi*	*f. miyarai*
Locality	Japan-Korea	Mikura	Amami-Okinawa	Yaeyama
Number examined	38	10	3	25
Entirely white	15.4%	10.0%	34.4%	88.0%
White scales reaching apex dorsally	51.3	90.0	37.5	12.0
White scales not reaching apex	33.3	-	28.1	-

As a result of the above diagnosis on 13 adult characters, the populations of Palaearctic Japan and Korea, Amami, Okinawa and Yaeyama are considered as a single species. The Palaearctic population is the nominate subspecies, *flavopictus*. The Amami and Okinawa populations are identical, conforming to subspecies *downsi*. The southernmost population (Yaeyama) of *flavopictus*, is identical with subspecies *flavopictus* in 2 characters, with subspecies *downsi* in 2 characters, intermediate in 4 characters, different from both in 5 characters, 3 of the lattermost not appearing clinal. This population is assigned to another subspecies, *miyarai*. Further study will be necessary to clarify the taxonomical position of the population of Mikura Is., Izu Shichitô.

Miyagi and Toma (1976) reported that there was no reproductive incompatibility between *flavopictus* from Nagasaki, Kyushu and *downsi* from Okinawa Is.

The following discussions on larvae are based on individually reared examples unless otherwise stated. Huang (1972) used the complete saddle of *f. flavopictus* as one of the criteria for regarding it as a separate species. The saddle was incomplete in all 76 specimens we examined from 15 localities in Hokkaido, Honshu, Korean Peninsula and Cheju Do, including 2 specimens from the same collection (Misakubo, Shizuoka Pref., 14 VIII 1969, Sawada and Yoshii, bamboo stump) used by Huang.

The larvae of *f. flavopictus* are characterized by stiff stellate body setae, but the variation is wide, and examples having weak setae resembling those of *albopictus* with stiffer setae than usual, have been noted. Remarkable variations were found in the branching of setae 11, 14-C, 1-Mx, 0, 3, 4, 8, 14-P, 1, 13, 14-M, 1, 4, 5, 13-T, 1-I-VIII, X, 2-I-VII, 3-VIII, 5-I-VIII, 9-II-VII, 11-I and 13-I-VII. Though it is not clear, owing to the small sample studied, some of these setae showed an apparent bimodal frequency distribution in the number of branches. Then, both hairy and non-hairy types may exist in this subspecies, but further study is necessary to confirm their presence.

No definite hairy type was found in our collection of the Ryukyuan subspecies, *downsi* and *miyarai*, whose setae have in general fewer branches and are usually weak. In this respect, they will be easily confused with *riversi* and *albopictus*. The larvae of *f. downsi* and *f. miyarai* are, contrary to the adult, fairly homogenous, there being only minor differences, *e.g.*, the laterobasal fringe of spicules of the comb scales is usually very weak and basally restricted in *f. downsi*, usually a little stronger and extending up to near middle of the apical spine in *f. miyarai;* the number of the pecten teeth is 4-12 (19; $x = 6.7$) in *f. downsi*, 7-19 (20; $x = 11.6$) in *f. miyarai*. Subspecies *downsi* and *miyarai* differ from *flavopictus* in the longer seta 1-VII (the average length relative to the antenna being 1.63, 1.57 and 1.06 in *downsi* (19), *miyarai* (13) and *flavopictus* (30), respectively) and in that the ventral anal gill is usually shorter than the dorsal one, while in 75% of *flavopictus* they were equal. Huang's (1972) diagnosis on the branches of setae 14-P, 11-M, T is of little value, as she covered only a part of the range of individual variation.* It is interesting that, in *f. flavopictus*, many setae, such as 14-P, 5-T, 2-I, III-VII, 5-III-V, 9-VI, 13-I, III-V, have double or quadruple the numbers of branches found in the equivalent setae of *f. downsi* and *f. miyarai*. The non-hairy type in *f. downsi* and *f. miyarai* may represent an ancestral form of this species.

Diagnostic characters for the separation of larval *albopictus* and *f. downsi* or *f. miyarai* were previously discussed under *albopictus*. Discrimination of

*It should be noted that Huang's observations (l.c.) were based upon only 4 larval skins (editor).

f. downsi or *f. miyarai* from *riversi* is also very difficult. Huang (1972) stated, "The larva of *riversi* can be separated from *downsi* [including our *f. miyarai*] by having hair 1-VII usually with 2 (2-3) branches, long, at least 2.5 times as long as 5-VII, and hair 2-VII usually single; in *downsi* hair 1-VII usually has 4 branches which are short and less than twice as long as 5-VII, and hair 2-VII 3-branched." In our specimens, 1-VII is 2,3 branched with equal ratios in *riversi* (20), 3,4 branched in 45% and 55%, respectively, in *f. downsi* (19), and 3,4 branched in equal ratios in *f. miyarai* (20); the 3 branched case existing in about a half of each, thus, it is not a good diagnostic character. Relative lengths of 1-VII to 5-VII are 1.91-3.48 (10; $x = 2.88$) in *riversi*, 1.63-2.41 (19; $x = 1.98$) in *f. downsi*, 1.68-2.14 (10; $x = 1.88$) in *f. miyarai;* in a more reliable comparison of 1-VII to the length of the antenna, the relative lengths of 1-VII are 1.43-2.55 (30; $x = 1.68$) in *riversi*, 1.07-2.26 (19; $x = 1.63$) in *f. downsi*, 1.34-1.79 (13; $x = 1.57$) in *f. miyarai*. It is certain that seta 1-VII is relatively shorter in *f. downsi* and *f. miyarai* than in *riversi*, but because of overlapping values, it cannot be a definite diagnostic character. Seta 2-VII is usually (96.7%) single, otherwise double in *riversi* (30); it is 1-3 branched, single in 10%, double in 40% in *f. downsi* (19); 1-4 branched, single in 10%, double in 50% in *f. miyarai* (20); thus this also cannot be a good diagnostic character.

Comb scales may be the most reliable diagnostic character between *riversi* and *f. downsi* as was the case with between *riversi* and *albopictus*. It must be used with great care between *riversi* and *f. miyarai*. In the latter, the latero-basal fringe of spicules is usually more developed than in *f. downsi*, occasionally resembling that of *riversi*. Apically bi- or multifurcate and basally fused comb scales were not found in either *f. downsi* or *f. miyarai*, thus they can be used for differentiating *riversi*. The range of branching of all body setae were found to overlap with each other between *riversi* and *f. downsi* or *f. miyarai*. Only several setae showed somewhat different patterns of variations, with the area of overlap very narrow. These are shown in Tables 30 and 31. Discrimination of *f. downsi* or *f. miyarai* from *riversi* may be possible by examination of all these setae together with comb scales, however, some specimens may still remain unidentifiable.

BIONOMICS. Common throughout Japan, but less so than *albopictus*. Larvae are most often found in bamboo stumps in temperate Japan, also frequent in tree holes, sometimes in various small artificial containers; very frequent in leaf axils of *Alocasia macrorrhiza* and bananas on the Ryukyu Archipelago. They are often associated with *Ae. riversi*, *Ae. albopictus* and *Tripteroides bambusa*. Adult females are severe day biters.

TABLE 30. Comparison of larval characteristics between *Aedes (Stegomyia) riversi* and *Ae. (Stg.) flavopictus downsi* [1].

Seta	Branches	*riversi*	*f. downsi*	Seta	Branches	*riversi*	*f. downsi*
6-C	1	93.3%	10.0%	2-VI	1	100.0%	10.0%
	2	6.7	90.0		2	-	30.0
10-C	1	86.7	-		3-5	-	60.0
	2	13.3	100.0	2-VII	1	96.7	10.0
2-V	1	100.0	20.0		2	3.3	40.0
	2	-	45.0		3	-	50.0
	3-5	-	35.0				
				Comb with furcate scales		70/111[2]	0

[1]Specimens examined: individually reared 30 *riversi* and 19 *flavopictus downsi*.
[2]Specimens from Amami and Okinawa, including whole mounted specimens.

85. *AEDES (STEGOMYIA) AEGYPTI* (LINNAEUS)
(Figs. 120, 121, 234; Table 119)

Culex aegypti Linnaeus, 1762: 470 (A). Type-locality: Egypt.
Stegomyia fasciata: Theobald, 1901d: 289: Tokyo, Japan; Mochizuki 1913: 60, Naha, Okinawa Is., Ryukyu Archipelago; Yamada 1916: 386, Chichijima, Ogasawara Isls.
Aedes (Stegomyia) aegypti: LaCasse and Yamaguti, 1950: 104 (♂, ♀, L).

FEMALE (Fig. 234). Wing length 2.5-3.5 mm. *Head.* Eyes narrowly separated above, moderately below. Vertex covered with broad dark scales, with median stripe of broad pale scales, the stripe extending onto interocular space; eye margin with a line of rather narrow white scales, the line usually not reaching temporal pale area; many erect forked, pale brown scales, occasionally a few dark ones intermixed; tempus covered with broad pale scales, with a stripe or anterior spot of broad dark scales within the pale area; 4-6 vertical and 4, 5 temporal bristles on each side. Clypeus somewhat depressed along median line, with a pair of anterior patches of broad white scales, the patches occasionally fused together. Antenna: flagellum 0.86-0.90 (5) length of proboscis; flagellomere 1 1.23-1.40 (5) length of Flm 2, with some dark scales. Palpus 0.20-0.23 (5) length of proboscis; segment 3 0.94-1.20 (5) length of 2; 4 very small or absent. Proboscis 1.07-1.08 (4) length of fore-femur. *Thorax.* Pronotal integument brown to rather dark brown; anterior

TABLE 31. Comparison of larval characteristics between *Aedes* (*Stegomyia*) *riversi* and *Ae.* (*Stg.*) *flavopictus miyarai*.

Seta	Branches	*riversi*	*f. miyarai*	Seta	Branches	*riversi*	*f. miyarai*
6-C	1	93.3%	5.0%	9-V	1	70.0%	-
	2	6.7	95.0		2	30.0	10.0%
10-C	1	86.7	-		3	-	75.0
	2	13.3	95.0		4	-	15.0
	3	-	5.0	9-VI	1	16.7	-
9-II	1	80.0	-		2	76.7	-
	2	20.0	50.0		3	6.7	80.0
	3	-	45.0		4	-	15.0
	4	-	5.0		5	-	5.0
9-III	1	66.7	-	2-V	1	100.0	10.0
	2	33.3	5.0		2	-	45.0
	3	-	80.0		3-4	-	45.0
	4	-	15.0	2-VI	1	100.0	15.0
9-IV	1	70.0	-		2	-	50.0
	2	30.0	5.0		3-4	-	35.0
	3	-	60.0	Comb with furcate scales		17/44*	0
	4	-	35.0				

Specimens examined: individually reared 30 *riversi* and 20 *flavopictus miyarai*

*Specimens from Yaeyama, including whole mounted specimens.

lobe covered with broad white scales, bearing about 10 bristles; posterior lobe dorsally with narrow curved brownish scales, midanteriorly, several rather narrow pale scales, and midposteriorly, a patch of broad white scales, bearing 3-6 bristles. Scutum with integument dark brown, covered with narrow curved dark brown scales and following ornamentation of pale scales: a spot of curved, rather narrow white scales on anterior promontory; a pair of fine submedian

stripes of narrow curved, pale yellow scales, not reaching prescutellar space; rather broad anterolateral white stripes of crescent-shaped scales, extending posteromesally along scutal suture and connected with distinct posterior dorsocentral stripes of crescent-shaped white scales; an anteromedian and a pair of posterosubmedian short prescutellar stripes of narrow curved, pale yellow scales; a small lateral patch of crescent-shaped white scales just before wing-root. No posterior fossal bristles. Scutellar lateral lobe with 5-8, median lobe with 4-6 long or medium-sized dark bristles, each lobe with a few additional fine bristles. Paratergite with a patch of broad white scales. Pleural integument brown to rather dark brown, patches of broad white scales on propleuron, subspiracular area (usually with an additional small patch on anterodorsal margin), upper sternopleuron, lower-posterior sternopleuron, upper mesepimeron and middle mesepimeron; prealar knob usually with a few ventral scales; 3-5 propleural bristles, 2-5 postspiraculars, about 10 prealars, 1,2 upper sternopleurals, 2-4 posterior sternopleurals, 2-6 upper mesepimerals. *Wing*. Cell R_2 2.00-2.71 (5) length of vein r_{2+3}. Halter knob with pale scales. Legs. Forecoxa mostly pale scaled, occasionally with some dark lateromedial scales; midcoxa pale scaled and often with medially dark scales; hindcoxa pale scaled. Forefemur with a small anterodorsal fringe at apex and a white streak on anterior surface, pale scaled on posterior half of ventral surface; midfemur with pale fringe at apex and white streak on anterior surface, pale scaled on basal 0.67 of posterior surface, the pale area expanding dorsally toward base; hindfemur with pale apical fringe, pale scaled on anterior surface, the pale area apically narrowed and reaching near apex, pale scaled also on basal 0.67 of posterior surface. Fore- and midtarsomeres 1 and 2 with white basal bands; hindtarsomeres 1-4 with broad white basal bands, that of 4 usually reaching about apical 0.25, 5 entirely pale or with very narrow dark tip. Foretarsomere 5 longer than or equal to 4; hindtarsomere 1 0.59-0.61 (5) length of tibia. Claws unidentate in fore- and midtarsi. *Abdomen*. Tergum I pale scaled; II-VI with white dorsobasal bands and sublaterobasal patches, the band and patch not connected; II-VII with apical fringes of creamy scales, these extending a little basad along lateral margin; VII with lateral patch of white scales. Sterna II-V covered with pale scales, with dark-scaled laterobasal area more developed in posterior segments; VI usually with apical half dark; VII mostly dark, usually with small lateral patches and apical fringe of pale scales.

MALE (Figs. 121,234). Wing length: 2.1-2.6 mm. Antenna: pedicel unscaled; flagellum 0.75-0.78 (3) length of proboscis; flagellomere 12 1.29-1.34 (3) length of Flm 13, both together 0.74-0.80 of Flm 1-11. Palpus 0.98-1.05 (4) length of proboscis, length ratio of segments 2-5: 0.97-1.10 : 1.35-1.40 : 1.00-1.13 : 1.00 (5). Proboscis 1.23-1.27 (4) length of forefemur. Cell R_2 2.00-2.60 (4) length of vein r_{2+3}. Foretarsomere 5 1.61-1.68 (2) length of 4, midtarsomere 5 1.43-1.50 (2) length of 4; hindtarsomere 1 0.65-0.69 (4) length of tibia. Anterior claw of foretarsus with short blunt median tooth; other claws simple. Tergum VIII dark scaled; sternum VIII with white lateral patches. *Genitalia*. Tergum IX moderately sclerotized, deeply concave medially on apical margin; lobes large, triangular, strongly produced, well sclerotized, each with 2-5 very fine bristles. Basistyle basally broadened on sternal aspect, 1.9-2.3 (5) as long as wide, laterally and sternally scaled, with fine scattered tergomesal bristles, long lateral bristles, moderate sternal ones; claspette large, reaching apical 0.81-0.87 (6) of basistyle, with several stout setae and many bristles on its expanded mesoapical surface. Dististyle 0.58-0.63 (8) length of basistyle, slightly swollen distad of middle, curved at apex, weakly and irregularly striate, with 2-4 minute setae on convex side in

apical half, and 1,2 subapically on concave side; claw nearly terminal, 0.11-0.16 (7) length of dististyle, pigmented. Cercal tergal surface poorly sclerotized; paraproct well and nearly evenly sclerotized, with rather long median sternomesal process. Aedeagus broadest near base, 1.6-2.2 (8) as long as wide in tergal view, tergoapically and tergobasally narrowly closed, tergally broadly open in middle, sternally narrowly open; apex with many spines, a row of short spines on sternal margin.

LARVA (Fig. 120). (Described from specimens from a laboratory colony at U.S. Army Medical Laboratory, Pacific, originating in Venezuela.) *Head.* Width: 0.93-0.98 mm; somewhat quadrate, 1.10-1.20 as wide as long; seta 14-C usually double. *Antenna* light brown, 0.29-0.33 mm long; seta 1-A inserted at apical 0.40-0.46. *Mandible* with 1-Md usually single, rarely double, very fine, occasionally rudimentary, usually not branched, rarely 2 branched; MdS_5 about 0.5 length of MdS_1; pectinate brush 3,4 haired; mandibular hairs (2-3) + (2-3) + (5-7), 10-11 in total, hairs of median group widely spaced. *Maxilla* with seta 1-Mx 2,3 branched (usually 2), rather thick, sparsely barbed; mesostipes about 1.25 as long as wide, lateral surface with a few small spines. Lacinia with 1-3 simple spines anteriorly and several apically branched stout hairs posteriorly on mesal margin, the most anterior spine distinctly larger than others. Palpostipes about 0.6 length of mesostipes; $S_1 > S_3 \geq S_2 > S_4$ in length. *Mentum plate* broad, with 25-27 teeth. *Thorax.* Setae 11-P and 10-M usually single, 5-P, 14-M and 9-T double, 13-M, 1,13-T triple, and 6,8-M 4 branched. *Abdomen.* Setae 9-II, 2,14-III, 4,8,12-IV, 8,14-V, 7,14-VI, 7-VII and 14-VIII usually single; 2-I,II, 1-IV, 1,7-V and 5-VII usually double; 11-I, 5-II,III, 6-IV and 1-VI usually triple; 1-I usually 4 branched. Comb scales 8-10, individual scales with a strong apical spine and several fairly strong laterobasal denticles, the latter progressively and basally markedly weaker. *Siphon* subparallel in basal half, apex 0.43-0.54 width of widest part; length 0.80-0.87 mm, index 1.85-2.30; surface with distinct imbrication-like sculpture; pecten reaching apical 0.41-0.56 of siphon, of 14-24 teeth; seta 1-S located beyond pecten at apical 0.40-0.46, shorter than siphon diameter at insertion. *Saddle* incomplete, 0.31-0.36 mm long, surface with fairly distinct imbricate-like sculpture, but without distinct spicules; seta 4-X of 8 cratal and usually 2 short precratal hairs, each 2,3 branched. Anal gills parallel-sided, apically rounded, 2.9-3.5 length of saddle; ventral gill 0.8-1.0 length of dorsal gill, more frequently equal to dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 11♂, 12♀: Ishigaki Is., Yaeyama Guntô (K-0177). 8♂, 18♀, 55 L from a colony at U.S. Army Laboratory, Pacific, originating in Venezuela.

DISTRIBUTION. RYUKYU ARCHIPELAGO (?Okinawa, ?Miyako and Yaeyama Guntô). ?OGASAWARA ISLANDS. COSMOTROPICAL.

DISCUSSION. Adult specimens obtained in Kabira, Ishigaki Is. appear to belong to the type-form of Mattingly (1957b). We cannot discuss the identity of immature stages owing to the lack of material from this region.

In the Ryukyu Archipelago, *aegypti* appeared common on Okinawa Is. in the early 20th century (Yamada 1916); it has also been said to have been as common in Okinawa, Miyako and Yaeyama at or before World War II (Hatori 1919, Miyao 1931, Saigo 1940 and Iwata 1943). There has been, however, no record of *aegypti* since 1958 (Kishimoto, 1970, personal communication; Tanaka, Saugstad and Mizusawa 1975. Our recent rediscoveries (Tanaka 1971b), and those of Reisen (1970a, b) and Reisen and Basio (1972) (the record of the latter authors may need confirmation), do not necessarily prove continuous occurrence of this species in the Ryukyus, as it may have been reintroduced.

In Palaearctic Japan, *aegypti* had once been established at Ushibuka (32° 10' N, 130° E), Amakusa Shimojima, an island close to mid-western Kyushu, from 1944 to 1952 (Oguri and Kobayashi 1947, 1948; Sasa 1958). Ushibuka is said to have been a flourishing port of fishing boats and overseas traffic between Japan and Southeast Asia at that period. Probably frequent introduction of this species from Southeast Asia and the lack of environmental sanitation near the end of World War II favored the establishment of *aegypti* there for a limited period. Before and since then there has been no evidence that *aegypti* occurs in Palaearctic Japan including the Kyushu district, except Theobald's (1901d) classic but doubtful record from Tokyo (C.H.B. Wood, 3.8.1899). Yamada et al. (1943) collected some larvae on a ship at the port of Nagasaki, but, according to them, there was strong indication that this species was present on the ship during its voyage to Nagasaki after a 4 month's stay at Singora (Songkhla), Thailand.

BIONOMICS. *Aedes aegypti* is at present not apparently established in any part of Japan, including the Ryukyu Archipelago and Ogasawara Isls. We have been unable to find the immature stages of this species during the course of this project. This species is thought to have been introduced in the Oriental region and is chiefly found near seaports; the larvae occur in almost all types of artificial containers. Females are day biters, but are also known to feed on man at night.

MEDICAL IMPORTANCE. *Aedes aegypti* is well known as the principal vector of urban yellow fever. In Asia, however, it is also significant as a vector of dengue fever viruses and it may also serve as a vector of Chikungunya virus (Halstead et al. 1969).

86. *AEDES (STEGOMYIA) WADAI* NEW SPECIES
(Figs. 121, 122, 235; Table 120)

Aedes (Stegomyia) sp.: Sasa, Wada, Fujita and Ishii, 1969: 122, Chichijima, Ogasawara Isls.
Aedes (Stegomyia) sp. I: Takahashi, 1973: 144.

FEMALE (Fig. 235). Wing length 3.5-4.2 mm. *Head.* Eyes very narrowly separated above, moderately below. Vertex covered with broad dark scales, with a medioanterior white patch narrowly extending along eye margin to sides; many erect forked dark scales; tempus covered with both broad dark and white scales which form irregular patches; 5-7 vertical and 4, 5 temporal dark bristles on each side. Clypeus without scales. Antenna: flagellum 0.75-0.81 (3) length of proboscis; flagellomere 1 1.43-1.58 (4) length of Flm 2, with dark scales. Palpus 0.20-0.21 (3) length of proboscis, segment 3 0.87-1.06 (3) of 2; 4 very small, papilliform or reduced. Proboscis 1.13 (2) length of fore-femur. *Thorax.* Pronotal integument very dark brown; anterior lobe, covered with broad white scales on lateral half, bearing about 10 or more dark bristles; posterior lobe with a few crescent-shaped dark scales along dorsal margin, bearing 2-4 dark bristles. Scutum with integument blackish brown, covered with narrow curved or crescent-shaped, dark scales, with a pair of fairly large, semilunar lateral patches of crescent-shaped white scales, the patches laterally delimited by humeral margins and posteriorly by scutal suture; a spot of narrow curved white scales on anterior promontory, a partly broken line of crescent-shaped white scales along margin between promontorial spot and lateral patch; prescutellar space bare; a few humeral bristles, no posterior

fossals. Scutellum with 2, 3 long, 1-3 medium and a few short dark bristles on each lateral lobe, 4, 5 (usually 4) long and a few short ones on median lobe. Paratergite unscaled. Pleural integument dark brown; white patches of broad scales on propleuron, subspiracular area, upper sternopleuron, lower-caudal sternopleuron and upper mesepimeron; 3-5 yellow to brown propleural bristles, 1-4 postspiraculars, 5-13 dark prealars; 1, 2 upper sternopleurals, 2, 3 posterior sternopleurals, 4-9 yellowish brown upper mesepimerals. *Wing*. Cell R_2 1.95-3.00 (6) length of vein as r_{2+3}. Halter knob dark scaled. *Legs*. Coxae with patches of white broad scales; femora with distinct white knee spot; fore- and midfemora with a short basal white stripe on anterior surface and a basal white ring, both less distinct in midfemur; hindfemur white scaled in basal half, white area on anterior surface longer than that on posterior surface, a dorsal narrow dark stripe not reaching base. All tarsomeres with basal white bands; in foretarsus, the basal band very short and barely complete on tarsomere 1, covering about basal half on 2 and 3, covering basal half of posterior surface on 4 and 5; in midtarsus, the basal band short but complete on tarsomere 1, covering 0.75-0.80 on 2-4, covering basal 0.67-0.75 anterior surface on 5; in hindtarsus, the basal band short but complete on tarsomere 1, covering basal 0.33 on 2, 0.6 on 3, 0.67-0.80 in 4 and 5. Femora, tibia and tarsi otherwise dark scaled. Foretarsomere 5 slightly shorter to slightly longer than 4; hindtarsomere 1 0.68-0.72 (5) length of tibia. Claws simple. *Abdomen*. Terga II-VII with basal white bands confluent with laterobasal patches, often interrupted at middle, the bands on V-VII tending to extend slightly more apically. Sterna with basal white bands similar to those on terga. Abdomen otherwise dark scaled.

MALE (Figs. 121, 235). Wing length 2.5-3.0 mm. Antenna: flagellum 0.65-0.70 (4) length of proboscis, flagellomere 12 1.21-1.39 (5) length of Flm 13, both together 0.83-0.90 (5) length of Flm 1-11. Palpus 0.80-0.85 (3) length of proboscis, length ratio of segments 2-5: 1.11-1.24 : 1.36-1.41 : 0.94-1.12 : 1.00 (5). Proboscis 1.25-1.31 (4) length of forefemur. Cell R_2 1.83-2.48 (6) length of vein r_{2+3}. Foretarsomere 5 1.70-1.74 (2) length of 4; midtarsomere 5 1.53-1.64 (2) of 4; hindtarsomere 1 0.70-0.75 (6) length of tibia. Anterior claw of fore- and midtarsi slightly sinuate; all claws without tooth. Abdominal tergum VIII pale scaled, with narrow apical band of dark scales; sternum VII dark scaled, with lateral white patches. *Genitalia*. Tergum IX well sclerotized; apical margin medially concave; lobes rather wide, only a little protrudent, each bearing 7-15 medium-sized bristles. Basistyle basally widening on sternal aspect, 2.2-2.5 (9) as long as wide, laterally and basally scaled, bearing short to medium-sized bristles on both tergal and sternal surfaces, long lateral and apical bristles; claspette large, reaching apical 0.34-0.36 (9) of basistyle; its expanded apex 0.4 length of basistyle, bearing numerous bristles on mesoapical surface, several prominent-based stout setae on sternoapical margin. Dististyle evenly arcuate, apically tapering, 0.68-0.77 length of basistyle, with short setae on apical half, 3, 4 on convex side and 2, 3 on concave side; claw rather stout, pigmented, 0.14-0.19 (7) length of dististyle. Cercal tergal surface moderately sclerotized; paraproct evenly sclerotized, with long median sternomesal process, its apex sternally prolonged. Aedeagus slightly constricted in middle, with broadest part usually in basal half, 1.88-2.40 (8) as long as wide in tergal view; tergally broadly open, sternally narrowly open, tergoapically and tergobasally narrowly closed, apex both tergally and sternally with numerous spines.

LARVA (Fig. 122). *Head*. Width 0.84-0.95 mm; 0.94-1.08 ($x = 1.02$) as wide as long; seta 1-C pale, separated by about twice their length; 4-C usually

4, 5 branched; 7-C occasionally slightly barbed; 14-C fairly stiff. *Antenna* 0.30-0.32 mm long, 0.30-0.35 length of head, yellowish brown, tapering slightly in distal half; seta 1-A inserted at apical 0.33-0.38 of shaft. *Mandible* with 1-Md single, rarely double, fine, 1, 2 branched; microspines occasionally bifid; MdS_5 about 0.33 length of MdS_1; pectinate brush 3, 4 haired; mandibular hairs (2-3) + (1-4) + (5-7), 9-12 in total, hairs of median group widely spaced. *Maxilla* with seta 1-Mx 5-8 branched, stiff, sparsely barbed. Mesostipes 1.67 as long as wide; lateral surface smooth or with 1, 2 small spines; 3-Mx single or apically bifid. Lacinia with several simple spines and several apically branched stout hairs on mesal margin. Palpostipes about 0.5 length of mesostipes; S_1 equal to or longer than S_3. *Mentum plate* rather high crowned, with 17-25 teeth. *Thorax*. Setae 4, 8, 14-P, 13-M, 8, 13-T usually stiffer than the others, frequently stellate; 1-P, usually triple, well barbed; 8-M and 1-T usually triple, 3-T usually single. *Abdomen*. Setae 1-I-VIII, 2-I-VII, 4-I, 5-I-VIII, 7-II-VII, 9-II-VI, 11-I, 13-I, VII stiff; 2-I-VII, 9-II-VI and 11-I stiffer than others, all stiff setae appearing stellate when 5 or more branched; 7-I, 14-III, VII and 6-VI usually double; 1-I-VII usually triple; 13-II usually 4 branched; 5-VIII stronger than 1-VIII. Comb scales 5-10; individual scales with a strong apical spine, 1-3 strong laterobasal denticles and several fine spicules proximad to the denticles. *Siphon* slightly inflated near middle (about 1.1-1.2 basal diameter), apex about 0.5-0.6 width of base; length 0.95-1.04 mm, index 2.5-3.1; microsculpture consisting of short, widely spaced, low ridges tipped with tiny spicules; pecten reaching basal 0.42-0.67 (x = 0.51) of siphon, of 8-20 teeth including 0-5 basal abortive teeth, frequently 1-3 apical teeth detached, occasionally distad of seta 1-S; 1-S inserted at basal 0.48-0.63 (x = 0.57) a little ventrad of pecten, usually triple, about 0.6-0.75 of siphon diameter at insertion. *Saddle* with microsculpture similar to that of siphon, except spicules becoming more needle-like on dorsocaudal aspect; setae 1-3-X usually double; 1-X always barbed, nearly 2.0 length of the saddle; 4-X of 8 cratal hairs, all double. Anal gills subequal, cylindrical, broadly rounded at apex, 1.0-1.6 saddle length.

TYPE-SERIES. Holotype male (#7356, N-1510) with slides of associated genitalia, wing and legs, Kitafukurozawa, Chichijima, Ogasawara Isls., 26 V 1975, net, Shinonaga. Paratypes: 30 males, 31 females, 42 larvae, 33 larval skins, with slides of associated skins (12 larval and 12 pupal), genitalia (11 males, 3 females), mouthparts (5 males, 4 females, 5 larvae), wings (11 males, 14 females) and legs (10 males, 8 females). Paratypes from Chichijima - 3 females (N-1507): Kitafukurozawa, 19 V 1973, net, Shinonaga; 3 females (N-1510): Kitafukurozawa, 26 V 1973, net, Shinonaga; 3 females (N-1511): Kitafukurozawa, 26 V 1973, net, Kusui; 1 female (N-1512): Fukurozawa, 26 V 1973, net, Kusui; 1 female (N-1513): Fukurozawa, 16 V 1973, net, Kusui; 27 males, 15 females, with associated skins (12 larval and 12 pupal), 42 larvae, 33 larval skins (N-1715): nr. Mt. Chuozan, 28 IX 1973, tree hole, Mizusawa. Paratypes from Hahajima - 2 females (N-1508): Mt. Kuwanokiyama, 20 V 1973, net, Shinonaga and Kusui; 1 male (N-1560): 23 V 1973, net, Hayashida; 1 female (N-1563): Mt. Kuwanokiyama, 1 VI 1973, net, Hayashida; 1 male, 2 females (N-1567): 13 VI 1973, net, Hayashida.

The holotype and one-half the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

DISTRIBUTION. OGASAWARA ISLANDS.

DISCUSSION. *Aedes wadai* undoubtedly belongs to Group A (*aegypti* group) of Edwards (1932), because of the characteristics of the male genitalia, including the armed paraproct quite typical of the group. This is the 2nd indigenous

species of Group A found outside the Ethiopian region. The discovery of this species on such isolated Pacific islands is intriguing. Mattingly (1957b, 1962, 1965) discussed the sole Palaearctic representative of Group A, *chemulpoensis* from Korea and North China, suggesting the former Palaearctic extension of the range of this group. The present finding will reinforce this conception, extending the range further to the subtropical Pacific region, and thus perhaps involving the Oriental region.

Aedes wadai shares the untoothed claws with *chemulpoensis*. It is also characterized by the absence of the white prescutellar stripes and white patches on the posterior pronotal lobe and paratergite. The diagnostic characters, including the pupal paddle of Subgroup A_1 (*aegypti* subgroup) of Mattingly (1965) appear applicable to *wadai*, but further study will be needed for inclusion of this species in Subgroup A_1.

BIONOMICS. Apparently not abundant. Larvae were found in tree holes. Adult females were obtained by human bait (Takahashi 1973). Mr. Kusui (1973, personal communication) observed that numerous females attacked a wild goat which had been trapped on Chichijima.

87. *AEDES (STEGOMYIA) CHEMULPOENSIS* YAMADA
(Figs. 123, 124, 236; Table 121)

Aedes chemulpoensis Yamada, 1921: 54 (♂, ♀). Type-locality: Jinsen (Chemulpo), Korea.
Aedes (Stegomyia) chemulpoensis: LaCasse and Yamaguti, 1950: 111 (♀).

FEMALE (Fig. 236). Wing length 2.6-3.6 mm. *Head.* Eyes very narrowly separated above, moderately below. Vertex covered with broad dark scales, with a rather narrow median line of broad white scales, the stripe extending onto interocular space, eye margin with broad white scales; many erect forked scales, color variable, mostly yellowish brown to mostly dark; tempus covered with broad pale scales, with a broad stripe of broad dark scales within pale area; 6-8 vertical and 4, 5 dark temporal bristles on each side. Clypeus without scales. Antenna: flagellum 0.9 (1) length of proboscis; flagellomere 1 1.36-1.53 (2) length of Flm 2, with dark scales. Palpus 0.23-0.24 (1) length of proboscis; segment 3 0.93-1.05 (1) of 2; 4 absent in a dissected specimen. Proboscis 1.17 (1) length of forefemur. *Thorax.* Pronotal integument very dark brown; anterior lobe covered with broad white scales, bearing 7 to more than 10 dark bristles; posterior lobe dorsally with narrow curved dark scales and a mid-posterior patch of broad white scales, bearing 3-7 dark bristles. Scutum with integument blackish brown, covered with narrow curved dark and crescent-shaped white scales, the white scales forming an anteromedian spot, large triangular fossal patches, a small prescutellar spot and narrow posterior dorsocentral stripes, a patch of broad and crescent-shaped white scales just laterally before wing-root; no posterior fossal bristles. Scutellar lateral lobe with 6, 7 long and medium dark bristles, median lobe with 4, 5 long dark bristles, a few short bristles also usually present on each lobe. Paratergite covered with broad white scales. Pleural integument dark brown; patches of broad white scales on propleuron, subspiracular area, upper-posterior sternopleuron, lower-posterior sternopleuron and upper mesepimeron, mesepimeral patch restricted to upper 0.6; 4, 5 dark and yellowish propleural bristles, one dark postspiracular, nearly 10 dark prealars, one upper sternopleural, several posterior sternopleurals, and 2-7 yellowish brown upper mesepimerals. *Wing.*

Cell R_2 2.50-4.26 (7) length of r_{2+3}. Halter knob with both pale and dark scales. *Legs*. Forecoxa basally and apically white scaled, dark scaled in-between; midcoxa basally white scaled, apically dark scaled; hindcoxa white scaled. Forefemur with following pale scaled areas: small dorsoapical fringe, ill-defined basal band, fine basal streak followed by a row of several small spots up to near apex on anterior surface, and a streak in basal 0.6 of posterior surface; midfemur with apical spot and a short streak followed by a row of spots approaching apex on anterior surface, pale scaled on basal 0.4 of posterior surface; hindfemur with apical spot, pale scaled on about basal 0.67 on anterior surface and about basal 0.4 on posterior surface, the pale scaled areas apically narrowed, broadened and basally expanding onto dorsal surface. Each tibia with an incomplete band of white scales at basal 0.25-0.33. Fore- and midtarsomeres 1-3 and hindtarsomeres 1-5 with basal bands of white scales; basal band on hindtarsomere 4 reaching basal 0.4-0.6 of the segment; that on 5 sometimes dorsally reaching apex. Femora, tibiae and tarsi otherwise dark scaled. Foretarsomere 5 longer than or equal to 4; hindtarsomere 1 0.57-0.60 (6) length of tibia. Claws simple. *Abdomen*. Tergum I dark scaled; II-VI dark scaled, with basal bands and laterosubbasal patches of white scales, the bands not laterally broadened, separated from laterosubbasal patches, the laterosubbasal patch on II reaching base at lateral margin; VII with lateral patches of white scales, with or without mediobasal patch. Sterna II-VI basally white scaled, apically dark scaled; VII dark scaled, with lateral patch of white scales.

MALE (Figs. 124, 236). Wing length 2.0-2.7 mm. Antenna: flagellum 0.8 (1) length of proboscis, flagellomere 12 1.42 (1) length of Flm 13, both together 0.95 of Flm 1-11. Palpus length of proboscis, length ratio of segments 2-5: 1.29-1.36 : 1.57 : 1.07-1.11 : 1.00 (1). Proboscis 1.2 (1) length of forefemur. Cell R_2 1.90-3.11 (5) length of vein r_{2+3}. Foretarsomere 5 1.51-1.61 (2) length of 4; midtarsomere 5 1.56-1.58 (2) of 4; hindtarsomere 1 0.61-0.67 (4) length of tibia. Claws simple. *Genitalia*. Tergum IX moderately sclerotized; apical margin medially concave; lobes convex, well sclerotized and broadly separated, each bearing 6-11 medium-sized bristles. Basistyle basally broadened on sternal aspect, twice as long as wide, laterally and sternally scaled, with small to medium-sized tergomesal and sternal bristles, long lateral and sternoapical bristles; claspette reaching apical 0.4 of basistyle, apical expanded portion rounded, its apical surface densely covered with bristles, a row of stouter setae on the lowest part, 3 of them usually especially stronger. Dististyle rather slender, gently arcuate, 0.61-0.69 (4) length of basistyle, not swollen in middle, with 6-9 short setae on convex side, and 2,3 on concave side near apex; claw nearly apical, 0.13-0.14 (4) length of dististyle, straight, pigmented. Cercal tergal surface laterobasally weakly sclerotized; paraproct evenly sclerotized, with long median sternomesal process. Aedeagus broadest at basal 0.25-0.33, twice as long as wide, tergally broadly open, sternally narrowly open, with a pair of apparent sternolateral openings, closed only at tergal apex; apex covered with numerous strong spines.

LARVA (Fig. 123). *Head*. Width: 0.74-0.79 mm; 1.05-1.10 as wide as long; seta 1-C separated by about their length; 4-C slender, usually 2,3 branched, 5-C rarely lightly barbed; 14-C substellate; 15-C usually 2,3 branched. *Antenna* 0.24-0.31 mm long, basally brownish, gradually becoming apically paler; seta 1-A inserted at apical 0.38-0.49 (x = 0.42). *Mandible* with 1-Md single or double, very fine, occasionally rudimentary, not branched; pectinate brush 4-6 haired; mandibular hairs (2-3) + 2 + (4-6), 8-11 in total, hairs of median group widely spaced. *Maxilla* with seta 1-Mx 5-10 branched,

stiff, sparsely barbed, substellate. Mesostipes about 1.25 as long as wide, lateral surface with a few to several small spines; 3-Mx occasionally apically bi- or trifid. Lacinia with several simple spines and several apically branched stout spicules on mesal margin. Palpostipes about 0.5 length of mesostipes; $S_3 > S_1 > S_2 \geq S_4$. *Mentum plate* rather high crowned, with 16-19 teeth. *Thorax.* Setae 2-P and 11-T usually single; 5, 11-P and 6-M usually double; stellate setae (see chaetotaxy table) stiff; 10, 12-P, 3, 4-M and 3-T with variable barbing. *Abdomen.* Setae 3, 8-II and 0-III usually single, 6-V double and 6-VII triple; stellate setae (see chaetotaxy table) stiff; 9-II-IV substellate, usually with 7 or fewer branches. Comb scales 3-11, individual scales with a strong apical spine and usually 2, 3 stout lateral denticles. *Siphon* slightly sinuate, slightly inflated near middle; index 3.10-3.52 ($x = 3.29$); no microsculpture evident at 400X; pecten attaining basal 0.34-0.43 ($x = 0.38$), of 9-19 ($x = 13.2$) teeth; seta 1-S usually inserted beyond pecten, at basal 0.39-0.46 ($x = 0.43$), not reaching apex. *Saddle* incomplete, 0.22-0.24 mm long, microsculpture of short transverse rows of minute spicules, becoming dorsally more conspicuous; seta 1-X 0.9-1.2 saddle length, inserted on caudal margin; 4-X of 6 cratal and 2 precratal hairs, the cratal hairs long, smooth, usually single, sometimes double; precratal hairs much shorter, 3-6 branched, substellate, usually lightly barbed. Anal gills cylindrical, dorsal gill 2.7-3.0 saddle length, ventral gill subequal to slightly shorter than dorsal gill.

SPECIMENS EXAMINED. KOREA. 9♂, 11♀; with associated skins (10 l, 10 p), 6 L, 3 l: Korean Peninsula (L-0106, L-0107, L-0108, L-0552, L-0829, L-2024, L-2025, K-2026, L-2027, L-2094).

DISTRIBUTION. KOREA (Korean Peninsula). NORTH CHINA.

DISCUSSION. This is the only species of Subgroup A_3 (*Ae. chemulpoensis* subgroup) of Mattingly (1965), and the sole Palaearctic representative of Group A (*aegypti* group) of Edwards (1932). It may be a relict of Group A, presumed to have spread over the Palaearctic region in the preglacial epoch. Huang (1974) redescribed the type-specimens and designated a lectotype.

BIONOMICS. Apparently not common in Korea. Larvae are found in tree holes.

SUBGENUS *AEDIMORPHUS* THEOBALD

Aedimorphus Theobald 1903: 290. Type-species: *Uranotaenia domestica* Theobald, 1901c; Old Calabar, Nigeria.

Usually brownish medium-sized mosquitoes, ornamentation of scutum indistinct or variable.

FEMALE. *Head.* Eyes very narrowly separated above. Vertex covered with narrow curved scales (with exception of a few species not represented in this region); erect forked scales numerous, over almost entire vertex. Proboscis longer than forefemur, dark, with ventral pale area. *Thorax.* Pronotal lobes entirely narrow scaled or with more narrow scales than broad scales; posterior pronotal bristles along posterior margin, usually arranged in a row. Scutum covered with narrow curved scales; all scutal bristles developed, except occasionally for those in middle of fossal area. Scutellum with narrow or broad scales. Pleural bristles usually well developed; no lower mesepimerals. Base of mesomeron well above that of hindcoxa. *Legs.* Claws equal,

those of fore- and midtarsi unidentate, those of hindtarsus simple or unidentate. *Abdomen*. Laterotergite white scaled. *Genitalia*. Seminal capsules 3, 2 of them slightly smaller or rudimentary.

MALE. Palpus longer than proboscis, apex of segment 3 slightly curved dorsad, 4-5 slightly swollen and turned downward, 4 and apex of 3 with numerous long bristles, 5 with numerous bristles of medium length. Foretarsomere 4 very short; 5 usually more than 2.0 length of 4, with several stout ventrobasal bristles and a pair of short setiferous ventromedian processes; midtarsomere 4 rather short; 5 usually less than 2.0 length of 4. Anterior claws of fore- and midtarsi with blunt-tipped median tooth; posterior claw with sharp subbasal tooth; claws of hindtarsus equal or anterior claw longer, simple or unidentate. *Genitalia*. Tergum IX with moderately or poorly protrudent lobes, each bearing fine bristles; sternum IX moderately sclerotized, basally, laterally and medioapically, with bristles on medioapical sclerotized area. Basistyle with mesal membrane from base to apex, with neither apical nor basal tergomesal lobe; claspette poorly to moderately developed, usually bristled at apex, without apical filament. Dististyle highly modified; claw on mesal margin before apex or mesoapical corner, accessory claws often developed. Proctiger with more or less developed basal sternomesal arm; paraproct weakly to moderately sclerotized, without strongly sclerotized apical tooth, occasionally with a moderately sclerotized small subapical process; cercal setae absent. Aedeagus composed of a pair of well sclerotized, tergobasally connected and toothed lateral pieces, their tergal side with wing-like lateral expansions; paramere apparently basally fused with aedeagus.

LARVA. *Head* usually distinctly broadened in posterior half; seta 4-C very fine, branched; 5, 6-C well developed, variable in position. *Antenna* usually 0.50-0.67 length of head, spiculate; seta 1-A usually inserted at basal 0.33-0.50, branched. *Mandible* with or without microspines dorsolaterally near base; 1-Md absent; MdS_5 less than 0.5 length of MdS_1. Cutting organ with 2 dorsal spines, lateral one (DS_1) longer; 2 dorsal teeth, lateral tooth smaller; ventral tooth with 1, 2 lateral denticles, lateral one (VT-4) well developed, spiniform; 3 mesal denticles, $VT_2 > VT_1 > VT_3$; 2 mesally pectinate ventral blades, proximal one (VB_2) much smaller; pectinate brush of 3-5 hairs, shorter than VB_1. Piliferous process well protrudent; labula at most extending slightly beyond apex of the broader anterior part. Mandibular hairs simple in distal group, apically frayed in proximal group. *Maxilla* of filter feeding or browsing type. Cardo fused with cranium by a narrow sclerotized strip along anterior margin, seta 1-Mx single. Mesostipes with pseudoartis moderately to well developed, usually not fused with cranium; equal stipital sensoria at about middle or proximal to it, without basal ring; seta 4-Mx moderately long, on a prominent socket. Lacinia with seta 5-Mx slightly proximad of level of stipital sensoria. Palpostipes short, basally swollen, not fused mesobasally with mesostipes; palpal sensoria rather weakly developed, S_5 very small; ampulla present. *Mentum plate* with more than 20 small teeth. *Thorax*. Setae 1, 8-P short to moderately long, 2, 3-P short, 12-P short to moderately long, usually longer than 9, 10-P; 0-P, 13, 14-M and 8-T dendritic with many short branches. *Abdomen*. Seta 12-I lacking; 13-II, VI dendritic with many short branches. Comb scales variable in shape, number and arrangement; 1, 2-VIII often on a common callus. *Siphon* rather long, index usually 3; acus present; pecten with apical detached teeth; seta 1-S located beyond middle of siphon, shorter than siphon diameter at insertion. *Saddle* narrowly incomplete, with acus; seta 1-X shorter than saddle; 2-X rather short, with more than 5 branches; 4-X with precratal tufts, each tuft usually with many branches.

DISTRIBUTION. Oriental region, Ethiopian region, Pacific islands, Northern Australian region; Holarctic region *(vexans)*.

KEYS TO SPECIES OF *AEDES (AEDIMORPHUS)*

FEMALE ADULT

Scutellum covered with broad silvery white scales; tarsi unbanded. *alboscutellatus* (p. 407)

Scutellum with narrow curved pale scales; tarsi pale banded. *vexans nipponii* (p. 410)

MALE TERMINALIA

Dististyle greatly expanded in apical half; claspette poorly developed, represented by a long narrow sclerotized strip on mesal membrane of basistyle. . . . . *alboscutellatus* (p. 407)

Dististyle parallel-sided; claspette moderately developed, with apex somewhat expanded and heavily bristled. *vexans nipponii* (p. 410)

LARVA

Setae 5-7-C on a line; mentum teeth 32-41; comb scales rounded, laterally and apically evenly fringed; 3-VIII distinctly shorter than 1, 5-VIII, not barbed, with numerous branches. *alboscutellatus* (p. 407)

Setae 6, 7-C on the same level and 5-C distinctly behind them; mentum teeth 24-29; comb scales thorn-shaped, with a strong apical spine, laterobasally fringed only; 3-VIII similar to 1, 5-VIII in size and branching, distinctly barbed. . . . . *vexans nipponii* (p. 410)

88. *AEDES (AEDIMORPHUS) ALBOSCUTELLATUS* (THEOBALD) (Figs. 124, 125, 237; Table 122)

Lepidotomyia alboscutellata Theobald, 1905b: 80 (♀). Type-locality: Simbang, Huon Gulf, New Guinea.

Aedes omurensis Yamada, 1921: 73 (♂, ♀). Type-locality: Ômura, Kyushu, Japan.

Aedes (Aedimorphus) alboscutellatus: LaCasse and Yamaguti, 1950: 130 (♂, ♀).

Descriptions of all stages based on specimens from Mindanao, Philippines.

FEMALE (Fig. 237). Wing length 3.4-3.6 mm (reared specimens). *Head.* Vertex including interocular space covered with narrow curved pale yellowish scales, with an anteromedian diamond-shaped patch (not clearly defined, size variable) of narrow curved dark scales, and a pair of small anterolateral patches of broad dark scales; erect forked scales dark; tempus covered with

broad scales, white above, yellowish below, brownish in-between; 5, 6 vertical and 4 temporal dark bristles on each side, an additional one on underside close to eye. Clypeus brown. Antenna: pedicel laterodorsally light yellowish brown, mesoventrally dark brown, with several very fine bristles and scales mostly in dark area; flagellum 1.09-1.12 (3) length of proboscis; flagellomere 1 basally pale, with several dark small scales, 1.40-1.48 (3) length of Flm 2. Palpus 0.17-0.19 (3) length of proboscis, dark scaled; segment 3 1.25-1.89 (3) of 2; 4 lacking or minute. Proboscis 1.11-1.12 (3) length of forefemur, usually with 4 ventrobasal bristles, dark scaled, with a ventral pale scaled area from basal 0.17-0.20 to apical 0.33. *Thorax*. Pronotal integument rather pale brown; anterior lobe with only a few narrow curved dark and pale and often broad pale scales, bearing many dark bristles; posterior lobe with narrow curved dark scales above, posteromedially a few narrow curved pale scales (a few pale scales sometimes rather broad), bearing 4-6 dark brown bristles. Scutum with integument brown, somewhat darker on anterior promontory, paler on prescutellar area, covered with narrow curved dark scales, narrow curved pale yellowish scales forming ill-defined small patches on anterior promontory, humerus and often near the termination of the scutal suture, scattered elsewhere; 2-4 humeral bristles, 0-2 posterior fossals, usually no bristles in the middle of fossal area. Scutellum covered with broad silvery white scales; each lobe with 5-8 long dark bristles and several short ones. Paratergite usually unscaled, occasionally with one or a few narrow curved pale scales. Pleural integument pale yellowish brown, small silvery white patches of broad scales on propleuron, upper sternopleuron, midposterior sternopleuron and upper mesepimeron; pleural bristles brownish, more than 10 propleurals, prealars, upper to posterior sternopleurals and upper mesepimerals, 4-8 postspiraculars, several very fine bristles, on subspiracular area. *Wing*. Fringe scales of alula short and narrow. Veins dark scaled; costa with basal spot of pale scales. Cell R_2 1.32-1.80 (5) length of vein r_{2+3}. Halter knob pale or dark scaled. *Legs*. Forecoxa basally and apically pale scaled, dark scaled in-between; mid- and hindcoxae with patches of pale scales. Forefemur with anterodorsal white apical fringe spot, pale scaled on posterior half of ventral surface including narrow posterior surface; midfemur with pale apical spot, pale scaled on basal half or more of posterior surface; hindfemur with pale apical spot, pale scaled except dorsally and lateroapically. Tibiae with pale dorsoapical spots. Legs otherwise dark scaled. Foretarsomere 5 length of 4; hindtarsomere 1 0.73-0.83 (5) length of tibia. Claws of hindtarsus simple. *Abdomen*. Tergum I medially dark scaled II-VI dark scaled, with lateral patches of white scales, the patches basal on II, basal to subbasal on III, median on IV-VI; VII with laterobasal patches of white scales; occasionally III-VII with basal bands of pale scales, the bands often interrupted at middle on III-VI. Sterna covered with pale yellowish scales, with apical bands of dark scales. Seminal capsules 3, with 2 rudimentary.

MALE (Figs. 124, 237). Wing length 3.1-3.2 mm (reared specimens). Head with some broad pale scales intermixed on vertex. Antenna: pedicel glabrous; flagellum 0.93-0.97 (4) length of proboscis; flagellomere 12 1.14-1.37 length of (4) Flm 13, both together 0.78-0.82 (4) of Flm 1-11. Palpus 1.21-1.24 (5) length of proboscis; length ratio of segments 2-5: 2.22-2.50 : 2.56-2.85 : 1.00-1.15 : 1.00. Proboscis 1.17-1.24 (5) length of forefemur, without ventral pale scaled area. Anterior claw of hindtarsus longer and more strongly curved than posterior claw, both claws untoothed. Abdominal terga always with pale basal bands; sternum VIII entirely pale scaled. *Genitalia*. Tergum IX moderately or rather poorly sclerotized; lobes triangularly rounded,

moderately protrudent and widely separated, each with 3-6 fine bristles. Sternum IX with 3-6 bristles. Basistyle 2.6-3.2 as long as width at sternal base, laterally and sternobasally scaled, laterally and sternoapically with long bristles, medium-sized sternobasal bristles, short tergomesal bristles, lacking bristles in apical half of a longitudinal median area of tergal surface; claspette represented by a long narrow sclerotized strip on mesal membrane of basistyle, nearly reaching apex of basistyle, slightly swollen and bearing a few fine bristles at basal 0.25-0.33. Dististyle 0.51-0.56 length of basistyle, greatly expanded in apical half, 1.6-1.8 as long as wide, with a sternal lateroapical lobe terminating in an acute apex, short bristles evenly scattered on tergal surface of expanded portion, and more densely from lateroapical margin onto sternal lateroapical lobe; claw on mesal margin at basal 0.57-0.75, broad, flattened and with a recurved apical hook, lightly pigmented; usually one, occasionally 2, smaller and paler accessory claws on apical margin. Paraproct rather weakly sclerotized, with a moderately sclerotized thumb-like subapical process; cercal tergal surface apparently poorly sclerotized. Aedeagus 1.37-1.66 as long as wide, each lateral piece with dorsal expansion broad in basal half; sternomesal portion with 5-10 strongly sclerotized teeth in apical half, more apical teeth tergally directed.

LARVA (Fig. 125). *Head.* Width 1.2 mm (1); yellowish brown, 1.39 (1) as wide as long; seta 1-C slender with filamentous apex; 5-7-C on a line; 6-C well mesocaudad of 7-C; 5-C slightly mesocaudad of 6-C, usually 3 branched; 4-C on level of 5-C, extremely fine; usually, 7-C 6 branched, 13-C double and 15-C 4 branched. *Antenna* 0.50-0.60 mm long, pale, slender, arcuate, about 0.67 length of head, slightly apically narrowed, spinulate, spinulation denser in proximal part; seta 1-A inserted at basal 0.36-0.52 (9; $x = 0.42$) of shaft, with 6-10 (5) barbed branches, usually not reaching apex of shaft. *Mandible* without microspines dorsolaterally on proximal portion. Cutting organ with DS_1 not reaching apex of VT-4; dorsal teeth simple, a row of several sharp accessory denticles from base of mesal dorsal tooth to base of ventral tooth; VB_1 extending far beyond apex of VT_0; pectinate brush 4 haired, apparently mesally pectinate. Mandibular hairs 12-15, middle 2 widely spaced. *Maxilla* of filter-feeding type. Mesostipes longer than wide; pseudoartis moderately developed, not fused with cranium; parartis moderately developed; lateral surface denticulate; hairs of maxillary brush slender and very long; stipital sensoria a little basal to middle. Lacinia with mostly slender hairs on mesal margin, only, 1, 2 apically frayed, rather stout hairs proximal to middle; 5-Mx about length of 4-Mx; 6-Mx uncertain. Palpostipes 0.33 length of mesostipes, 2.0 as long as broad; S_1 broadest, $S_3 > S_1 > S_4 = S_2 > S_5$ in length. *Mentum plate* with 32-41 ($x = 36.1$) small teeth. *Thorax.* Setae relatively short; 1-P short; usually, 7-P triple and 14-P double. *Abdomen.* Setae relatively short; 7-II slender, of medium length, strongly barbed; 6-III short and slender; 10-I, 1-II and 5-V usually single; 12-II and 10-IV usually double; 13-IV and 12-VII usually 4 branched; 1, 2-VIII on a common callus, latter usually 3 branched; 3-VIII not barbed, short, with many branches; 4-VIII usually double. Comb scales 16-20 (9; usually 20) in a patch, individual scales rounded, evenly fringed laterally and apically with spicules. *Siphon* light yellowish brown, fusiform with widest part proximal to middle, 3.9-4.1 as long as wide, apex 0.41-0.50 (2) of widest part; length 1.39-1.56 mm, index 4.69-4.77 (2); pecten reaching basal 0.32-0.41, of 15-17 dark brown teeth including 0-2 basal abortive ones, 1, 2 apical teeth detached, each tooth with a few ventral denticles, detached teeth light brown and often without denticles; seta 1-S located beyond pecten at apical 0.35-0.47, very fine; 2-S at apex of siphon, very short.

Saddle 0.30-0.36 mm long; apex with a number of small dorsolateral spines; 4-X of 9-11 cratal and 1-3 precratal tufts (12 in total), each with 9-17 branches. Anal gills tapering toward apex, about 2.0 length of saddle.

SPECIMENS EXAMINED. PHILIPPINES. 21♂, 10♀, 2 L, 8 l: Calinan, Mindanao, 15 VIII 1972, ground pool, Mizusawa & Soma.

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Kyushu). PHILIPPINES. BORNEO. JAVA. SUMATRA. MOROTAI. CERAM. VIETNAM. MALAYA. THAILAND. BURMA. INDIA. SRI LANKA. NEW GUINEA. ADMIRALTY ISLANDS. BISMARCK ARCHIPELAGO. SOLOMON ISLANDS. AUSTRALIA.

BIONOMICS. *Aedes alboscutellatus* is one of the rarer species in Japan; the only known localities are Ômura, Nagasaki Pref., Kyushu (Yamada 1921, Bekku 1954), and the vicinity of Sendai, Miyagi Pref., northern Honshu (Waku 1950). Records of Reisen et al. (1971) from Yokota and Misawa Air Base should be re-examined. The larvae were found in temporary ground pools in woods or bamboo groves. In other regions, larvae have been collected in a variety of habitats, including flood pools, permanent ditches, foxholes, rock pools, swamps and potholes in a stream bed. These larval habitats are usually at least partly shaded (Reinert 1973). In the vicinity of Sendai, larvae were found associated with *Ae. vexans nipponii* and *Ae. imprimens* (Waku 1950). Adult females were captured utilizing human bait from 1900 to 2300 hr at Ômura (Bekku 1954).

89. *AEDES (AEDIMORPHUS) VEXANS* (MEIGEN)*

Culex vexans Meigen, 1830: 241 (♀). Type-locality: Berlin, Germany.

DISTRIBUTION. WORLDWIDE EXCEPT NEOTROPICAL REGION.

89A. *AEDES (AEDIMORPHUS) VEXANS NIPPONII* (THEOBALD) (Figs. 126, 127, 238; Table 123)

Culicada nipponii Theobald, 1907: 337 (♀). Type-locality: Karuizawa, Nagano Pref., Japan.

Aedes vexans variety *nipponii:* Yamada, 1927: 570, Korea.

Aedes (Aedimorphus) vexans nipponii: Bohart and Ingram, 1946b: 69, Okinawa Is., Ryukyu Archipelago; LaCasse and Yamaguti 1950: 125 (♂, ♀, L).

FEMALE (Fig. 238). Wing length 3.1-4.8 mm. *Head.* Vertex including interocular space covered with narrow curved white scales, with an ill-defined anteromedian patch of narrow curved brownish scales, and a pair of latero-anterior patches of broad dark scales; erect forked scales grayish brown, some yellow ones intermixed, expecially anteriorly; tempus covered with broad pale scales; 7-9 vertical and 3, 4 temporal bronze-brown bristles on each side, an additional bristle on underside close to eye. Clypeus rather dark brown. Antenna: pedicel light dorsolaterally yellowish brown, ventromesally dark brown, with very small white scales and minute bristles; flagellum 0.92-1.01 (5) length of proboscis; flagellomere 1 with pale scales, 1.32-1.48 (5) length of Flm 2. Palpus 0.19-0.26 (5) length of proboscis, dark scaled, with some pale

*The nominal subspecies does not occur in this region.

scales at base and apex of segment 3, often mottled with pale scales in other dark areas; 3 1.61-1.93 (5) length of 2; 4 papilliform, occasionally developed up to 0.2 length of 3. Proboscis 1.17-1.29 (5) length of forefemur, with several ventrobasal bristles, dark scaled, with ventral surface covered with yellowish scales except for apex and base, the corresponding dorsal area with yellowish scales intermixed. *Thorax*. Pronotal integument dark brown; anterior lobe with narrow curved or crescent-shaped pale yellowish brown scales, bearing many yellowish brown bristles; posterior lobe anterodorsally covered with narrow curved brown and posterioventrally with crescent-shaped to broad white scales, bearing 4-9 brownish bristles. Scutum with integument dark brown, somewhat paler on prescutellar area, covered with narrow curved brown scales, scales of anterior and supraalar margins and prescutellar area pale; scutal bristles brown to dark brown, median fossal bristles present. Scutellum with narrow curved pale scales; lateral lobe with more than 10, median lobe with 7-14 pale brown to brown, long and medium-sized bristles, each lobe with several additional fine bristles. Paratergite rather wide, with narrow to broad pale yellowish scales. Pleural integument dark brown, partly pale; patches of pale yellowish or white broad scales on propleuron, upper subspiracular area, lower subspiracular area, postspiracular area, upper-posterior sternopleuron, middle-posterior sternopleuron, and upper mesepimeron, prealar knob with several white scales, lower subspiracular patch more or less extending posterodorsally and often fused with postspiracular patch; pleural bristles pale yellowish brown, many on propleuron, upper to posterior sternopleuron, prealar knob and upper mesepimeron, 5-11 post-spiraculars. *Wing*. Fringe scales of alula rather narrow and round-tipped. Veins dark scaled and speckled with yellowish scales especially on anterobasal area, usually posterior side of costa in basal half and subcosta mainly yellow scaled. Cell R_2 1.68-2.62 (5) length of vein r_{2+3}. Halter knob pale scaled. *Legs*. Forecoxa broadly pale scaled basally and apically, dark scaled in-between; mid- and hindcoxae with patches of pale scales. Forefemur with pale apical fringe, pale scaled on posterior half of ventral surface including posterior surface; mid- and hindfemora with pale apical fringe, posterior and anterior surfaces of hindfemur largely pale scaled except apical area. Foretibia with pale dorsoapical patch. Foretarsomeres 2 and 3, midtarsomeres 1-4 and hindtarsomeres 1-5 with pale basal bands or dorsobasal spots, occasionally foretarsomeres 4, 5 and midtarsomere 5 with pale dorsalbasal spots or basal bands. Legs otherwise speckled with dark and pale scales. Foretarsomere 5 longer than 4; hindtarsomere 1 0.70-0.74 (5) length of tibia. Claws of hind-tarsus usually simple, occasionally unidentate. *Abdomen*. Tergum I pale scaled in middle; II-VII dark scaled with basal bands, laterobasal patches and usually median spots or patches of pale scales, the basal bands often narrowed at middle, the laterobasal patches reaching apical 0.67 to near apical margin of the segment, usually not connected with basal bands, occasionally connected with them in anterior segments, the median spots of II-IV rounded and free, or often extending anteriorly and/or posteriorly, connected with basal band and/or reaching posterior margin, that of V usually posteriorly broadened to form a triangular medioapical patch; VI and VII usually with basal band strongly laterally broadened, and usually with median patch apical, triangular and well developed, leaving a narrow dark turned up V-shaped patch in-between; sometimes VII almost entirely pale scaled; occasionally all median spots or patches reduced. Sterna pale scaled. Seminal capsules 3, one slightly larger than other 2.

MALE (Figs. 127, 238). Wing length 2.8-4.3 mm. Vertex laterally with

more broad pale scales, dark scale patch smaller or reduced. Antenna: flagellum 0.76-0.80 (4) length of proboscis; flagellomere 12 1.05-1.23 length of Flm 13, both together 0.99-1.06 of Flm 1-11. Palpus 1.20-1.27 (5) length of proboscis; segment 2 with pale subbasal band; 3 with pale basal band; 4 and 5 with pale dorsobasal spots; length ratio of 2-5: 1.17-1.41 : 1.69-2.00 : 1.03-1.11 : 1.00. Proboscis 1.29-1.38 (5) length of forefemur, entirely dark scaled. Cell R_2 1.15-1.72 (5) length of vein r_{2+3}. Claws of hindtarsus simple and equal. *Genitalia*. Tergum IX well sclerotized; lobes triangular, or apically rounded, moderately protrudent, broadly separated, each with 4-9 fine bristles. Sternum IX with 4-7 bristles. Basistyle 3.1-3.6 as long as width at sternal base, laterally and sternally scaled, bristled throughout, long lateral and sternomesal bristles in apical half; claspette reaching basal 0.34-0.42 of basistyle, pilose, apex somewhat expanded, rounded and bearing many medium-sized bristles. Dististyle 0.67-0.74 length of basistyle, nearly straight and parallel-sided, flattened, bluntly pointed, about 6.0 as long as wide, tergal (mesal) surface pilose, hair-like spicules apically longer and denser, more than 10 short setae scattered in apical half; claw 0.14-0.19 length of dististyle, straight, pigmented, on a short process at apical 0.20-0.27 of dististyle. Paraproct moderately sclerotized, cercal tergal surface apparently weakly sclerotized. Aedeagus 1.65-2.12 as long as wide, each lateral piece with tergal expansion greatest near middle; sternomesal portion with 3-5 strongly sclerotized teeth, the apices of which are tergally curved.

LARVA (Fig. 126). *Head*. Width 1.13-1.27 mm; brownish, 1.28-1.41 as wide as long; front margin of labrum only slightly concave; seta 1-C moderately stiff, 0.96-1.23 (5) length of distance between bases; 4, 6, 7-C on about same level, 5-C usually 3-5, rarely 2, 6 branched, fairly posteriad and a little mesad of 6-C; usually, 10-C double and 14-C single. Integument with distinct microsculpture of reticulations formed by minute tubercles, occasionally some of these tubercles distinctly larger than others giving a granulate appearance under lower magnification. *Antenna* 0.38-0.50 mm long, about 0.5 length of head, only slightly arcuate, strongly spinulate, darker in apical half; seta 1-A inserted at basal 0.34-0.46 of shaft, with 9-14 barbed branches, not reaching apex of shaft; 2 > 4 > 3 > 6-A in length; 5-A with a rudimentary accessory sensorium on proximal division. *Mandible* with a number of simple, rather stout dorsolateral microspines near base; teeth of mandibular comb 9-14, 2-4 lateral teeth slender and plumose. Cutting organ with DS_1 reaching apex of VT-4; lateral dorsal tooth with a mesal denticle, mesal dorsal tooth with or without a mesal denticle, accompanied by a row of several accessory denticles mesally at base; ventral tooth with VT-1 rather abortive; VT_{1-3} each with a tiny secondary anterobasal denticle; VB_1 stout, just reaching apex of VT_0, VB_2 about 0.67 length of VB_1; pectinate brush 3-5 haired, apparently mesally pectinate. Mandibular hairs (3-6) + (1-3) + (9-10), middle group broadly spaced. *Maxilla* of browsing type. Cardo well sclerotized, seta 1-Mx rather stiff. Mesostipes about as long as wide; pseudoartis well developed, usually not fused with cranium; parartis poorly developed; lateral surface denticulate; hairs of maxillary brush rather short and stiff; stipital sensoria about at middle; 2-Mx near lateral margin about at anterior 0.33; 4-Mx more anterior. Lacinia with mesobasal corner strongly sclerotized; mesal margin with apically branched, rather stiff spicules, anterior ones progressively shorter and stouter, a few most anterior ones simple, stout and spine-like, 6-Mx long, rather broad, apparently flat. Palpostipes about 0.5 length of mesostipes; S_1 distinctly larger than others, $S_1 > S_3 > S_4 \geq S_2 > S_5$. *Mentum plate* with 24-29 small teeth. *Thorax*. Setae 5, 9-P usually single; 14-M smaller than 13-M. *Abdomen*.

Setae 13-I, 11-II, 8,13,14-III, 8,9,13,14-V, 6,9,14-VI usually single; 12-II, 3-III, 2,4-VIII usually double; 1,2-VIII on a common callus, 3-5-VIII each on a small callus. Comb scales 8-12, in an irregular single or double row, individual scales thorn-shaped with a strong apical spine, laterobasally fringed with fine spicules. *Siphon* brownish, usually broadest at about basal 0.25, 3.40-4.00 as long as wide, apex 0.54-0.61 of widest diameter, length 1.32-1.54 mm, index 3.64-4.62; microsculpture imbricate-like, of short arcuate ridges bearing minute denticles; pecten reaching basal 0.36-0.46, of 13-19 dark brown, closely spaced teeth, including 0-3 basal abortive teeth and 1-4 apical detached teeth, each tooth with a few ventral denticles, detached teeth stronger, with ventral denticles weaker; seta 1-S at apical 0.36-0.43; 2-S very short. *Saddle* 0.34-0.50 mm long; microsculpture similar to that of siphon, the denticles slightly stronger apically; seta 4-X of 10-14 cratal and 2-5 precratal tufts (12-17 in total), cratal tufts 4-10 branched, precratal tufts 6-11 branched. Anal gills apically tapering with pointed apex, dorsal gill 2.0-2.4 length of saddle, ventral gill usually a little shorter.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 165♂, 162♀; with associated skins (23 l, 23 p), 67 L, 22 l: Hokkaido (A-0038, A-0040, A-0043, A-0044, A-0185, A-0193, A-0194, A-0195, A-0196, A-0197, A-0199, A-0221, A-0222, A-1637, A-1639, A-1640, A-1644, A-1649, A-1650, A-1670, A-1712, A-1789, A-1790, A-1792, A-1916, A-1918, A-1919, A-1920, A-1921, A-1924, A-1925, A-1926, A-1928, A-1934, A-1936, A-1948). 5♂, 7♀, 30 L: Honshu (C-2087, C-2177, C-2214, C-2215, C-2216, C-2218, C-2219, C-2220, C-2221, C-2222). 7♀: Kyushu (H-0318, H-2123). KOREA. 1♂, 5♀: Korean Peninsula (L-0829, L-2212, L-2213). RYUKYU ARCHIPELAGO. 1♂, 10♀, 1 L: Okinawa Guntô (J-0499, J-0523, J-0525, J-0536, J-1623). 4♂, 5♀, 2 L: Yaeyama Guntô (K-0113, K-1431).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). SAKHALIN. PRYMORYE. KHABAROVSK AREA. MANCHURIA. NORTH AND SOUTH CHINA. TRANSBAIKALIA. MONGOLIA.

TAXONOMIC DISCUSSION. Subspecies *nipponii* is chiefly characterized by the presence of pale median patches on the anterior abdominal terga of the adults. Most specimens encountered in Japan and the Ryukyus belong to this type, and the *vexans* type or *nocturnus* type is rare. On the contrary, the *nipponii* type is rarely found in North America, and apparently never in Southeast Asia (Reinert 1973) or the South Pacific (Belkin 1962). Suzuki (1958) found that exposure of the immature stages to high temperatures produced adults with the *vexans* type (?*nocturnus* type) of abdominal scaling. Unfortunately, he did not refer to other diagnostic characters. Subspecies *vexans* of North America differs from that (*nocturnus* (Theobald)) of Southeast Asia and *nipponii* in the absence of pale scales on the dorsal wing veins and the reduced number of pale scales on the palpi and legs. Reinert (1973) pointed out that larvae from Southeast Asia had the frontoclypeus granulose. In Japan and the Ryukyus, this type appears rare. Seta 5-C is usually single in specimens from the South Pacific (Belkin 1962), 1-3 (usually 2) branched in those from Southeast Asia (Reinert 1973), and 2-6 (most frequently 4) branched in those from the Ryukyus and Japan. It is debatable whether these apparent geographical variations could be diagnostic characters. Suzuki's study should be followed by a supplementary experiment taking the above additional characteristics into consideration.

BIONOMICS. *Aedes vexans nipponii* is one of the more common species in

this region. Larvae are usually found in unshaded ground pools, rice fields, ponds, ditches and other open water. Females are day and dusk feeders. They are readily attracted by light. They appear to have a bimodal abundance in Okinawa, being commonest in late spring and late autumn (Savage and McDonald 1972).

MEDICAL IMPORTANCE. Japanese encephalitis virus has been isolated from wild-caught females of *Aedes vexans nipponii* (Hayashi et al. 1965; Shichijo et al. 1970). The Okinawa strain of this virus was experimentally transmitted to mice by this species *(vexans vexans ?)* (Hodes 1946). However, the role of this species in the epidemiology of Japanese encephalitis has not yet been clarified. Getah (Itakura) virus, a group A agent, and Batai virus (Bunyamuera group), has been isolated from *vexans nipponii* from Gumna Prefecture (Takahashi et al. 1971). Some other arboviruses, Sagiyama, Akabane, etc., have also been isolated from this species. Natural infections with tularemia have been found, and experimental transmission of it by this species has been reported (Gutsevich et al. 1970).

SUBGENUS *GEOSKUSEA* EDWARDS

Geoskusea Edwards, 1929: 341. Type-species: *Aedes fimbripes* Edwards, 1924; New Britain.

Small to medium-sized brownish or dark mosquitoes with unornamented scutum and tarsi; larvae occur in crab holes.

FEMALE. *Head.* Eyes contiguous above. Decumbent scales of vertex all broad; erect scales numerous on posterior 0.67 of vertex; several vertical and temporal bristles on each side. Antennal flagellum length of or slightly shorter than proboscis; flagellomere 1 1.2-1.3 (*baisasi*) length of Flm 2. Palpus 0.13-0.20 length of proboscis; segment 4 minute. Proboscis longer than forefemur. *Thorax.* Anterior pronotal lobe not scaled, with many bristles of various sizes; posterior pronotal lobe scaled, with bristles along upper posterior margin, also with many minute hairs. Scutum covered with narrow curved scales; all scutal bristles well developed excepting median fossals. Scutellum with narrow scales. Paratergite bare. Pleura with thin scale patches on sternopleuron and mesepimeron; many pleural bristles on propleuron, prealar knob, sternopleuron, and upper mesepimeron; several to many postspiraculars; minute hairs scattered on unscaled area of pleura. Base of mesomeron slightly above that of hindcoxa. *Wing.* Cell R_2 slightly longer than vein r_{2+3}. *Legs.* Tarsi not banded; hindtarsomere shorter than tibia. Claws simple and equal. *Abdomen.* Laterotergite lacking scales. Seminal capsules 3, one larger than other 2.

MALE. Antennal flagellum shorter than proboscis; flagellomeres 12 and 13 greatly elongate, Flm 13 longer than 12, both together as long or longer than Flm 1-11. Palpus 0.20-0.67 length of proboscis; segments 4 and 5 short, without tufted bristles. Foretarsomere 4 shortened; 5 modified, about 2.0 length of 4, with 4 short stout curved setae on top of ventrobasal swelling, 2 rows of several stiff subventrobasal setae, and a setiferous process ventrally at basal 0.33. Midtarsomere 4 not shortened; 5 barely modified, about length of 4, with a very short ventral setiferous process. Both claws of fore- and midtarsi toothed; hindtarsal claws equal and simple. *Genitalia.* Tergum IX with a pair of distinct lobes bearing bristles or stout setae. Sternum IX

with bristles. Basistyle laterally and sternally scaled, usually with a densely bristled median tergomesal lobe, without claspette. Dististyle slender, simple, with claw usually long, terminal or subterminal. Cercal setae present; paraproct with strongly sclerotized, uni- or bicuspid apex. Aedeagus simple, weakly sclerotized. Basal plate small.

LARVA. *Head.* Wider than long; seta 1-C slender; 4-7-C caudad of antennal base; 8-C rather long. *Antenna* rather long but shorter than head, finely spinulate; seta 1-A branched. *Mandible* without mandibular seta 1-Md; MdS_3 subequal to MdS_1 in length. Mandibular comb of slender simple teeth. Cutting organ with a dorsal spine; lateral dorsal tooth poorly developed, mesal dorsal tooth very long but weakly sclerotized, a well developed accessory denticle present; ventral tooth with one lateral denticle (VT-4) and 3 mesal denticles (VT_{1-3}); 2 ventral blades; pectinate brush of slender hairs. Piliferous process well protrudent, deeply cleft at apex. *Maxilla.* Cardo quadrangular, rather broadly fused mesobasally with cranium, a sclerotized strip-like anterior margin not very strongly developed. Mesostipes distinctly longer than wide, peach-shaped, without strong spine-like or xiphoid spicules on mesal margin; hairs of maxillar brush long; parartis a rounded weakly sclerotized broad plate produced from base of maxillary suture; pseudoartis poorly developed, separated from cranium; stipital sensoria on a common basal ring. Palpostipes less than 0.5 length of mesostipes; apex with 5 palpal sensoria, and at least an internal papilliform structure of ampulla. *Mentum plate* with more than 20 small teeth. *Thorax.* Setae 0-P, 13, 14-M and 8-T dendritic; 1-3, 8-P short; 5-7-P, 5-10, 12-M, 7, 9, 10-T strong; 13-P absent. *Abdomen.* Setae 6-I, II and 7-I strong; 13-II, VI dendritic. Comb scales numerous in a large patch, individual scales fringed apically and laterally with spicules. *Siphon* moderately long, with acus; pecten evenly spaced; seta 1-S beyond pecten. *Saddle* small; seta 1-X on ventral margin of or off saddle; 2-X branched, 3-X single; 4-X on grid. Anal gills very short.

DISTRIBUTION. Ryukyu Archipelago. Philippines. Indonesia. Papuan subregion. Solomon and New Hebrides islands. ?Northern Australia.

This subgenus is represented by a single species in this region.

90. *AEDES (GEOSKUSEA) BAISASI* KNIGHT AND HULL
(Figs. 127, 128, 239; Table 124)

Aedes (Geoskusea) baisasi Knight and Hull, 1951: 197 (♂, ♀). Type-locality: Iwahig Penal Colony, Palawan Is., Philippines; Tanaka, Saugstad and Mizusawa 1974: 308, Iriomote Is., Ryukyu Archipelago.

FEMALE (Fig. 239). Wing length 2.6-3.0 mm. *Head.* Eyes very narrowly separated below. Vertex covered with broad dark scales, the dark-scaled area rather variable, occasionally both sides of vertex covered with pale scales as in tempus; erect forked scales blackish; tempus covered with broad pale scales; 5-7 vertical and 4 temporal bristles on each side. Clypeus very dark brown. Antenna: pedicel rather dark brown, with fine hairs and small dark scales on mesal surface; flagellum 0.92-0.95 (2) length of proboscis; flagellomere 1 with a few scales, 1.21-1.29 length of Flm 2. Palpus dark scaled, 0.18-0.21 (2) length of proboscis; segment 3 1.36-2.00 of 2; 4 papilliform. Proboscis 1.26 (1) length of forefemur, dark scaled. *Thorax.* Anterior pronotal lobe light brown, bearing more than 10 dark or pale bristles; posterior pronotal lobe dark

brown, ventrally paler, roughly covered with broad dark scales on upper half, bearing 5-7 mostly stout and dark bristles along upper posterior margin, more than 10 extremely fine hairs on lower posterior area. Scutum with integument dark brown, covered with narrow curved dark scales, narrow curved pale scales on anterior margin, a narrow prescutellar space bare; scutal bristles very dark; usually 3-5 humerals and 2,3 posterior fossals. Scutellum rather dark brown on lobes, pale between them; lobes covered with broad dark scales, bearing 4-9 dark long bristles and several short or medium-sized ones, median lobe usually with fewer bristles than lateral lobes. Pleural integument mostly dark brown, propleuron light brown; posterior margin of sternopleuron, lower margin of mesepimeron, upper margin of mesomeron, and metapleuron pale; broad pale scales thinly covering upper sternopleuron and upper mesepimeron; extremely fine hairs covering entire unscaled area of sternopleuron, middle 0.33 of mesepimeron below scaled area and entire metameron, lower postspiracular area also with several extremely fine hairs; pleural bristles pale yellow to dark brown; numerous propleural bristles varying in size, usually 3 of them dark and stout; 6-12 mostly dark postspiraculars, more than 10 (up to about 20) mostly dark prealars; many sternopleurals in an irregular, partly double row along upper to posterior margin, usually 3 prominent dark bristles just above level of lower margin of mesepimeron; about 20 fine upper mesepimerals, no lower mesepimeral. *Wing.* Alula fringed with 2 types of scales, one rather broad with truncate apex, another lanceolate, usually longer than broad scales. Veins dark scaled; cell R2 1.15-1.60 (7) length of vein r_{2+3}. Halter with dark scaled knob. *Legs.* Forecoxa with integument of anterior surface dark brown and covered with dark scales; midcoxa with integument mostly dark brown forming a patch with dark lower mesomeron, with pale lateral scales; hindcoxa with a dark integumental spot above and pale lateral scales. Femora posteroventrally pale toward base; femora otherwise, tibiae and tarsi dark scaled. Midfemur a little slightly swollen; foretarsomere 1 equal to or slightly longer than 4; hindtarsomere 0.84-0.89 (5) length of tibia. *Abdomen.* Terga dark scaled, II-VI with laterobasal spots of pale ochreous scales visible from above on III-VI. Sternum II usually entirely pale scaled, II-VI basally pale scaled and apically dark scaled; VII dark scaled.

MALE (Figs. 127, 239). Wing length 2.4-2.6 mm. Antenna: pedicel glabrous; flagellum 0.76-0.84 (3) length of proboscis; flagellomere 1 without scales; Flm 12 0.70-0.84 (3) length of Flm 13, both together 0.97-1.16 of Flm 1-11. Palpus 0.63-0.65 (3) length of proboscis, with a few dark stout, but not long, bristles at apex; length ratio of segments 2-5: 4.25-4.88 : 5.50-6.68 : 1.71-1.75 : 1.00. Cell R2 1.00-1.27 (7) length of vein r_{2+3}. Hindtarsomere 1 0.88-0.91 (5) length of tibia. Anterior claw of foretarsus with a blunt-tipped median and a sharp laterobasal tooth; anterior claw of midtarsus with a sharp laterobasal tooth; posterior claw of fore- and midtarsi with a sharp basal tooth. *Genitalia.* Tergum IX with well protrudent, moderately pigmented and capitate lobes, each bearing more than 20 short, strong setae. Sternum IX trapezoidal, membranous, with 5-8 bristles in middle. Basistyle cylindrical, slightly swollen at middle of sternomesal surface, 4.4-5.2 length of tergal middle narrowest part just distal to basal tergomesal lobe, bristled except on basal mesal half of tergal surface, fine bristles on sternal mesal surface; median tergomesal lobe conspicuous, well protrudent, square with mesal margin straight in tergal view, 0.33 length of basistyle, the tergomesal surface densely covered with setae of moderate length, the setae progressively longer proximally. Dististyle curved at apex, slightly more than 0.5 length of basistyle, pilose at apex; claw pigmented, straight, at most 0.33 length of dististyle, apex

slightly broadened, somewhat palm-like. Paraproct sclerotized at uni- or bicuspid apex; cercal setae 4-9 on each side. Aedeagus weakly sclerotized, roughly conical, 1.58-1.80 (4) as long as wide, widest at about basal 0.33, then apically narrowed, base about 0.75 of widest part, tergal side widely open; sternal side closed.

LARVA (Fig. 128). *Head.* Width 0.87-0.96 mm; 1.23-1.46 as wide as long; yellow-brown, sometimes with a tinge of reddish-brown; seta 1-C slender, usually ventromesally curved, separated by slightly more than their length; 5-C usually double, slightly shorter than cranium; 6-C usually single, about 1.2 length of cranium, inserted barely cephalad of a line between 5, and 7-C; 7-C usually 10-11 branched, inserted mesocaudad of antennal bases, distance from 6- to 7-C about 2.0 distance from 7-C to dorsomesal corner of antennal base. *Antenna* paler than, and slightly more than 0.5 length of cranium, 0.40-0.41 mm long, tapering slightly distad of middle, sparsely spinulate, the spinules more numerous on the dorsal and lateral aspects, virtually absent on proximal half of ventral aspect; seta 1-A 2-5 branched, lightly barbed, inserted at basal 0.48-0.56 (x = 0.51), reaching to or beyond apex of shaft. *Mandible* with a few needle-like microspines on medial aspect of dorsolateral surface. Cutting organ with dorsal spine almost reaching tip of VT_0, curved in apical 0.25; mesal dorsal tooth quite long, with 4-6 long spine-like denticles on basal half, and smaller blunter denticles distad; a well developed accessory denticle mesad of mesal dorsal tooth, its mesal margin with irregular but distinct denticles; ventral tooth with VT-4 well-developed, slender, very sharp, not attaining tip of VT_0; VT_{1-3} triangular, progressively more acute-tipped, VT_3 slightly shorter than other 2; VB_1 extending well beyond VT_0, gradually tapering to subacute apex, strongly pectinate on mesal margin, VB_2 0.5 length of VB_1; pectinate brush of 6-9 hairs, each 0.50-0.67 length of ventral blade; membranous process with labula extending beyond apex of anterior part. Mandibular hairs 7 + 6, with 1, 2 isolated hairs between the groups, hairs of proximal group basally smoother and apically brush-like than those of distal group. *Maxilla* with seta 1-Mx single, lightly-pigmented. Mesostipes 1.4-1.5 as long as wide, with lateral surface smooth, with somewhat stiff, mostly forked spicules on mesal margin; stipital sensoria slightly proximad of middle, equal, slender, long, nearly attaining mesal margin of mesostipes; 4-Mx more apical than 2-Mx. Lacinia with 5-Mx proximad of level of stipital sensoria, 6-Mx apparently simple, longer than 4-Mx. Palpostipes about 0.33 length of mesostipes, slightly broadened at base; S_1 stouter and darker than others, S_3 S_1 = S_5 S_2 = S_4 in length. *Mentum plate* with 23-29 (usually 24, 25) teeth, the flanking teeth becoming more acute laterad, median tooth only slightly larger than flanking teeth. *Thorax.* Seta 7-P definitely shorter than 6-P, usually double; 9-P usually single, shorter than 10, 12-P; 14-P usually triple; 12-M slightly shorter than 10-M, smooth to sparsely barbed; 9-T usually 7 branched. *Abdomen.* Seta 11-I well mesad of 12-I; 6-III-VI much smaller than 6-II; 5-V usually single; 11, 13-I, 5, 6-III, 12, 13-IV, 14-VI-VIII and 7-VII usually double; 3-VIII usually smaller than 1-VIII, with a few large barbs; 5-VIII stiffer and longer than 1, 3-VIII, usually smooth, occasionally with a few small barbs. Comb scales about 100-130 in a triangular patch, the individual scales progressively larger caudad, roughly spoon-shaped, apically fringed with strong, irregular-sized spicules, laterally with finer spicules. *Siphon* light brown, with narrow darker basal ring, of fairly uniform diameter in basal half, then gradually tapering, the surface with numerous short transverse low ridges bearing minute spicules; length 0.72-0.84 mm, index 2.56-2.95 (x = 2.78); pecten reaching apical 0.38-0.44 (x = 0.41) of siphon, of 11-17 strong teeth

(plus 0-4 smaller basal teeth), each tooth with 1-3 sharp denticles on basal half; seta 1-S inserted beyond pecten at apical 0.31-0.39 (x = 0.34), slightly more than 0.5 length of siphon diameter at insertion; 2-S stiff, subapical, about 0.67 length of apical pecten tooth. *Saddle* small, covering about 0.33 circumference of segment X, 0.25-0.27 mm long; microsculpture similar to that of siphon; seta 1-X usually single, about 0.67 length of saddle, inserted at about caudal 0.25 of ventral margin of saddle; 2-X with longest branch about 2.5 saddle length; 4-X of 12-14 cratal tufts, each with 9-15 or more smooth branches. Anal gills subequal, bud-like, 0.3-0.6 (x = 0.4) length of saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 23♂, 21♀; with associated skins (18 l, 18 p), 10 L, 25 l: Yaeyama Guntô (K-1593, K-1595, K-1630, K-1631, K-1707, K-1733, K-1734). PHILIPPINES. 2♂, 1♀ (Paratypes 1♂: Pintanahon, Samar Is., 13 IV 1945, crab hole, Rozeboom, Knight & Laffoon; 1♂: Osmena, Samar Is., 24 IV 1945, crab hole, Rozeboom, Knight & Laffoon; 1♀: Zamboanga, Mindanao, 12 IX 1945, light trap, Rozeboom, Knight & Laffoon, No. 59350, USNM).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô). PHILIPPINES.

BIONOMICS. The larvae of this species were found in brackish water crab holes at Komi and along the river Maira in Iriomote Is. This is the first record of the larva of this species. All the known larvae of this subgenus have been obtained from crab holes of the coastal regions (Bright and Hogue 1972). Adult habits are not known.

SUBGENUS *NEOMELANICONION* NEWSTEAD

Neomelaniconion Newstead, 1907: 31. Type-species: *Neomelanoconion palpale* Newstead; Belgian Çongo.

Dark mosquitoes, with sides of scutum broadly yellow or white; tarsi not banded.

FEMALE. *Head.* Eyes separated above and below. Decumbent scales of vertex medially narrow; numerous erect forked scales; nearly covering entire vertex; several vertical and temporal bristles present. Antennal flagellum shorter than proboscis; flagellomere 1 1.6 length of Flm 2 *(lineatopennis)*. Palpus short, Proboscis longer than forefemur. *Thorax.* Anterior pronotal lobes widely separated, with many dark brown bristles of various sizes; posterior pronotal lobe with narrow scales, bearing bristles along posterior margin. Scutum covered with narrow scales, with sides broadly yellow or white scaled; all scutal bristles present except median fossals. Scutellum with narrow scales. Paratergite bare. Pleural scale patches poorly developed, bristles well developed, lower (anteromedian) mesepimerals present or absent. Base of mesomeron slightly above that of hindcoxa. *Wing.* Cell R_2 longer than vein r_{2+3}; 1a reaching level between cubital fork and m-cu. *Legs.* Foretarsomere 5 longer than or as length of 4; hindtarsomere 1 shorter than tibia. Fore- and midtarsal claws toothed; hindtarsal claw simple. *Abdomen.* Laterotergite not scaled. Segment VIII completely retractile.

MALE. Antennal flagellum plumose; flagellomeres 12 and 13 elongate, Flm 12 longer than Flm 13, both together slightly shorter than Flm 1-11. Palpus length of or longer than proboscis; segment 5 reduced; 4 turned upwards; 4 and apex of 3 with long tufted bristles. Lower mesepimeral bristles absent.

Foretarsomere 4 shortened, midtarsomere 4 only slightly shortened; fore- and midtarsomere 5 longer than 4, but poorly modified, with 1, 2 pairs of stiff ventrobasal setae. Anterior claw of fore- and midtarsi longer than posterior claw, both anterior and posterior claws toothed; hindtarsal claws equal and simple. *Genitalia*. Tergum IX undivided, lobes at most poorly differentiated, bristled. Sternum IX with bristles. Basistyle long, with narrow basal tergomesal lobe bearing stout setae, without apical lobe and claspette. Dististyle inserted before apex of basistyle, short, enlarged in middle; claw apical, long. Cercal setae absent; paraproct with strongly sclerotized apex, and a sternomesal arm. Aedeagus paired, well sclerotized, rather complex, apex toothed. Basal plate rather small.

LARVA. *Head*. Seta 4-C small, only slightly anteriad of 6-C; 4-6-C caudad of 7-C; 8-C short; 12, 13-C approximated. Antenna moderately long, spinulate; seta 1-A branched. *Mandible* (no dissected material studied). Cutting organ with 2 dorsal teeth, lateral tooth smaller; ventral tooth with one lateral (VT-4) and 3 mesal (VT_{1-3}) denticles; ventral blade (VB_1) exceeding tip of VT_0; pectinate brush of broad hairs. Piliferous process well protrudent. *Maxilla* (no dissected material studied). Cardo triangular, narrowly fused mesobasally with cranium through a strongly sclerotized strip-like structure. Mesostipes peach-shaped; pseudoartis well developed, but not fused with cranium; seta 4-Mx subapical. Palpostipes short, separated from mesostipes; apex with ampulla and at least 4 palpal sensoria. *Mentum plate* with many small teeth. *Thorax*. Setae 0-P, 13, 14-M, 8, 13-T small, dendritic; 1-P short to medium; 2, 3-P short; 5-8-P, 5-10, 12-M, 7, 9, 10-T strong; 13-P absent. *Abdomen*. Comb scales in a line or a patch. *Siphon* with acus; pecten with one or more apical teeth detached; seta 1-S beyond pecten. *Saddle* incomplete; seta 4-X with precratal tufts.

DISTRIBUTION. Ethiopian region, except for *lineatopennis*, which is found in the Oriental and Australian regions, north to Korea.

This subgenus is represented in this region by only one widely distributed species, *lineatopennis*.

91. *AEDES (NEOMELANICONION) LINEATOPENNIS* (LUDLOW)
(Figs. 129, 130, 240; Table 125)

Taeniorhynchus lineatopennis Ludlow, 1905b: 133 (♀). Type-locality: Camp Gregg, Bayambang, Pangasinan, Luzon, Philippines.
Aedes lineatopennis: Kimbell, 1966: 12, Korea.

FEMALE (Fig. 240). Wing length 3.0-3.3 mm. *Head*. Eyes rather broadly separated above and moderately below. Vertex medially covered with narrow curved golden yellow scales and concolorous erect forked scales; interocular space with narrow curved golden yellow scales; side of vertex and tempus covered with broad dark scales, erect forked dark scales lateroposteriorly on vertex, a few broad pale scales close to eye on tempus; 5-7 vertical bristles above and several on interocular space on each side, a few most lateral bristles dark, others golden yellow; 3, 4 dark temporal bristles on each side. Clypeus dark brown. Antenna: pedicel dark brown, laterodorsally lighter, with a few small dark scales and fine bristles on mesal side; flagellomere 1 1.56-1.57 (1) length of Flm 2, with a few small dark scales. Palpus 0.20-0.25 length of proboscis, dark scaled; segment 3 2.08-2.18 (1) length of 2. Proboscis dark scaled, with 4 ventrobasal bristles. *Thorax*. Pronotal integument

brown to rather dark brown; anterior lobe unscaled; posterior lobe roughly covered with narrow curved dark scales, with a few posteroventral scales pale, bearing 5, 6 dark brown bristles. Scutum with integument dark brown, with a pair of well-defined broad sublateral stripes of narrow curved golden yellow scales from anterior to posterior margin, the stripes reaching lateral margin only at anterior humeral area; middle of anterior promontory also with narrow curved golden scales, prescutellar space with narrow curved pale yellowish scales, remainder including lateral margin covered with narrow curved dark scales; most scutal bristles dark brown, supraalars within sublateral stripe golden yellow, fossal area with 4-8 bristles along humeral margin only. Scutellum with narrow curved, pale yellowish scales on each lobe, bearing 7-9 long pale brown bristles on each lateral lobe and 6 on median lobe, each lobe with a few additional short bristles. Pleural integument light brown to rather dark brown; small patches of broad pale scales on propleuron, upper and midposterior sternopleuron, and middle mesepimeron; subspiracular area with several narrow curved or crescent-shaped pale scales; pleural bristles mostly dark brown, only posterior bristles on upper mesepimeron rather paler, about 10 or more propleurals, prealars and upper mesepimerals, 5-10 postspiraculars, more than 10 upper to posterior sternopleurals, 2-4 lower (anteromedian) mesepimerals. *Wing*. Alula fringed with dark rather broad scales. Scales of c very dark; r from remigium to a little distad of base of rs, cu and cu_2 pale scaled; broad scales on sc, plume scales on rs, r_{2+3}, bases of r_2 and r_3, apical half of m and base of m_{1+2} and m_{3+4} rather pale; veins otherwise dark scaled. Cell R_2 1.82-2.71 (5) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Fore- and midcoxae dark scaled, a few laterobasal scales appearing paler; hindcoxa with apical dark scales. Posterior surface of femora, fore- and midtibiae and ventral surface of hindtibia more or less pale scaled; legs otherwise dark scaled. Foretarsomere 5 longer than or about length of 4; hindtarsomere 1 0.77-0.83 (2) length of tibia. Claws of fore- and midtarsi unidentate. *Abdomen*. Terga and sterna dark scaled; tergum I with or without median patch of pale scales; II-VI with mediobasal patches or bands of pale scales, the bands not reaching lateral margin; posterior segments with small laterobasal spots of pale scales.

MALE (Figs. 130, 240). Wing length 2.9-3.3 mm. Antenna: pedicel glabrous; flagellum 0.89-0.92 (1) length of proboscis, flagellomere 12 1.19-1.20 length of Flm 13, both together 0.91-0.92 length of Flm 1-11. Palpus 1.27 (1) length of proboscis; segment 4 and apex of 3 with long bristles, 5 reduced to a very small papilliform appendage; length ratio of 2-5: 0.59-0.64 : 1.04-1.07 : 1.00. Pleural bristles, except propleurals, fewer than in female, 2, 3 postspiraculars, 4-8 upper mesepimerals, no lower mesepimerals. Cell R_2 1.44-1.93 (3) length of vein r_{2+3}. Hindtarsomere 1 0.8 (2) length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped submedian tooth, posterior claw with a sharp submedian tooth. *Genitalia*. Tergum IX moderately sclerotized in apical area, concave on apical margin, with lobes not differentiated, bearing 5-8 bristles on each side mostly in apical half. Sternum IX moderately sclerotized in basal area, with 2-4 bristles at middle near apex. Basistyle 3.3-4.1 as long as median width, tapering from middle toward apex, curved mesad at apex, bearing fine tergal and sternal bristles, long lateral bristles; mesal surface distad of middle densely covered with bristles of medium length and many subapical stout, blunt tipped, rather short setae; basal tergomesal lobe narrow, well protrudent, tergally bearing 2, 3 stout, rather short, pigmented setae and one fine seta at apex, and sternally one fine apical and several fine submedian setae. Dististyle short, 0.32 (1) length of

basistyle, remarkably swollen on mesal side; apex narrow; claw straight, pigmented, 0.35-0.42 (2) length of dististyle. Tergite X moderately sclerotized, only anterior margin placed under tergum IX; cercal tergal surface moderately sclerotized; paraproct with strongly sclerotized narrow blunt apex and well developed sternomesal arm. Aedeagus cylindrical, 2.40-2.64 (3) as long as wide, slightly expanded at base and apex, with a wing-like flat expansion at basal 0.33, apparently broadly open on tergal aspect except base and apex, with a median narrow opening on sternal aspect; apex with 3 strongly sclerotized teeth on each side, 2 tergally and one apically directed.

LARVA (Fig. 129). (Description based on 2 skins from Thailand.) *Head.* Light brownish; labrum straight to slightly convex; microsculpture of irregularly transverse rows of very minute tubercles; seta 1-C separated by 0.9-1.0 their length; 4-C semidendritic, well mesocephalad of 5-C; 5-C caudad of a point between 4, 6-C; 6-C well laterad and slightly caudad of 4-C; 5, 7-C nearly on line; 11-C very small; 13-C usually with 3 main branches, sometimes apically split. *Antenna* 0.36-0.40 mm long, slightly bowed, brownish, becoming slightly paler towards apex, well spiculate, the spicules relatively large, becoming apically sparser; seta 1-A apparently 6-8 branched, lightly barbed, inserted at basal 0.47-0.48, almost reaching apex; 2-6-A apical. *Mandible* slightly basolaterally rugose, a few small needle-like microspines on middorsolateral aspect. Cutting organ with dorsal spine (DS_1) pigmented, slightly curved in apical 0.33, not attaining apex of VT_0, presence of DS_2 uncertain; dorsal teeth acutely triangular, lateral tooth unicuspid, mesal tooth darker, with a mesobasal denticle; several small accessory denticles mesad of mesal dorsal tooth; ventral tooth with VT-4 well developed, broad-based, becoming acute, not reaching apex of VT_0; VT_{1-3} acutely triangular, progressively larger; ventral blade (VB_1) relatively stout, slightly sinuate, tapering in distal half, finely mesally pectinate; presence of VB_2 uncertain; pectinate brush of apparently less than 6 hairs. Piliferous process relatively thick, labula not exceeding the broader anterior portion. Mandibular hairs (4-5) + 9, hairs of proximal group with apices slightly tufted. *Maxilla.* Cardo with seta 1-Mx apparently single, small, pale. Mesostipes with several short stout lateral spines; stipital sensoria subequal, apparently lacking a basal ring; 4-Mx a little distad of level of 2-Mx, pale. Lacinia with 5-Mx well proximad of stipital sensoria; 6-Mx apparently barbed. Palpostipes stubbed; S_1 stoutest and darkest, S_2 much smaller, S_3 longest, very pale, S_4 about equal to S_2. *Mentum plate* triangular, with apparently 36-37 small blunt teeth, the median tooth longer, but not much wider than immediate flanking teeth. *Thorax.* Setae 5-M and 12-T usually single, sometimes with aberrant branching. *Abdomen.* Except 6-I-VI and 7-I, II, most setae on segments I-VII relatively weak; 4-I, II and 6-VII usually with secondary branching; 1, 2-VIII on a common callus; 3-VIII slightly larger than 1-VIII. Comb scales 8 in an irregular row, the individual scales thorn shaped, with apparently 8-10 short, stiff, subequal basolateral spicules on each side. *Siphon* mostly light brownish, indistinctly apically darker, with base narrowly dark brown; acus small, light brown; microsculpture imbricate, of short curved rows of minute spicules; 1.02-1.03 mm long, index 2.1-2.5 (Knight and Hull 1953); pecten reaching basal 0.52-0.61, of 13, 14 strong teeth, each with usually one (occasionally 2) ventrobasal denticle, the distal 1, 2 teeth usually detached and slightly stronger; seta 1-S short, inserted just beyond pecten at basal 0.62-0.63, apparently not barbed; 2-S very small, subapical, less than 0.33 length of apical pecten tooth. *Saddle* narrowly incomplete, 0.38-0.39 mm long, light brownish, narrowly dark brown towards base, microsculpture similar to that of siphon, continuing onto unsclerotized portion of X; seta

1-X 0.5-0.6 saddle length; 2-X about 1.33 saddle length; 4-X of 7-9 cratal and 3, 4 precratal tufts, the tufts 7-12 branched, the precratal tufts much shorter than the cratal tufts. Anal gills elongate, tapering, dorsal gill slightly less than 3.0 saddle length, the ventral gill slightly shorter than, to subequal to dorsal gill.

SPECIMENS EXAMINED. KOREA. 1♂, 4♀: Korean Peninsula (L-0102, L-0103, L-0104, L-0894). 1♂: Cheju Do (M-0105). THAILAND. 2♂, 4♀, 2 l (1♀: Ayudhaya, 1963, U. S. Army; 1♀: Cholburi, 1963, U. S. Army; 2♂, 2♀, 2 l: Chiang Mai, 27 III 1970, ground pool, U. S. Army-SEATO Lab.).

DISTRIBUTION.* KOREA (Korean Peninsula, Cheju Do). ORIENTAL REGION. EASTERN AND SOUTHERN AFRICA. NIGERIA. GOLD COAST. UPPER VOLTA. AUSTRALIA.

BIONOMICS. Apparently rare and very local in Korea. Larval habitats are apparently not known in this region.** Adults are attracted by light.

SUBGENUS *EDWARDSAEDES* BELKIN

Edwardsaedes Belkin, 1962: 408. Type-species: *Aedes imprimens* (Walker 1860); Amboina.

FEMALE. Similar to *Aedimorphus*. *Head*. Eyes very narrowly separated above. Vertex medially covered with narrow scales; erect scales numerous, covering almost entire vertex. Proboscis slightly longer than forefemur, entirely dark scaled. *Thorax*. Pronotal lobes with more narrow than broad scales. Scutum covered with narrow curved scales; all scutal bristles present, except occasional reduction of median fossal bristles. Scutellum with narrow curved scales. Pleural bristles well developed; no lower mesepimerals. Base of mesomeron well above that of hindcoxa. *Legs*. Tarsi pale banded. All claws equal and unidentate. *Abdomen*. Laterotergite pale scaled. Seminal capsules 3, one larger than other 2.

MALE. (After Belkin 1962.) Palpus 4 segmented (very small segment 5 may be present), 4 upturned with numerous lateral bristles. All claws with subbasal tooth. *Genitalia*. Tergum IX divided in middle. Basistyle very short and broad, with large sternomesal lobe; basal tergomesal lobe and claspette not developed. Dististyle apical, with large mesal lobe; claw absent. Paraproct with strongly developed apical spine; cercal setae absent. Aedeagus toothed, apex sagittate.

LARVA. (After Belkin 1962.) *Head*. Seta 4-C far cephalad of 6-C. Antenna long, spiculate; 1-A inserted in basal half, branched. *Thorax*. Setae 1-3-P short; 9-13-M and 8-12-T on very large basal calli. *Abdomen*. Seta 12-I lacking; 6-I-VI relatively short; 6-I-IV and 7-I usually at least 3 branched. Comb scales arranged in an irregular double row; individual scales with a single apical spine, lateral fringe fine and restricted to base; 1, 2-VIII on a common basal callus. *Siphon* rather long, with acus; pecten with apical enlarged detached teeth; seta 1-S distad of pecten, shorter than siphon diameter

*After the manuscript was submitted, Miyagi and Toma (1977a, Mosquito News 37: 144) recorded this species from Ishigaki Is., Yaeyama Gunto, Ryukyu Archipelago.

**Miyagi and Toma (l. c.) collected larvae in the Ryukyus from shallow grassy pools in fallow land together with *Ae. vexans nipponi*.

at insertion. *Saddle* complete; seta 1-X shorter than saddle; 2, 3-X both not very long, branched; 4-X with anterior tufts off grid but on saddle; each tuft with many branches.

DISTRIBUTION. Japan, Indomalayan subregion, Papuan subregion.

92. *AEDES (EDWARDSAEDES) IMPRIMENS* (WALKER)* (Figs. 130, 241)

Culex imprimens Walker, 1860: 144 (♀). Type-locality: Amboina Is., Moluccas.
Aedes imprimens: Yamada, 1927: 571; Hokkaido and Kyushu, Japan.
Aedes (Banksinella) imprimens: LaCasse and Yamaguti, 1950: 102 (♂, ♀).
Aedes (Edwardsaedes) imprimens: Reinert, 1976: 12.

FEMALE (Fig. 130, 241). Wing length 3.3-4.2 mm. *Head.* Eyes very narrowly separated above and broadly below. Vertex with an oblong anteromedian patch of narrow curved brown scales and a pair of anterolateral patches of broad dark scales, vertex otherwise including interocular space covered with narrow curved white or pale yellowish brown scales, some broad pale scales on mesal side of dark lateral patches; numerous erect forked dark brown scales over vertex, some pale ones anteromedially intermixed; tempus covered with broad pale scales, with a stripe or spot of broad dark scales; 5, 6 vertical and 5 temporal bristles on each side, one or 2 most mesal vertical bristles often yellowish, others brown, most ventral temporal bristles more widely spaced. Clypeus brown. Antenna: pedicel yellowish brown, slightly mesoventrally darker, with small white scales and fine brownish bristles on mesal surface; flagellum 1.12-1.14 (2) length of proboscis; flagellomere 1 1.44-1.63 length of Flm 2, with mesally pale scales, a few dark scales usually intermixed. Palpus 0.21 (2) length of proboscis, dark scaled, segment 3 1.83-1.84 (2) length of 2; 4 undeveloped in 2 dissected specimens. Proboscis 1.07 (1) length of forefemur, with several ventrobasal bristles. *Thorax.* Pronotal integument brown; anterior lobe with narrow curved or crescent-shaped pale scales, fewer broad pale lateral scales, bearing many brownish bristles; posterior lobe with narrow curved pale dorsal scales and broad pale posteromedial scales, bearing 5-11 pale brown to brown bristles along posterior margin in a single or irregular double row. Scutum with integument brown to rather dark brown, covered with narrow curved yellowish brown scales, scales on margins paler, some supraalar scales rather broad and nearly white; scutal bristles brown to dark brown, fossal area occasionally without bristles in middle. Scutellum covered with narrow curved pale scales, median lobe with 5-9, lateral lobe with 6-8 long brownish bristles and several short pale ones. Paratergite unscaled. Pleural integument brown to rather dark brown; patches of broad white scales on propleuron, subspiracular area, postspiracular area, upper sternopleuron, lower-posterior sternopleuron and upper mesepimeron, the upper sternopleural patch fairly large but not reaching cephalic angle; pleural bristles pale to yellowish brown, many on propleuron, prealar knob, upper to posterior sternopleuron and upper mesepimeron, 6-12 postspiraculars.

*After the manuscript was submitted, Mogi (1977, Trop. Med., Nagasaki 19: 129) gave a new name, *"bekkui"*, with full description of all stages to the Japanese *imprimens*. The name *bekkui* is valid.

Wing. Alula fringed with rather narrow scales of 2 different lengths. Veins dark scaled; c with basal spot of pale scales. Cell R_2 1.55-2.32 (9) length of vein r_{2+3}. Halter knob dark, pale scaled. *Legs.* Forecoxa pale basally and mesoapically scaled, dark in-between; mid- and hindcoxae with patches of pale scales. Femora with pale apical fringe; forefemur with an indistinct pale basal band, and pale anterobasal streak, pale on posterior half of ventral surface including basal half of posterior surface; midfemur pale on posterior surface except apical area; hindfemur pale on anterior and posterior surfaces including ventral surface except apical area, dark area on dorsal surface not reaching base. Foretarsomeres I-IV and midtarsomeres I-V with very narrow pale basal bands, occasionally incomplete; hindtarsomeres I-V with moderately broad pale basal bands. Legs otherwise dark. Foretarsomere 5 length of 4 or slightly shorter; hindtarsomere 1 0.74-0.77 (3) length of tibia. *Abdomen.* Tergum I medially dark scaled, with some pale lateral scales; II-VII dark scaled, with large laterobasal patches of pale scales, the patches progressively longer in posterior segments, reaching near apical margin on VI and VII, more or less extending dorsobasally but usually not confluent at middle; occasionally mediobasal pale scales or complete basal bands of pale scales present. Sternum II pale scaled; III-VII pale scaled, with apical bands of dark scales; VIII retractile.

Male and larval specimens were not available for our study.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 7♀: Honshu (C-2102, D-0406).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Kyushu, Tsushima).

TAXONOMIC DISCUSSION. *Aedes imprimens* seems to be very rare in Japan, known from only a few localities scattered from Hokkaido to Kyushu. Female specimens from Japan do not appear to differ from the descriptions of *imprimens* of Knight and Hull (1953) and Belkin (1962). Male and immature specimens were not available for our study. Waku (1950, 1952) gave short descriptions of all stages together with illustrations (his specimens were lost). According to him, the male genitalia has the basistyle globular, the dististyle consists of a very narrow slender long mesal arm and a very short broad lateral arm; his larval description states that seta 4-C is on the level of 7-C, the mentum plate has 36 teeth, the siphon lacks an acus, the pecten is composed of 15 teeth, the saddle is incomplete, 3-X is 2 branched, longer than the anal gill, and 2.0 length of 2-X. The descriptions and figures for *imprimens* of Knight and Hull (1953) and Belkin (1962) show different shapes of the basistyle and dististyle; larval seta 4-C distinctly anteriad of 7-C, 39-49 mentum teeth, siphon with acus, 19-24 (usually more than 20) pecten teeth, complete saddle; 3-X 3-6 branched, distinctly shorter than anal gill and only slightly longer than 2-X. We found figures of the male and female genitalia, and the male palpus in our laboratory; they were undoubtedly prepared by Yamaguti and LaCasse, but not published (Fig. 130). This figure of the male genitalia appears closer to that of Waku (1950) than those of *imprimens* by Knight and Hull (1953) and Belkin (1962).

BIONOMICS. *Aedes imprimens* is one of the rarer species in Japan. Larvae were found in a temporary ground pool in woods in the vicinity of Sendai (Waku 1952) and at Omura, Kyushu (Bekku 1954). Larvae of *Ae. alboscutellatus*, *Ae. vexans nipponii* and *Ae. esoensis* were found with them (Waku 1952). Adult females bite man during daytime and at night (Bekku 1954).

SUBGENUS *AEDES* MEIGEN

Aedes Meigen, 1818: 13. Type-species: *Aedes cinereus* Meigen, 1818; Europe.

Yellowish to dark medium-sized mosquitoes, with scutum unornamented; tarsi not banded; male palpus short.

FEMALE. *Head.* Eyes narrowly separated above. Vertex with both broad and narrow decumbent scales; 5-8 vertical and 3-6 temporal bristles. Antennal flagellum length of or slightly longer than proboscis; flagellomere 1 1.2-1.8 length of Flm 2. Palpus not more than 0.25 length of proboscis; segment 3 1.0-2.0 length of 2; sometimes a very short 4 present. Proboscis subequal to forefemur in length. *Thorax.* Anterior pronotal lobe with narrow scales and many bristles; posterior pronotal lobe with narrow scales and often also broad scales, 4-9 bristles along posterior margin. Scutum with narrow scales, without ornamentation. Scutellar scales narrow. Paratergite scaled. Pleura with scale patches of moderate size on propleuron, postspiracular area, upper sternopleuron, posteromedian sternopleuron and upper mesepimeron; subspiracular area, prealar knob and metameron without scales. Many propleural, prealar, sternopleural and upper mesepimeral bristles; 2-9 postspiraculars, no lower mesepimerals. Base of mesomeron well above that of hindcoxa. *Wing.* Alula fringed with narrow dark scales. Veins dark scaled. Cell R_2 1.6-2.6 length of vein r_{2+3}. *Legs.* Tarsi not banded. Fore- and midtarsal claws unidentate, hindtarsal claw simple or unidentate. *Abdomen.* Laterotergite pale scaled.

MALE. Vertex often more or less differently scaled from female, usually with broader scales. Antennal flagellum distinctly plumose, slightly shorter to slightly longer than proboscis; flagellomeres 12 and 13 elongate, both together 0.6-0.8 length of Flm 1-11. Palpus as in female, short 0.14-0.20 length of proboscis, 3 segmented, occasionally very small segment 4 present; 3 1.0-2.5 length of 2. Proboscis length of or slightly longer than forefemur. Cell R_2 1.3-2.2 length of vein r_{2+3}. Foretarsomere 4 shortened; 5 much longer than 4, with a number of stout setae on ventrobasal swelling. Midtarsomere 4 slightly shortened; 5 longer than 4, shape similar to foretarsomere 5 but usually ventrobasal swelling less developed. Hindtarsomere 1 0.7-0.8 length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median tooth, posterior claw simple; hindtarsal claws equal in length, simple or unidentate. *Genitalia.* Tergum IX transverse, trapezoidal, usually with bristles on apical margin laterad of lobes, which are protrudent, moderately separated, well sclerotized, densely bristled at apex. Sternum IX rhomboidal, bristled. Basistyle with apex conical, scaled, excavated and rugose basad of basal tergomesal lobe, with a small group of rather long bristles on sternomesal margin at middle; basal tergomesal lobe protrudent, heavily bristled on tergal surface; claspettoid single or bifurcate, pilose, with apical setae. Dististyle inserted at apical 0.20-0.25 of basistyle, rather short, bifurcate at base, occasionally also at apex; lateral (main) arm with a comb of short blunt apical teeth, without claw; mesal arm short, with fine setae. Tergite X band-shaped, not separated at middle; cercal setae absent; paraproct strongly sclerotized, rod-shaped. Aedeagus bulb-shaped in tergal view, composed of a pair of strongly sclerotized lateral pieces, connected by a narrow sternal band at base, a triangular

dorsal plate at apex and a sternal flap at middle, leaving a narrow median slit at basal half of sternal surface; each lateral piece with a few strong hook-like incurved apical processes and one straight sternal process in middle. Basal plate large.

LARVA. *Head.* Wider than long; seta 1-C slender, longer than distance between bases; 4-6-C caudad of 7-C; 5-7-C on a straight line. *Antenna* shorter than head, inwardly arcuate, spinulate throughout; seta 1-A inserted at middle or proximad of it, with 4 or more barbed branches. *Mandible* with several scattered simple dorsolateral microspines, without seta 1-Md. Mandibular comb with teeth pectinate basally. Cutting organ with 2 dorsal spines, DS_1 (lateral) long, but not reaching apex of VT_0, DS_2 short; 2 dorsal teeth, the lateral tooth smaller; accessory denticles present; ventral tooth with one spiniform lateral denticle (VT-4) and 3 triangular mesal denticles (VT_{1-3}), VT-4 nearly reaching apex of DS_1, VT_2 larger than $VT_{1,3}$; ventral blade extending beyond apex of VT_0; pectinate brush of 4-8 broad hairs. Piliferous process with labula at most extending slightly beyond apex of anterior part. Mandibular hairs of anterior group simple, those of posterior group apically frayed. *Maxilla.* Cardo triangular, rather narrowly fused mesobasally with cranium, a strongly sclerotized narrow strip-like ridge extending from anterior termination of hypostomal suture through the point of fusion to anterior margin of cardo; seta 1-Mx usually single. Mesostipes pear-shaped, slightly longer than wide, with lateral surface denticulate, with rather stiff spicules on mesal margin but without strong spine-like ones; stipital sensoria equal, slender, on a sclerotized half ring at middle; 4-Mx subapical; hairs of maxillary brush rather long; pseudoartis developed, not fused with cranium. Lacinia with 5-Mx slightly proximad of level of stipital sensoria; 6-Mx basally broadened, coarsely barbed. Palpostipes 0.5 length of mesostipes or shorter, apically narrowed, free from mesostipes; apex with ampulla and usually 5 palpal sensoria, S_5 sometimes uncertain. *Mentum plate* broadly triangular, with 23-30 small teeth. *Thorax.* Setae 0-P 13, 14-M, 8, 13-T short and dendritic; 1-P medium-sized, 2, 3-P short; 5-8-P, 5-10, 12-M, 7, 9, 10-T strong; 13-P absent. *Abdomen.* Setae 6-I-VI and 7-I strong; 13-II, VI dendritic. Comb scales 6-16 in an irregular single or double row, individual scales with a single apical spine, laterobasally fringed with fine spicules. Siphon with acus, index 3.4-4.4; pecten of dark brown teeth, several apical teeth detached, longer, usually with finer denticles than basal teeth; seta 1-S beyond pecten, shorter than width of siphon at insertion; 2-S shorter than apical pecten tooth, usually extending beyond apex of siphon; small accessory siphonal setae usually subdorsally and/or subapically present. Saddle covering dorsal 0.67-0.75 of the segment; seta 1-X shorter than saddle; 2-X less than 0.5 length of 3-X; 4-X of 10-14 tufts including 2-5 precratal tufts. Anal gills at least 2.0 length of saddle.

DISTRIBUTION. Holarctic region.

KEYS TO SPECIES OF *AEDES (AEDES)*

FEMALE ADULT

1. Abdominal terga laterally pale yellow and dorsally brown, without lateral pale spot and dorsobasal pale spot; yellowish species.
yamadai (p. 432)

Abdominal terga with pale laterobasal patches, and often with pale dorsobasal spots or bands. 2

2(1). Abdominal terga with laterobasal patches not becoming smaller toward posterior segments, often visible from above on VI, VII; III-VII often with complete pale basal bands; forecoxa usually with a pale scale patch apically on posterolateral surface;* brown to blackish species. *esoensis* (p. 427)

Abdominal terga with laterobasal patches becoming smaller toward posterior segments, usually barely visible from above on VI, VII; III-VII never with complete pale basal bands; forecoxa usually without a scale patch apically on posterolateral surface; blackish species. *sasai* (p. 434)

MALE GENITALIA

1. Dististyle apically bifurcate; claspettoid with lateral branch. *sasai* (p. 434)

Dististyle not apically bifurcate; claspettoid rarely with lateral branch. 2

2(1). Basal mesal arm of dististyle thick, not reaching middle of dististyle. *esoensis* (p. 427)

Basal mesal arm of dististyle slender, apically tapering and extending beyond middle of dististyle. . . . . *yamadai* (p. 432)

LARVA

Setae 6-T and 4-VIII double or triple. . . . . *yamadai* (p. 432)
Setae 6-T and 4-VIII single. . . . . *esoensis* (p. 427) *sasai* (p. 434)

93. *AEDES (AEDES) ESOENSIS* YAMADA
(Figs. 131, 132, 133, 242; Table 126)

Aedes esoensis Yamada, 1921: 77 (♂, ♀). Type-locality: Kanayama, Hokkaido, Japan.

Aedes (Aedes) esoensis: LaCasse and Yamaguti, 1950: 95 (♂, ♀, L); Chu 1956: 40, Korea.

Aedes (Aedes) asanumai Sasa, Kano and Takahasi, 1950: 637 (♂). Type-locality: Rubeshibe, Hokkaido, Japan; Tanaka, Mizusawa and Saugstad 1975b: 48 (syn.).

Aedes (Aedes) pseudoesoensis Yamaguti and Tamaboko, 1954: 418 (♂, ♀, P, L). Type-locality: Mt. Hakusan, Ishikawa Pref., Japan; Nakagawa, 1956: 51 (syn.).

Aedes (Aedes) rossicus: Hara, 1958: 23; Tanaka, Mizusawa and Saugstad 1975b: 48 (misidentification of Hara).

*The scale patch was often reduced or lacking in reared undernourished small specimens.

FEMALE (Fig. 242). Wing length 2.9-5.0 mm. *Head.* Interocular space covered with narrow pale scales. Vertex with an anterior large patch of broad dark scales divided by a median triangular patch of narrow curved pale scales; eye margin covered with narrow curved pale scales; erect forked scales dark over median and posterior areas of vertex, a few on anterior area often pale brown; tempus covered with broad pale scales, with a broad stripe of broad dark scales in the pale scaled area, which extends onto posterolateral part of vertex; 5-7 vertical and 3-6 temporal bristles on each side, most mesal bristles golden brown, others dark. Clypeus dark brown. Antenna: pedicel tawny yellow, mesal surface infuscate, with brownish short hairs and rather small dark scales; flagellum 0.99-1.13 (12) length of proboscis; flagellomere 1 pale except for apex, with dark mesal scales, 1.45-1.75 length of Flm 2. Palpus dark scaled, 0.18-0.24 (12) length of proboscis; segment 3 1.03-2.10 (12) length of 2; 4 at most 0.07 length of 3. Proboscis dark scaled, 0.93-1.00 length of forefemur. *Thorax.* Pronotal integument rather dark brown, paler on lower part of posterior lobe; anterior lobe covered with narrow curved yellowish scales, bearing many brownish or dark bristles; posterior lobe with narrow curved yellowish scales on upper area, lower posterior area with narrow curved yellowish and/or rather narrow pale scales, occasionally (more frequently in Hokkaido population) with rather broad pale scales, dorsoposterior margin with 4-9 pale to dark brown bristles. Scutum with integument usually brown, occasionally light brown or dark brown, covered with narrow curved yellowish brown scales, narrow curved pale scales on anterior and supraalar margins and prescutellar space; scutal bristles dark brown, those on supraalar area and prescutellar space paler; 2-7 humerals, 1-6 posterior fossals, middle of fossal area usually lacking bristles, occasionally 1, 2. Scutellum with integument lighter than scutum, covered with scales similar to those on prescutellar space; each lobe bearing 4-10 long, brown or yellowish brown bristles and several medium or short bristles. Paratergite covered with narrow curved yellowish scales and/or crescent-shaped pale or rather narrow flat scales. Pleural integument brown, partly lighter, occasionally dark brown; postspiracular area with wide variety of scales from narrow curved yellowish to broad white scales, rather narrow to rather broad pale scales more frequently seen; patches of broad white scales on propleuron, upper sternopleuron, caudal middle sternopleuron and upper mesepimeron; pleural bristles light brown, more than 10 bristles on propleuron, prealar knob, sternopleuron and upper mesepimeron, 2-9 postspiraculars. *Wing.* Vein c often with several pale scales at base. Cell R_2 1,81-2.59 (17) length of vein r_{2+3}. Halter knob rather dark brown, covered with pale scales. *Legs.* Forecoxa with anterior surface pale scaled on basal 0.33 and dark scaled otherwise, usually with a small patch of pale scales apically on posterolateral surface; midcoxa with a large patch of pale scales on anterolateral surface; hindcoxa apically with a small patch of pale scales. Femora with narrow pale yellowish apical fringe; forefemur with a pale streak on basal 0.4 of anterior surface, pale scaled on posterior surface and posterior half of ventral surface; midfemur pale scaled on posterior and ventral surfaces; hindfemur pale scaled except on dorsal surface, the narrow dark dorsal area barely reaching base, apically widened, forming a subapical dark band often incomplete on posterior surface; tibiae, especially fore- and midtibiae with pale scales on posterior surface; legs otherwise dark scaled. Foretarsomere 5 slightly shorter to slightly longer than 4; hindtarsomere 1 0.74-0.79 (17) length of tibia. Claws of hindtarsus more frequently simple, occasionally (22%) with a sharp submedian tooth, often only one of paired claws toothed. *Abdomen.* Tergum I dark scaled in middle, with

scattered pale scales; II-VII with laterobasal patches of white scales, these neither reaching apical margin on each segment, nor becoming smaller toward posterior segments, often visible from above on VI and VII; basal bands of pale scales on II-VII quite variable, in the most developed case the bands are connected with laterobasal patches (the band complete) and slightly mesally broadened, in the least developed case the bands are totally reduced; the band never complete and most frequently reduced to a median small spot on II, most frequently incomplete on III and IV, most frequently lacking on V-VII; complete band more frequently present on III and IV than on other segments. Sterna mainly pale scaled, dark scales present from III or IV, increasing toward posterior segments and covering medioapical area, often posterior segments with pale scaled area reduced to a narrow basal band. Segment VIII apparently sparsely covered with dark scales.

MALE (Figs. 133, 242). Wing length: 2.4-4.3 mm. Vertex mainly covered with pale or light gray scales, median triangular patch of narrow curved pale scales narrower, dark stripe of tempus obsolete. Pedicel glabrous, usually darker than in female; flagellum 0.88-1.09 (12) length of proboscis; flagellomere 12 1.00-1.47 (13) length of Flm 13, both together 0.61-0.77 (13) of Flm 1-11. Palpus 0.12-0.18 (13) length of proboscis; segment 3 1.10-2.27 (14) length of 2. Proboscis 1.02-1.09 (13) length of forefemur. Scales on anterior pronotal lobe, lower area of posterior pronotal lobe, postspiracular area usually broader than in female; 1-6 postspiracular bristles; often less than 10 prealars. Cell R_2 1.34-2.16 (18) length of r_{2+3}. Claws of hindtarsus usually simple, rarely (5.3%) one of paired claws toothed. Abdominal tergal basal bands on III-VII usually entire, occasionally (10%) lacking; laterobasal spots usually indistinct. *Genitalia*. Sternum IX with 2-6 bristles. Basistyle 2.6-3.4 length of basal sternal width, laterally, sternally and apically bristled, sternally scaled; apical conical part distad of insertion of dististyle about length of its base; claspettoid poorly to moderately sclerotized, apically and sometimes laterally bearing 2-4 setae, often basal sclerotized part extending toward apex of basistyle on mesal membrane, very rarely (1.5%) with a short lateral branch accompanying 1,2 apical setae. Dististyle inserted at about apical 0.20-0.25 of basistyle, lateral arm slightly arcuate, slender in middle, with a comb of short and blunt teeth laterally at apex; mesal arm nearly 0.5 length of lateral arm, usually wide and not pointed at apex, bearing 6-10 fine setae. Aedeagus with 2 strong hook-like incurved apical processes and one small process or tooth under them on each lateral piece.

LARVA (Figs. 131, 132). *Head*. Width: 1.01-1.25 mm; moderately pigmented, 1.28-1.47 as long as wide; labrum slightly concave; seta 1-C occasionally with a few barbs; 4-C even with or slightly anterior to 5-C and slightly posterior to 6-C; distance between 5, 6-C about 0.33 distance between 6, 7-C. *Antenna* 0.48-0.62 mm long, 0.60-0.75 (x =0.67) length of head, moderately pigmented, usually area basad of seta 1-A pale; spinulation finer in basal area; 1-A inserted at basal 0.34-0.51 (x =0.41), 6-11 (x = 8.7) branched, strongly barbed, reaching or not quite reaching apex of shaft. *Mandible*. Cutting organ with lateral dorsal tooth most frequently bearing 1 median denticle on mesal margin, occasionally simple or with 2 denticles, rarely apically bicuspid; mesal dorsal tooth 1.5 length of lateral tooth, usually with a fairly large submedian denticle, often with 1-5 basal denticles; usually 1-6 small accessary denticles on mesal surface at base of ventral tooth; pectinate brush 4-8 (most frequently 6) haired. Mandibular hairs (7-9) + (8-12), 16-20 in total. *Maxilla*. Seta 1-Mx usually single. Palpostipes with S_1 broadest, well pigmented; $S_{2,4}$ subequal, much smaller than S_1; S_3 longest; S_5 narrow, trans-

parent, difficult to see. *Mentum plate* with 23-30 (x =27.1) teeth. *Thorax.* Setae 2, 10-P, 3-M and 5-T usually single; 6-T always single; usually, 7-P triple and 8-P double. *Abdomen.* Setae 1-I, II very weak, highly variable in branching; 10-I, 2, 9-II, 2, 6-III, 2, 6, 14-IV, 6, 9-V, 6, 9, 10, 14-VI, 0, 14-VIII usually single; 10-III usually double; 4-VIII always single. Comb scales 6-14 (x =11.3). *Siphon* moderately pigmented, with imbricate surface, broadest near base, apically tapering, with apex 0.54-0.67 of broadest part; length 0.98-1.48 mm; index 3.44-4.41; pecten reaching apical 0.38-0.60 (x = 0.47) of siphon, of 10-19 (x =13.9) teeth, apical 1-4 teeth detached, each tooth with 1-3 ventral denticles; seta 1-S located at apical 0.29-0.44 (x =0.35) of siphon; 1-7 subdorsal accessory siphonal setae and 0-3 subventral, usually 2-4 of them subapical. *Saddle* covering about dorsal 0.67 of segment X; seta 4-X of 6-10 (usually 8, 9) cratal and 2-5 (usually 3, 4) precratal tufts (10-14 tufts in total), the former 4-12 branched and the latter 3-10 branched. Anal gills 2.2-4.1 length of saddle, ventral gill usually slightly shorter than dorsal gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 216♂, 374♀; with associated skins (57 l, 57 p), 68 L, 6 l: Hokkaido (Holotype ♂ of *Aedes asanumai:* Rubeshibe, 1947, Sasa and Takahasi, IMSUT. A-0030, A-0032, A-0037, A-0040, A-0043, A-0192, A-0195, A-0196, A-0197, A-0200, A-0203, A-0204, A-0205, A-0206, A-0207, A-0208, A-0209, A-0210, A-0212, A-0213, A-0218, A-0219, A-0220, A-0223, A-0225, A-1670, A-1683, A-1712, A-1792, A-1794, A-1927, A-1936, A-1938, A-1939). 194♂, 129♀; with associated skins (23 l, 23 p), 80L, 4 l: Honshu (*Aedes rossicus* of Hara, ♂-genitalia slide, L: Tsuta-Onsen, Aomori Pref., VI 1957, Hara, JHCOL. B-0352, B-0353, B-0354, B-0369, B-0379, B-0381, B-0383, B-0385, C-1190, C-1193, D-1182, D-1183). KOREA. 4♂, 5♀; with associated skins (9 l, 9 p): Korean Peninsula (L-1484, L-2093).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). KOREA (Korean Peninsula). FAR EAST OF USSR. SAKHALIN. NORTH CHINA.

TAXONOMIC DISCUSSION. Synonyms and diagnostic characters were fully discussed by Tanaka et al. (1975b), with the exception of the laterobasal patches of the abdominal terga; these patches can be good diagnostic characters as utilized in the foregoing key. It is most difficult to discriminate the larva of *esoensis* from *sasai;* no definite diagnostic characters were detected. However, the number of pecten teeth and accessory siphonal setae will be useful to a limited degree (Tables 32 and 33). In Hokkaido, examples of *sasai* with 4 accessory siphonal setae appear to occur (Sato and Tomita 1962), thus only specimens with 5 or more accessory siphonal setae can be identified as *esoensis.* Individual and local variations of *esoensis* were also fully discussed by Tanaka et al. (1975b). Two tables demonstrating clinal variations used in their paper are reproduced (Tables 34 and 35).

TABLE 32. The number of pecten teeth of *Aedes (Aedes)* spp. (Tanaka et al. 1975b, modified).

Species	Specimens examined	Range	$\bar{x}$	Range and percent distinguishable from *sasai*		Range and percent of *sasai* distinguishable from each species	
sasai	40	16-24	20.9	-	-	-	-
esoensis	32	10-19	13.9	10-15	85.3%	20-24	64.5%
yamadai	7	11-15	13.3	11-15	100.0	16-24	100.0

Localities of the specimens examined: *sasai* - Honshu (Umegashima and Kamikôchi); *esoensis* - Hokkaido and Honshu (Aomori, Oze and Mt. Hakusan); *yamadai* - Hokkaido.

TABLE 33. Variation of the number of the accessory siphonal setae of *Aedes (Aedes) sasai* and *Ae. (Aed.) esoensis* (Tanaka et al. 1975b).

Species	Specimens examined	Number of accessory siphonal setae								
		1	2	3	4	5	6	7	8	9
sasai (Honshu)	45	4%	28%	68%	-	-	-	-	-	-
esoensis (Hokkaido)	32	-	-	3	5%	17%	30%	39%	5%	2%
esoensis (Aomori)	32	-	-	16	50	13	9	11	2	-
esoensis (Hakusan)	33	2	20	50	29	-	-	-	-	-

TABLE 34. Clinal variations of the extent of the pecten and the position of seta 1-S on the larvae of *Aedes (Aedes) esoensis* from 3 areas (Tanaka et al. 1975b).

Area	Specimens examined	Pecten from apex of siphon		Seta 1-S from apex of siphon	
		Range	$\bar{x}$	Range	$\bar{x}$
Hokkaido	10	0.45-0.60	0.51	0.33-0.44	0.38
Aomori	10	0.40-0.50	0.46	0.29-0.39	0.34
Hakusan	10	0.38-0.50	0.44	0.29-0.37	0.33

TABLE 35. Clinal variations of selected characteristics of the larvae of *Aedes (Aedes) esoensis* from 3 areas (Tanaka et al. 1975b).

Area	Specimens examined	No. of pecten teeth Range	No. of pecten teeth $\bar{x}$	Anal gill index	Total number of branches of 105 body setae Average per larva
Hokkaido	10	10-14*	12.6*	2.2-3.3	463.8
Aomori	10	11-16	14.1	2.6-3.8	455.6
Hakusan	10	13-19	14.9	3.4-4.1	376.0

*11-16; $\bar{x}$ = 13, after Sato and Tomita 1962.

BIONOMICS. Common in lowland and mountain woods of Hokkaido and northern Honshu; restricted to higher mountains in central Honshu. Larvae occur in ground pools, ditches, ponds and other ground waters. The adults emerge from early spring in pools formed by melted snow, being frequently associated with *Ae. sasai, Ae. (Ochlerotatus)* spp. and *Culex rubensis*. Hattori (1958) reported that the females of this species attack man, and are as aggressive as species of *Ochlerotatus*, however, Kamimura (1976b) has claimed that they apparently do not bite man.

94. *AEDES (AEDES) YAMADAI* SASA, KANO AND TAKAHASI (Figs. 132, 133, 134, 243; Table 127)

Aedes esoensis variety *flavus* Yamada, 1927: 575, Hokkaido, Japan; Sakhalin *(nomen nudum)*.

Aedes (Aedes) yamadai Sasa, Kano and Takahasi, 1950: 635 (♂, ♀). Type-locality: Shimoyubetsu, Hokkaido, Japan.

FEMALE (Fig. 243). Wing length: 3.2-4.3 mm. *Head.* Vertex covered with rather broad dark, somewhat purplish or bluish scales on anterior half, with pale yellowish brown ones on posterior half, and with pale yellowish brown or golden narrow scales on posterior 0.67 of median line, eye margin and interocular space; many erect forked dark brown scales on posterior part; tempus covered with broad pale yellow scales; 7, 8 (1) vertical bristles on each side, laterally black and medially brown, 4 (1) temporals black. Clypeus pitchy brown. Antenna: pedicel testaceous, mesal surface infuscate, with several small bristles and scales; flagellum 1.09 (1) length of proboscis; flagellomere 1 1.40 length of Flm 2, tawny yellow except dark apex, with a few dark scales. Palpus dark scaled, 0.19 (1) length of proboscis; segment 3 1.05 of 2. Proboscis dark scaled, 1.07 (1) length of forefemur. *Thorax.* Integument yellowish brown. Anterior pronotal lobe with narrow curved scales and many dark bristles; posterior pronotal lobe covered mostly with narrow curved dark bronze-brown scales, some pale ones on lower part, bearing about 10 dark bristles along posterior margin. Scutum covered with narrow curved dark

bronze-brown scales which show a golden reflection, narrow curved pale yellowish brown scales covering prescutellar area and scutellum; scutal and scutellar bristles dark and more or less bronzy, lower supraalars golden brown. Paratergite with narrow curved, pale bronze-yellow scales. Pleura: propleuron with moderately broad yellowish white scales and many yellow bristles; postspiracular area with narrow curved, scales pale bronze-yellow and 4 (1) bristles; sternopleuron with 2 patches of broad creamy white scales on posterior half and about 20 yellow bristles along posterior margin; mesepimeron with a patch of broad snow-white scales on upper part, upper mesepimeral bristles numerous, fine, pale yellow. *Wing.* A few pale scales occasionally at bases of c and r. Cell R_2 1.63-2.23 (3) length of vein r_{2+3}. *Legs.* Forecoxa with anterior surface pale scaled on basal 0.33 and dark scaled otherwise, apically with pale scales on posterolateral surface; mid- and hindcoxae each with a patch of moderately broad creamy white scales. Ventral surface of forefemur, posterior and ventral surfaces of midfemur pale; hindfemur pale except apex and apical 0.67 of dorsal surface; posterior surface of fore- and midtibiae and of tarsomere 1 pale scaled; legs otherwise dark scaled. Foretarsomere 5 equal to or slightly longer than 4; midtarsomere 5 slightly shorter than or equal to 4; hindtarsomere 1 0.70-0.79 (3) length of tibia. Claws unidentate. *Abdomen.* Tergum I covered with somewhat golden brown scales; II-VII covered with rather pale golden brown scales, more or less dark with purplish tinge on dorsal area of II-VI. Sterna covered with somewhat golden pale yellowish brown scales.

MALE (Figs. 133, 243). Wing length: 3.2-3.8 mm. Vertex uniformly covered with broad creamy white scales; pedicel dark; flagellomeres 12 and 13 equal in length, both together 0.62 (1) length of Flm 1-11. Palpus 0.13 (1) length of proboscis; segment 3 1.03 (1) of 2. Proboscis 1.10 (1) length of forefemur. Cell R_2 1.62 (1) length of vein r_{2+3}. Hindtarsomere 1 0.71 (1) length of tibia. Claws of hindtarsus simple or toothed. *Genitalia.* Sternum IX with 3-5 bristles. Basistyle 2.9-3.5 length of basal sternal width, laterally, sternally and apically bristled, sternally scaled; apical conical part distad of insertion of dististyle about 1.5 length of its base (usually more slender than in *esoensis*); basal tergomesal lobe usually wider than in *esoensis*; claspettoid moderately sclerotized, apically and/or laterally bearing 2-4 setae, variable in shape, sometimes laterally with a short setiferous branch, basal sclerotized part well differentiated from mesal membrane, usually wider than in *esoensis* and more or less extending toward apex of basistyle. Dististyle inserted at apical 0.25 of basistyle, lateral arm with a comb of short blunt teeth laterally at apex; mesal arm 0.50-0.67 length of main arm, apically tapering, more slender and longer than that of *esoensis*, bearing 6-8 setae. Aedeagus with 2 strong hook-like incurved apical processes on each lateral piece.

LARVA (Figs. 132, 134). *Head.* Width: 1.12 mm; seta 4-C on level of or somewhat anterior to 5-C. *Antenna* 0.46-0.50 mm long, infuscate in apical half; spinulation finer than in *esoensis*; seta 1-A inserted at basal 0.38-0.48 (x = 0.44), with 6-10 (x = 7.7) branches, not reaching apex of shaft; 2-A about 0.33 length of shaft. No dissected specimens available for detailed description of mandible and maxilla. Cutting organ with pectinate brush 7 haired. Mandibular hairs 14-15. *Maxilla* with seta 1-Mx single. Palpostipes with S_1 stout, S_3 longest, $S_{2,4}$ subequal in size; S_5 uncertain. *Mentum plate* with 25-28 (x = 26.6) teeth. *Thorax.* Seta 1-P with very few barbs or almost smooth; 3-M almost always double, 2-P and 6-T most frequently double; usually, 8, 14-P double, 7-P triple, and 4-T 4, 5 branched. *Abdomen.* Setae 9, 10-II, 14-III, 12, 14-V and 14-VI usually single; 8-III, 10, 12-IV, 10, 11-V, VI, 11-VII and

4-VIII usually double. Comb scales 6-12 (x = 10.3). *Siphon* 1.18-1.34 mm long, index uncertain (only compressed specimens available); pecten extending to apical 0.41-0.51 (x = 0.46) of siphon, of 11-15 (x = 13.3) teeth including 0-3 basal abortive ones, apical 2-5 teeth detached, each tooth as well as detached one with a main ventral denticle together with 1, 2 very small proximal ones; seta 1-S inserted at apical 0.31-0.38 (x = 0.35) of siphon; 1 (sometimes 2) subapical and 2 (rarely 1, 3) midsubdorsal accessory siphonal setae on each side, each seta with 5-7 dendritic branches. *Saddle* apparently covering 0.75 of the segment; seta 4-X of 9 (occasionally 8) cratal and 3 precratal tufts, each 3-10 branched. Anal gills slightly more than 2.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 14♂, 44♀; with associated skins (1 l, 1 p), 2 L, 9 l: Hokkaido (2♀: Shimoyubetsu, Hokkaido, 27 VIII 1917, Yamada, IMSUT. A-0038, A-0040, A-0043, A-0187, A-0188, A-0197, A-1781, A-1783, A-1784, A-2273, A-2274, A-2277). SAKHALIN. 1♂ (Kaizuka, 15 VIII 1919, Yamada, IMSUT).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu). SAKHALIN.

BIONOMICS. Rare species. Larvae occur in temporary shallow ground pools in grasslands; associated with *Culex rubensis* and *Ae. vexans nipponii*. This is thought to be one of the lowland species; adult females attack man in open grasslands (Hattori 1960). Ono (1969) reported *yamadi* to hibernate as adults.

95. *AEDES (AEDES) SASAI* TANAKA, MIZUSAWA AND SAUGSTAD
(Figs. 132, 135, 136, 244; Table 128)

Aedes (Aedes) cinereus: Sasa, 1948: 176; Rubeshibe, Hokkaido, Japan.
Aedes cinereus subspecies: Shogaki, 1950: 3, Akan-kohan, Hokkaido, Japan.
Aedes (Aedes) sasai Tanaka, Mizusawa and Saugstad, 1975b: 41 (♂, ♀, L).
Type-locality: Umegashima Spa, Shizuoka Pref., Japan.

FEMALE (Fig. 244). Wing length 4.3-4.8 mm. *Head.* Vertex anteriorly with a pair of large patches of broad dark scales and posteriormedially with a triangular patch of narrow curved pale yellow scales, apex of this patch extending onto interocular space; erect dark scales covering posterior 0.67 of vertex; eye margin heavily covered with rather narrow, pale yellow scales; tempus covered with broad pale yellow scales, a broad stripe of broad dark scales within the pale scaled area; 5-7 vertical bristles on each side, most mesal bristles bronze-yellow, others dark; 5, 6 temporals on each side. Clypeus blackish brown. Antenna: pedicel testaceous, mesal surface infuscate, bearing small scales and hairs; flagellum 1.04-1.10 (5) length of proboscis; flagellomere 1 with rather dark scales, 1.24-1.50 length of Flm 2. Palpus 0.20-0.24 (5) length of proboscis, dark scaled; segment 3 1.50-1.79 of 2; 4 papilliform. Proboscis 1.00-1.10 (5) length of forefemur, dark scaled. *Thorax.* Anterior pronotal lobe with integument brown to dark brown, covered with narrow curved yellowish scales; posterior pronotal lobe integument dark brown above and pale brown below, covered with narrow curved bronze-yellow scales, those on lower posterior part almost white and often broader, 5-8 yellowish brown bristles along posterior margin, upper 1, 2 bristles usually dark. Scutum with integument dark brown, covered with narrow curved bronze-yellow scales, those on margins somewhat paler; scutal bristles dark bronze-brown. Scutellum covered with rather narrow curved, pale bronze-yellow scales and bearing many dark bronze-brown bristles. Paratergite with narrow curved or rather narrow pale

yellowish scales. Pleural integument mostly dark brown, partly pale; propleuron covered with broad, pale ochreous scales; postspiracular area with pale yellowish, narrow curved or rather narrow scales, rarely with rather broad scales; sternopleuron with 2 patches of broad pale scales; mesepimeron with a large patch of broad white scales covering upper 0.6; pleural bristles yellowish brown, more than 10 on propleuron, prealar knob, sternopleuron and upper mesepimeron, 4-6 postspiraculars. *Wing*. Cell R_2 1.67-2.19 (9) length of vein r_{2+3}. Halter with knob pale scaled, often partly dark scaled. *Legs*. Forecoxa with anterior surface basally covered with pale ochreous scales and apically with dark scales; mid- and hindcoxae with a patch of pale ochreous scales. Femora with a rather indistinct apical pale fringe; forefemur pale scaled on posterior half of ventral surface; midfemur largely pale scaled on posterior surface; hindfemur pale scaled on both anterior and posterior surfaces, the pale area apically narrowed; legs otherwise dark scaled. Hindtarsal claw simple, rarely (6%) with a tooth. *Abdomen*. Terga dark scaled; I sometimes with scattered pale scales near base; II-IV each with a small mediobasal white spot, the spot occasionally developed to a short band on III and IV, often reduced on IV; II-VII with progressively smaller laterobasal white patches not reaching apical margin. Sterna mostly pale scaled, II-VII with progressively broader dark apical bands.

MALE (Figs. 136, 244). Wing length 3.5-3.6 mm. Pedicel dark; flagellum 0.99-1.10 (2) times length of proboscis; flagellomere 12 0.81-0.95 (2) length of Flm 13, both together 0.76-0.79 of Flm 1-11. Palpus 0.19-0.21 (2) length of proboscis; segment 3 2.00 of 2. Proboscis 1.03-1.05 (2) length of forefemur. Scales of lower anterior pronotal lobe, lower posterior pronotal lobe, paratergite and postspiracular area in general slightly broader than in female; 2-4 postspiracular bristles. Cell R_2 1.85-1.91 (2) length of vein r_{2+3}. Hindtarsomere 1 0.66-0.76 (4) length of tibia. Claws of hindtarsus simple. White spot of abdominal terga II-IV usually a little more developed than in female. *Genitalia*. Sternum IX with 3-6 bristles. Basistyle 2.9-3.5 length of basal sternal width, bristled except at base and on mesal half of tergal surface proximad of insertion of dististyle, laterally and sternally scaled; apical conical part distad of insertion of dististyle 0.25 length of basistyle (the shape similar to that in *esoensis*, wider than in *yamadai*); claspettoid moderately sclerotized, bifurcate, lateral branch narrow and bearing 2-8 apical setae, mesal branch wide and bearing 4-6 apical and lateral setae. Dististyle inserted at apical 0.25 of basistyle, 0.5 length of basistyle; lateral arm slightly broadened toward apical 0.33, then abruptly narrowed and bifurcate, the mesal branch slightly apically broadened, rounded at apex, which is surrounded by a comb of densely arranged short blunt teeth, those on lateral side of the branch (inner side of furcation) much wider, the lateral branch more slender, apically narrowed, with closely set blunt teeth at apex and on mesal margin; basal mesal arm reaching about middle of main arm, apically tapering (the shape similar to that of *yamadai*), bearing a number of small setae. Aedeagus with 2 strong hook-like incurved apical processes on each lateral piece.

LARVA (Figs. 132, 135). *Head*. Width 1.02-1.27 mm; moderately pigmented, 1.31-1.49 as wide as long; labrum slightly concave at middle of apical margin; seta 1-C sometimes weakly barbed, rarely bifurcate at apex; 4, 5-C on about same level. *Antenna* 0.43-0.60 mm long, 0.60-0.67 length of head, infuscate except basal 0.2-0.4, rather finely and sparsely spinulate; seta 1-A inserted at basal 0.36-0.48 ($x = 0.43$), with 6-12 ($x = 9.1$) strongly barbed branches, often with secondary branches, not quite reaching apex of shaft; 2-A 0.25-0.33 length of shaft. *Mandible*. Cutting organ with lateral dorsal tooth

bearing a median denticle, mesal dorsal tooth with a subbasal denticle; a row of several accessory denticles between bases of mesal dorsal tooth and ventral tooth; pectinate brush 6 haired. Mandibular hairs 17-19. *Maxilla* with seta 1-Mx single. Palpostipes with 5 palpal sensoria, S_1 stout, $S_{2,4}$ subequal in size, S_3 longest, S_5 shortest. *Mentum plate* with 24-28 (x = 25.8) teeth. *Thorax.* Usually, seta 1-P single, 9-P double and 9-T triple; 6-T always single. *Abdomen.* Seta 7-I almost always single, length of 6-I, but in one specimen 4 branched and about 0.67 length of 6-I; 7-II of medium size, strongly barbed; 6-I, II usually triple; 10-I, 8, 10, 11, 14-III, 2, 6, 10, 14-IV, 2, 8, 12, 14-V usually single; 9-I, 8, 12-II, 12-IV, 3, 5-V, 10, 12-VII usually double. Comb scales 12-16 (x = 13.3). *Siphon* widest near base, apically tapering, apex 0.54-0.62 of widest part; length 1.13-1.57 mm; index 3.43-4.43; pecten reaching apical 0.42-0.53 (x = 0.47) of siphon, of 16-24 (x = 20.7) teeth including 1-4 basal abortive ones, apical 2-4 teeth detached, basal teeth usually more closely spaced than in *esoensis*, each tooth with 2-4 ventral denticles, detached teeth larger with finer denticles; seta 1-S located at apical 0.29-0.37 (x = 0.33) of siphon, most frequently 4, 5 branched; 2 subapical (1 subdorsal and 1 subventral, rarely one of them lacking) and 0 (42%) or 1 (58%) midsubdorsal accessory siphonal seta on each side, each seta dendritic, 3-7 branched. *Saddle* extending to ventral 0.33 of the segment; seta 4-X of 8-10 cratal and 2-4 precratal tufts (usually 12 in total, occasionally 11), the former with 3-10 branches, latter with 3-8. Anal gills about 3.0 length of saddle, dorsal gill usually somewhat longer than ventral one.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 5♂, 6♀: Hokkaido (A-1683, A-1684). 35♂, 40♀; with associated skins (11 l, 11 p), 37 L, 34 l: Honshu (Holotype ♂: D-1156; Paratypes 10♂, 11♀; with associated skins (1 l, 1 p), 4 L, 2 l: D-1156. 24♂, 29♀; with associated skins (10 l, 10 p), 33 L, 32 l: D-1156, D-1158, D-1540, D-1541, D-1542, D-1543).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu).

TAXONOMIC DISCUSSION. The relationship between *Aedes sasai* and the other members of the subgenus *Aedes* were fully discussed by Tanaka et al. (1975b). We examined specimens of *sasai* from Japan only. However, this species is also likely to occur in continental Asia, since the figures of the dististyle and claspettoid given by Ljvov (1956, Fig. 2-3) as intermediate forms between *cinereus* and *esoensis* agree fairly well with those of *sasai*.

BIONOMICS. Larvae are usually found in shaded ground pools in the woods. One of our larval collections of this species at the type-locality, Umegashima, contained a single larva of *Ae. (Finlaya) japonicus;* the other 5 collections (one at Umegashima, 4 at Kamikôchi) contain *Ae. sasai* exclusively. Sato (1959), Sato and Tomita (1962), and Sato and Tatewaki (1967) presented biological data from Hokkaido, reporting that the larvae were found in ground pools formed by melted snow, and often were associated with *Ae. (Aedes) esoensis, Ae. (Ochlerotatus) communis* and *Ae. (Ochlerotatus) punctor.* They felt that the species was univoltine.

SUBGENUS *VERRALLINA* THEOBALD

Verrallina Theobald, 1903: 295. Type-species: *Aedes butleri* Theobald, 1901e; Malaya; Belkin 1962: 412 (resurrection); Reinert 1974: 3 (new interpretation).

Neomacleaya Theobald, 1907: 238. Type-species: *Neomacleaya indica* Theobald, 1907; India; Delfinado 1967: 2 (resurrection); Reinert 1974: 3 (syn.).

Small to medium-sized mosquitoes, scutum without distinct patches, tarsi unbanded; both male and female with genitalia unusually well developed, abdomen usually apically broad.

FEMALE. *Head.* Eyes separated or contiguous. Decumbent scales of vertex mostly broad, sometimes with narrow scales on median line and eye margin; erect forked scales restricted to near posterior margin of vertex; 4-8 vertical and 3, 4 temporal bristles. Antennal flagellum shorter to longer than proboscis; pedicel with small hairs and scales on mesal surface; flagellomere 1 1.5-2.2 length of Flm 2, with a few small dark scales. Palpus less than 0.25 length of proboscis. Proboscis dark scaled, shorter to longer than forefemur. *Thorax.* Anterior pronotal lobes broadly separated, scaled or unscaled, with many bristles; posterior pronotal lobe scaled or unscaled, with about 10 or less bristles along posterior margin. Scutum covered with narrow scales; all scutal bristles present, dark, sometimes middle of fossal area lacking bristles. Scutellum with narrow scales. Paratergite usually not scaled. Pleura with scale patches on propleuron, upper sternopleuron, lower-caudal sternopleuron and upper mesepimeron; post spiracular area with or without scale patches; usually many bristles on propleuron, prealar knob, upper to posterior margin of sternopleuron and upper mesepimeron, about 10 or less postspiraculars, no lower mesepimerals; occasionally, sternopleuron with fine bristles anteriorly and mesepimeron with many bristles along posterior margin. Base of mesomeron well above that of hindcoxa. *Wing.* Alula fringed with narrow to broad scales. Veins dark scaled. Remigial bristles 1-3. *Legs.* Tarsi unbanded. Foretarsomere 5 subequal to 4; hindtarsomere 1 shorter than tibia. Claws equal, simple or toothed. *Abdomen.* Laterotergite scaled. Terga all dark, or banded or spotted. Sternum VIII with a median indentation on apical margin, often with a lobe on each side of it, with fine and/or stout setae on the lobe. *Genitalia.* Strongly developed, complex, providing good specific characteristics. Insula small or absent. Both upper and lower vaginal sclerites variable in shape and development. Spermathecal eminence simple to complex, with or without spiny excrescences. Cercus triangular. Seminal capsules 3, unequal.

MALE. Antennal flagellomeres 12 and 13 elongate, Flm 12 shorter than 13, both together shorter than Flm 1-11. Palpus as in female, but usually slightly shorter relative to proboscis than in female. Cell R_2 shorter than in female, occasionally as long as vein r_{2+3}. Fore- and midtarsomere 4 not shortened, 5 subequal to 4 in length, usually with one stout seta on each side of ventrobasal swelling, other setae short and fine. Claws simple or toothed. *Genitalia.* Strongly developed. Tergum IX with or without lobes, lacking bristles. Sternum IX bristled. Basistyle short and broad, ventrally and often also laterally scaled, usually with lateroapical and/or mesoapical processes bearing spines or spine-like setae. Claspette (basal mesal lobe) variable in development, occasionally absent, often with strong spines. Dististyle short to moderately long, greatly variable in shape, often located before apex of basistyle, usually with distinct bristles, without apical claw. Paraproct variably developed, usually free from each other; tergite X usually small; cercal setae absent. Phallosome complex, composed of opisthophallus, prosophallus, phallus and paramere, each greatly variable in development and shape; opisthophallus a single median tergalmost structure, basally divergent and fused with basal plate, occasionally almost membranous and poorly developed; prosophallus, a paired structure, located under opisthophallus, laterotergal to phallus, connected laterobasally with paramere; phallus a median structure, more or less

divided into lateral pieces, with base connected with prosophallus; paramere laterad of or laterotergal to prosophallus. Basal plate variable in shape, usually large.

LARVA. *Head.* Wider than long; seta 1-C rather slender; 4, 6-C on about level of 7-C or posteriad of it, 5-C caudad of 4, 6-C. *Antenna* shorter than head, sparsely spinulate; seta 1-A inserted at about middle or basad of it, branched, usually barbed; 2-A with a slight kink at apical 0.2; 5-A longer than 6-A, with an accessory sensorium on its proximal division. *Mandible* with microspines proximally on dorsolateral surface. Mandibular comb with teeth basally pectinate. Cutting organ with a long stout dorsal spine; 2 dorsal teeth, lateral tooth smaller; ventral tooth with a slender lateral denticle (VT-4) and 3 triangular mesal denticles (VT_{1-3}), VT_{1-3} progressively larger; 2 ventral blades, VB_1 reaching apex of VT_0 or extending beyond it, VB_2 much smaller; pectinate brush of a few broad hairs. Piliferous process with labula extending only slightly beyond apex of anterior part. Mandibular hairs of distal group simple or very finely barbed, hairs of proximal group apically frayed. *Maxilla.* Cardo triangular, narrowly fused mesobasally with cranium, a strongly sclerotized strip-like ridge extending from anterior termination of hypostomal suture through the point of fusion to anterior margin of cardo; seta 1-Mx single or double. Mesostipes slightly longer than wide, peach-shaped; mesal margin with brush-like spicules, but without strong spine-like or xiphoid spicules; stipital sensoria equal or subequal, on a sclerotized half ring at middle of mesostipes; hairs of maxillary brush rather stiff; pseudoartis well developed, apex sometimes fused with cranium. Lacinia with seta 5-Mx on about level of stipital sensoria or a little proximad of it. Palpostipes about 0.5 length of mesostipes, apex rather broad, with ampulla and 4 palpal sensoria. *Mentum plate* triangular, with 17-45 small teeth. *Thorax.* Seta 0-P, 13, 14-M, 8, 13-T small, dendritic; 1-3-P short; 5-7-P, 5-10, 12-M, 7, 9, 10-T strong; 8-P medium to strong; 13-P absent. *Abdomen.* Setae 6-I-III or occasionally up to 6-VI, and 7-I strong; 13-II, VI dendritic. Comb scales 7-17 in an irregular row, individual scales with an apical spine and lateral spicules, the apical spine distinctly stronger than to subequal to subapical spicules. *Siphon* usually moderately long, moderately pigmented, with acus; pecten extending to basal 0.47-0.75, of 6-17 teeth, apical tooth (teeth) often more widely spaced, each tooth with 1-3 small ventral denticles, apical detached teeth occasionally simple; seta 1-S shorter than siphon diameter at insertion, branched, very rarely single; 2-S very short, much shorter than apical pecten tooth. *Saddle* incomplete; seta 2-X moderately long, usually branched; 3-X single, very long.

DISTRIBUTION. Southern Palaearctic Japan. Oriental region. Papuan subregion. Northern Australia. Western South Pacific.

This subgenus was fully discussed by Reinert (1974).

KEY TO SPECIES OF *AEDES (VERRALLINA)*

FEMALE ADULT

1. Eye margin without pale scales; vertex with a posteromedian spot of broad pale scales. . . . . *iriomotensis* (p. 442)
   Eye margin with pale scales. 2

2(1). Pale scales of eye margin narrow; vertex with a median line of narrow curved pale scales. . . . . *atriisimilis* (p. 443)
Pale scales of eye margin broad; vertex with or without a pair of submedian stripes of broad pale scales, without median line of scales. *nobukonis* (p. 439)

FEMALE GENITALIA

1. Spermathecal eminence with an anteriorly produced trilobed pouch. *nobukonis* (p. 439)
Spermathecal eminence without anteriorly produced pouch. 2

2(1). Spermathecal eminence with a strongly sclerotized, apically incomplete ring-like structure; lower vaginal sclerite large, bilobed, basally joined. . . . . *atriisimilis* (p. 443)
Spermathecal eminence without a strongly sclerotized ring-like structure; lower vaginal sclerite a pair of small, crescent-shaped, widely separated plates. . . . . *iriomotensis* (p. 442)

MALE GENITALIA*

1. Opisthophallus very weakly developed, short, thin and transparent; prosophallus short, about length of phallus; basistyle with lateroapical corner strongly produced distally, bearing 2 strong spines. *atriisimilis* (p. 443)
Opisthophallus strongly sclerotized, very long and pointed; prosophallus length of opisthophallus and more than 3.0 length of phallus; basistyle with lateroapical angle not produced, without spines. *nobukonis* (p. 439)

LARVA*

1. Setae 5-7-C slender, 5-8, 5-7 and 11-16 branched respectively; pecten reaching apical 0.25-0.28 of siphon, with apical 4, 5 teeth detached. *atriisimilis* (p. 443)
Setae 5-7-C rather stiff, 5, 6-C consistently double, 7-C 4-7 branched; pecten reaching apical 0.46-0.53 of siphon, all teeth usually evenly spaced, occasionally one apical tooth detached. . *nobukonis* (p. 439)

96. *AEDES (VERRALLINA) NOBUKONIS* YAMADA
(Figs. 136, 137, 138, 245; Table 129)

Aedes nobukonis Yamada, 1932: 228 (♀). Type-locality: Ômura, Kyushu, Japan.
Aedes (Aedes) ishigakiensis Bohart, 1956: 32 (♂, ♀, P, L). Type-locality: Mt. Banna, Ishigaki Is., Ryukyu Archipelago; Reinert 1974: 69 (syn.).

*Male and larva of *iriomotensis* unknown.

FEMALE (Figs. 137, 245). Wing length 2.8-3.2 mm. *Head.* Eyes separated above; interocular space covered with broad pale scales; vertex covered with broad dark scales, and usually with a pair of submedian irregular, occasionally incomplete or lacking stripes of pale scales; eye margin with broad pale scales; a number of erect forked scales brown; tempus with a wide stripe of broad pale scales, otherwise covered with broad dark scales; 4-6 stout vertical and 2 or more fine dark temporal bristles on each side. Clypeus yellowish brown. Antenna: pedicel yellowish brown, mesal surface slightly infuscate; flagellum longer than proboscis; flagellomere 1 about 2.0 length of Flm 2. Palpus 0.17-0.25 length of proboscis. Proboscis shorter than forefemur. *Thorax.* Pronotal integument brown or light brown; anterior lobe covered with broad pale scales, bristles dark or pale brown; posterior lobe with a few broad pale scales, bearing 3-5 dark or pale brown bristles. Scutum with integument brown, covered with narrow curved brown scales with a golden or bronzy sheen, scales on margins appear somewhat pale. Scutellum with integument brown, covered with narrow curved yellowish brown scales, scales on lateral lobes appearing slightly darker than those on median lobe; each lobe with 3-6 long dark bristles and a few short ones. Pleural integument light brown to brown; patches of broad white scales on propleuron, upper sternopleuron, midposterior sternopleuron and mesepimeron; lower 0.33 of mesepimeron bare; several broad white scales on postspiracular area; prealar bristles rather dark brown, other pleural bristles brown to pale brown, more than 10 propleurals and sternopleurals, 2-4 postspiraculars, less than 10 prealars, 7 to more than 10 upper mesepimerals. *Wing.* Alula fringed with rather narrow dark scales. Cell R_2 1.25-1.60 length of vein r_{2+3}. Halter with dark scaled knob. *Legs.* Forecoxa covered with scales on anterior surface, basally and apically pale, medially dark; mid- and hindcoxae each with a patch of white scales. Femora with rather indistinct pale apical fringe; forefemur pale scaled on posterior half of ventral surface; midfemur largely pale on posterior surface; hindfemur pale scaled on both anterior and posterior surfaces, these pale-scaled areas apically narrowed and not reaching apex; legs otherwise dark scaled. Hindtarsomere 1 0.7-0.8 length of tibia. All claws subbasally unidentate. *Abdomen.* Terga dark scaled; laterotergite covered with white scales; II-VII with distinct laterobasal spots of white scales barely visible from above. Sterna pale basally scaled and apically dark scaled; VIII with a pair of medioapical rounded lobes bearing many thick pigmented setae. *Genitalia.* Tergum IX very weakly sclerotized, concave on apical margin. Upper vaginal lip posteriorly unsclerotized, with a well sclerotized, incompletely bilobed, rounded anteromedian horizontal shield; lower vaginal lip widely concave on apical margin; insula undifferentiated. Upper vaginal sclerite a pair of lateral plates, their mesal margins well sclerotized; lower vaginal sclerite fused with lower vaginal lip. Spermathecal eminence bulbous, with a well sclerotized semilunar anterior portion, and trilobed anterior pouch, the median lobe of the pouch larger than lateral lobes, the dorsal surface of the pouch with many short hairs, the ventral surface bearing numerous branched spiny hairs. Postgenital plate shallowly to moderately medioapically emarginate.

MALE (Figs. 136, 245). Wing length 2.2 mm. Palpus 0.17 length of proboscis. Cell R_2 length of or longer than r_{2+3}. Hindtarsomere 1 0.75-0.80 length of tibia. Anterior claw of fore- and midtarsi with a blunt-tipped median tooth; posterior claw with a sharp subbasal tooth; hindtarsal claws with a sharp median tooth. *Genitalia.* (Described from a paratype slide of *ishigakiensis.*) Tergum IX laterally sclerotized, with large triangular lateroapical lobes. Sternum IX rounded, with 8 medium-sized bristles at middle on apical half.

Basistyle 1.84 as long as wide, laterally scaled, bearing medium and long bristles on rather narrowly sclerotized lateromedian part of tergal surface, with scattered short and medium bristles on sternal surface, without basal lobe or claspette; apical part distad of insertion of dististyle rather narrow, membranous on tergal surface, rounded at apex, with a small tergomesal apical process bearing one stout short curved pigmented spine and a few short setae; interbasal fold about level of apical 0.33 of basistyle. Dististyle inserted at about apical 0.3, slightly less than 0.5 length of basistyle, markedly laterally expanded at about middle, with several hairs on both tergal and sternal surfaces at apex of the expansion, with a slight knob and several hairs at apical 0.33 on tergal surface, then narrowed and strongly tergolaterally curved, apex recurved and apparently pigmented. Paraproct long, horn-shaped, laterally curved, with apex pointed. Opisthophallus well sclerotized, median part long, lanceolate, with apex subacute; prosophallus well sclerotized, narrow, pointed at apex, reaching about same level as apices of paraproct and opisthophallus, longer than paraproct; phallus nearly 0.33 length of prosophallus, composed of 3 parts; tergal part crescent-shaped, placed above prosophallus, base of tergal part connected with base of middle part placed under prosophallus, the middle part cylindrical, tergally closed, deeply apically emarginate, sternally open; sternal part bilobed with mesal margins thickened, with narrow laterobasal arms connected with base of prosophallus; paramere large, nearly 0.8 length of prosophallus, with a laterosubbasal expansion; basal plate very long.

LARVA (Fig. 138). *Head.* Width 0.78-0.87 mm*; lightly pigmented, 1.38-1.43 (5) as wide as long*; labrum concave on apical margin, seta 1-C curved mesad, shorter than distance between bases; 4, 6, 7-C approximately on the same level, or 4-C slightly anterior to 6-C and 6-C slightly anterior to 7-C; 5-C well caudad of 7-C, almost tandem with or slightly mesad of 6-C; 5-7-C rather stiff and pigmented; 9-C usually 5 branched; 11-C very fine. *Antenna* 0.25-0.28 mm long, pale, slightly incurved; seta 1-A inserted at basal 0.44-0.48 of shaft, with 2, 3 rather stiff, pigmented branches, not reaching apex of shaft; proximal division of 5-A with an accessory sensorium. *Mandible* (described from mounted skins) with a number of stout dorsolateral microspines. Cutting organ with both dorsal teeth simple; VB_1 reaching apex of VT_0. Mandibular hairs 14 in 2 equal groups. *Maxilla* (described from mounted skins) with seta 1-Mx single. Mesostipes with pseudoartis strongly fused with cranium at apex. Palpostipes with S_1 apparently largest among palpal sensoria, with a fairly large basal ring. *Mentum plate* with 31-35 small teeth. *Thorax.* Usually, seta 12-P single and 3-M triple; 10-T usually single, double in one specimen on one side. *Abdomen.* Setae 1-I, II pale and very fine; 7-IV fine; 1-I and 5-IV, V usually single; 11-II, III, 7, 9, 11-VII usually double; 12-II, VII and 4-III usually triple; 1-VI usually 4 branched. Comb scales 9-12, most frequently 10, in a single row; individual scales fringed with spicules up to apex, the spicules progressively larger towards apex, apical spicule usually 2.0 length of subapical spicules. *Siphon* dark brown dorsally at basal margin, apically tapering; length 0.56-0.64 mm; surface covered with distinct microsculpture of short transverse ridges; pecten reaching apical 0.46-0.53 of siphon, of 11-14 teeth, occasionally with basal tooth abortive and apical tooth detached, each tooth with 1-3 ventrobasal denticles; seta 1-S beyond pecten at apical 0.32-0.38; 2-S much shorter than apical pecten tooth. *Saddle* covering 0.8 of segment X, seta 1-X shorter than saddle, usually double; 2-X less than

*The specimens examined may be somewhat compressed.

0.5 length of 3-X; 4-X of 10, occasionally 11, cratal and 1-3 short precratal tufts (12-13 tufts in total), cratal tufts 4-8 and precratal tufts 3-5 branched. Anal gills apically tapering, with apex pointed, 2.4-2.8 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 3♂, 11♀: Kyushu (Syntypes 1♂, 4♀: Omura, Nagasaki Pref., 21 VII 1916, Yamada, IMSUT. 2♂, 7♀: Omura, Nagasaki Pref., 6 VII 1952, Sasa, IMSUT). RYUKYU ARCHIPELAGO. 1♂, 4♀, 6 L, 6 l: Yaeyama Guntô (Paratypes of *Aedes ishigakiensis:* Mt. Banna, Ishigaki Is., 27 X 1951, foxhole in pine woods, Bohart, USNM).

DISTRIBUTION. PALAEARCTIC JAPAN (?Oki Guntô, Kyushu). RYUKYU ARCHIPELAGO (Yaeyama Guntô).

BIONOMICS. One of the rarer species in this region. Larvae were found in temporary ground pools in woods at Ômura, Kyushu (Bekku 1954); Bohart (1956) obtained them from a foxhole in pine woods on Ishigaki Is., Ryukyus. Adult females bite man, being active both during daytime and at night (Bekku 1954).

97. *AEDES (VERRALLINA) IRIOMOTENSIS* TANAKA AND MIZUSAWA (Figs. 139, 246)

Aedes (Neomacleaya) iriomotensis Tanaka and Mizusawa, 1973: 633 (♀). Type-locality: Funaura, Iriomote Is., Ryukyu Archipelago.

FEMALE (Figs. 139, 246). Wing length 2.6-3.3 mm. *Head.* Eyes very narrowly separated above; interocular space without scales; vertex mostly covered with broad dark scales, with broad pale scales along posterior margin, a small patch of pale scales posteriorly at middle; a number of yellowish erect forked scales; tempus with a stripe of broad pale scales above, covered with broad dark scales below; 5-7 vertical and 3 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel dark brown; flagellum 0.93-1.03 (4) length of proboscis; flagellomere 1 1.46-1.60 length of Flm 2. Palpus 0.15-0.19 (4) length of proboscis; segment 3 1.41-2.20 (4) of 2. Proboscis 1.06-1.28 (3) length of forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe not scaled; posterior lobe with scattered narrow curved dark scales, bearing 5-7 dark bristles. Scutum with integument blackish brown, entirely covered with narrow curved dark scales; scutal bristles dark. Scutellum with integument dark brown, with scales similar to those of scutum, but median lobe with a small medioapical patch of pale scales, each lobe with several long dark bristles and several small ones. Paratergite not scaled. Pleural integument dark brown, rather lighter on mesomeron; patches of broad white scales on propleuron, upper and lowercaudal sternopleuron, and middle mesepimeron; pleural bristles dark, about 10 or more bristles on propleuron, upper to posterior margin of sternopleuron, prealar knob and upper mesepimeron, a few rather dark or a number of fine pale posteromedian mesepimerals, 3-7 postspiraculars. *Wing.* Alula fringed with dark narrow scales. Cell R_2 1.94-2.60 (5) length of vein r_{2+3}, longer than M_{1+2}. Halter with dark scaled knob. *Legs.* Forecoxa scaled on anterior surface, pale at base and dark otherwise; mid- and hindcoxae each with a patch of anterolateral pale scales. Forefemur pale on posteroventral surface; midfemur pale on posterior surface; hindfemur pale on both anterior and posterior sides, these pale-scaled areas apically narrowed; legs otherwise dark scaled. Foretarsomere 5 length of or slightly longer than 4, hindtarsomere 1 0.73-0.76 (4) length of tibia. Fore- and midtarsal claws with a submedian sharp tooth; hindtarsal claw simple. *Abdomen.* Dark

scaled. Laterotergite covered with white scales; terga II-VII with laterobasal spots of white scales, the spots usually extending slightly posteromesad. Sterna with small laterobasal spots of pale scales; VIII rather widely and deeply emarginate and heavily bristled medially on apical margin. *Genitalia*. Upper vaginal lip somewhat square, slightly convex posteriorly at middle; lower vaginal lip of about even width. Upper vaginal sclerite somewhat complex, weakly sclerotized; lower vaginal sclerite consisting of a pair of small, poorly sclerotized, crescent-shaped, widely separated plates. Spermathecal eminence apically bulbous, greatly expanded anterolaterally into a pair of plates, lateral angle of the plate often protrudent, forming a short knob; lateral margin with many spiny excrescences, many of these branched. Postgenital plate short, medioapically very slightly to deeply notched. Seminal capsules with a slightly swollen neck.

Male and immature stages unknown.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 104♀: Yaeyama Guntô (Holotype ♀: K-0906. Paratypes 101♀: K-0906, K-0913, K-0919, K-1021, K-1102. 2♀: K-1587).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

BIONOMICS. The adult females are found in jungles and frequently bite man, appearing to fly more slowly than is usual for anthropophilic species.

98. *AEDES (VERRALLINA) ATRIISIMILIS* TANAKA AND MIZUSAWA (Figs. 140, 141, 247: Table 130)

Aedes (Neomacleaya) atriisimilis Tanaka and Mizusawa, 1973: 625 (♂, ♀, L). Type-locality: Itokawa-rindô, Iriomote Is., Ryukyu Archipelago.

FEMALE (Figs. 140, 247). Wing length 3.4-4.4 mm. Eyes narrowly separated above; interocular space with narrow curved pale scales; vertex covered with broad dark scales, a narrow median line formed by narrow curved white scales barely reaching apex, eye margin with narrow curved white scales, erect forked scales dark; tempus with a patch of broad white scales; 5-8 vertical and 2-4 temporal dark bristles on each side. Clypeus dark brown. Antennal flagellum 1.0 (1) length of proboscis; flagellomere 1 1.68 length of Flm 2. Palpus 0.20 (1) length of proboscis; segment 3 2.25-2.30 of 2. Proboscis 0.96 (1) length of forefemur. *Thorax*. Anterior pronotal lobe with moderately broad pale scales; posterior pronotal lobe with narrow golden anterodorsal scales and broad pale posterior scales, bearing 5-10 bristles. Scutum with integument reddish brown, covered with narrow dark and golden brown curved scales not forming definite stripes or patterns, scales of prescutellar area mostly golden brown; middle of fossal area usually lacking bristles. Scutellum rather roughly covered with narrow curved, golden yellowish brown scales; each lobe with 4-9 long dark bristles and several small ones. Paratergite unscaled. Pleural integument brown, partly darker; patches of broad pale scales on propleuron, upper sternopleuron, and upper mesepimeron; postspiracular area sometimes with a few pale moderately broad scales; more than 10 yellow propleural bristles, 4-9 postspiraculars, about 10 or more sternopleurals along upper to posterior margin, some fine bristles within the lower caudal scale patch and a few very fine bristles on cephalic middle part; more than 10 pale upper mesepimerals and 5 to more than 10 fine caudal middle mesepimerals. *Wing*. Alula fringed with moderately broad dark scales. Cell R_2 1.44-1.82 (5) length of vein r_{2+3}. Halter with

pale and/or dark scaled knob. *Legs*. Forecoxa scaled on anterior surface, basally pale and dark otherwise; mid- and hindcoxae each with a patch of broad white scales. Femora posteroventrally pale; legs otherwise dark scaled. Foretarsomere 5 equal to or slightly shorter than 4; hindtarsomere 1 0.77-0.87 (5) length of tibia. Fore- and midtarsal claws unidentate, hindtarsal claw simple. *Abdomen*. Terga dark scaled; laterotergite heavily covered with white scales; each tergum with laterobasal patches of white scales, the patches on VI and VII extending dorsosubbasally but not forming a complete band. Sterna II-VII dark scaled, with broad basal bands of white scales; VIII notched and densely bristled at middle of apical margin. *Genitalia*. Upper vaginal lip moderately sclerotized, very convex posteriorly; lower vaginal lip narrow; insula poorly differentiated. Upper vaginal sclerite a pair of anterolateral plates; lower vaginal sclerite very wide, bilobed, each lobe rounded, pilose. Spermathecal eminence complex, with a strongly sclerotized, basally pedunculate, apically incomplete, semicordate, ring-like dorsal structure; the ventral structure with numerous lateral and basal dendritic excresences, edge of the median orifice formed by a pair of strongly sclerotized bars. Postgenital plate bilobed.

MALE (Figs. 140, 247). Wing length 2.6-3.3 mm. Broad pale scales along eye margin and scattered on posterior part of vertex, pale patch of tempus generally more developed than in female. Antennal flagellum 0.90 (1) length of proboscis; flagellomere 12 0.80-0.86 (1) length of Flm 13, both together 0.68-0.75 of Flm 1-11. Palpus 0.14-0.15 (1) length of proboscis; segment 3 1.21-1.25 of 2. Proboscis 1.08 (1) length of forefemur. Cell R_2 1.36-1.53 (3) length of vein r_{2+3}. Foretarsomere 5 0.97-1.05 (3) length of 4; midtarsomere 5 0.96-0.99 (3) length of 4; hindtarsomere 1 0.81-0.85 (3) length of tibia. Anterior claw of fore- and midtarsi longer than posterior claw, with a blunt-tipped median tooth, posterior claw with a short sharp laterobasal tooth; hindtarsal claw equal and simple. *Genitalia*. Tergum IX band-shaped, without lobes, longitudinally carinate at middle of internal surface, emarginate at middle of sclerotized apical margin. Sternum IX oblong, about 2.0 as wide as long, with 16-25 medioapical bristles. Basistyle very stout, 1.7-1.9 as long as maximum width at middle excluding a wide and stout well sclerotized mesoapical process, with many short and moderately long sternal bristles, the posterior apical angle of the process protrudent and unidentiform, the anterior apical angle bearing 1,2 short spines; lateroapical angle of basistyle protrudent as a long and narrow slightly mesally arcuate process, sternally covered with more than 10 long and stout bristles and bearing 2 long stout pigmented spines, the spines equal in length, nearly 0.5 length of basistyle; tergal surface of basistyle with a few long and several short bristles basad of insertion of dististyle, sternomesal surface with scattered short bristles, laterosternal surface white scaled on basal 0.33; claspette not protrudent, hirsute, with 3 curved pigmented spines, a few unpigmented setae present sternobasad of them, sometimes are (rarely 2) of them developed to a stout pigmented seta, but always distinctly smaller and paler than the 3 spines. Dististyle inserted at about middle of basistyle, 0.6 length of it, stout, laterally curved near middle, moderately pigmented in apical half, with a protuberance at curved portion on concave side and several tergal and sternal bristles. Paraproct remarkably long, curved mesad, with pointed apex, uniformly pigmented. Phallosome: opisthophallus membranous, short; prosophallus wide and unpigmented in basal 0.67, narrow and well sclerotized in apical 0.33, with a small apical and a retrorse subapical tooth; phallus well sclerotized, length of or slightly shorter than prosophallus, 1.64-1.67 (2) as long as wide, tergally closed, sternally open, with

a narrow and deep notch tergally at apex; paramere 0.67 length of prosophallus, somewhat pigmented. Basal plate broadly fused with basistyle.

LARVA (Fig. 141). *Head.* Width 0.91-0.92 mm (2); 1.28-1.29 (2) as wide as long; labrum concave at apical margin; seta 1-C about length of distance between bases; 4-C nearly on level of 7-C; 5-C most frequently 7 branched; 6-C most often 5 branched, caudad of level of 7-C. *Antenna* 0.35-0.36 mm (7) long, inwardly arcuate, slightly darker distad of insertion of seta 1-A; 1-A inserted at basal 0.40-0.43 (7), with 3-5 barbed branches, usually just reaching apex of shaft, sometimes slightly shorter. *Mandible* (a single dissected specimen) with simple dorsolateral microspines. Cutting organ with lateral dorsal tooth bicuspid, mesal dorsal tooth simple; VB_1 extending slightly beyond apex of VT_0, very wide basally; VB_2 0.67 length of VB_1, coarsely serrate on mesal margin; pectinate brush 2 haired. Mandibular hairs 13-14. *Maxilla* (a single dissected specimen) with seta 1-Mx single. Mesostipes with a few tubercles basally on lateral surface; stipital sensoria rather stout; 2,4-Mx on same level; 6-Mx long, swollen and densely barbed at base. Palpostipes about 1.5 as long as wide, slightly less than 0.5 length of mesostipes; S_1 broadest, tapering, with apex rather pointed, S_3 longest, but narrower than S_1, $S_{2,4}$ subequal. *Mentum plate* with 37-38 (7) teeth. *Thorax.* Usually, 14-P and 6-T double and 12-T single; 2,14-M, 1,13-T very fine. *Abdomen.* Setae 1-I, II extremely fine, 1-II usually single, but 2,3 branched in one specimen; usually, 13-I single, 6-II double, 11-II 2 forked, and 4-VII 3 branched. Comb scales 12-15 in an irregular single or double row, individual scales with apical spine narrow and very sharp, laterally fringed with spicules. *Siphon* narrowed in apical 0.33; index 2.96-3.04 (3), length 0.89-0.98 mm (2); pecten reaching apical 0.25-0.28 (6), of 13-16 teeth including 0-2 basal abortive ones, apical 4,5 teeth detached, longer than others, usually simple, other teeth with usually 1, rarely 2, ventrobasal denticle; seta 1-S beyond pecten at apical 0.20-0.22 (6), most often double; 2-S 0.25-0.33 length of longest pecten tooth, extending beyond apex of siphon. *Saddle* covering dorsal 0.67 of the segment; seta 1-X shorter than saddle, nearer to ventral margin of saddle than to dorsomedian line; 4-X of 10 cratal and 2 precratal tufts, the former 4-9 branched, the latter 3-5. Anal gills slender, dorsal gill about 2.5 length of saddle, slightly longer than ventral one.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 10♂, 13♀, 2 L, 5 l: Yaeyama Guntô (Holotype ♂: K-0181. Paratypes: 9♂, 13♀, 2 L, 5 l, K-0181, K-0183, K-0584, K-0726, K-0730, K-0946, K-1023, K-1037, K-1038).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

BIONOMICS. Only a single larval collection was made at a very shallow ground pool filled by fallen leaves in a jungle. Adults are found in jungles; females bite man.

9. GENUS *ARMIGERES* THEOBALD

Armigeres Theobald, 1901b: 235. Type-species: *Culex obturbans* Walker, 1860; Celebes.

Medium-sized to large mosquitoes; larvae with short siphon lacking pecten.

FEMALE. *Head.* Eyes narrowly separated above. Decumbent scales of vertex largely broad; erect forked scales restricted to posterior portion. Antenna about length of proboscis. Palpus 0.20-0.75 length of proboscis. Pro-

boscis rather stout, usually slightly curved ventrally, with several ventrobasal bristles. *Thorax*. Anterior pronotal lobes well separated or rather closely approximated. Scutum without acrostichal, anterior dorsocentral and fossal bristles except bristles on anterior margin, 1-5 prescutellars (may or may not include posterior dorsocentrals) on each side, supraalars well developed. Scutellum covered with broad decumbent scales. Postnotum usually glabrous. Paratergite rather broad, scaled. Pleural scale patches well developed; spiracular bristles absent, postspiracular bristles present or absent, other pleural bristles including lower mesepimerals present. Base of mesomeron on level of that of hindcoxa or distinctly above it. *Wing*. Squama fringed with hair-like scales; alula fringed with scales. *Legs*. Hindtarsomere 1 shorter to longer than tibia; claws of fore- and midtarsi usually toothed, those of hindtarsus simple and equal. *Abdomen*. Tergum I hirsute, laterotergite scaled; segment VIII partially retractile. *Genitalia*. Seminal capsules 3, one larger than other 2.

MALE. Antenna plumose, shorter than or length of proboscis. Palpus length of or longer than proboscis, upturned and apically tapering, apex without conspicuous bristles. Foretarsomere 4 slightly shortened, 5 longer than 4, with about 10 stout ventrobasal setae; midtarsomere 5 shorter than 4, not very strongly modified, with several stout ventrobasal setae. Anterior claw of foretarsus longer than posterior claw, both claws toothed; anterior claw of midtarsus longer than or as long as posterior claw; hindtarsal claw simple. *Genitalia*. Tergum IX with well developed lobes. Basistyle usually with numerous bristles, with mesal membrane from base to apex; basal tergomesal lobe not or very poorly developed; claspette weakly developed, appressed to mesobasal surface of basistyle, usually with strong apical setae. Dististyle with 4 or more claws. Cercal setae absent; paraproct without strongly sclerotized apical tooth. Aedeagus complex, toothed, at least dorsally divided.

LARVA. *Head*. Setae 4-6-C well anteriad of antennal base; 9-C strongest of all head setae. Antenna short and smooth, 1-A very fine. *Mandible* and maxilla greatly modified, subpredatory type, seta 1-Md absent; mandibular ring distinct; 3 almost equal mandibular spurs; mandibular brush and comb well developed. Cutting organ without dorsal spine; mesal dorsal tooth reduced; ventral tooth very strongly developed, with a large lateral denticle (VT-4) and 3 mesal denticles (VT_{1-3}); ventral blade rather weakly developed; pectinate brush absent. Piliferous process well protrudent, with 5 groups of hairs. Mandibular hairs in a single group. *Maxilla*. Cardo fused with cranium along its entire posterior margin, without suture. Mesostipes slightly longer than wide; parartis stout, strongly sclerotized, directly attached to paracoila (without connecting rod); apicomesal ventral surface with numerous strong forked spicules; twin stipital sensoria distal to middle, lacking basal ring; seta 2-Mx absent. Lacinia rather small; maxillary suture posteromesally, greatly broadened. Palpostipes long, cylindrical; lateral artis, a crescent-shaped strongly sclerotized rod, separated from but jointed with base of palpostipes and connecting it with postcoila and mandibular postartis; seta 3-Mx absent; palpal sensoria $S_{1,2}$ on a common basal ring; S_5 and ampulla absent. *Thorax* and *abdomen*. Setae poorly to strongly developed; seta 12-I absent; 3-III-V mesad of 4-III-V (after Belkin 1962); 1-VIII short. Comb scales small, arranged in a patch or irregular row. *Siphon* short, largely unsclerotized ventrobasally, neither acus nor pecten present; seta 1-S short, in distal 0.33 of siphon or beyond. *Saddle* incomplete, seta 1-X off saddle, 3-X only slightly longer than 2-X, both branched; grid incomplete, 4-X of branched hairs.

DISTRIBUTION. Japan and Korea. Oriental region. Papuan subregion.

Solomon and Santa Cruz islands.

The genus *Armigeres* is represented in this region by a single species belonging to the subgenus *Armigeres*.

SUBGENUS *ARMIGERES* THEOBALD

Armigeres Theobald, 1901b: 235. Type-species: *Culex obturbans* Walker, 1860; Celebes.

ADULT. Female palpus less than 0.33 length of proboscis. Anterior pronotal lobes well separated. Scutum neither laterally compressed nor distinctly produced over head. Postnotum bare. Postspiracular bristles present. Bases of mesomeron and hindcoxa on about the same level.

LARVA. As in the generic description.

DISTRIBUTION. Same as in the genus.

99. *ARMIGERES (ARMIGERES) SUBALBATUS* (COQUILLETT)
(Figs. 142, 143, 248; Table 131)

Culex subalbatus Coquillett, 1898: 302 (♀). Type-locality: Japan.
Desvoidea obturbans: Hatori, 1919: 1057, Ishigaki Is., Ryukyu Archipelago.
Armigeres subalbatus: Yokoo, 1944: 49, Mokpo, Pusan, and Cheju Do, Korea.
Armigeres (Armigeres) subalbatus: LaCasse and Yamaguti, 1950: 53 (♂, ♀, L).

FEMALE (Fig. 248). Wing length 3.2-5.4 mm. *Head.* Eyes moderately separated below. Vertex covered with broad dark scales, with a posteromedian patch of broad white scales; eye margin including interocular space with smaller broad white scales; many erect forked dark scales; tempus covered with broad pale scales, posteriorly above with a patch of broad dark scales; 5-8 dark vertical and 3, 4 temporal bristles on each side, the lowest temporal bristles detached. Clypeus dark. Antenna: pedicel dark, covered, except dorsally, with small white scales; flagellum 0.96-1.04 (5) length of proboscis; flagellomere 1 1.37-1.50 length of Flm 2, basally yellow, with some small scales. Palpus 0.26-0.29 (5) length of proboscis, dark scaled; segment 3 2.42-3.14 length of 2; 4 rudimentary to developed up to 0.15 length of 3. Proboscis dark scaled, ventrobasal bristles rather long. *Thorax.* Pronotal integument dark; anterior lobe anteriorly and laterally covered with broad white scales, narrow or crescent-shaped white scales otherwise, bearing about 10 or more dark bristles, a few fine most lateral ones yellowish; posterior lobe anterodorsally covered with narrow curved dark scales, ventroposteriorly with broad white scales, and narrow curved white scales in-between, bearing 4-7 brown to blackish brown bristles along posterior margin, occasionally 1, 2 additional very fine bristles present. Scutum with integument very dark brown, covered with narrow curved dark scales, some rather broad scales intermixed on posterior margin, often some crescent-shaped or rather broad pale scales on prescutellar space, a white border of narrow curved scales from anterior promontory to above wing-base, the white scales on supraalar margin broader, crescent-shaped and some rather broad truncate scales intermixed; a few anterior pairs of acrostichal bristles, several to about 10 bristles laterally on anterior margin, 1-5 bristles on each side of prescutellar space. Scutellum covered with

broad dark scales, varying amount of pale apical ones present; each lateral lobe with 5-9, median lobe with 4-7 long dark bristles together with several short ones. Paratergite covered with broad white scales. Pleural integument dark brown; large patches of broad white scales on propleuron, subspiracular area, postspiracular area, upper sternopleuron, lowerposterior sternopleuron and upper mesepimeron, upper sternopleural patch almost reaching cephalic corner, upper mesepimeral patch covering upper 0.67 of the sclerite; pleural bristles yellowish brown, about 10 or more propleurals, 3,4 postspiraculars, more than 10 prealars and sternopleurals, 6 to more than 10 upper mesepimerals, one lower mesepimeral. *Wing.* Alula fringed with short dark rather broad scales. Veins dark scaled, c with a small basal spot of pale scales. Cell R_2 1.84-2.35 (5) length of vein r_{2+3}. Halter knob dorsally dark scaled, pale scaled otherwise. *Legs.* Forecoxa broadly basally and apically pale scaled, dark scaled in-between; mid- and hindcoxae with pale scales. Forefemur with pale anteroapical fringe and indistinct pale anterobasal streak or spot, pale in posterior 0.50-0.67 of ventral surface; midfemur with pale anteroapical fringe, pale on posterior surface except dorsoapical area; hindfemur with pale apical fringe, pale on both sides including ventral surface, pale area apically narrowed and usually reaching near apex on anterior surface and apical 0.33 on posterior surface, dorsal surface dark from base. Femora otherwise, tibiae and tarsi dark scaled. Hindtarsomere 1 0.81-0.85 (5) length of tibia. Claws equal, those of fore- and midtarsi unidentate. *Abdomen.* Tergum I mesally broadly dark scaled, laterally with pale scales; laterotergite white scaled; II-VII dark scaled, with laterobasal patches of white scales, VIII basally pale scaled, apically dark scaled. Sternum II pale scaled; III-VI pale scaled with apical band of dark scales; VII broadly basally and narrowly apically dark scaled, pale scaled in-between; VIII with white and pale ochreous scales, apex unscaled.

MALE (Figs. 143, 248). Wing length 2.8-4.8 mm. Pale scaling in general more developed than in female. In examples with pale scales most developed (Fig. 248), vertex largely pale leaving a very narrow dark transverse stripe between eye margin and posterior pale area, scutum with rather broad pale median line from anterior promontory, broadened on prescutellar space and extending onto scutellar median lobe, and with rather broad pale posterior dorsocentral stripes extending onto scutellar lateral lobes; pale area of anterior surface of hindfemur reaching apex. Antenna: flagellum 0.90-0.95 (4) length of proboscis; flagellomere 12 0.94-1.00 length of Flm 13, both together 0.88-0.97 of Flm 1-11. Palpus 1.11-1.26 (6) length of proboscis; length ratio of segments 2-5: 0.72-0.87 : 0.98-1.09 : 0.89-0.97 : 1.00 (6). Proboscis 0.90-0.99 (5) length of forefemur. Cell R_2 1.36-1.44 (5) length of vein r_{2+3}. Hindtarsomere 1 0.86-0.89 (5) length of tibia. Anterior claw much longer than posterior claw in foretarsus, only slightly so in midtarsus, with blunt-tipped basal tooth; posterior claw with sharp basal tooth. *Genitalia.* Tergum IX well sclerotized; lobes large, roughly triangular, well separated and protrudent, each bearing 5-12 rather fine bristles. Sternum IX large, weakly sclerotized laterally, with 3-7 bristles. Basistyle 2.9-3.3 as long as wide, laterally and sternally scaled in lateral half, densely and almost evenly bristled over entire surface, the bristles mesally finer, laterally and sternoapically stronger, no exceptionally long bristles; basal tergomesal lobe poorly developed, represented by a slightly swollen area just basal to middle, covered densely with fine bristles; claspette reaching about basal 0.4 of basistyle, apically with 2 strong pigmented setae. Dististyle moderately sclerotized, evenly arcuate, 0.46-0.51 (4) length of basistyle, with 1-6 short setae on convex side in apical half, occasionally with a seta

in basal half; 17-23 spiniforms, pigmented, stout, blunt-tipped, closely spaced, arranged in a row in apical 0.67 of dististyle, occasionally the row partially doubled. Cercal tergal surface apparently membranous. Aedeagus 1.45-1.57 (4) as long as wide, apically broadened in tergal view, sternally closed in apical half, tergobasally connected, tergally broadly open, sternobasally narrowly open; lateral and sternal surfaces covered with numerous sclerotized teeth, those of sternobasal area larger.

LARVA (Fig. 142). *Head.* Width: 0.97-1.08 mm; brownish, rather rounded, 1.08-1.17 as wide as long, smooth; front margin of labrum only slightly concave; seta 1-C slender, occasionally apically bifid, 0.87-1.06 (5) length of distance between bases; 3-C rudimentary; 4-C a little anteriad and well mesad of 6-C; 5-C slightly mesad and well posteriad of 6-C; 7-C on level of antennal base; 8-C anteriad of 9,10-C; 18-C 2,3 branched. *Antenna* 0.29-0.36 mm long, about 0.33 length of head, brownish; seta 1-A inserted at basal 0.36-0.56, single; 2-6-A apical, short, 2-A on a rounded protuberance, longer than 3-6-A; 5-A with apical transparent division very short, basal division with a narrow accessory sensorium. *Mandible* with rather narrow basal half and strongly developed ventral tooth; a number of microspines on dorsolateral surface near base, small but rather stout, simple; MdS_1 only slightly longer than other 2; mandibular comb with lateral slender teeth simple. Cutting organ with lateral dorsal tooth simple, occasionally rudimentary mesal dorsal tooth present; ventral tooth very large, VT-4 almost as large as VT_0, VT_{1-3} equal, triangular, a tiny accessory denticle usually present at base on mesal surface; VB_1 not reaching apex of VT_0, VB_2 small, hair-like, often reduced. Piliferous process broad, rounded, apically cleft; labula also broad, not extending beyond apex of anterior part; 5 hair groups well developed, PPH_5 reaching lateral 0.25 of base of cutting organ. Mandibular hairs 5-7, laterally barbed, apically frayed. *Maxilla.* Cardo with seta 1-Mx usually single, rarely double, usually somewhat thickened in middle, lightly barbed. Mesostipes quadrate, lateral surface smooth; stipital sensoria equal, near anterolateral corner; 4-Mx near lateral margin, long, with prominent socket. Lacinia occupying a rather narrow anteromesal area, covered with numerous hair-like spicules; 5-Mx distad of middle, proximad of stipital sensoria; 6-Mx at apex of lacinial suture. Palpostipes about 0.67 length of mesostipes, only slightly basally thickened; palpal sensoria well developed, $S_{1,2}$ equal; $S_{3,4}$ subequal in length. *Mentum plate* with 13-17 rather large teeth. *Thorax.* Setae 1,8-P moderately long; 2-P short, usually single; 3-P short; 5,12-M and 10-T always with 3 or more branches; 7,10-M often double; 6-T usually single. *Abdomen.* Seta 6-I, II strong, multibranched; 7-I, II distinctly shorter and more slender than 6, I, II; 3-VI mesad of 1-VI; 5-VII laterad of 4-VII; 5-VIII stiff, pigmented; usually, 9-II, 14-III and 8-V single, 13-V double, and 3-IV and 4-VIII triple. Comb scales 9-16 in an irregular single or double row, individual scales rather small, apex shorter than base, subacute, evenly fringed apically and laterally with fine spicules. *Siphon* brownish 1.65-1.92 as long as wide, apex 0.56-0.67 of widest part; length 0.79-0.98 mm; microsculpture absent; seta 1-S fine, shorter than siphon diameter at insertion, located at apical 0.13-0.19 of siphon; 2-S short. *Saddle* covering only dorsal surface of segment X, 0.38-0.43 mm long, without microsculpture except a group of several spiculiferous ridges laterally on apical margin; seta 1-X shorter than saddle; 4-X of usually 10 (rarely 9) tufts, each with 3-11 barbed branches. Anal gills subequal, parallel-sided, apically rounded, 2.5-4.0 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 23♂, 17♀; with associated skins (5 l, 5 p), 2 l: Honshu (C-1901, C-1954, C-2081, D-0007, D-0018,

D-1157). 2♂, 5♀: Shikoku (G-1277). 11♂, 6♀; with associated skins (7 l, 7 p), 1 l: Kyushu (H-0073, H-0079, H-0081, H-0315). 2♂, 1♀: Yakushima (H-0082, H-0083). 1♀: Tsushima (H-2003). KOREA. 5♂, 2♀: Korean Peninsula (L-0834, L-0878). RYUKYU ARCHIPELAGO. 32♂, 15♀; with associated skins (2 l, 2 p), 2 L, 1 l: Amami Guntô (I-0244, I-0273, I-0283, I-0306, I-0307, I-0308, I-0309, I-0310, I-0312, I-1828, I-1837, I-2066). 5♂, 14♀, 26 L: Okinawa Guntô (J-0457, J-0522, J-0525, J-0528, J-0535, J-0537). 32♂, 98♀; with associated skins (2 l, 2 p): Yaeyama Guntô (K-0175, K-0179, K-0180, K-0181, K-0183, K-0561, K-0562, K-0568, K-0579, K-0580, K-0582, K-0583, K-0584, K-0719, K-0720, K-0722, K-0723, K-0724, K-0726, K-0727, K-0728, K-0730, K-0731, K-0733, K-0734, K-0736, K-0773, K-0777, K-0786, K-0911, K-0913, K-0931, K-0970, K-1037, K-1038, K-1078, K-1089, K-1243, K-1324, K-1328, K-1337, K-1422, K-1587, K-1596, K-1754, K-1771, K-1773).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Izu Shichitô, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula, Cheju Do). RYUKYU ARCHIPELAGO (Amami, Okinawa, Miyako and Yaeyama Guntô). TAIWAN. SOUTH CHINA. INDOCHINA. THAILAND. BURMA. INDIA. SRI LANKA.

BIONOMICS. Very common south of central Honshu. Larvae occur in various types of containers holding strongly polluted water. The type of the larval mandible and maxilla suggests that the species might be partially carnivorous. Adult females bite man throughout the day, being most active at dusk.

MEDICAL IMPORTANCE. Japanese encephalitis virus was isolated from wild-caught females (Shichijo et al. 1968). However, its capability for transmitting this virus to man is not certain (Yamamoto 1971). An unidentified viral agent was found in a pool of *subalbatus* collected in the Nagasaki area in 1970 (Hayashi et al. 1973).

(ii) TRIBE URANOTAENIINI

FEMALE. *Head.* Decumbent scales of vertex all broad; vertical bristles in a continuous row, but widely spaced; temporal bristles finer, anteriorly directed. Palpus unsegmented. Proboscis straight, rather short, slightly apically thickened. *Thorax.* Anterior pronotal lobes broadly separated, both anterior and posterior lobes with very few bristles. Scutum strongly arched; all scutal bristles usually well developed. Scutellum trilobed, long bristles fairly constant in number, 3-5 on each lobe, bristles lacking on portions between lobes; scales all broad. Postnotum bare. Paratergite narrow. Pleural bristles rather few, but often stout; spiracular, propleural, prealar, sternopleural and upper and lower mesepimeral bristles present; postspiraculars absent. Base of mesomeron well above that of hindcoxa. *Wing.* Membrane with extremely minute microtrichia visible only at 1000x. Squama bare; alula with or without fringe scales. Cell R_2 usually much shorter than vein r_{2+3}; 1a ending at or before level of cubital fork; m-cu proximad of r-m. *Legs.* Midfemur basally swollen; hindfemur and hindtibia subequal to respective forefemur and foretibia; hindtarsomere 1 equal or subequal to tibia in length. Claws simple, often unequal. Pulvilli undeveloped. *Abdomen.* Tip truncate. Seminal capsule single.

MALE. Antennal flagellum plumose; flagellomeres 12-13 not very elongate, both together at most 0.6 length of Flm 1-11, often less than half. Palpus as in female. Anterior claw of midtarsus longer than posterior claw, strongly curved. *Genitalia.* Tergum IX without lobes. Basistyle with basal

tergal lobe, without claspette. Dististyle simple, with terminal claw. Proctiger nearly membranous, without strongly sclerotized paraproct. Aedeagus composed of a pair of lateral pieces bearing well sclerotized teeth.

LARVA. *Head.* Seta 3-C dorsal; 5-8-C not in line; 14-C and 1-Mx close together. Hypostomal suture absent or incomplete, never reaching posterior tentorial pit. *Antenna* short, setae 2, 3-A distad of 1-A. Mouth brush of numerous slender hairs. *Mandible* with 5 spurs. *Maxilla.* Cardo often more or less square, hinged with cranial process, seta 1-Mx on margin of articulation. Mesostipes transverse, with one ventral ring-based seta. Lacinia apparently occupying anteromesal area of mesostipes, with one ventral or mesal ring-based seta and another on anterior surface. Palpostipes very large, without seta 3-Mx; palpal sensoria greatly developed. *Mentum plate* rather long, triangular. *Thorax* and *abdomen* pale, without strongly developed calli. Comb scales of VIII present. Siphon with acus and pecten; seta 1-S of single pair. Seta 4-X of 10-12 hairs, grid developed.

The tribe Uranotaeniini consists of a single genus, *Uranotaenia.*

TAXONOMIC DISCUSSION. The genus *Uranotaenia* has some peculiar characteristics. These include the extremely minute microtrichia and short vein 1a of the wing, the almost membranous proctiger, and the unusual larval mouthparts, especially the maxilla, which is difficult to homologize with that of other mosquitoes. The almost membranous proctiger is similar to that of the Anophelinae, but a close phylogenetic relationship between them is doubtful. Some adult characters, e.g., the single segmented and sexually unimorphic palpus, the reduced number of thoracic bristles, the presence of spiracular bristles, the bare squama, etc., are more often seen in Sabethini than in Culicini. It appears reasonable to consider the Uranotaeniini as a tribe of the Culicinae and place it near the Sabethini.

10. GENUS *URANOTAENIA* LYNCH ARRIBÁLZAGA

Uranotaenia Lynch Arribâlzaga, 1891a: 375; 1891b: 163. Type-species: *Uranotaenia pulcherrima* Lynch Arribâlzaga, 1891b; Argentina.

Small to medium-sized mosquitoes; *Ur. (Uranotaenia) macfarlanei* is the smallest mosquito in this region. Broad decumbent round-tipped scales of head and body often showing diverse colors varying with direction of light.

FEMALE. *Head.* Vertex with 3-5 pairs of vertical bristles, bristles of median pair close together and longer than others; 1-3 temporal bristles on each side close to eye. Antenna longer than proboscis; flagellomere 1 1.1-1.8 length of Flm 2. Palpus 0.07-0.17 length of proboscis. Proboscis shorter than forefemur, dark scaled. *Thorax.* Anterior pronotal lobe with 3 long dark bristles and occasionally with one or more fine yellowish bristles; posterior pronotal lobe with a single (rarely 2) dark bristle on posterior margin, occasionally with a few additional fine yellowish bristles. Scutum covered with lanceolate scales*; acrostichal bristles relatively short except for anterior ones; both anterior and posterior dorsocentrals long and stout; one to several humerals, 0-3 angulars, 1-2 posterior fossals, midfossal area usually lacking

*Species of *shillitonis* series (not represented in this region) have broad scutal scales and lack acrostichal bristles (Peyton 1972).

bristles. Scutellum with each lobe bearing 3-5 long dark bristles, additional fine dark bristles (usually a few) present. Pleura with broad scales always on sternopleuron and frequently on mesepimeron; pleural bristles; 1-3 propleurals, occasionally accompanied by a few fine bristles; 1-3 spiraculars, 1-3 prealars, 6 to more than 10 sternopleurals, 2 to more than 10 upper mesepimerals, 1, 2 lower mesepimerals, usually no postspiraculars. *Wing*. Veins usually dark scaled; 1a abruptly apically curved. Halter usually with pale stalk and dark scaled knob. *Legs*. Long and slender. *Abdomen* relatively short; tergum I hirsute; laterotergite scaled or bare. Segment VIII usually hardly visible.

MALE. Posterior claw of midtarsus occasionally reduced *(Ur. macfarlanei)*. *Genitalia*. Basistyle short, with basal tergal lobe bearing a few stout setae. Dististyle apical. Cercal seta present or absent. Aedeagus composed of paired lateral pieces. Paramere well developed, longer than aedeagus; basal plate broadly fused with basistyle.

LARVA. *Head*. Labrum with paired prominent apical processes, bearing often modified seta 1-C; 6-C well anteriad of 5-C; 8, 9-C on eye-level; 13-C closer to 12- than to 11-C; 14-C occasionally modified. *Antenna* less than 0.5 length of head; 1-A fine, 1-3 branched; 2-6-A occasionally modified. *Mandible* with a group of microspines laterobasally on dorsal surface; 5 mandibular spurs, MdS_1 longest, MdS_2 double or multiple and usually more slender than others, $MdS_{3,4}$ similar to MdS_1 in shape but smaller, MdS_5 shortest but usually broadest. Mandibular comb lacking; mandibular brush normally developed. Cutting organ well developed; 0-1 dorsal spine; 2 to more than 10 dorsal teeth; ventral tooth with 2-4 lateral and 3 mesal denticles, VT_3 usually somewhat modified; ventral blade usually stout, single or with 2, 3 accessory blades; pectinate brush lacking or rudimentary. Piliferous process at most moderately protrudent, with usually 2 groups of hairs. Mandibular hairs in a single row. Ventral artis well developed. *Maxilla* with cardo variable in shape. Mesostipes transverse; dorsal surface with 2 sclerotized bands: one from posteromesal corner to center of the sclerite (lacinial suture), another from middle of anterior margin to center of the sclerite and confluent with the former; ventral surface sclerotized on posterior half, the sclerotized area extending dorsally on lateral area; twin stipital sensoria, often with 1 or 2 well developed basal rings; seta 4-Mx usually at middle of anterior margin of ventral sclerotized area, usually long, occasionally modified. Lacinia with a ring-based seta (?6-Mx) on anterior surface at or near level of anterior termination of lacinial suture; another (difficult to homologize) on anteroventral membranous area, occasionally close to mesal margin. No sclerotized apodeme in articulation with paracoila. Palpostipes well developed, with entire mesal surface non-sclerotized, without seta 3-Mx; apical membranous area with or without small sclerotized dorsal and ventral plates (?remnant of true palpal segment); apex with 5 palpal sensoria and ampulla, all or some of the sensoria strikingly developed, often longer than stipital sensoria; $S_{1,2,4}$ with one or more basal rings. *Mentum plate* with medium-sized teeth. *Thorax*. Setae 1-3-P on a common sclerotized callus; 10-P longer than 9, 12-P; 13-P lacking in the species of this region; 7-M short or medium. *Abdomen*. Segment VIII with a strongly or poorly developed comb plate, bearing comb on posterior margin. *Siphon* with a single pair of seta 1-S. *Saddle* without acus; setae 2, 3-X subequal, 2, 3 branched; 4-X of 10-12 cratal hairs; grid occasionally incomplete.

DISTRIBUTION. Throughout tropical and temperate regions.

KEYS TO SUBGENERA OF *URANOTAENIA*

ADULT

Prealar area not separated from sternopleuron by a suture; alula usually fringed with broad scales; erect forked scales of vertex numerous and covering most of vertex.
Pseudoficalbia (p. 453)

Prealar area separated from sternopleuron by a suture; alula bare; erect forked scales of vertex absent or very few.
Uranotaenia (p. 468)

MALE GENITALIA

Lateral pieces of aedeagus connected by tergal and sternal bridges, if sternal bridge absent, tergum IX with bristles.
Pseudoficalbia (p. 453)

Lateral pieces of aedeagus connected by tergal bridge only; tergum IX without bristles. . . . . *Uranotaenia* (p. 468)

LARVA

Setae 5, 6-C slender, apically filamentous; grid of segment X usually not midventrally joined with saddle. . . . . *Pseudoficalbia* (p. 453)

Setae 5, 6-C very stout; grid of segment X midventrally joined with saddle. . . . . *Uranotaenia* (p. 468)

SUBGENUS *PSEUDOFICALBIA* THEOBALD

Pseudoficalbia Theobald, 1911: 272. Type-species: *Ficalbia inornata* Theobald, 1908, Transvaal (= *Uranotaenia fusca* Theobald, 1907, Sierra Leone); Peyton, 1972: 21 (resurrection).

ADULT. Suture between prealar knob and sternopleuron absent. Alula with dark broad fringe scales. Female claws equal or subequal. Lateral pieces of aedeagus connected both tergally and sternally (only tergally in *nivipleura*).

LARVA. Seta 5, 6-C simple. Grid not midventrally joined to saddle.

KEYS TO SPECIES OF *URANOTAENIA (PSEUDOFICALBIA)*

ADULT

1. Abdominal terga without pale bands. 2
   Abdominal terga with pale basal bands. 4

2(1). Scutum with a stripe of pale scales along side margin anteriad of wing root. . . . . *nivipleura* (p. 467)

Scutum without stripe of pale scales along side margin anteriad of wing root. 3

3(2). Scutum with a dark patch above wing root on each side. *novobscura* (p. 460)
Scutum without dark patch above wing root. . . . . *yaeyamana* (p. 460)

4(1). Side of thorax with a distinct dark patch covering posterior pronotal lobe, postspiracular area and upper sternopleuron; sternopleuron without minute midanterior seta; mesepimeron with upper scale patch, but without scales in middle. . . . . *ohamai* (p. 457)
Side of thorax with a rather indistinct dark patch covering postspiracular area and upper sternopleuron; sternopleuron with minute midanterior setae; mesepimeron without upper scale patch, but usually with translucent scales in middle. . . . . *jacksoni* (p. 455)

MALE GENITALIA

1. Tergum IX without bristles. 2
Tergum IX with bristles. 4

2(1). Aedeagus with 1,2 middle sternal teeth very small, occasionally reduced. *yaeyamana* (p. 460)
Aedeagus with middle sternal teeth (tooth) not very small. 3

3(2). Basal tergal lobe of basistyle usually with 3 distinctly larger bristles in addition to 2 strong setae. . . . . *jacksoni* (p. 455)
Basal tergal lobe of basistyle without distinctly larger bristles other than 2 strong setae. . . . . *ohamai* (p. 457)

4(1). Aedeagus with sternoapical teeth strong, extending more distally than tergoapical tooth; distance between apices of tergoapical teeth wider than that of sternoapical teeth; sternal bridge lacking. *nivipleura* (p. 467)
Aedeagus with tergoapical teeth extending more distally than slender sternoapical teeth; distance between apices of tergoapical teeth narrower than that of sternoapical teeth; sternal bridge present. *novobscura* (p. 460)

LARVA

1. Head with seta 1-C rudimentary; abdomen without stiff pigmented setae; segment VIII with large comb plate. 2
Head with seta 1-C stout, longer than labral process; abdomen with 2-I, II, 5-IV-VI, 11-I and 9-II-V remarkably stiff and pigmented; segment VIII with small, poorly sclerotized comb plate. 3

2(1). Head with seta 4-C single; pecten reaching basal 0.32-0.39; 1-S located beyond pecten at basal 0.39-0.43. . . . . *nivipleura* (p. 467)
Head with seta 4-C branched; pecten reaching apical 0.24-0.44; 1-S located at apical 0.26-0.43, usually within pecten. *novobscura* (p. 460)

3(2). Abdomen with seta 5-III as long and stiff as 5-IV; all pecten teeth of uniform shape, evenly spaced apically; saddle complete, with apex fringed with subequal fine spicules. . . . . *ohamai* (p. 457)
Abdomen with seta 5-III very short; pecten with apical teeth detached, the detached teeth usually simple, larger than basal fringed teeth; saddle incomplete, with apex fringed with spicules of different sizes. 4

4(3). Labral process with apex rounded; seta 1-S located at apical 0.40-0.46 (x = 0.43) of siphon, longer than siphon diameter. . *jacksoni* (p. 455)
Labral process with apex pointed; seta 1-S located at apical 0.32-0.39 (x = 0.36), length of siphon diameter. . . . . *yaeyamana* (p. 460)

100. *URANOTAENIA (PSEUDOFICALBIA) JACKSONI* EDWARDS
(Figs. 143, 144, 249; Table 132)

Uranotaenia jacksoni Edwards, 1935: 130 (♂). Type-locality: Hong Kong.
Uranotaenia stonei Bohart and Ingram, 1946a: 47 (♂, ♀, L). Type-locality: Chizuka, Okinawa Is., Ryukyu Archipelago; Peyton 1972: 36 (syn.).

FEMALE (Fig. 249). Wing length 2.7-3.4 mm. *Head.* Eyes contiguous above and below, or narrowly separated below. Vertex covered with broad dark scales and large erect forked dark scales; eye margin and tempus covered with broad pale ochreous scales; 4, 5 pairs of dark vertical bristles, the median pair very long, a pair of small brown bristles under them; 3 dark temporal bristles on each side, with several fine brown bristles ventrad to underside of head. Clypeus dark brown. Antennal pedicel yellowish brown, somewhat infuscate and with small hairs and scales on mesal side; flagellum 1.35-1.41 (4) length of proboscis; flagellomere 1 1.25-1.33 length of Flm 2. Palpus 0.12-0.13 (4) length of proboscis, dark scaled. Proboscis 0.80-0.82 (4) length of forefemur. *Thorax.* Pronotal integument pale yellowish brown with a number of broad dark or pale gray scales; anterior pronotal lobe bearing 3 stout dark bristles; posterior pronotal lobe usually bearing one dark stout and a few fine bristles near posterior margin. Scutum with integument light brown, partly grayish, covered with narrow dark grayish brown scales, a number of pale gray scales at apex; series of anterior dorsocentral bristles doubled in posterior part, 3-5 stout humerals often accompanied by 1-4 small bristles, usually one bristle near scutal angle, one stout posterior fossal close to dorsocentral series, occasionally one fossal present. Scutellar lobes covered with broad dark scales, each lobe bearing 3, 4 (rarely 5) stout dark bristles together with 1-5 small dark ones. Pleura pale yellowish brown, only upper margin of sternopleuron and subspiracular area infuscate, sometimes the dark area indistinct; upper and posterior parts of sternopleuron thinly covered with translucent scales; middle mesepimeron with several thin translucent scales (usually very difficult to see); pleura otherwise devoid of scales; 1-3 stout propleural bristles accompanied by several fine pale ones, 1, 2 dark spiraculars, 1-3 stout dark prealars, one stout sternopleural on posterior margin just above level of lower margin of mesepimeron, about 10 dark bristles forming a row along upper to posterior margin of sternopleuron above this bristle, several fine pale bristles along posterior margin below it; a group of fine hairs on anterior sternopleuron above level of propleuron; 7-10 upper mesepimerals and one stout lower mesepimeral. *Wing.* Cell R_2 0.39-0.47 (6) length of vein

r_{2+3}. *Legs*. Coxae pale, forecoxa with pale or gray scales, mid- and hindcoxae with translucent scales. Femora, tibiae and tarsi dark scaled, only underside of femora somewhat basally pale. Hindtarsomere 1 nearly length of tibia. Claws equal. *Abdomen*. Tergum I with a median patch of dark scales and with pale lateral scales; II-VII dark scaled, III-VII with a pale ochreous basal band*; sterna pale scaled.

MALE (Figs. 143, 249). Wing length 2.3-3.0 mm. Antennal flagellum 1.08-1.13 (4) length of proboscis; flagellomeres 12 and 13 together 0.40-0.44 length of Flm 1-11, 12 equal to or slightly longer than Flm 13. Proboscis 0.85-0.86 (4) length of forefemur. Palpus 0.09-0.11 (4) length of proboscis. Mesepimeron usually without scales. Cell R_2 0.36-0.47 (5) length of vein r_{2+3}. *Genitalia*. Tergum IX poorly sclerotized, fairly large. Sternum IX transverse, oblong, with sclerotized basal edge. Basistyle 1.6-1.8 as long as wide (length measured from sternal base), apically narrowed, bristled over entire surface except for tergal apex, with a rather large bristle at middle of tergal side; basal tergal lobe moderately protrudent, bearing 2 long setae and a number of bristles, one bristle proximal to the setae and usually 2 bristles mesal to the setae fairly thick. Dististyle slightly shorter than basistyle, 9.0 length of middle width, gently arcuate, bearing 10 or more minute setae near apex. Tergite X falciform, separated at middle; 2 cercal setae. Aedeagus length of apical width, with base narrower than apex, well sclerotized, lateral pieces tergally connected by a joint at apical 0.25 and sternally by a poorly sclerotized, narrow bridge, apex of each piece armed with 2 stout lateroapically directed tergal teeth and 3 (rarely 4) recurved sternal teeth, of the sternal teeth, apical tooth usually largest and middle tooth moderate.

LARVA (Fig. 144). *Head*. Width 0.66-0.74 mm; lightly pigmented, as long as wide or slightly longer than wide; labral process as long as wide and rounded at apex; seta 1-C laterobasally on labral process, very stout, short, slightly incurved, about 5.0 as long as wide; 4, 5-C on the same level and posterior to 7-C; 6-C somewhat thickened, nearly tandem with 5-C and anterior to 7-C; 9-C usually double. *Antenna* 0.21-0.29 mm long, lightly pigmented; seta 1-A 2 branched, rarely 3 branched, inserted at about apical 0.4, not reaching apex of shaft. *Mandible* and *maxilla* nearly identical with those of *ohamai*. *Mentum plate* with 13-17 teeth. *Thorax*. Setae 1-M, 1, 3-T fairly stiff and stellate, their longest branch distinctly shorter than antenna; 5-T stiff; 14-P not very stiff; usually, 9-P triple, 1-M 4 branched and 4-M double. *Abdomen*. Setae 2, 11-I, 2-II, 9-II-V, 5-IV-VI stiff and pigmented; 2-I, II about length of antenna, 5-III 0.25-0.33 length of 5-IV; 6-I with dorsal branch longer than ventral branch and subequal to 7-I; 6-II 0.67 of 6-I, 3.1-3.4 length of 2-II, with 2 unequal branches; 7-II equal to 6-II; 10-I, 12-II, 6-III, 2, 6, 11-IV, 1, 11, 13-V, 6-VI, 1, 5-VII usually double; 1, 8-III, 0, 1-IV, 14-V, 11, 12-VII usually single. Segment VIII with small and very poorly sclerotized (barely visible) comb plate bearing a row of 14-20 comb scales, individual scales subparallel-sided, laterally and apically fringed with minute spicules, apical spicule not markedly larger than others; 1, 2-VIII usually single, on a narrow sclerotized pigmented callus; 14-VIII usually single. *Siphon* lightly pigmented, slightly sinuate; length 0.82-0.96 mm, index 3.2-3.7; pecten extending to apical 0.44-0.51 (x = 0.48) of siphon, of 18-26 teeth, apical 1-3 teeth detached,

*Base of tergum II often exposed in dried specimens, it gives an appearance of a basal pale band but actually there are no pale scales.

detached teeth usually slightly larger, each tooth apically fringed with spicules, 1, 2 apical teeth (not all detached teeth) simple; seta 1-S beyond pecten at apical 0.40-0.44 ($x = 0.43$), longer than width of siphon, weakly barbed in apical half; 2-S on apical margin, shorter than apical pecten tooth. *Saddle* incomplete, with irregularly arranged spines of various sizes on apical margin; seta 1-X usually double, shorter than saddle; 3-X usually double; 4-X of 10 cratal tufts, each tuft 5-9 branched, 8th tuft exceptionally long, 2 branched. Anal gills apically tapering, longer than saddle, ventral gill usually slightly longer than dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 28♂, 21♀; with associated skins (11 l, 11 p), 24 L, 23 l: Okinawa Guntô (paratypes of *Uranotaenia stonei*, 2♂, 2♀: Chizuka, Okinawa Is., IX 1945, on damp rocks, Bohart & Ingram; 2 L: Chizuka, Okinawa Is., 20 IX 1945, deep rock hole, Bohart, No. 57884, USNM. J-1207, J-1252, J-1254, J-1255, J-1256, J-1286).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa Guntô). HONG KONG.

BIONOMICS. Bohart and Ingram (1946a) collected larvae of *jacksoni* (as *stonei*) from heavily shaded deep rock holes along the banks of streams and a hillside spring. All our larval specimens were obtained from fresh water crab holes along shaded streamlets in the hilly area of Motobu Peninsula, central Okinawa Is. One of their larval collections also contained *Culex tritaeniorhynchus* (Peyton 1977). Bohart and Ingram (1946b) found larvae of *jacksoni* (as *stonei*) hanging straight down from the water surface and observed them moving sinuously when disturbed.

101. *URANOTAENIA (PSEUDOFICALBIA) OHAMAI* TANAKA, MIZUSAWA AND SAUGSTAD
(Figs. 145, 146, 250; Table 133)

Uranotaenia (Pseudoficalbia) ohamai Tanaka, Mizusawa and Saugstad, 1975a: 27 (♂, ♀, L). Type-locality: Yashigawa, Iriomote Is., Ryukyu Archipelago.

Uranotaenia stonei: Bohart, 1959: 196 (in part), Ishigaki Is., Ryukyu Archipelago.

FEMALE (Fig. 250). Wing length 2.4-2.7 mm. *Head.* Eyes contiguous above and below, or narrowly separated below. Vertex covered with broad dark grayish brown scales and with large, pale or dark brown, erect forked scales; eye margin bordered with broad white or pale ochreous scales; tempus covered with broad pale ochreous or grayish brown scales; usually 3 pairs of dark vertical bristles, an additional brownish fine pair located beneath long median pair; 2,3 dark temporal bristles on each side, with several fine bristles ventrad to underside of head. Clypeus dark brown. Antennal pedicel laterally light brown, mesally dark brown, with a few fine bristles and scales on mesal surface; flagellum 1.32-1.34 (2) length of proboscis; flagellomere 1 1.16-1.19 length of Flm 2. Palpus 0.11-0.13 (3) length of proboscis, dark scaled. Proboscis 0.87-0.92 (3) length of forefemur. *Thorax.* Anterior pronotal lobe yellowish brown, darker above, with broad very dark gray scales above, translucent scales below, bearing 3 stout dark bristles; posterior pronotal lobe dark brown, with a few translucent, rather broad scales, bearing one (rarely 2 on one side) dark bristle near upper posterior corner. Scutum with integument light brown, partly grayish, roughly covered with narrow curved grayish brown scales, a few rather broad pale scales along anterior

margin; series of anterior dorsocentral bristles doubled in posterior part, one stout humeral accompanied by 1-3 shorter ones, 1,2 bristles near scutal angle, one posterior fossal close to dorsocentral series. Scutellar lobes covered with broad dark brown scales, both lateral lobes bearing 3 stout dark bristles, median lobe bearing 4 such bristles, each lobe with 3,4 additional small bristles. Pleura dark brown on postspiracular area and upper sternopleuron, otherwise quite pale; sternopleuron sparsely covered with rather broad, white subhyaline scales; upper mesepimeron with translucent scales; one stout propleural bristle accompanied by several fine yellowish ones, 2 spiraculars (rarely 1,3), one stout prealar; sternopleurals forming a continuous row along upper to posterior margin, upper 3-6 dark, others brownish or yellowish, stout or fine, but one rather stout brown bristle always present just above level of lower margin of mesepimeron; 4-7 fine upper mesepimerals, one stout dark lower mesepimeral. *Wing*. Cell R_2 0.40-0.50 (5) length of vein r_{2+3}. *Legs*. Coxae and trochanters pale; forecoxa with pale gray scales basally on anterior surface, hindcoxa with a few translucent scales. Femora, tibiae and tarsi dark scaled; lower posterior surface of femora basally pale. Hindtarsomere 1 length of or slightly longer than tibia. Claws equal or sometimes anterior claw slightly wider than posterior claw. *Abdomen*. Terga covered with blackish brown scales; laterotergite with pale ochreous scales; III-VI each with a complete pale ochreous basal band; VII sometimes with an indistinct pale basal band. Sterna covered with pale ochreous scales, VI and VII often with an indistinct basal band or patches of darker scales.

MALE (Figs. 146, 250). Wing length 2.1-2.4 mm. Antennal flagellum 1.06-1.07 (3) length of proboscis; flagellomeres 12 and 13 equal in length, both together 0.40-0.46 length of Flm 1-11. Cell R_2 0.33-0.44 (3) length of vein r_{2+3}. *Genitalia*. Tergum IX poorly sclerotized, fairly large. Sternum IX rounded triangular, membranous, with basal edge well sclerotized. Basistyle apically narrowed, 1.5 as long as wide (length measured from sternal base), bristled over entire surface except for tergal apex, with an outstanding bristle at center of tergal surface; basal tergal lobe slightly protrudent, bearing 2 long setae and a number of bristles, usually 2 bristles mesal to the setae slightly stouter than others. Dististyle only slightly shorter than basistyle, rather stout, gently curved, apically tapering, bearing 10 or more small setae near apex. Tergite X falciform, moderately separated; 2 cercal setae. Aedeagus slightly wider than long, with base usually as wide as apex, well sclerotized; lateral pieces connected tergally by a joint at apical 0.33 and sternally by a moderately sclerotized bridge, apex of each piece with 2 large dorsal teeth lateroapically directed and with 3,4 recurved ventral teeth, the basalmost largest, middle 1,2 not much smaller.

LARVA (Fig. 145). *Head*. Width 0.66-0.75 mm; lightly pigmented, approximately as long as wide; labral process slightly longer than basal width, rounded at apex; seta 1-C laterobasally on labral process, very stout, short, slightly incurved, 4.0-5.0 as long as wide, shorter than distance between bases; 4,5-C on the same level and slightly posterior to 7-C; 6-C somewhat thickened, slightly anterior to 7-C and slightly laterad of or almost tandem with 5-C; 8-C usually single. *Antenna* 0.19-0.23 mm long, lightly pigmented; seta 1-A single, fine, inserted slightly distad of middle, not reaching apex of shaft. *Mandible* with relatively large pectinate microspines proximally on lateral surface; MdS_2 double. Cutting organ with one dorsal spine; 2 dorsal teeth, lateral tooth triangular, mesal tooth with lateral division similar to lateral tooth in shape and size and with mesal division of a much shorter triangle; ventral tooth with 4 lateral denticles, 2 of them (VT-2,4) only slightly

smaller than VT_0; VT_3 square; ventral blade single, stout, not reaching apex of VT_0, without accompanying pectinate brush. Piliferous process not protrudent, with a tuft of dorsoapical hairs and a row of ventral hairs; mandibular hairs 8-10, pectinate. *Maxilla*. Cardo square, attaching to lateral margin of postgenal process, with single seta 1-Mx on mesocaudal corner. Mesostipes with stipital sensoria laterally on cephalic membranous area, with 2 well developed basal rings, basal one ring-shaped, 2nd fairly large, with apex stepwise; 4-Mx fairly long. Lacinial ventral membranous area hairy, with 3 broad flat brush-like spicules on mesal area, most lateral spicule longest, with 4, 5 main branches together with several secondary fine branches, mesal 2 spicules with many finer branches; lacinial suture mesocaudally broadened and covered with short, wide, apically pectinate spicules; lacinial dorsal membranous area very hairy; lacinial cephalic surface occupied by a very dense brush of mostly curved pectinate hairs, the dorsalmost hairs simple; mesal margin with many strong spine-like, apparently flattened spicules; a ring-based seta (?5-Mx) on dorsal membranous area laterad of brush-like hair; another ring-based seta (?6-Mx) on cephalic border just ventrad of dense brush. Membranous apex of palpostipes flanked by 2 sclerotized plates, dorsal plate rather wide, ventral one very narrow; $S_{1,2}$ well developed, longest of all palpal and stipital sensoria, each with a basal ring; S_4 curved, with a basal ring; S_3 subequal in length to S_4, straight and pointed, S_5 most proximal, very small. *Mentum plate* with 14-16 teeth. *Thorax*. Setae 14-P, 1, 14-M and 1-T stiff and stellate; 3-T often fairly stiff; 5-T stiff; 1, 9-P usually double; 1-M usually 4 branched. *Abdomen*. Setae 1, 11-I, 2-I, II, 5-III-VI and 9-II-V markedly stiff and pigmented; 6-I with 2 subequal branches; 7-I equal to 6-I; 6-II 1.1-1.6 length of 2-II, with 2 equal branches, 0.60-0.67 length of 6-I, slightly shorter than 6-III, and equal to 7-II; 2, 13-I, 5-II, 8-III, 3, 10-IV, 10-V, 12-VI, 11, 12, 14-VII usually single; 11-I, 4-II, 6, 12-III, 4, 6, 11-IV, 4, 12-V, 4, 11-VI and 10-VII usually double; 12-I, 1, 6-VI usually triple; 13-IV, V usually 4 branched. Segment VIII with poorly sclerotized comb plate bearing a comb of 13-17 scales, each scale rather long and slender, of about equal width from base to apex, fringed with minute spicules; 1, 2-VIII on a common narrow sclerotized callus. *Siphon* slightly sinuate, lightly pigmented; length 0.72-0.90 mm, index 3.5-4.0; pecten reaching basal 0.40-0.48 (x = 0.45) of siphon, of 14-24 evenly spaced teeth, sometimes with 1, 2 basal abortive ones, each tooth fringed with minute spicules along apical and anterior margin; seta 1-S longer than width of siphon, usually placed slightly distad of pecten at middle of siphon, sometimes just at apex of pecten. *Saddle* complete, spinulate on apical margin, spinules of middle part slightly smaller; seta 1-X shorter than saddle, usually 3 branched; 4-X of 10 cratal tufts (12 in one of 20 specimens), each 3-7 branched, 8th tuft longest, 3, 4 branched. Anal gills longer than saddle, apically tapering, equal.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 236♂, 131♀; with associated skins (27 l, 27 p), 82 L, 10 l: Yaeyama Gunto (Holotype ♂: K-1028-7; paratypes 28♂, 32♀; with associated skins (17 l, 17 p), 66 L: K-0722, K-0724, K-0726, K-0730, K-0731, K-0732, K-0924, K-0925, K-0946, K-1002, K-1010, K-1016, K-1018, K-1026, K-1027, K-1028, K-1029, K-1030, K-1031, K-1084, K-1086, K-1099, K-1119, K-1128, K-1129, K-1130, K-1321, K-1379, K-1408, K-1466. 207♂, 99♀; with associated skins (9 l, 9 p), 16 L, 10 l: K-0724, K-0726, K-0730, K-0731, K-0732, K-0919, K-0924, K-0925, K-0946, K-0951, K-0956, K-1002, K-1010, K-1015, K-1016, K-1018, K-1021, K-1026, K-1027, K-1028, K-1035, K-1057, K-1065, K-1078, K-1084, K-1085, K-1086, K-1088, K-1093, K-1096, K-1098, K-1099, K-1101, K-1111, K-1119,

K-1121, K-1126, K-1128, K-1129, K-1130, K-1212, K-1220, K-1241, K-1247, K-1317, K-1321, K-1324, K-1326, K-1328, K-1337, K-1375, K-1407, K-1464, K-1466, K-1469, K-1470, K-1601, K-1609, K-1615, K-1616).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

BIONOMICS. The larvae of this species occur in fresh water crab holes along shaded streamlets in lowlands or at the foot of mountains, very often in association with *Ur. (Pfc.) yaeyamana* and *Culex (Lophoceraomyia) tuberis*. Occasionally, *Cx. (Lop.) minor*, *Cx. (Lop.) infantulus* and *Cx. (Culiciomyia) ryukyensis*, and rarely a species of *Aedes (Stegomyia) scutellaris* group and *Ur. (Ura.) macfarlanei* were found together. Bohart (1959) obtained his *stonei* in cave springs and rock holes as well as in crab holes on Ishigaki Is. The adults are commonly found in shrubbery or crab holes. They have not been observed to attack man.

102. *URANOTAENIA (PSEUDOFICALBIA) YAEYAMANA* TANAKA, MIZUSAWA AND SAUGSTAD
(Figs. 146, 147, 251; Table 134)

Uranotaenia (Pseudoficalbia) yaeyamana Tanaka, Mizusawa and Saugstad, 1975a: 31 (♂, ♀, L). Type-locality: Funaura, Iriomote Is., Ryukyu Archipelago.

Uranotaenia stonei: Bohart, 1959: 196 (in part): Ishigaki Is., Ryukyu Archipelago.

FEMALE (Fig. 251). Wing length 2.7-3.1 mm. *Head.* Eyes contiguous above and below, or narrowly separated below. Vertex covered with broad dark grayish brown scales and large, erect forked dark-brown scales; eye margin and tempus covered with broad pale grayish scales; 3, 4 pairs of black vertical bristles, an additional pair of small brown bristles located beneath long median pair; usually 3 temporal bristles on each side with several finer brown bristles ventrad to underside of head. Clypeus rather dark brown. Antennal pedicel yellowish brown, mesal side infuscate, with several fine bristles and a few small gray scales; flagellum 1.21-1.38 (5) length of proboscis; flagellomere 1 1.11-1.23 length of Flm 2. Palpus 0.11-0.14 (5) length of proboscis, dark scaled. Proboscis 0.80-0.85 (5) length of forefemur. *Thorax.* Pronotal lobes with brown integument and dark gray scales; anterior lobe bearing 3 dark stout bristles, posterior lobe bearing 1, 2 dark bristles. Scutum with integument brown, partly grayish, roughly covered with rather narrow, grayish brown scales, sometimes rather broad, pale gray, scales on anterior promontory; series of anterior dorsocentral bristles doubled in posterior part, one stout humeral bristle accompanied by 1-3 shorter ones, 1-3 bristles near scutal angle, one posterior fossal close to anterior dorsocentral series. Scutellar lobes covered with broad dark scales, both lateral lobes bearing 3 dark bristles, median lobe bearing 4, each lobe with 2-6 additional small bristles. Pleura rather dark brown on postspiracular area, upper and middle sternopleuron and whole or upper and lower mesepimeron, otherwise pale; sternopleuron and mesepimeron sparsely covered with rather broad, translucent scales; one stout dark propleural bristle accompanied by several small brown ones, one spiracular, one stout dark prealar; a fairly stout dark brown sternopleural bristle always present just above level of lower margin of mesepimeron; above this, about 10 black or dark brown, mostly stout bristles form a continuous row along upper to upper posterior margin of

sternopleuron, fine yellowish bristles along lower posterior margin; 5-13 fine upper mesepimerals and one (rarely 2) stout dark lower mesepimeral. *Wing.* Cell R_2 0.37-0.41 (5) length of vein r_{2+3}. *Legs.* Coxae pale, with dark gray scales on forecoxa, pale scales on mid- and hindcoxae; trochanters pale. Femora, tibiae and tarsi dark scaled; lower posterior surface of femora pale. Hindtarsomere 1 length of or slightly longer than tibia. Claws equal. *Abdomen.* Terga covered with dark brown scales, without pale bands; scales of laterotergite rather pale. Sterna covered with pale ochreous scales.

MALE (Figs. 146, 251). Wing length 2.3-2.6 mm. Antennal flagellum length of forefemur; flagellomere 12 length of or slightly shorter than Flm 13, both together 0.39-0.45 (5) length of Flm 1-11. Cell R_2 0.33-0.39 (6) length of vein r_{2+3}. Anterior claw of foretarsus slightly longer than posterior one. *Genitalia.* Tergum IX poorly sclerotized, fairly large. Sternum IX rounded triangular, membranous, with basal edge well sclerotized. Basistyle short, apically narrowed, 1.5 as long as wide (length measured from sternal base), bristled over entire surface, with an outstanding bristle at center of tergal side; basal tergal lobe slightly protrudent, with 2 long setae and a number of bristles, one bristle proximal to the setae and usually 2 bristles mesal to the setae fairly stout. Dististyle only slightly shorter than basistyle, rather stout, gently arcuate, apically tapering, bearing 10 or more small setae near apex. Tergite X falciform, separated at middle; 2 cercal setae. Aedeagus slightly wider than long, with base usually narrower than apex, well sclerotized; lateral pieces connected tergally by a joint at apical 0.33, and sternally by a moderately sclerotized bridge, apex of each piece armed with 2 large dorsal teeth lateroapically directed and with 2-4 (usually 3) recurved ventral teeth, the apicalmost largest, middle one or 2 very small and occasionally reduced.

LARVA (Fig. 147). *Head.* Width 0.65-0.75 mm; lightly pigmented, as long as or slightly longer than width; labral process longer than basal width, pointed at apex; seta 1-C laterobasally on labral process, stout, slightly incurved, about 6.0 as long as wide, shorter than distance between bases; 4, 5-C on the same level and posterior to 7-C; 6-C somewhat thickened, tandem with 5-C and anterior to 7-C; 9, 13-C usually double. *Antenna* 0.23-0.25 mm long, lightly pigmented; seta 1-A single or double, rarely 3 branched, inserted slightly distal to middle, usually not reaching apex of shaft. *Mandible* and *maxilla* almost identical with those of *ohamai*. *Mentum plate* with 14-17 teeth. *Thorax.* Setae 1-M, T, and 3-T stiff and stellate, their longest branch length of antenna; 5-T stiff; 14-P fairly stiff and very strongly barbed; usually, 11-M single and 9-T 6 branched. *Abdomen.* Setae 2, 11-I, 2-II, 9-II-V and 5-IV-VI noticeably stiff and pigmented; 2-I, II longer than antenna; 1-I and 5-III stiff but very small; 6-I with dorsal branch slightly longer than ventral one and equal to 7-I; 6-II with dorsal branch slightly longer than ventral one, subequal to 7-II and 2.4-2.9 length of 2-II; 1-I, 7-II, 0, 3-III, 0, 10-IV, 0, 3, 10-V, 0, 12, 14-VI and 11, 12-VII usually single; 9-VII usually single, often with a tiny barb-like branch; 10-II, 6-III, 3, 4, 6, 11-IV, 1, 11-V, 1, 11-VI and 1, 7, 10-VII usually double; 12-I and 3-VII usually triple. Segment VIII with small and very poorly sclerotized comb plate bearing 13-20 comb scales, individual scales subparallel-sided, laterally and apically fringed with spinules, apical spinule slightly larger than others; 1, 2-VIII on a sclerotized pigmented callus; usually, 1-VIII single, 2-VIII double and 14-VIII single. *Siphon* slightly sinuate, lightly pigmented; length 0.77-0.98 mm, index 3.2-4.0; pecten reaching apical 0.36-0.45 (x = 0.41) of siphon, of 15-24 teeth, apical 2-4 detached, sometimes 1-3 abortive teeth at base, each tooth apically fringed with spinules, detached teeth simple and distinctly larger than others; seta 1-S beyond pecten at apical 0.32-

0.39 (x = 0.36) of siphon, as long as width of siphon; 2-S on apical margin, shorter than apical pecten tooth. *Saddle* incomplete, with irregularly arranged spines of various sizes on apical margin; seta 1-X shorter than saddle; 2,3-X usually double; 4-X of 10 cratal tufts, 8th tuft longest and usually 2,3 branched, others 4-8 branched. Anal gills subequal, narrow, apically tapering, slightly longer than or length of saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 78♂, 50♀; with associated skins (24 l, 24 p), 76 L; 40 l: Yaeyama Guntô (Holotype ♂: K-1094-28; Paratypes 61♂, 43♀; with associated skins (15 l, 15 p), 74 L: K-0722, K-0724, K-0730, K-0731, K-0732, K-0739, K-0919, K-0924, K-0925, K-0941, K-1002, K-1010, K-1065, K-1078, K-1085, K-1094, K-1096, K-1096, K-1098, K-1099, K-1126, K-1224, K-1247, K-1249, K-1317, K-1320, K-1321, K-1324, K-1328, K-1337, K-1373, K-1375, K-1377, K-1407, K-1465, K-1467, K-1470. 16♂, 7♀; with associated skins (8 l, 8 p), 2 L, 40 l: K-1094, K-1096, K-1221, K-1248, K-1372, K-1464, K-1470).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

BIONOMICS. Larval habitats same as *Ur. ohamai*. One female was in a light trap at Itokawa-rindô, Iriomote Island, 14-15 IV 71.

103. *URANOTAENIA (PSEUDOFICALBIA) NOVOBSCURA* BARRAUD

Uranotaenia novobscura Barraud, 1934: 84 (♂, ♀, L). Type-locality: Sukna, Darjeeling District, West Bengal, India.

DISTRIBUTION. PALAEARCTIC JAPAN. RYUKYU ARCHIPELAGO. TAIWAN. MALAYA. INDIA.

103A. *URANOTAENIA (PSEUDOFICALBIA) NOVOBSCURA NOVOBSCURA* BARRAUD
(Figs. 148, 149, 252; Table 135)

Uranotaenia novobscura Barraud, 1934: 84 (♂, ♀, L). Type-locality: Sukna, Darjeeling District, West Bengal, India; Peyton, 1976 (taxonomy; personal communication).

Uranotaenia bimaculata: Edwards, 1921b: 283. Tokio, Japan.

Uranotaenia (Uranotaenia) bimaculata: LaCasse and Yamaguti, 1950: 42 (♂, ♀, L).

FEMALE (Fig. 252). Wing length 2.0-2.8 mm. *Head.* Eyes very narrowly separated above and below. Vertex covered with broad bluish-tinged brown scales; pale erect forked brown scales over entire vertex; tempus covered with broad pale ochreous scales; usually 3, rarely 4, dark vertical bristles and 3 dark temporal bristles on each side. Clypeus brown to yellowish brown. Antennal pedicel yellowish brown, infuscate on mesal side, with a few small scales and several short bristles; flagellum 1.41-1.50 (5) length of proboscis; flagellomere 1 1.21-1.36 length of Flm 2, pale in basal half, with several scales. Palpus 0.15-0.17 (5) length of proboscis, dark scaled. Proboscis 0.74-0.76 (4) length of forefemur. *Thorax.* Pronotal lobes not scaled; anterior lobe pale yellowish brown, bearing one fine and 3 stout dark bristles; posterior lobe dark brown, with a single dark bristle near posterodorsal corner. Scutum with integument grayish brown, with a pair of large, very dark

brown supraalar patches, covered with grayish brown lanceolate scales except for supraalar area and prescutellar space, scales of anterior margin white; usually, 2 humeral, one angular and one posterior fossal bristles. Scutellum with integument rather pale brown, covered with bluish-tinged, grayish brown broad scales; lateral lobe bearing usually 3, rarely 4, long dark bristles together with 2-4 fine ones; median lobe bearing 4 long dark bristles together with 0-3 fine ones. Paratergite dark brown. Pleura dark brown on postspiracular area, prealar knob, upper sternopleuron, mesepimeron and lower metapleuron, otherwise pale brown or almost colorless; propleuron mesally with a few broad semitranslucent scales, sternopleuron posteriorly covered with broad semitranslucent scales; 2, 3 pale yellowish brown propleural bristles, one (rarely 2) dark spiracular, one (rarely 2) dark prealar; 8-10 sternopleurals, of which upper 2, 3 are dark, others pale; 3, 4 fine upper mesepimerals, one long dark lower mesepimeral. *Wing*. Remigium pale scaled in basal half. Cell R_2 0.53-0.59 (5) length of vein r_{2+3}. Halter with brownish stalk. *Legs*. Coxae with translucent scales. Femora posteroventrally pale, legs otherwise dark scaled. Hindtarsomere 1 0.94-1.00 (5) length of tibia. Claws equal. *Abdomen*. Tergum I with a median patch of dark scales; laterotergite unscaled; II-VII dark scaled. Sterna covered with pale ochreous scales.

MALE (Figs. 149, 252). Wing length 1.9-2.3 mm. Antennal flagellum 1.06-1.20 (5) length of proboscis; pedicel and flagellomere 1 lacking scales; flagellomeres 12 and 13 together 0.51-0.52 length of Flm 1-11, Flm 12 1.59 of Flm 13. Palpus 0.09-0.15 (5) length of proboscis; proboscis 0.81-0.88 (3) length of forefemur. Cell R_2 0.48-0.58 (5) length of vein r_{2+3}. Hindtarsomere 1 0.91-1.05 (5) length of tibia; claws of fore- and hindtarsi equal. *Genitalia*. Tergum IX weakly and rather broadly sclerotized along apical margin, with 2-6 bristles on each side of middle near apex. Sternum IX membranous, sclerotized only on basal edge, without bristle. Basistyle 1.33 as long as wide, basally broadened, bristled throughout, laterally and sternally scaled; basal tergal lobe slightly protrudent, with 4 strong setae and a few bristles. Dististyle rather thick, 4.0 as long as wide, 0.8 length of basistyle, with a number of minute apical setae; apex curved and pointed; claw broad, unpigmented. Paraproct pilose, without cercal seta; tergite X weakly sclerotized, not or only slightly extending beyond apical margin of tergum IX, not fused at middle. Aedeagus excluding teeth 1.6-1.8 as wide as long, sclerotized, lateral pieces connected by a narrow, strongly sclerotized tergal bridge at apical 0.33, and a narrow, weakly sclerotized, arcuate sternal bridge; each piece with 4 teeth: dark, laterodistally directed, strong tergoapical tooth; dark, small tergolateral tooth; pale, laterally directed, slender sternoapical tooth; and dark, proximally directed, strong sternal tooth; tergoapical tooth usually extending distally beyond sternoapical tooth but always extending less laterally than it, distance between apices of sternoapical teeth 1.4-1.8 as long as that between apices of tergoapical teeth.

LARVA (Fig. 148). *Head*. Width 0.61-0.73 mm; dark brown, 1.1 as wide as long; seta 1-C dorsosubapically on labral process, rudimentary; 0-C very short but broad; 4-C with usually more than 10 slender, partly dendritic branches; 5-C posteriad of antennal base; 6-C nearly tandem with 5-C, but most anterior among 4-7-C; 7-C a little anteriad of antennal base; 9-C usually double; 14-C short, stiff. *Antenna* 0.11-0.15 mm long, about 0.2 length of head, about 4.0 as long as wide, dark brown; seta 1-A inserted at apical 0.25-0.35, 2-4 branched, usually extending slightly beyond apex of shaft; 2-6-A relatively stout, dark brown; 2-4-A with filamentous apex. *Mandible* with several stout microspines laterodorsally near base; MdS_2 double, slender,

much shorter than MdS_1; $MdS_{3,4}$ intermediate between $MdS_{1,2}$ in length. Mandibular brush with several lateral hairs stouter than other. Cutting organ with one very strong dark dorsal spine; 2 dorsal teeth, both deeply bifurcate; ventral tooth well developed, with 3 strong lateral denticles of nearly same size as VT_0; VT_3 very broad and apparently flattened; ventral blade single, reaching apex of VT_0, basally broadened, with strong mesal pectination; apparently one rudimentary hair-like pectinate brush. Piliferous process not protrudent, with apically tufted hairs and ventrally a row of hairs; only 3 mandibular hairs. *Maxilla*. Cardo trapezoidal; seta 1-Mx single, slender. Stipital sensoria on anterolateral corner of mesostipes, lateral sensorium smaller, both arising from a common, unequally bifurcate, well developed basal ring; 4-Mx at middle of anterior margin of ventral sclerotized area. Lacinia with a ring-based seta (?6-Mx) at base of a dense group of pectinate hairs on anterior margin, and another (?5-Mx) between it and 4-Mx on ventral surface; mesal margin anteriorly with 2 transparent brush-like broad flattened spicules and posteriorly many basally broadened spicules. Membranous apex of palpostipes with sclerotized dorsal plate and very small ventral plate; $S_{1,2,4}$ well developed, pigmented, subequal in size; S_1 with one, S_2 with 2 basal rings, both arising from another common basal ring; S_4 with 3 basal rings; S_3 short, pointed, pigmented; S_5 very small, unpigmented. *Mentum plate* longer than wide, with 13-17 (most frequently 15) teeth. *Thorax*. Seta 12-P shorter than 9-P; 14-P simple to strongly barbed; 3-T often partly dendritic; 9-P, 2, 5-M and 12-T usually single. *Abdomen*. Segments II-VII ventrally spiculate; 6, 7-I, II pigmented; 6-III-VI, when single, usually darker and more strongly barbed than when branched; 3-VII longest seta on the segment; 2-I, 9, 11-II, 11-III, 9-IV, 4, 12-VII usually single; 4-III, 11, 12-IV and 10-V usually double. Segment VIII with large, dark brown, lateral comb plate bearing 0-VIII dorsolaterally on anterior margin and comb ventrolaterally on posterior margin; comb scales 7-11 including 0-3 abortive teeth, individual scales pointed, fringed with fine spicules up to apex and ventrobasally with several denticules. *Siphon* dark brown, slightly sinuate on ventral margin in lateral view; surface distinctly imbricate as well as comb plate and saddle; length 0.46-0.59 mm, index 2.45-3.17; pecten reaching apical 0.24-0.38 (x = 0.31), of 18-32 evenly spaced teeth, usually with 1-5 basal abortive teeth, often with 1-5 teeth out of the row; each tooth broad, rounded, fringed with spicules; seta 1-S slightly longer than siphon diameter at insertion, usually inserted within pecten at apical 0.26-0.43 (x = 0.36) of siphon, very rarely at apex of or distal to pecten. *Saddle* dark brown, complete, 0.25-0.30 mm long; seta 1-X shorter than saddle; 2-X usually double; 4-X of 10 cratal tufts, each 1-6 branched. Anal gills 0.73-1.27 length of saddle.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 28♂, 30♀; with associated skins (16 l, 16 p); 23 L, 18 l: Honshu (C-1522, C-1544, C-1581, C-1897, C-2103, C-2289, C-2290, C-2291, C-2292, C-2293, D-0061, E-2099, E-2278). 1♂, 2♀; with associated skins (1 l, 1 p), 2 L: Shikoku (G-1270, G-1271). 1♂, 5♀; with associated skins (1 l, 1 p): Kyushu (H-0317).

DISTRIBUTION. PALAEARCTIC JAPAN (Honshu, Shikoku, Kyushu, Yakushima). TAIWAN. MALAYA. INDIA.

103B. *URANOTAENIA (PSEUDOFICALBIA) NOVOBSCURA RYUKYUANA* NEW SUBSPECIES
(Fig. 252)

Uranotaenia bimaculata: Yamada, 1932: 229 (in part); Ryukyu.

The population of the Ryukyu Archipelago is characterized by the entirely pale pleura; the scutum is also rather paler, and the supraalar dark patches are smaller than in the populations of Palaearctic Japan. The latter is identical with specimens from Taiwan and Malaya*. The female antenna appears slightly shorter, 1.30-1.40 (8) length of proboscis and male antennal flagellomere 12 is shorter relative to Flm 13, *viz.*, Flm 12 1.11-1.25 (7) length of Flm 13. Remigium scales are all dark in the Amami and Okinawa populations, but pale ochreous in the basal half in the Yaeyama population. Bristles on each side of tergum IX of the male genitalia are fewer, 1-4 (x = 2.7, mode = 2) in Amami and Okinawa, 1-3 (x = 1.6, mode = 1) in Yaeyama, while they are 2-6 (x = 3.4, mode = 3) in Palaearctic Japan. Differences in the larvae are rather obscure; they are shown in Table 36. Six larvae from Yaeyama do not appear distinctly different from specimens from Okinawa Is.

TABLE 36. Comparison of larval characteristics between *Uranotaenia (Pseudoficalbia) novobscura ryukyuana* and *Ur. (Pfc.) n. novobscura*.

Subspecies	*ryukyuana*				*novobscura*			
Locality	Okinawa				Palaearctic Japan			
Character	Specimens examined	Range	x	Mode	Specimens examined	Range	x	Mode
Pecten teeth	20	15-29	20.7	-	20	18-32	24.5	-
Seta 3-P	30	2-5	3.0	-	26	1-3	2.2	2
Seta 4-P	20	2-6	3.2	3	20	1-3	2.2	2
Seta 7-P	30	1-3	2.0	2	26	1-2	1.5	-
Seta 14-P	20	2-5	2.8	3	20	1-3	2.1	2
Seta 6-V	30	1-4	2.7	3	26	1-3	2.0	2
Seta 6-VI	30	1-4	2.0	-	26	1 (constant)		

TYPE-SERIES. Holotype male (#22329, J-0717-15) with associated slides of genitalia, larval and pupal skins: Okinawa Is., Ryukyu Archipelago, 26 IV 1971, tree hole, Mizusawa & Nishikawa. Paratypes: 49 males, 48 females, with slides of associated skins (12 larval and 12 pupal), 13 larvae, genitalia (12 males), mouthparts (7 males, 6 females, 3 larvae), wings (10 males, 9 females) and

*Specimens examined. TAIWAN. 20♂, 20♀: Taipei, Hsinchu, Chiai and Taitung Hsien, NAMRU-2. 2♂, 2♀: Sanmin, Taoyuan Hsien, 21 IX 1961, bamboo stump, Chung and Lu. MALAYA. 2♂, 2♀: Cameron Highland, Pahang, USNM.

legs (10 males, 9 females). 1 male (J-0408): Mt. Nago, 28 VIII 1970, tree hole; 2 males, 1 female (J-0432): Yona, 1 IX 1970, tree hole; 2 females, with skins (2 larval and 2 pupal) (J-0461): Yona, 6 IX 1970, tree hole; 2 males, 2 females (J-0463): Yona, 7 IX 1970, bamboo stump; 2 males (J-0468): Yona, 7 IX 1970, tree hole; 1 male (J-0480): Yona, 8 IX 1970, tree hole; 5 males, 5 females (J-0487): Yona, 8 IX 1970, tree hole; 1 male, 2 females (J-0491): Mt. Yonaha, 9 IX 1970, tree hole; 5 males, 1 female, with associated skins (1 larval and 1 pupal) (J-0500): Oku, 9 IX 1970, tire; 2 males, 2 females, with associated skins (1 larval and 1 pupal) (J-0504): Mt. Onishi, 10 IX 1970, tree hole; 5 males, 8 females, with associated skins (1 larval and 1 pupal) (J-0507): Mt. Onishi, 10 IX 1970, tree hole; 1 male, 1 female, with associated skins (2 larval and 2 pupal) (J-0510): Mt. Onishi, 10 IX 1970, tree hole; 1 male, 1 female, with associated skins (1 larval and 1 pupal) (J-0511): Mt. Onishi, 10 IX 1970, tree hole; 1 female, with associated skins (1 larval and 1 pupal) (J-0520): Yona, 12 IX 1970, rock hole; 2 males, 1 female, with associated skins (1 larval and 1 pupal) (J-0716): Yona, 26 IV 1971, tree hole, Mizusawa & Nishikawa; 9 males, 7 females, with associated skins (2 larval and 2 pupal) (J-0717): Yona, 26 IV 1971, tree hole, Mizusawa & Nishikawa; 1 male, 4 females (J-1288): Gajanokobanta, 28 XI 1972, tree hole, Mizusawa & Imamura; 1 male, 3 females (J-1291): Gajanokobanta, 28 XI 1972, rock hole, Mizusawa & Imamura; 8 males, 7 females, 13 larvae (J-1293): Mt. Nago, 29 XI 1972, tin can, Mizusawa & Imamura (all specimens in the type-series collected by Tanaka and Mizusawa unless otherwise indicated).

The holotype and one-half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN THE TYPES. RYUKYU ARCHIPELAGO. 10 males, 7 females, with associated skins (5 larval and 5 pupal), 1 larva, 4 larval skins: Amami Guntô (I-0252, I-0277, I-0280, I-0300, I-1828, I-1835, I-1851, I-1888). 5 males, 6 females, 17 larvae, 3 larval skins: Okinawa Guntô (J-0413, J-0443, J-0463, J-0472, J-0477, J-0482, J-0487, J-0504, J-0505, J-0506, J-0508, J-0509, J-0510, J-0717, J-0902, J-1291, J-1292). 12 males, 6 females, 6 larvae: Yaeyama Guntô (K-0139, K-0151, K-0561, K-0726, K-0918, K-0946, K-0951, K-1297, K-1298, K-1331, K-1357, K-1451).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô).

DISCUSSION. Misusage of the name *bimaculata* for this species was corrected by Peyton (1977). Roth (1946) studied some larval characters on specimens of *ruykyuana* from Okinawa and found that there were 2 types separated mainly by the number of branches of the lateral setae of abdominal segments III-VI (setae 6-III-VI) (he also gave data for a seta on segment VII, but this was 4-VII). In his type A (more hairy), these setae are most frequently 3 branched though varying from 2-4 in 6-III, V, 1-4 in 6-IV, 1-3 in 6-VI; in type B (less hairy), they are most frequently single though varying up to 3. The adults associated with both types were the same. We observed a similar situation in our collections from Okinawa. The more hairy type was obtained during August to September, and the less hairy type November to December. This suggests that these types might be a seasonal variation. However, our material was not sufficient to be conclusive, and Roth did not give the collection dates for his material. Further study will be necessary.

BIONOMICS. The larvae occur chiefly in tree holes, occasionally in bamboo stumps, and also frequently in small artificial containers such as metal and earthenware jars, discarded tires, etc., in rural environments.

104. *URANOTAENIA (PSEUDOFICALBIA) NIVIPLEURA* LEICESTER (Figs. 149, 150, 253, Table 136)

Uranotaenia nivipleura Leicester, 1908: 219 (♂, ♀). Type-locality: The Gap, Selangor, Malaya, Singapore; Bohart and Ingram, 1946b: 57, Chizuka, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 253) (2 specimens). Wing length 2.0-2.4 mm (3 mm, Barraud 1934). *Head.* Eyes very narrowly separated above and below. Vertex covered with broad dark grayish brown scales and wide erect forked pale brown scales; eye margin of vertex usually appearing pale; tempus heavily covered with dark gray scales; 3 pairs of dark or brown vertical bristles, the median pair very large; 1, 2 dark temporal bristles on each side, with several fine bristles ventrad to underside of head. Clypeus dark brown. Antenna longer than proboscis; pedicel laterally tawny brown; mesally dark brown, with several small hairs and few small scales; flagellomere 1 1.1-1.2 length of Flm 2, with a few small scales. Proboscis 0.9 length of forefemur. Palpus 0.1 length of proboscis, dark scaled. *Thorax.* Pronotal integument pale yellowish brown; anterior lobe bearing 3 dark bristles, posterior lobe with a few easily lost, gray scales, bearing one bristle near upper posterior corner. Scutal integument brown, anterior promontory, fossal and supraalar areas and prescutellar space dark brown, margin from humerus to wing root pale; scutum covered with narrow dark grayish brown scales and with a narrow border of narrow white scales from apex to wing root; posterior portion of anterior dorsocentral bristles double; one stout dark humeral bristle accompanied by 0-2 finer bristles; one fine bristle near scutal angle, sometimes lacking; one posterior fossal close to dorsocentral series. Scutellar lobes covered with dark scales, both lateral lobes bearing 3 long dark bristles and median lobe 4, 5 bristles, each with 1-4 additional small bristles. Pleura pale yellowish brown, well contrasting with dark scutum; sternopleuron sparsely covered with translucent scales intermixed with gray scales; 2 propleural bristles, sometimes accompanied by one fine bristle, 1, 2 fine spiraculars, one stout dark prealar; sternopleurals arranged along upper and posterior margins, upper 1-3 dark and stout, others brown to pale yellow and fine; 3-5 fine upper mesepimerals, 1, 2 dark lower mesepimerals. *Wing.* Cell R_2 0.4-0.6 length of vein r_{2+3}. *Legs.* Coxae and trochanters concolorous with pleura, with broad gray scales. Femora, tibiae and tarsi dark scaled. Hindtarsomere 1 length of or slightly shorter than tibia. Claws small, equal. *Abdomen.* Terga and sterna uniformly covered with dark brown scales.

MALE (Fig. 149). (Description based on 1 specimen from Taiwan.) Wing length 2.4 mm. Hindtarsomere 1 length of tibia. No dissected specimen available for description of head appendages. *Genitalia.* Tergum IX narrowly and weakly sclerotized along apical margin, with 5, 6 bristles on each side of middle near apex. Sternum IX membranous, sclerotized only on basal edge, with 2 bristles at middle. Basistyle 1.33 as long as wide, basally broadened, bristled throughout, laterally and sternally scaled; basal tergal lobe narrow, well protrudent, bearing 3 slender setae and a few bristles. Dististyle with a number of minute apical setae; claw missing in the single specimen. Paraproct covered with minute hairs, with 3, 4 cercal setae on each side; tergite X well protrudent as a pair of weakly sclerotized, triangular lobes beyond apical margin of tergum IX, both lobes connected at middle. Aedeagus excluding teeth 2.0 as wide as long, sclerotized; lateral pieces tergally connected at api-

cal 0.33, apparently without sternal bridge; each plate with 3 strong, dark teeth: laterally directed tergoapical tooth, laterodistally directed sternoapical tooth, and proximally directed sternal tooth; sternoapical tooth with 1, 2 mesobasal denticles, extending more distally than tergoapical tooth, which extends more laterad than sternoapical tooth; distance between apices of tergoapical teeth 0.63 of that between apices of sternoapical teeth.

LARVA (Fig. 150). (Description based on 2 mounted skins from Taiwan.) *Head.* Labral process bearing rudimentary seta 1-C at apex; 0-C broad, transparent; 6, 7-C somewhat anteriad of antennal base; 4-C slightly posteromesad of 6-C; 5-C far posterior to them and slightly laterad of 6-C. *Antenna* dark brown, 0.19 mm long, 4.8-5.2 as long as broad, with extremely fine spinules on mesal surface; seta 1-A single, inserted at apical 0.13-0.24; 2-4-A rather basally thick, apically attenuate; 5-A thick, with a distinct accessory sensorium on proximal division; 6-A subequal to 5-A, narrowly truncate at apex. *Mandible* with a number of microspines of various sizes proximally on dorsolateral surface; ventral tooth with 3 strong lateral denticles equal to VT_0 in size; $VT_{1,2}$ triangular, VT_3 quadrate. *Maxilla.* Mesostipes with a strongly developed sensorium on a long basal ring bearing a small accessory sensorium (shape similar to 5-A). Apex of palpostipes with strongly developed $S_{1,2,4}$; $S_{1,2}$ each with a basal ring, both on a common 2-segmented structure, proximal segment ring-like, distal one fairly long, asymmetric; S_4 on a 2-segmented basal ring. *Mentum plate* longer than wide, with 13 teeth. *Thorax.* Seta 7-M branched. *Abdomen.* No stiff pigmented seta; 2-I, II and 4-III, IV slightly mesad of 1-I-IV respectively; 3-VI, VII stronger than 1-VI, VII respectively; segment VIII with broad, weakly sclerotized comb plate bearing a row of 7-11 comb scales on posterior margin, occasionally 1, 2 abortive scales present; individual comb scales parallel-sided, with apex rounded, evenly fringed with fine apical and lateral spicules. *Siphon* rather dark brown, 0.60-0.65 mm long; pecten reaching basal 0.32-0.39 of siphon, of 11, 12 evenly spaced teeth, 1, 2 basal teeth occasionally abortive; each tooth broad, with apex rounded, apically and laterally fringed with fine spicules; seta 1-S located slightly distad of pecten at basal 0.39-0.43, approximately 0.33 length of siphon; 2-S fine. *Saddle* apparently incomplete, 0.22-0.27 mm long, dorsoapically dark brown; seta 1-X rather strong, nearly 2.0 length of saddle; 4-X of 10 cratal tufts, each 2-4 branched, 2 proximal tufts very short. Anal gills broad, with apex rounded, about 4.0 length of saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 1♀: Okinawa Guntô (J-0541). 1♀: Yaeyama Guntô (K-0184). TAIWAN. 1♂, 1♀; with associated skins (2 l, 2 p), Chituan, Tatung, Ilan Hsien, 9 IX 1961, tree hole, Chung & Lu.

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Guntô). TAIWAN. MALAYA. SINGAPORE. JAVA. INDIA. SRI LANKA.

BIONOMICS. Larvae have not been collected in the Ryukyus. Elsewhere (Peyton 1977), they have been found in tree stumps, holes in dead fallen trees, an automobile tire and a rusted tin. A female adult (Yona, Okinawa Is.) was captured on a naked knee of a man in a room in the evening, but it is unlikely that it bites man (Tanaka, Saugstad and Mizusawa 1975).

SUBGENUS *URANOTAENIA* LYNCH ARRIBALZAGA

Uranotaenia Lynch Arribálzaga, 1891a: 375; 1891b: 163. Type-species: *Uranotaenia pulcherrima* Lynch Arribálzaga, 1891b; Argentina.

ADULT. Suture between prealar knob and sternopleuron present. Alula bare. Female anterior claw broader than posterior claw. Lateral pieces of aedeagus only dorsally connected. The 2 species of this region have a distinct pale transverse line formed by broad scales and pale integument from the anterior pronotal lobe to metapleuron. Such a line is not present in species of *Pseudoficalbia* of this region.

LARVA. Setae 5, 6-C strongly developed, spine-like. Grid midventrally joined to saddle.

KEYS TO SPECIES OF *URANOTAENIA (URANOTAENIA)*

ADULT

Abdominal terga entirely dark; male midtarsus with 2 unequal claws. . . . . *annandalei* (p. 469)
Abdominal terga with pale patches or bands; male midtarsus with only a single long curved claw. . . . . *macfarlanei* (p. 472)

MALE GENITALIA

Aedeagus rounded, its tergal base not greatly extended laterally and narrower than anterior widest part; apex without strong, distally produced tooth. . . . . *annandalei* (p. 469)
Aedeagus trapezoidal, its tergal base greatly extended laterally and much wider than apex which has a pair of strong, distally produced teeth. . . . . *macfarlanei* (p. 472)

LARVA

Antenna with setae 2-4-A very broad, leaf- or blade-like; comb plates of abdominal segment VIII dorsally connected. . *annandalei* (p. 469)
Antenna with setae 2-4-A slender; comb plates of abdominal segment VIII dorsally separated. . . . . *macfarlanei* (p. 472)

105. *URANOTAENIA (URANOTAENIA) ANNANDALEI* BARRAUD (Figs. 151, 152, 254; Table 137)

Uranotaenia annandalei Barraud 1926: 343 (♂, ♀). Type-locality: Golaghat, Assam, India.
Uranotaenia nanseica Bohart and Ingram, 1946b: 56 (♂). Type-locality: Chizuka, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 254). Wing length 2.0-2.4 mm. *Head.* Eyes separated above and below. Eye margin covered with broad bluish silvery scales, brown scales intermixed on tempus; remainder of vertex covered with bluish or brownish, broad dark scales which show green reflection in some light; erect forked dark scales anteriorly and posteriorly scattered; 4 pairs of vertical bristles, 2 pairs of which are on interocular space, the under pair finer and paler, others dark; a few dark temporal bristles on each side. Clypeus dark

brown. Antennal pedicel testaceous, infuscate and with some pale scales on mesal side; flagellum 1.18-1.25 (3) length of proboscis; flagellomere 1 1.41-1.55 length of Flm 2. Palpus very short, 0.09-0.11 of proboscis, yellowish brown, dark at apex. Proboscis 0.76-0.83 (3) length of forefemur. *Thorax.* Pronotal integument dark brown; anterior lobe heavily covered with broad bluish-silvery scales, bearing 3 dark stout bristles; posterior lobe without scales, bearing one dark stout bristle on posterior margin. Scutum with integument brown, partly infuscate, covered with narrow or rather narrow dark brown scales, with a pair of patches of broad grayish scales on supraalar area; one stout humeral bristle accompanied by 1, 2 shorter ones, one bristle near scutal angle, one posterior fossal close to dorsocentral series. Scutellum covered with broad dark brown scales which show bluish reflection, each lobe bearing 3 (rarely 4) long dark bristles, occasionally additional small bristles present. Paratergite dark brown. Pleural integument dark brown on postspiracular area, upper sternopleuron, upper mesepimeron and upper metapleuron, remainder yellowish brown to pale brown; upper sternopleuron with a transverse patch of broad bluish silvery scales in the middle of dark area, the patch together with bluish silvery patches of head and anterior pronotal lobe (and also with pale parts of mesepimeron and metapleuron) forming a conspicuous transverse line in contrast with dark integument above and below the line; a thin cover of broad silvery scales on posterior-lower sternopleuron; 2, 3 propleural bristles, 1, 2 stout prealars; 6-9 sternopleurals, 1, 2 of them stout and placed above scale patch, others fine; 2-4 fine upper mesepimerals, 1, 2 lower mesepimerals near cephalic lower corner. *Wing.* Cell R_2 0.42-0.53 (3) length of vein r_{2+3}. *Legs.* Coxae pale brown, with translucent scales; femora, tibiae and tarsi dark scaled with bluish or greenish reflection, underside of femora more or less pale. Hindtarsomere 1 0.94-1.00 (3) length of tibia. Claws subequal in length. *Abdomen.* Terga covered with dark brown scales, laterotergite with translucent scales or not scaled; sterna covered with pale brown scales.

MALE (Figs. 152, 254). Wing length 1.8-2.2 mm. Antennal flagellum 1.10-1.17 (4) length of proboscis; flagellomeres 12 and 13 together 0.53-0.55 (5) length of Flm 1-11, 12 1.11-1.21 (5) of Flm 13. Palpus 0.06-0.07 length of proboscis. Proboscis 0.84-0.96 (4) length of forefemur. Cell R_2 0.42-0.50 (5) length of vein r_{2+3}. Hindtarsomere 1 0.95-1.05 (5) length of tibia. *Genitalia.* Tergum IX poorly sclerotized. Sternum IX membranous, without bristle. Basistyle 1.4 as long as wide (length measured from sternal base), bristled over entire surface, basal tergal lobe slightly protrudent, usually bearing 3 setae together with several small bristles. Dististyle stout, basally broadened, 0.67 length of basistyle, slightly more than 3.0 as long as wide, with about 8 small setae on apical half, apex pointed; claw narrow. Tergite X fairly long, approximated at middle. Aedeagus well sclerotized, slightly less than 0.5 length of basistyle, lateral plates connected at a point near tergoapical 0.33, from this point tergal edges diverge both apically and basally, sternal edge usually armed with 5 strong, retrose teeth.

LARVA (Fig. 151). *Head.* Width 0.52-0.54 mm; brown, 1.04-1.15 as long as wide; labral process markedly prominent; seta 0-C slender; 1-C at apex of labral process, moderately stout, laterally compressed toward the ventrally curved apex, length subequal to distance between bases; 4, 6-C on same level slightly anterior to 7-C; 5-C well posterior to and slightly mesad of 6-C; 5, 6-C strongly developed, broad, somewhat flattened, very dark brown, laterally fringed with dense spicules, 5-C longer than 6-C; 14-C broad and flattened, with blunt apex; 4, 7, 8-C usually single, 9-C usually double. *Antenna* 0.13-0.15

mm long, lightly pigmented, about 3.5 as long as wide and slightly swollen in middle in dorsal view, with a prominent ventral process at middle of shaft bearing leaf-like seta 2-A; 1-A single, short and slender, inserted at about apical 0.25; 3-A apical, blade-shaped, narrower than and 0.75 length of 2-A; 4-A subapical, leaf-shaped, very wide, the apex on same level as that of 3-A; 5-A ventrosubapical, about 0.5 length of 2-A, with a long accessory sensorium; 6-A apical, narrow, blunt-tipped, subequal to 3-A; 2-4, 6-A lightly pigmented. *Mandible* laterobasally with single or occasionally doubled microspines of various sizes and dorsally several rows of minute spinules; MdS_1 broadest, MdS_2 fine and multiple, MdS_5 about 0.67 length of MdS_1. Mandibular brush with several lateroventral hairs basally broadened and serrate on mesal margin. Cutting organ with a single slender dorsal spine almost reaching lateroapical denticle of ventral tooth; 10 or more strongly sclerotized dorsal teeth, most mesodorsal one largest and dorsally bicuspid; ventral tooth with 2 lateral denticles, one (VT-4) almost equal to VT_0 in size, another small; $VT_{1,2}$ triangular, subequal; VT_3 with blunter apex; 3, 4 ventral blades, VB_1 very wide, just extending beyond apex of VT_0, pectinate on mesal margin and denticulate on ventrolateral surface in middle, VB_{2-4} with lateral pectination; pectinate brush absent. Piliferous process moderately protrudent, with tufted hairs at apex and base; 6-8 mandibular hairs, each with branched or brush-like apex. *Maxilla* with seta 1-Mx single, slender and close to 14-C. Mesostipes square; stipital sensoria equal, located just laterad of lacinial suture, without basal ring; 4-Mx very broad, fan-shaped, with midrib and large socket. Lacinia hair, mesally with spine-like spicules and brush-like hairs anteriorly; a ring-based seta (?6-Mx) just mesad of anterior termination of lacinial suture; another (?5-Mx) in an anteromesal concavity on ventral surface. Membranous apex of palpostipes apparently lacking sclerotized plates; all 5 sensoria well developed, S_3 flattened and somewhat bent apically, S_5 bifurcate at tip; a cylindrical appendage dorsad of S_1, its basal half broader than broadest sensorium, apical half narrow. *Mentum plate* with usually 13 teeth. *Thorax.* Seta 1-P rather thick, apically frayed; 2-P more slender than and length of 1-P; 3-P, 1-M, 1, 3, 13-T somewhat stellate; 7-M fine, about length of 2-M; 14-P usually single. *Abdomen.* Segments II-VIII with broad median area of ventral surface finely spiculate. Setae 6-I, II each with 3 equal branches; 6-III slightly shorter and distinctly more slender than 6-I, II, with 2 equal branches; 3-I, 1-II-VII, 6-IV-VI somewhat stellate; 1, 2-I, 8-II, 14-III, IV, VI-VIII usually single; 12-II, 3-III, 11-V and 12-VI usually double; 13-I usually triple. Segment VIII with well sclerotized, dorsally complete large comb plate covering greater part of the segment; comb scales 4-6 on lower-posterior margin of the plate, usually 2nd scale from ventral side almost 2.0 length of others, individual scales spiniform with acute apex, laterally fringed with fine spicules; 0-VIII on comb plate, 1, 2-VIII on a common, weakly sclerotized, relatively wide, rounded plate; 1-VIII shorter than 2-VIII, 5-VIII shorter than 3-VIII. Siphon pale yellowish brown, of even width from base to apex; length 0.44-0.46 mm; index 3.0-3.4 (x = 3.2); pecten reaching basal 0.38-0.45 (x = 0.41) of siphon, of 8-12 evenly spaced, broad and apically fringed teeth apically decreasing in size; seta 1-S located near apex of pecten, longer than width of siphon, with 7-10 barbed branches which are broadened and distally flattened then narrowed toward acute apex; 2-S short, at apex of siphon; spiracular valves fairly large. *Saddle* complete, fringed with spinules on apical margin laterally, the spinules largest in middle, progressively smaller dorsally and ventrally; seta 1-X much shorter than saddle; 4-X of 12 hairs on incomplete grid, usually proximal 2 single, distal 2 3-5 branched, others intermediate.

Anal gills tapering toward apex, 0.60-0.75 length of saddle.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 5♂, 16♀; with associated skins (2 l, 2 p), 3 L: Okinawa Guntô (J-0436, J-0476, J-0490, J-0502, J-0540, J-0898). 61♂, 101♀, 49 L: Yaeyama Guntô (K-0588, K-0601, K-0603, K-0642, K-0668, K-0671, K-0672, K-0673, K-0676, K-0677, K-0680, K-0720, K-0726, K-0730, K-0732, K-0758, K-0795, K-0801, K-0908, K-0919, K-0924, K-0925, K-0934, K-0939, K-0940, K-0941, K-0946, K-0951, K-0956, K-0964, K-0965, K-0966, K-1002, K-1010, K-1021, K-1059, K-1065, K-1078, K-1089).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Guntô). TAIWAN. SOUTH CHINA. BURMA. NEPAL. INDIA.

BIONOMICS. Common in Yaeyama, less so in Okinawa Is. The larvae are found in shaded shallow stream pools or ground pools. They are characterized by an *Aedes*-type sinuous swimming action. The adults are found in shrubbery along streams.

106. *URANOTAENIA (URANOTAENIA) MACFARLANEI* EDWARDS (Figs. 152, 153, 255; Table 138)

Uranotaenia macfarlanei Edwards, 1914: 127 (♀). Type-locality: Hong Kong; Bohart and Ingram 1946b: 55, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 255). Wing length 1.8-2.4 mm. *Head.* Eyes barely contiguous above, moderately separated below. Vertex covered with broad brownish black scales which show bluish, greenish or coppery reflection according to direction of light; a narrow border of broad white scales to eyes, the white border connected to a wide stripe of broad white scales on upper tempus, remainder of which is covered with broad brownish black scales; white scales on interocular space rather narrow; a few erect forked dark scales scattered on vertex; usually 3 pairs of vertical bristles and 2 pairs of temporal bristles, usually all dark. Clypeus blackish brown. Antennal pedicel brown, mesal side infuscate and bearing a few small hairs and small pale scales; flagellum 1.21-1.25 (3) length of proboscis; flagellomere 1 1.36-1.75 length of Flm 2, with a few scales. Palpus very short, 0.07-0.08 (3) length of proboscis, dark scaled. Proboscis 0.96-0.98 (3) length of forefemur. *Thorax.* Integument of pronotal lobes dark brown; anterior lobe covered with broad white scales, bearing 3 dark bristles; posterior lobe bare, with lower corner pale, bearing one dark bristle on posterior margin. Scutum with integument dark brown, covered with mixture of narrow bronzy light brown scales and narrow dark brown scales, dark scales predominant on fossal and prealar areas, scales on prescutellar area paler, a stripe of rather broad white scales on lateral margin of prealar area; one stout humeral bristle, one (rarely 2) posterior fossal close to dorsocentral series, no bristle near scutal angle. Scutellum basally covered with broad bluish dark brown scales and apically with broad ochreous scales, each lateral lobe bearing 3 dark bristles, median lobe bearing 4, occasionally additional small bristles present. Pleural integument dark brown, middle of mesepimeron and lower part of metapleuron paler; a stripe of broad white scales on upper 0.33 of sternopleuron, the stripe together with white scale-patch of head and anterior pronotal lobe and with paler part of integument of posterior pronotal lobe, mesepimeron and metapleuron forming a long clear transverse line parallel to scutal marginal white stripe; a small patch of broad white scales on lower posterior margin of sternopleuron close to midcoxa; one stout dark and one fine brown propleural bristle, 4 rather stout

dark and 3, 4 fine sternopleurals, one fairly stout spiracular, one stout dark prealar, 2 fine upper mesepimerals, one stout dark lower mesepimeral near cephalic-lower angle. *Wing*. Base of vein r pale scaled for nearly 0.33 of wing length. Cell R_2 0.39-0.49 (3) length of r_{2+3}. *Legs*. Each coxa with a small patch of broad white scales, the patches together with a lower sternopleural patch forming a dotted line subparallel to pleural white line; forecoxa dark scaled on anterior side, midcoxa with another pale scale patch on anterior lower part. Each femur with white apical scale fringe, underside of mid- and hindfemora pale scaled, the pale scaled area more or less basally widened on both sides, remainder of femora, tibiae and tarsi dark scaled, the scales showing bluish reflection. Hindtarsomere 1 0.81-0.82 (3) length of tibia. Claws rectangularly curved, subequal in length. *Abdomen*. Terga covered with blackish brown and white or creamy-white scales; pale scales covering greater part of I including laterotergite, forming large transverse medioapical patches and small lateroapical spots on II, III and IV, a small medioapical and a small lateroapical spot on VI, and a complete apical band on V; VIII pale scaled. Sterna covered with brown, somewhat golden, or dark brown scales, V and VI with pale lateroapical spot.

MALE (Figs. 152, 255). Wing length 1.6-1.9 mm. Antennal flagellum 1.08-1.13 (4) length of proboscis; flagellomeres 12 and 13 together 0.48-0.53 length of Flm 1-11, 12 1.29-1.40 of Flm 13. Palpus 0.05-0.06 (4) length of proboscis. Proboscis 1.02-1.11 (4) length of forefemur. Cell R_2 0.36-0.46 (4) length of vein r_{2+3}. Hindtarsomere 1 0.76-0.79 (4) length of tibia. Midtarsus with posterior claw reduced. *Genitalia*. Tergum IX poorly sclerotized. Sternum IX short, membranous, without bristles. Basistyle 1.20-1.25 as long as wide (length measured from sternal base), bristled over entire surface; basal tergal lobe slightly protrudent, bearing one long seta and several large and small bristles. Dististyle stout, 0.75 length of basistyle, 4.0 as long as wide, of fairly even width from base to near apex, then abruptly narrowed toward pointed apex, bearing about 10 small setae on apical half. No cercal seta; tergite X extending slightly beyond tergum IX, terminating in a widely rounded apex; apices widely separated. Aedeagus well sclerotized, conspicuously basally widened, nearly 2.0 as wide as long, with apex usually narrower than sternal base, tergally closed and sternally open; apex composed of a pair of parallel processes, tergolateral edge appearing to be folded at base of apical process; each sternal edge bearing 3 very large basally directed teeth on apical half, basal half outcurved.

LARVA (Fig. 153). *Head*. Width 0.58-0.64 mm; dark brown, 1.11-1.20 as long as wide; labral process very prominent, basally broad; seta 0-C broad, transparent; 1-C on apex of labral process, stout, pigmented, shorter than distance between bases; 4, 6-C slightly posterior to 7-C or 4-C on level of 7-C; 5-C well caudad of them, 5, 6-C strongly developed, broad, slightly flattened, very dark brown, finely but densely laterally spiculate, 5-C longer than 6-C; 14-C very stout; 15-C usually double. *Antenna* 0.15-0.17 mm long, dark brown, straight, with scattered minute spinules; seta 1-A single, very fine, inserted at basal 0.26-0.37 ($x = 0.34$) of shaft; 2-A longest of all the apical antennal setae, with filamentous apex; 3-A shortest; 4, 6-A subequal; 5-A slightly shorter than 4-A, with an accessory sensorium, arising from apical 0.25 of basal pigmented part and extending beyond it. *Mandible* laterobasally with a number of single slender microspines on dorsal surface; MdS_2 fine and multiple, MdS_{3-5} subequal to each other and slightly shorter than MdS_1, MdS_5 broadest. Cutting organ with 2 rather small dorsal teeth, lateral one simple, mesal one with a mesal denticle; an irregularly toothed comb-like seta between base of ventral

tooth and mandibular spurs; no definite dorsal spine visible; ventral tooth with 2 large proximal and 2 small distal denticles on anterolateral margin, the large denticles equal to VT_0 in size; VT_1 distinctly smaller than VT_0 and slightly larger than VT_2, VT_3 nearly length of VT_0, wide and flattened, blade-like, with anteroapical angle rounded off; 3 ventral blades, VB_1 very wide, reaching apex of VT_0, strongly serrate on mesal margin, the serrations basally becoming abruptly finer, apex with secondary fine serration on inner margin; $VB_{2,3}$ slender, with mesal pectination; pectinate brush lacking. Piliferous process barely protrudent, with a tuft of dorsal hairs at apex, a group of anterobasal hairs and an anteriorly directed plumose process on ventral side near apex; mandibular hairs 9-11, each branched or apically frayed. *Maxilla* with seta 1-Mx 3-5 branched, close to 14-C. Mesostipes well sclerotized on posterior half of ventral surface; stipital sensoria subequal, located laterad of lacinial suture, lacking basal ring; 4-Mx large, unpigmented, dendritic, with branches apically convergent. Lacinia mesally with spiny spicules; a ring-based seta (?6-Mx) just mesad of lacinial suture near apex; another (?5-Mx) on anteroventral membranous area near mesal margin. Membranous apex of palpostipes apparently lacking sclerotized plates; all 5 palpal sensoria well developed; S_3 longest; S_5 broadest, with apex bifurcate and acuminate; dorsally a cylindrical membranous appendage. *Mentum plate* with 12-15 rather large teeth. *Thorax.* Setae 1-M, 1, 3, 13-T stellate; 12-M slender; 8, 9-M usually 5 branched; 6-T usually double. *Abdomen.* Segments III-VII finely spiculate anteromedially on ventral surface. Seta 6-I with 2nd branch slightly shorter than first branch, 3rd (shortest) branch about 0.67-0.75 length of first branch and also slightly shorter than 7-I; 6-II with 2nd and 3rd branches distinctly shorter and more slender than 7-II, 3rd (shortest) branch less than 0.5 length of first branch; 8-II, 4, 12, III, 11-IV and 8-V usually double; 12-II, 9-III, 4-IV and 12-VII usually single, 5-VI usually 3 branched. Segment VIII with a large moderately sclerotized comb plate on each side, bearing 7-9 comb scales along posterior margin, individual scales acutely spine-like with lateral fringe of fine spicules; 0-VIII on comb plate; 1, 2-VIII on a common rather wide callus; 4-VIII usually double. *Siphon* yellowish brown, only slightly apically narrowed, subapical part 0.75 of widest part, apex occasionally slightly expanded; length 0.64-0.72 mm, index 3.8-4.3 ($\bar{x}$ = 4.1); pecten reaching basal 0.4-0.5, of 11-14 evenly spaced teeth which are progressively shorter towards apex, each tooth wide, rather rounded, evenly fringed with spicules; seta 1-S located slightly distal to pecten at middle of siphon, arising from a somewhat prominent socket, longer than siphon width; 2-S at apex, short; spiracular valves, especially ventral one, well developed, 13-S kinked near base. *Saddle* complete, apical margin laterobasally fringed with spinules of various sizes; seta 1-X usually 5-branched, shorter than saddle; 4-X of 10 cratal hairs, proximal 2 very short, single, others long and 1-4 branched, usually proximal hairs with fewer branches. Anal gills tapering toward apex, usually subequal to saddle though variable in length.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 3♂, 5♀; with associated skins (2 l, 3 p), 2 L: Okinawa Guntô (J-0476, J-0477, J-0490, J-0542, J-0898, J-0905, J-2332, J-2333). 231♂, 276♀, 27 L: Yaeyama Guntô (K-0584, K-0589, K-0601, K-0603, K-0616, K-0617, K-0620, K-0640, K-0641, K-0644, K-0645, K-0667, K-0674, K-0697, K-0726, K-0728, K-0730, K-0731, K-0732, K-0739, K-0789, K-0795, K-0805, K-0907, K-0919, K-0924, K-0925, K-0934, K-0941, K-0946, K-0951, K-0954, K-0955, K-0956, K-0961, K-0963, K-0968, K-0976, K-0979, K-1002, K-1010, K-1011, K-1013, K-1021, K-1035, K-1045, K-1056, K-1065, K-1067, K-1078, K-1080, K-1081, K-1089, K-1093, K-1111).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa and Yaeyama Gunto). TAIWAN. SOUTH CHINA. HONG KONG. SUMATRA. JAVA. MALAYA. INDIA.

BIONOMICS. Abundant in Yaeyama, not very common in Okinawa Is. The most common larval habitat is a leafy shaded stream pool or a blocked stream. Their actions are *Anopheles*-like. Occasionally larvae occur in ground pools, rock holes or crab holes. The adults are common in shrubbery along streams; also collected in light traps.

(iii) TRIBE SABETHINI

ADULT. Scales mostly very wide, round-tipped, translucent and producing metallic reflection of various colors.

FEMALE. *Head.* Decumbent scales all broad; median pair of vertical bristles close together, separated from other lateral vertical bristles. Palpus 1-3 segmented. Proboscis occasionally very long or strongly swollen at apex. *Thorax.* Anterior pronotal lobes widely to very narrowly separated, bristled; posterior pronotal lobe variously scaled, with one or only several bristles along posterior margin. Scutum moderately arched; bristles greatly reduced, acrostichals absent, except occasionally one anterior pair, dorsocentrals very few or absent except for several bristles on anterior margin, humeral one or absent, no other bristles in fossal area and along humeral to sutural margin, prescutellars few or absent, only supraalars well developed. Scutellum trilobed, with broad scales only; bristles on each lobe and not on portions between lobes. Postnotum bare. Broad scales of propleuron, sternopleuron and metapleuron when present, arranged in downward imbrication; broad scales of mesepimeron, and subspiracular, postspiracular and prealar areas when present, arranged in upward imbrication; pleural bristles usually reduced in number, spiraculars almost always present, postspiraculars absent, prealars few or absent, upper mesepimerals rather many, no lower mesepimerals. Bases of mesomeron and hind coxa at about same level. *Wing.* Squama bare or fringed with hair-like scales. Alula fringed with scales. Membrane with distinct microtrichia. Dorsal remigial bristles absent. Cell R_2 longer than vein r_{2+3}; m-cu proximad of r-m. *Legs.* Hindfemur and -tibia shorter than forefemur and -tibia respectively. Hindtarsomere 1 distinctly longer than tibia. Tarsomere 5 shorter than 4. Claws equal and simple, hindtarsal claw rarely single. Pulvilli undeveloped. *Abdomen.* Tip truncate.

MALE. Antenna, palpus, tarsomeres and claws as in female or modified. *Genitalia.* Tergum IX with single or paired lobes, when paired, lobes basally connected with sclerotized bridge. Sternum IX membranous, without bristles. Basistyle scaled; with or without mesal membrane; basal lobe, subapical lobe or or claspette present or absent. Dististyle simple or modified; claw present or absent. Proctiger with sclerotized paraproct. Aedeagus variously developed, laterally paired, single or consisting of 3 tergosternal parts.

LARVA. *Head.* Hypostomal suture often reaching posterior tentorial pit. Seta 1,3-C ventral in position, 3-C close to 0-C; 2-C absent. Antenna short, smooth; 1-6-A short; 1-A single, distad of middle; 2,3-A distad of 1-A. Mouth brush of numerous slender hairs. Mandible with 1-3 mandibular spurs, without seta 1-Md; mandibular brush well developed; mandibular comb weakly developed. Cutting organ usually rather well developed, with pectinate brush usually weakly developed. Mandibular hairs divided into 2 groups. *Maxilla.* Cardo

fused with palpostipes or free. Mesostipes variable in shape; pseudoartis undeveloped; stipital sensoria double, variable in position, with or without basal ring. Lacinia occupying mesal half of dorsal surface of mesostipes. Palpostipes without seta 3-Mx. *Mentum plate* short, usually very dark. *Thorax*. Setae 13, 14-M, and 8, 13-T not dendritic. *Abdomen*. Seta 12-I absent; 14-II present or absent; 1-5-VIII usually displaced dorsad. Comb scales usually present. *Siphon* without acus; pecten present or absent; usually more than one pair of seta 1-S and additional dorsolateral siphon setae present. *Saddle* incomplete; 4-X of only one pair; grid absent.

DISTRIBUTION. Japan and Korea. Oriental, Ethiopian, Australian, Nearctic and Neotropical region.

KEYS TO GENERA OF SABETHINI

ADULT

1. Squama fringed with hair-like scales; vertex with erect forked scales. *Tripteroides* (p. 477)
   Squama bare; vertex without erect forked scales. 2

2(1). Proboscis simple; anterior pronotal lobes well separated. *Topomyia* (p. 482)
   Proboscis markedly swollen in apical 0.33, hairy; anterior pronotal lobes very narrowly separated. . . . . *Malaya* (p. 486)

MALE GENITALIA

1. Aedeagus consisting of opisthophallus, phallus and prosophallus. *Topomyia* (p. 482)
   Aedeagus tergosternally single. 2

2(1). Aedeagus apically broad, emarginate on apical margin in tergal view. *Malaya* (p. 486)
   Aedeagus strongly apically narrowed, not emarginate on apical margin in tergal view. . . . . *Tripteroides* (p. 477)

LARVA

1. Seta 6-P single; 7-T spiniform; many body setae stiff and stellate. *Tripteroides* (p. 477)
   Seta 6-P multibranched; 7-T not modified, slender and multibranched; no or only a few body setae stiff and stellate. 2

2(1). Seta 4-X branched; maxilla with cardo free. . . . . *Topomyia* (p. 482)
   Seta 4-X single; maxilla with cardo fused with palpostipes. *Malaya* (p. 486)

11. GENUS *TRIPTEROIDES* GILES

Tripteroides Giles, 1904: 369. Type-species: *Rhunchomyia philippinensis* Giles, 1904; Philippines.

FEMALE. *Head.* Eyes contiguous above and below. Erect forked scales confined to posterior margin of vertex. Clypeus rounded, short. Antenna with flagellar whorls rather long, especially in basal flagellomeres. Palpus variable in length and segmentation. Proboscis slender, often very long. *Thorax.* Anterior pronotal lobes widely separated, with broad scales, with less than 10 bristles on anterior margin; posterior pronotal lobe with 0-4 bristles on posterior margin. Scutum without median line of broad scales; acrostichal bristles absent except some anterior ones, dorsocentrals and prescutellars few or absent, one to a few humerals, many supraalars. Paratergite usually broad. Pleural bristles: propleurals, spiraculars and prealars present, sternopleurals present or absent, upper mesepimerals relatively many. *Wing.* Squama fringed with hair-like scales; alula fringed with narrow scales. Vein 1a extending beyond level of cubital fork. *Legs.* Slender, often ornamented (subgenus *Tripteroides*); hindtarsal claw occasionally single. *Abdomen.* Tergum I hirsute; laterotergite bare or scaled. Seminal capsules 1-3.

MALE. Antenna distinctly plumose; flagellomeres 12 and 13 elongate, Flm 12 longer than 13, both together much shorter than Flm 1-11. Palpus variable. Foretarsomeres 4 and 5 modified, 5 longer than 4 and with some stout setae on ventrobasal swelling. Midtarsomeres not modified. Anterior claw of foretarsus and sometimes also of midtarsus enlarged, toothed or simple; claws of hindtarsus equal and simple, occasionally single. *Genitalia.* Tergum IX usually with prominent paired lobes, occasionally with single median lobe, bearing more or less modified bristles. Basistyle scaled, with basal mesal lobe bearing bristles. Dististyle simple, with apical or subapical claw. Paraproct with one or more strongly sclerotized apical teeth. Cercal setae usually present. Aedeagus tergosternally single, apically narrowed and not emarginate on apical margin in tergal view.

LARVA. Many body setae including 2, 14-II-VII often (usually in subgenus *Tripteroides*) stiff and stellate. *Head.* Small, rounded; seta 14-C often close to anterior margin of postgena; 15-C often near posterior margin. *Mandible* with rather stout dorsolateral microspines near base; MdS_1 well developed, other mandibular spurs short or reduced. Mandibular comb of slender branched teeth. Cutting organ with a single dorsal tooth; ventral tooth with 3 triangular mesal denticles (VT_{1-3}); ventral blade stout, with fine mesal serration; pectinate brush weakly developed. Piliferous process moderately protrudent, with 5 hair groups. *Maxilla* (subgenus *Tripteroides*). Cardo fused with palpostipes; seta 1-Mx usually branched, stiff and stellate. Mesostipes trapezoidal, broader than long, with a row of rather stiff spicules along mesoanterior margin; parartis with sclerotized rod; stipital sensoria unequal, on a common single-segmented basal ring on anterolateral corner dorsally; 2-Mx close to anterolateral corner; 4-Mx well developed. Lacinial suture extending from posteromesal corner to anterolateral corner; 5-Mx near anteromesal margin posteriad of level of stipital sensoria; 6-Mx uncertain. Palpostipes longer than mesostipes, cylindric; lateral artis weakly developed; apex with 5 palpal sensoria and an ampulla-like structure close together. Maxilla of subgenus *Rachionotomyia* moderately modified; mesostipes slightly longer than wide,

with several strong apical spines, palpostipes shorter than mesostipes. That of subgenus *Rachisoura* strongly modified, mesostipes much longer than wide, with short mesal spines and very strong apical spines (Belkin 1962). *Thorax.* Seta 6-P and also often 5-P single; 13-P present; 6-M often and 7-T usually spiniform. *Abdomen.* Seta 14-II usually present in subgenus *Tripteroides*. Comb scales in a single row. Siphon with pecten variously developed; 1-S almost ventral, additional lateral and/or subdorsal siphonal setae often irregularly scattered. Saddle with 4-X branched.

DISTRIBUTION. Japan, Korea, Oriental region, and Australian region. In this region, the genus *Tripteroides* is represented by a single species belonging to the subgenus *Tripteroides*.

SUBGENUS *TRIPTEROIDES* GILES

Tripteroides Giles, 1904: 369. Type-species: *Runchomyia philippinensis* Giles, 1904; Philippines.

Vertex with blue scales, thorax and abdomen with silvery scales; other subgeneric characters are given in the foregoing generic descriptions.

DISTRIBUTION. Japan and Korea. Oriental region except for most of India. Papuan subregion. Northern Australia. Solomon, Santa Cruz and Fiji islands.

107. *TRIPTEROIDES (TRIPTEROIDES) BAMBUSA* (YAMADA)

Rachionotomyia bambusa Yamada, 1917: 61 (♂, ♀, P. L, E). Type-locality: Tokyo, Higasiyama Spa, Fukushima Pref.; Kyoto; Hiroshima; Omura, Nagasaki Pref.; Kumamoto; Kagoshima; Japan.

DISTRIBUTION. PALAEARCTIC JAPAN. KOREA. RYUKYU ARCHIPELAGO. TAIWAN. SOUTH CHINA.

107A. *TRIPTEROIDES (TRIPTEROIDES) BAMBUSA BAMBUSA* (YAMADA) (Figs. 154, 155, 256; Table 139)

Rachionotomyia bambusa Yamada, 1917: 61 (♂, ♀, P, L, E). Type-locality: Tokyo; Higashiyama Spa, Fukushima; Kyoto; Hiroshima; Omura, Nagasaki; Kumamoto; Kagoshima, Japan.

Tripteroides (Tripteroides) bambusa: LaCasse and Yamaguti, 1950: 47 (♂, ♀, L); Chu 1956: 42, Korea.

FEMALE (Fig. 256). Wing length 2.8-4.2 mm. *Head.* Vertex covered with broad dark scales showing brilliant metallic blue lustre; many dark erect forked scales along posterior margin; tempus covered with broad silvery white scales; a pair of long dark vertical bristles anteriorly close together at middle; one lateral vertical and 2 temporal dark bristles on each side. Clypeus dark brown. Antenna: pedicel laterally yellowish brown, dark brown otherwise, with with or without minute dark bristles; flagellum 0.56-0.57 (4) length of proboscis; flagellomere 1 1.42-1.67 (5) length of Flm 2, with several pale scales in middle. Palpus 2 segmented, 0.13-0.15 (4) length of proboscis, dark scaled;

segment 2 4.63-5.64 (5) of 1. Proboscis long and slender, 1.42-1.52 (4) length of forefemur, dark scaled. *Thorax*. Pronotal integument light yellowish brown; anterior lobe with broad dark brown scales above, bearing 6-9 dark bristles; posterior lobe sparsely covered with narrow curved dark scales on upper half, with a single dark bristle on posterior margin at middle. Scutum chocolate brown, with anterior and posterior margins slightly paler, covered with narrow curved dark scales; scutal bristles dark brown, acrostichal bristles reduced to one anterior pair, dorsocentral series widely interrupted between anterior and posterior series, 2-5 (usually 3) posterior dorsocentrals, 1-3 (usually one) humerals, 1, 2 prescutellars. Scutellum pale yellowish brown, each lobe with a patch of broad dark scales, lateral lobe bearing 3-5 long dark bristles together with a few short ones, median lobe with 4 long dark bristles and occasionally with fewer short bristles. Paratergite chocolate brown. Pleura chocolate brown on post- and subspiracular areas, sternopleuron, mesepimeron and mesomeron, this pleural dark area continuous above with dark scutum; sternopleuron except for anteroventral area heavily covered with metallic-blue-tinged silvery translucent scales; mesepimeron more thinly covered with similar scales except for posterodorsal area and lower 0.25; pleural bristles yellowish brown except some dark brown ones of sternopleuron; 2-4 propleurals, 2-7 spiraculars, 3-5 prealars, no upper sternopleurals, 4-8 lower sternopleurals, 7-17 upper mesepimerals. *Wing*. Veins dark scaled; 1a ending at level between m-cu and cubital fork; cell R_2 1.46-2.42 (x =1.82) length of vein r_{2+3}. Halter with dark scaled knob. *Legs*. Anterolateral surface of fore- and midcoxae and posterolateral surface of hindcoxa covered with broad silvery translucent scales; midcoxa also posterobasally with similar scales. Femora with 2 spots of silvery white scales in apical half and a streak of silvery white scales in basal half on anterior surface, the streak of hindfemur usually reaching proximal spot; lower posterior surface of femora pale scaled, the pale area apically narrowed, not reaching apex; legs otherwise dark scaled. Forefemur subequal to or slightly longer than tibia, longer than mid- and hindfemora; midfemur subequal to or slightly longer than hindfemur; foretibia equal to or slightly shorter than midtibia, longer than hindtibia; hindtarsomere 1 1.12-1.23 (7) length of tibia. Claws of all tarsi paired, simple and equal. *Abdomen*. Tergum I dark scaled, laterotergite unscaled; II-VII dark scaled with lateral patches of silvery white scales, these lateral patches basal on II, median to subapical on III, subapical on IV-VI and fully covering VII or nearly so. Sterna II-VII golden yellow. Segment VIII dark scaled. Seminal capsules 3.

MALE (Figs. 155, 256). Wing length 2.4-3.5 mm. Antennal flagellomere 12 1.38-1.93 (5) length of Flm 13, both together 0.56-0.62 (x = 0.60) length of Flm 1-11. Palpus 0.16-0.18 (5) length of proboscis; segment 2 2.60-4.05 (5) of 1. Proboscis 1.56-1.66 (3) length of forefemur. Cell R_2 1.36-1.76 (7) length of vein r_{2+3}. Foretarsomere 5 longer than 4, with stout ventrobasal setae; anterior claw of foretarsus thick, longer than simple posterior claw, with a minute triangular median tooth; anterior claw of midtarsus longer than posterior claw, both simple; hindtarsal claw paired. *Genitalia*. Tergum IX well sclerotized; lobes long, 2.7-3.6 length of narrowest width, narrowly separated, well sclerotized, apices usually slightly expanded, each bearing 6-14 stout setae of medium length. Sternum IX rounded trapezoidal, weakly sclerotized except for membranous anteromedian area, covered with irregular reticulation on the sclerotized part. Basistyle subcylindrical, 2.1-2.3 as long as wide, laterally and sternally scaled, tergoapically and laterally with strong bristles, finer bristles sternally, with 2 rather fine, isolated bristles tergally near base; basal mesal lobe (claspette) fairly large, rounded, nearly reaching

apical 0.33 of basistyle, covered densely with bristles, several apical bristles long and stout. Dististyle nearly length of basistyle, curved, slightly narrowed from base to middle, apical half slightly thickened, bearing a number of minute setae near the rounded apex; claw short, pigmented. Paraproct with apex strongly sclerotized and 4-6 dentate; 3-10 cercal setae; tergite X fairly large and well sclerotized. Aedeagus broad in basal half and narrow in apical half, 1.65-2.00 (5) as long as wide, about 0.6 length of basistyle, apparently tergally closed, sternally open in a relatively wide median slit, with a large tergobasal orifice, subapical portion with several tergomesal teeth and a small paired semicircular sternal expansion, apical margin of which is simple and appears as a paired process in dorsoventral view.

LARVA (Fig. 154). *Head.* Width 1.02-1.09 mm; 0.94-1.06 as long as wide; seta 1-C arising from prominent socket, very stout, curved mesally; 4-6-C slender; 4-C separated by slightly less than half it length; 5-C well caudad and mesad of 7-C; 6-C mesad of 5-C and cephalad of 7-C, usually single; 14-C moderately stiff. *Antenna* 0.24-0.27 mm long, about 0.25 length of head, slightly bowed; seta 1-A slender, inserted at apical 0.20-0.25 of shaft. *Mandible* with 15-20 simple dorsolateral microspines. MdS_1 simple, pigmented; $MdS_{3,4}$ short, slender, pectinate; $MdS_{2,5}$ apparently reduced. Cutting organ with dorsal tooth large, unicuspid, strongly curved and heavily pigmented; ventral tooth with 2 spiniform lateral denticles ($VT\text{-}1_{,4}$), VT-1 fine, VT-4 strong, not reaching apex of VT_0; 3 mesal denticles ($VT_{1\text{-}3}$) becoming progressively smaller; ventral blade slightly curved, usually not reaching tip of VT_0; pectinate brush of apparently 3, 4 small nearly transparent hairs. Piliferous process with labula extending beyond apex of anterior part; mandibular hairs (12-13) + (5-7) (5). *Maxilla.* Seta 1-Mx laterally on basal margin, 9-14 branched. Mesostipes with rather stiff spicules along anteromesal margin, the spicules simple, short and stout proximad, progressively longer, more slender and apically branched distad; mesal stipital sensorium 1.75-2.00 length of lateral one; seta 2-Mx very short, laterad of stipital sensoria; 4-Mx long, inserted near anterolateral corner. Lacinia with 5-Mx slender, far proximad of level of stipital sensoria. Palpostipes slightly curved mesad; apex with 5 sensoria and an ampulla-like structure (occasionally not visible), S_3 longest, pointed, S_5 very small. *Mentum plate* with 17-19 (usually 19) short, blunt to subacute, teeth; median tooth about 1.33 as long and 1.5-2.0 as thick as flanking teeth. *Thorax.* Most setae lightly to moderately barbed; seta 6-M short and stiff; 7-T spiniform, very strongly developed, with 2-4 slightly curved short blunt branches, usually spiculate on basal 0.67, the spicules needle-like. *Abdomen.* Setae 5 and 11 usually more strongly developed than other setae, especially on segments I, II; 6-IV, V usually double. Comb scales 16-28 in a single row, occasionally with one or 2 scales cephalad of the row; the scales becoming progressively longer and narrower ventrad until about ventral 0.33, then becoming shorter; dorsalmost scales with simple acute tips; remainder fringed with spicules, often strongly so at apex. *Siphon* slightly broadened at middle, brownish, becoming slightly darker on apical 0.33-0.50; index 3.4-4.4; pecten of 4-6 widely spaced, smooth to laterally spiculate, dagger-like teeth, extending from basal 0.33 to apical 0.13 of siphon, longest pecten tooth about 0.33 length of siphon diameter at insertion; proximalmost seta 1-S inserted ventrally near base of siphon, followed by 6-8 pairs of 2 branched setae reaching apical 0.25 of siphon, the longest 1-S about 0.5 length of siphon, or slightly longer; siphon also with 3-6 (usually 5) pairs of 2, 3 branched laterodorsal accessory setae (2a), these setae stiff, weakly barbed, and about 0.67-0.75 length of siphon diameter; 2-S stout, slightly S-shaped,

about 0.75 length of apical diameter of siphon. *Saddle* slightly to moderately rugose, bearing 3-5 large and 2-4 small spines between 1-3-X, the longer spines slightly longer than and about 2.0 as thick as the largest pecten tooth, laterally and apically fringed with spicules, the spicules apically strongest; seta 1-X about 4.0 saddle length, 1,2 branched and lightly to moderately barbed; 2,3-X arising from a more or less distinct lobe; 4-X 4-6 branched, stiff, moderately barbed, roughly equal to saddle length. Anal gills apically rounded, 1.5-2.0 saddle length, dorsal gill longer than ventral gill.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 1♀, 2 L: Hokkaido (A-0025, A-0041, A-0202). 34♂, 34♀; with associated skins (5 l, 5 p), 96 L, 1 l: Honshu (B-0326, B-0335, B-0340, B-0341, B-0360, B-0361, B-0364, B-1188, C-1581, C-2103, C-2129, C-2130, C-2131, D-0048, D-0061, D-0091, D-0101, E-2090, E-2099, E-2128, F-0024). 21♂, 25♀; with associated skins (9 l, 9 p), 1 L: Kyushu (H-0073, H-0077, H-0080, H-0315, H-0316, H-0317, H-0318). 2♂, 3 l: Yakushima (H-0086, H-0087). 2♂, 8♀; with associated skins (1 l, 1 p): Tsushima (H-2004, H-2005, H-2014). KOREA. 4♂, 3♀: Korean Peninsula (L-0821, L-0834, L-0874).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsushima). KOREA (Korean Peninsula).

107B. *TRIPTEROIDES (TRIPTEROIDES) BAMBUSA YAEYAMENSIS* NEW SUBSPECIES
(Fig. 256)

Rachionotomyia bambusa: Yamada, 1927: 569 (in part), Ryukyu Isls.

Wing length: 2.3-3.3 mm (female and male). Differing from *bambusa bambusa* in the following characteristics. Scutum light yellowish brown, only central area more or less brownish; paratergite, lower end of sternopleuron and apex of mesomeron also yellowish brown. Scutum with more dorsocentral bristles, those of anterior and posterior series usually continuously arranged. Male antennal flagellomere 12 1.15-1.57 length of Flm 13, both together 0.50-0.57 ($x = 0.53$) of Flm 1-11. Female cell R_2 1.26-1.84 ($x = 1.53$) length of vein r_{2+3}.

TYPE-SERIES. Holotype male (#22393, K-0637-13) with associated slides of genitalia, larval and pupal skins: Mt. Banna, Ishigaki Is., Ryukyu Archipelago, 22 IV 1971, tree hole, Mizusawa & Nishikawa. Paratypes: 46 males, 48 females, 21 larvae, 4 larval skins, with slides of associated skins (16 larval and 16 pupal), genitalia (7 males), 2 females), mouthparts (7 males, 3 females, 3 larvae), wings (2 males, 8 females) and legs (2 males, 3 females). Paratypes from Ishigaki Is. - 3 males, 2 females (K-0135): Mt. Omoto, 2 V 1970, tree hole, Nishikawa; 2 females (K-0148): Yonehara, 6 V 1970, tree hole, Mizusawa & Nishikawa; 2 males, 1 female (K-0561): Yonehara, 18 XII 1970, tree hole, Mizusawa: 2 females, with associated skins (2 larval and 2 pupal) (K-0568): Arakawa, 25 XII 1970, tree hole, Mizusawa; 1 male (K-0630): Inoda, 18 IV 1971, rock hole, Mizusawa & Nishikawa; 5 males, 4 females, with associated skins (2 larval and 2 pupal) (K-0635): Inoda, 18 IV 1971, tree hole, Mizusawa & Nishikawa; 6 males, 2 females (K-0637): Mt. Banna, 22 IV 1971, tree hole, Mizusawa & Nishikawa; 3 females (K-0960): Mt. Banna, 8 XI 1971, tree hole, Tanaka & Mizusawa; 3 females (K-1075): Mt. Omoto, 26 XI 1971, net, Mizusawa; 5 larvae (K-1357): Mt. Banna, 10 XII 1972, tree hole, Saugstad, Mizusawa & Imamura; 1 male, with skins (1 larval and 1 pupal)

(K-1384): Mt. Banna, 13 XII 1972, tree hole, Mizusawa & Imamura; 4 larvae (K-1427): nr. Kabira, 26 XII 1972, tree hole, Mizusawa & Imamura; 12 larvae (K-1453): Mt. Banna, 31 XII 1972, tree hole, Mizusawa & Imamura; 5 males, 3 females (K-1603): nr. Kabira, 1 VIII 1973, tree hole, Mizusawa; 3 males, 4 females (K-1613): nr. Yoshiwara, 4 VIII 1973, tree hole, Mizusawa; 2 males, 2 females, with associated skins (4 larval and 4 pupal) (K-1736): Yonehara, 8 XII 1973, tree hole, Mizusawa & Kuroshima; 1 male, with associated skins (1 larval and 1 pupal) (K-2052): nr. Yoshiwara, 4 XII 1974, tree hole, Mizusawa & Watanabe; 1 female, with associated skins (1 larval and 1 pupal) (K-2053): nr. Yoshiwara, tree hole, Mizusawa & Watanabe. Paratypes from Iriomote Is. - 2 males (K-0154): Itokawa-rindo, 8 V 1970, bamboo stump, Mizusawa & Nishikawa; 1 male, 1 female, with associated skins (1 larval and 1 pupal) (K-0574): Foot of Mt. Goza, 22 XII 1970, tree hole, Mizusawa; 4 males (K-0584): Itokawa-rindo, 23 XII 1970, net, Mizusawa; 2 males, 1 female, with associated skins (1 larval and 1 pupal) (K-0693): Itokawa-rindo, 17 IV 1971, tree hole, Mizusawa & Nishikawa; 1 male, 2 females (K-0726): Itokawa-rindo, 14 IV 1971, net, Mizusawa & Nishikawa; 1 male (K-0727): Foot of Mt. Goza, 15 IV 1971, net, Mizusawa & Nishikawa; 1 female (K-0731): nr. Shirahama, 19 IV 1970, net, Mizusawa & Nishikawa; 2 females (K-0919): nr. Uehara, 29 X 1971, net, Mizusawa, Shinonaga & Kikuchi; 2 males, 8 females (K-0923): nr. Uehara, 29 X 1971, tree hole, Mizusawa, Shinonaga & Kikuchi; 1 male, 1 female, with associated skins (1 larval and 1 pupal) (K-1238): Itokawa-rindo, 24 IX 1972, tree hole, Mizusawa; 1 male, with associated skins (1 larval and 1 pupal) (K-1344): Foot of Mt. Goza, 7 XII 1972, tree hole, Mizusawa; 1 male, with associated skins (1 larval and 1 pupal) (K-2034): Itokawa-rindo, 30 XI 1974, tree hole, Mizusawa & Tamamori.

The holotype and one-half of the paratypes are deposited in the National Science Museum, Tokyo, the remaining paratypes are deposited in the USNM.

SPECIMENS EXAMINED OTHER THAN THE TYPES. RYUKYU ARCHIPELAGO. 63 males, 39 females, with associated skins (4 larval and 4 pupal), 63 larvae, 12 larval skins: Yaeyama Guntô (K-0122, K-0127, K-0130, K-0152, K-0153, K-0179, K-0184, K-0582, K-0631, K-0634, K-0638, K-0646, K-0694, K-0722, K-0724, K-0772, K-0773, K-0934, K-1065, K-1078, K-1112, K-1122, K-1234, K-1236, K-1245, K-1355, K-1369, K-1391, K-1451, K-1454, K-1462, K-1472, K-1474, K-1758, K-2195).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

BIONOMICS. Common throughout Palaearctic Japan and in Yaeyama Guntô. Larvae occur in tree holes and bamboo stumps, occasionally in artificial containers in more or less natural environments. This species was the 2nd commonest mosquito found in ovitraps in Kamakura, Japan, comprising slightly more than 13% of the total (Moriya 1974). Adults are stenogamous; females are diurnal feeders, laboratory findings showing highest preference for mice, less for chicks and reptiles, and no feeding on amphibians. The females drop eggs onto the surface of water while hovering above it, sometimes while resting on the wall of the container (Miyagi 1973). A small proportion of females are autogenous under appropriate conditions (Mori 1976).

12. GENUS *TOPOMYIA* LEICESTER

Topomyia Leicester, 1908: 238. Type-species: *To. gracilis* Leicester, 1908; Malaya.

FEMALE. *Head.* Eyes rather broadly contiguous above and below. Vertex without erect forked scales. Clypeus small, short. Palpus very short. Proboscis shorter than forefemur, not markedly apically swollen. *Thorax.* Pronotal lobes fairly well separated, anteriorly with broad scales and many bristles; posterior pronotal lobe with broad scales in upward imbrication, and 1, 2 bristles. Scutum with median line of broad scales; acrostichal bristles absent, dorsocentrals absent except several bristles on anterior margin, one humeral, a few prescutellars (or posterior dorsocentrals) and many supra-alars remaining. Pleural bristles: one or a few propleurals, spiraculars, prealars and sternopleurals, several to about 10 upper mesepimerals. *Wing.* Squama bare; alula fringed with short dark setiform scales. Vein scales variable. Vein 1a extending slightly beyond level of cubital fork. *Legs.* Slender, unornamented. Claws paired. *Abdomen.* Tergum I hirsute, laterotergite scaled.

MALE. Antenna, palpus, tarsomeres 4 and 5, and claws not modified, same as in female. Vein 1a ending at about level of cubital fork. Abdominal tergum VIII strongly bristled. *Genitalia.* Tergum IX with variously developed lobes, often bearing modified setae. Basistyle scaled; basal lobe, subapical lobe of claspette present or absent, often strongly modified setae present. Dististyle variable, often bifurcate; claw absent. Cercal setae present; paraproct rather simple, apex blunt, strongly sclerotized. Aedeagus consisting of opisthophallus, phallus and prosophallus.

LARVA. *Head.* Wider than long; setae 4-7, 13-C weak; 11, 14-C stronger than 13-C; 14-C well behind anterior margin of cranium. *Mandible* with mandibular ring distinct, on dorsal surface near base; 2 mandibular spurs ($MdS_{1,5}$ present), MdS_{2-4} reduced; mandibular comb reduced to a row of slender hair-like teeth, appressed to lateroanterior surface. Cutting organ strong, with a single dorsal tooth; ventral tooth with 3 triangular mesal denticles (VT_{1-3}); ventral blade with fine mesal serration; pectinate brush weakly developed. Piliferous process more or less protrudent, with hair-groups not always well defined. *Maxilla* (only predaceous *To. yanbarensis* studied in detail). Cardo not fused with palpostipes, triangular. Mesostipes longer than wide, parartis without sclerotized process; maxillary brush with hairs short and stiff, some transformed to short triangular spines; stipital sensoria distad of middle, without basal ring. Lacinia with a row of strong spines along mesal margin, and a tuft of longer apical spines. Palpostipes rather long, apex with 3 palpal sensoria ($S_{1,2,4}$) and ampulla-like structure. Maxilla of other predaceous species greatly simpligied, long and narrow, apex with 2 sometimes articulated unequal strong horn-like spines, (*To. imitata* after Baisas 1946; *To. argenteoventralis* after Edwards 1932). *Thorax.* Setae 5-7-P on common basal callus; 5, 6-P multibranched; 13-P absent; 6-M and 7-T ordinary long slender setae; 13, 14-M and 13-T rather well developed. *Abdomen.* Seta 14-II absent; 6-I-V and 7-I, II strong; 12-I absent; 13-II, VI not dendritic; 1-5-VIII dorsolateral to lateral in position. Comb scales arranged in an irregular row. *Siphon* with pecten teeth stout and scattered; seta 1-S subventral. *Saddle* with setae 1-4-X branched.

DISTRIBUTION. Oriental region (most species occur in Indomalayan subregion). Papuan subregion.

In this region, only a single species from the subgenus *Suaymyia* occurs in Okinawa Is. Makiya et al. (1976) reported that a single larva of this genus was obtained in a bamboo stump at Kagoshima City, southern Kyushu.

SUBGENUS *SUAYMYIA* THURMAN

Suaymyia Thurman, 1959: 44. Type-species: *Topomyia cristata* Thurman, 1959; Thailand.

ADULT. Foretarsomere 2 longer than 3; tarsomeres straight. Male genitalia with lobes of tergum IX widely separated; claspette with large rod-like setae.

DISTRIBUTION. Same as in the genus.

108. *TOPOMYIA (SUAYMYIA) YANBARENSIS* MIYAGI (Figs. 155, 156, 257; Table 140)

Topomyia (Suaymyia) yanbarensis Miyagi, 1976: 202 (♂, ♀, P, L). Type-locality: Yona, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 257) (2 specimens). Wing length 3.3-3.5 mm. *Head.* Vertex covered with broad dark scales, scales along eye margin appearing silvery; tempus covered with broad silvery scales; median pair of vertical bristles rather long, dark bronze brown, 4 lateral vertical and 3 temporal dark bristles on each side. Clypeus yellowish brown. Antenna: pedicel pale yellowish brown, mesal surface somewhat darker, with a number of minute yellowish brown bristles. Palpus very short, dark scaled. Proboscis distinctly shorter than forefemur, dark scaled, with a ventral line of yellowish scales, the line not reaching both base and apex; 2,3 ventrobasal setae present. *Thorax.* Anterior pronotal lobe with integument brown, covered with broad silvery scales, anteriorly bearing more than 10 dark bristles; posterior lobe covered with broad golden scales, one bristle may be present near posterior margin. Scutum with integument dark brown on disk, yellowish brown on margins, covered with narrow curved dark scales, with a median double row of broad translucent scales from anterior margin to posterior margin, appearing silvery at anterior promontory, dark otherwise; a line of rather large broad golden scales on lateral margin from scutal angle to wing root; scutal bristles dark, one humeral closer to scutal angle than anterior margin, a few prescutellars (or posterior dorsocentrals) close to posterior margin. Scutellum covered with broad dark scales; each lateral lobe with 3 and median lobe with 4 long dark bristles, each lobe with several additional short bristles. Paratergite hidden under marginal golden scutal scales. Pleural integument apparently light brown, sub- and postspiracular areas and prealar knob covered with broad golden scales, mesepimeron covered with broad silvery scales; propleuron, sternopleuron except anterior part, and metapleuron covered with broad silvery scales, some upper scales of metapleuron dorsally directed; 1,2 dark propleural bristles accompanied by 1,2 fine pale ones, 2,3 dark spiraculars, 3,4 short dark prealars, at least one sternopleural on posterior margin at about middle, and about 10 yellowish upper mesepimerals. *Wing.* Vein scales dark. Cell R_2 3.25-3.36 length of vein r_{2+3}. Halter knob dark scaled. *Legs.* Coxae covered with pale scales. Femora posteroventrally pale, remainder of legs dark. Hindtarsomere 1 1.06-1.16 length of tibia. *Abdomen.* Terga I-VII dark scaled, with lateral patches of golden scales, the patches mesally broadened toward apex. Sterna golden scaled.

MALE (Fig. 155) (2 specimens). Wing length 2.9-3.2 mm. Proboscis with

pale ventral scaling whitish and more developed, also covering dorsal side at base. Upper mesepimeral bristles 7, 8. Cell R_2 3.32-3.33 length of vein r_{2+3}. Hindtarsomere 1 1.12-1.13 length of tibia. Abdominal tergum VIII dark scaled as well as sternum VIII. *Genitalia*. Tergum IX narrow in middle, weakly sclerotized; lobes narrow, widely separated, very strongly produced, each bearing a rather short strong apical seta and 2, 3 mesal bristles, distalmost bristle rather thick. Basistyle short, about 1.5 as long as wide, sternally and laterally scaled, with short sternomesal bristles, tergobasal to lateroapical medium to long bristles; with mesal (rather tergal) membrane; claspette (mesal lobe) reaching near apex, with short tergal bristles, bearing 2 long pigmented rod-like blunt-tipped setae and one slender bristle at apex, the setae and bristle subequal in length and 0.67 length of basistyle. Dististyle 1.3 length of basistyle, swollen at basal 0.33, then bifurcate; both arms slender; the lateral arm slightly longer, with a number of minute setae near apex, several scattered short setae in apical 0.33 and one at tip; mesal arm with several short setae in apical 0.25. Cercal tergal surface with narrow sclerotizations; 3, 4 rather long cercal setae on each side; paraproct strongly sclerotized at apex, digitiform, unequally and shallowly cleft at apex. Aedeagus 2.19-2.45 as long as wide excluding lateral expansion of prosophallus; opisthophallus reaching near middle of aedeagus; phallus longest of all 3 parts, narrow, ampul-shaped in tergal view, narrow in apical 0.33, with apex pointed; prosophallus a curved rod of about even width, laterally curved in middle, then strongly tergomesally recurved, with apex over phallus, apparently apically flattened, rounded at tip, with many short blunt-tipped subapical spicules.

LARVA (Fig. 156) (3 specimens). *Head*. Width 0.98 mm (1); labrum concave between seta 1-C; 1-C stout, ventrally directed, 1.25-1.30 length of distance between bases; 14-C on about level of 12-C and posteriad of 15-C. *Antenna* 0.22-0.24 mm long, about 0.25 length of head, straight; seta 1-A inserted at apical 0.22-0.28, extending slightly beyond apex of shaft; 2-6-A apical; 2-A length of 1-A; 3, 4-A equal; 5-A longer than 3-A, with an accessory sensorium on proximal division; 6-A slightly shorter than 3-A. *Mandible* with a number of stout microspines on lateral surface near base; MdS_1 well developed, basally stout, pigmented; MdS_5 very short, pale, mesal serration relatively distinct. Cutting organ with dorsal tooth slender and apically curved; VT_0 very large and dark, VT-4 very small, VT_{1-3} subequal; ventral blade stout, not reaching apex of VT_0, with mesal serration; pectinate brush of 3, 4 mesally pectinate hairs. Piliferous process slightly protrudent, not distinctly apically cleft, most hairs apically packed, some scattered on anterior surface. Mandibular hairs about 10 in each group, partially barbed. *Maxilla*. Cardo with seta 1-Mx close to anterior margin, rather stiff, single or 2-forked. Mesostipes 1.89 (1) as long as wide, with lateral surface smooth; apex with a tuft of long blade-like pigmented spines; stipital sensoria rather short, slightly distad of middle; seta 2-Mx slightly distad of stipital sensoria, slender; 4-Mx close to apex, rather long, slender, with large prominent alveolus. Lacinia with a row of 8 strong pigmented spines near mesal margin from basal 0.33 to apex, the spines progressively larger towards apex; 5-Mx rather long, apically slender, rather basally thick, with large alveolus. Palpostipes excluding lateral artis about 0.6 length of mesostipes; $S_{1, 2, 4}$ subequal. *Mentum plate* with 15-17 teeth, median tooth distinctly larger than others. *Thorax*. Seta 0-P not dendritic; 1, 2, 9, 10-P, 13-M-T and 14-M fairly well developed; 12-P slightly longer than 9, 10-P; 5, 6-M subequal; 7-M shorter than 5-M. *Abdomen*. Setae 6-I-V, 7-I, II and 13-III-V strong; 11-I, 12, 13-II and 1-III-VII (especially 1-IV, V) fairly well developed; 8, 9-IV, V

dorsad of 6-IV, V; 5-VII laterad of 4-VII; 1-5-VIII weak and unbarbed, 1-3-VIII dorsolateral and 4, 5-VIII lateral in position. Comb scales 6-13 in a single or irregular double row; individual scales thorn-shaped with a strong apical spine, with fine spicules laterobasally fringed, occasionally apex shallowly bifid. *Siphon* apically tapering, apex 0.37 (1) of widest part; length 0.88 mm, index 3.24 (1); microsculpture absent; pecten extending over whole length of siphon, of 7-12 broadly spaced, blunt-tipped simple stout teeth, occasionally the row irregularly basally doubled; seta 1-S of 2, 3 pairs of weak subventral setae; 2, 3 pairs of single accessory subdorsal setae present, inserted in apical 0.67 of siphon; 2-S apical, stiff, pigmented, 0.8 length of apical pecten tooth. *Saddle* weakly sclerotized; seta 1-X strongly developed; 2, 3-X subequal; 4-X a pair of 6, 7 branched setae. Anal gills elongate conical, dorsal gill 1.9 (1) length of saddle, ventral gill 1.3 (1) length of dorsal gill.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 2♂, 2♀; with associated skins (2 l, 2 p), 1 L: Okinawa Guntô (Paratypes 1♂: J-2205; 1♀: J-2206. 1♂, 1♀; with associated skins (2 l, 2 p), 1 L: J-2198, J-2199, J-2200).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa Guntô).

DISCUSSION. Kamimura (1976b) regarded a single larval specimen found in Kagoshima, Kyushu as *yanbarensis*, but he stated adults are needed to confirm this identification.

BIONOMICS. This species has extremely peculiar habits. The larvae occur in bamboo internodes bearing a small hole bored by a cerambycid beetle, *Abryna coenosa*. They are carnivorous, feeding on tiny Branchiopoda living in water contained in the internodes. Adults emerge in these internodes, exiting through the same narrow hole made by the cerambycid as was utilized by their mother at oviposition. Adult habits in nature are uncertain; they do not feed on man in the laboratory. (Miyagi 1976, and personal communication).

13. GENUS *MALAYA* LEICESTER

Malaya Leicester, 1908: 258. Type-species: *Malaya genurostris* Leicester, 1908; Malaya.

Harpagomyia de Meijere, 1909: 165. Type-species: *Harpagomyia splendens* de Meijere, 1909; Java.

FEMALE. *Head.* Eyes distinctly separated above and below (? occasionally contiguous - Edwards 1932: 91). Vertex without erect forked scales. Clypeus 2.0 as long as wide or longer, medially ridged, somewhat pointed, bare or tomentose. Antenna longer than proboscis, flagellomere 1 1.5 length of Flm 2. Palpus 1 segmented. Proboscis flexible at apical 0.33, markedly swollen distad of it, bent upward, deeply pigmented, hairy and bearing 2 pairs of long curled bristles at apex; proximal 0.67 also hairy, with a row of upright bristles dorsally on each side; labella rather large, deeply pigmented as in swollen part of proboscis. *Thorax.* Anterior pronotal lobes very narrowly separated, each with less than 10 bristles on anterior margin, with broad scales; posterior pronotal lobe covered with broad scales, with 1-3 bristles along posterior margin. Scutum often with median line of broad flat silvery scales; acrostichal bristles absent, anterior dorsocentrals absent except for 2, 3 bristles on anterior margin, usually one or a few posterior dorsocentrals, no prescutellars, one humeral, many supraalars. Paratergite broad, bare. Pleural bristles: 1-3 propleurals, 0-3 spiraculars, no prealars, 0-2 sternopleurals, at most 10 upper mesepimerals. *Wing.* Squama bare; alula fringed

with hair-like scales. Vein 1a ending at level of cubital fork. *Legs.* Slender, unornamented. *Abdomen.* Tergum I hirsute, laterotergite scaled; terga except III usually with lateral or lateroapical silvery patches. Seminal capsules 3, one slightly larger than other 2.

MALE. Antenna, palpus, tarsomeres and claws as in females, but tarsomere 5 relatively longer, 0.60-0.67 length of 4 in fore- and midtarsi. *Genitalia.* Tergum IX with weakly differentiated bristled lobes. Basistyle scaled, with poorly defined basal lobe bearing weakly modified setae. Dististyle simple, with terminal claw. Cercal setae absent; paraproct simple, apex digitiform, well sclerotized. Aedeagus a single dorsoventral structure, apically broad, emarginate on apical margin in tergal view.

LARVA. *Head.* Wider than long; setae 4, 6-C anteriad of antennal base; 14-C far posteriad of anterior margin of postgena. *Mandible* with very sharp simple microspines laterally near base; only one well developed mandibular spur; mandibular comb of short slender hair-like teeth. Cutting organ with a single dorsal tooth; ventral tooth with 3 subequal triangular mesal denticles (VT_{1-3}); ventral blade single; pectinate brush weakly developed. Piliferous process only slightly protrudent, distal cleft poorly defined, with apparently 4 hair groups. *Maxilla.* Cardo fused with palpostipes; seta 1-Mx weak. Mesostipes pear-shaped, longer than wide; parartis well developed; stipital sensoria at middle, without basal ring; 4-Mx multiple at apex. Lacinia with 5-Mx at level of stipital sensoria; 6-Mx at termination of lacinial suture. Palpostipes short, apically cylindrical, with 5 palpal sensoria. *Thorax.* Seta 1-P slightly separated from 2,3-P, weak; 5-7-P on common callus, 5,6-P multibranched; 13-P absent; 6-M and 7-T ordinary long slender setae; 13-M, T and 14-M moderately to rather well developed. *Abdomen.* Setae 2-I-VII mesad of respective 1-I-VII; 12-I absent; 6-I, II multibranched, strong; 13-II, VI not dendritic. 6-III-VI longer than 6-I, II, 1-3 branched on III and V, VI, multibranched on IV; 3-III, IV mesad of respective 1-III, IV; 1-5-VIII dorsolateral to lateral in position. Comb of numerous scales in a patch. *Siphon* with pecten teeth scattered in whole length or basally restricted; seta 1-S of several subventral pairs. Setae 1,2-X branched, 3,4-X single.

DISTRIBUTION. Oriental and Ethiopian regions.

The genus *Malaya* is represented in our area by a single species.

109. *MALAYA GENUROSTRIS* LEICESTER
(Figs. 157, 158, 258; Table 141)

Malaya genurostris Leicester, 1908: 258 (♂). Type-locality: Malaya.
Harpagomyia genurostris: Bohart and Ingram, 1946b: 54, Okinawa Is., Ryukyu Archipelago.

FEMALE (Fig. 258). Wing length 2.0-2.6 mm. *Head.* Vertex with an anteromedian transverse oblong patch of broad silvery scales, the patch extending anteriorly as a narrow line onto interocular space, greater anterior lower part of tempus covered with broad silvery scales, remainder of vertex and tempus covered with broad dark scales; one median and 2,3 lateral vertical, and 4,5 temporal black bristles on each side. Clypeus silky white, sometimes yellowish, 2.5 as long as wide, ridged along median line. Antenna: pedicel yellowish brown, with minute dark bristles on mesal surface; flagellum 1.29-1.31 (2) length of proboscis; flagellomere 1 with a few pale scales, 1.53-1.55 length of Flm 2. Palpus 0.14-0.15 (2) length of proboscis, extending

only slightly beyond apex of clypeus, yellowish white, somewhat clavate, pointed at apex, with 2 dark bristles at middle; stipes large, bearing 2-4 bristles near upper margin. Proboscis conspicuously swollen in apical 0.25, yellowish white and clothed with pale scales in basal half, brown and clothed with dark scales on apical club, with long upright dark bristles dorsally and half-decumbent pale hairs ventrally; labella well developed, 0.67 length of apical club, dark brown, hairy. *Thorax.* Anterior pronotal lobe covered with silvery broad scales and bearing 6, 7 dark bristles; posterior pronotal lobe covered with scales similar to above, bearing 1, 2 bristles near posterior margin. Scutum with integument yellowish brown, infuscate on median line and anterior supraalar area, covered with narrow curved dark scales, with a median double row of broad silvery scales from apex to antealar level; scutal bristles dark bronzy brown or black, one humeral, usually one posterior dorsocentral, rarely one anterior dorsocentral present. Scutellum heavily covered medially with broad silvery scales and laterally with broad dark scales, bearing 4 bristles on median lobe, 3 on each lateral lobe. Pleural integument dark brown, prealar area pale yellow; broad silvery scales covering propleuron, subspiracular area, sternopleuron (except for lower anterior margin) and mesepimeron (excepting posterior and lower margins); pleural bristles yellowish brown, 1, 2 propleurals, 1-3 spiraculars, 1, 2 sternopleurals at lower angle, and less than 10 upper mesepimerals. *Wing.* Veins dark scaled; cell R_2 longer than vein r_{2+3}. Halter with dark scaled knob. Legs. Coxae with broad silvery scales. Posteroventral surface of femora and tibiae pale; femora, tibiae otherwise and tarsi dark. Hindtarsomere 1 1.16-1.21 (2) length of tibia. *Abdomen.* Terga dark scaled, laterotergite and side of II covered with silvery scales, III entirely dark scaled, IV-VII with lateroapical patches of silvery scales, the patches decreasing in size on posterior segments; VIII rather hairy. Sterna silvery scaled, IV-VII with basal bands of dark scales, the bands progressively broader on posterior segments.

MALE (Fig. 158). Wing length 1.9-2.4 mm. Basal half of apical club of proboscis often paler. Antenna, palpus and claws similar to those of the female. Sterna usually entirely pale scaled. *Genitalia.* Tergum IX emarginate at middle of apical margin; lobes only slightly produced, each bearing 8-13 rather long setae. Basistyle short, 1.7-2.1 as long as wide at sternal base, tergally and mesosternally bristled, laterally and ventrally scaled, with 2 strongly thickened setae and 2 moderately thickened ones tergomesally distal to middle, without mesal membrane; basal tergomesal lobe poorly defined, represented by 4 strong setae and many bristles. Dististyle moderately arcuate, about 0.6 length of basistyle, with a few minute setae in apical half; claw short and blunt. Paraproct apically well sclerotized. Aedeagus moderately sclerotized, 1.16-1.58 as long as wide in tergal view, constricted distad of middle, apically expanded; lateroapical margin serrate; tergal surface distinctly emarginate at apex and very deeply at base; sternal surface widely open.

LARVA (Fig. 157). *Head.* Width 0.9-1.1 mm; 1.3-1.5 as wide as long; seta 1-C stout, strongly downcurved, separated by about 0.63 their length; 4, 6, 7-C on a nearly straight diagonal line, distance from 4-6-C about 0.33 that of 6, 7-C; 4-C usually double; 5-C well caudad and slightly mesad of 6-C; 6-C usually single; 7-C usually 3 branched, slightly stiffer than 4-6-C. *Antenna* 0.19-0.27 mm long, 0.20-0.33 length of head, lightly pigmented, becoming slightly darker distad; 1-A very slender, arising from a small tubercle at apical 0.20-0.25. *Mandible* with MdS_1 long, curved, moderately pigmented. Cutting organ with dorsal tooth moderately curved, bearing an acute basal denticle; ventral tooth with VT-4 not quite reaching tip of VT_0; VT_0 about 2.0 as long and 1.67 as wide

as VT_1; $VT_{2,3}$ about equal to VT_1; ventral blade rapidly expanding to greatest width in basal 0.33, then gradually tapering to a subacute tip, reaching to or slightly beyond tip of VT_1, finely pectinate on mesal margin; pectinate brush of at least 3 fine hairs, the longest hair about 0.50-0.67 length of ventral blade, the shortest about 0.33 length of the blade. Piliferous process only slightly protuberant, apparently shallowly cleft at apex, with 5 hair groups rather poorly defined. *Maxilla.* Seta 1-Mx single, on anterior margin. Mesostipes with stipital sensoria at about middle; 2-Mx small, near lateral margin at about level of apex of palpostipes; 4-Mx very stout, arising from a large socket near apex. Lacinia with 5-Mx long, slender, at about level of stipital sensoria; 6-Mx very small. Palpostipes thumb-shaped; S_1 slightly larger than the others; S_{2-4} subequal, S_5 very small, all lightly pigmented. *Mentum plate* with 25-27 (usually 27) subacute teeth, median tooth much stronger than flanking teeth, which have their apices directed mesally. *Thorax.* Seta 5-P short, 0.5 length of 6-P, about 20-25 branched, some branches strongly curved near base; 6-P long, 12-16 branched; 8-P somewhat stiff; usually, 14-M 3 branched and 7-T 5 branched. *Abdomen.* Seta 9-I usually 8, 9 branched; 14-II absent; 13-III usually triple; 3-VII very long, reaching 1-S. Comb scales 40-60 in a patch, individual scales paddle-shaped, laterally and apically fringed with spicules. *Siphon* lightly pigmented, of fairly even diameter until narrowing rather abruptly in apical 0.25-0.33; index 3.4-4.2; pecten of 8-18 teeth in an irregular single or double (occasionally proximally triple) row, extending from near base to apical 0.33 of siphon; basalmost seta 1-S long, distally followed by 2-6 usually single moderately long setae, and 1-3, 1-4 branched short setae arranged in a straight or zigzag row; siphon also with several dorsolateral accessory setae: 2-4 pairs of moderately barbed stiff 1-3 proximally branched setae and distally by 1-3 pairs of smaller unbarbed 3-6 branched setae; 2-S stout, with tip hooked, 0.7 length of siphon diameter. *Saddle* proximally and ventrally weakly sclerotized, bearing several pecten tooth-like spines between setae 1, 3-X; 1-X with one branch always longer than others, about 4.0 length of saddle; 3-X usually single, smooth or very lightly barbed near base; 4-X usually single, sometimes double, fairly stiff, about 1.5-2.0 length of saddle. Anal gills subequal, with apices subacute, 3.0-4.0 length of saddle.

SPECIMENS EXAMINED: RYUKYU ARCHIPELAGO. 30♂, 33♀; with associated skins (1 l, 1 p), 25 L, 6 l: Okinawa Guntô (2 L: Chizuka, Okinawa Is., 12 IX 1945, Bohart & Ingram; 1 L: Chizuka, Okinawa Is., 15 IX 1945, taro axil, Bohart & Ingram; 2 L: Hedo, Okinawa Is., 23 IX 1945, taro axil, Bohart & Ingram, USNM. J-0412, J-0429, J-0433, J-0453, J-1289). 32♂, 31♀; with associated skins (10 l, 10 p), 33 L, 10 l: Yaeyama Guntô (K-0566, K-1305, K-1445, K-1599, K-1752).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami, Okinawa and Yaeyama Guntô). TAIWAN. PHILIPPINES. INDONESIA. SOUTH CHINA. MALAYA. SINGAPORE. THAILAND. BURMA. INDIA. SRI LANKA. MALDIVE ISLANDS. NEW GUINEA. AUSTRALIA.

BIONOMICS. Common throughout the Ryukyu Archipelago. Larvae dwell in water in leaf axils of *Alocasia macrorrhiza*. Adults are said to take food directly from the mouths of ants, *Cremastogaster* sp.

(iv) TRIBE TOXORHYNCHITINI

ADULTS. Very large mosquitoes with metallic colored scales. Clypeus very broad. Proboscis strongly curved ventrocaudally at about middle, stout

and rigid in basal half, slender in apical half. Scutellum evenly rounded, with a continuous row of bristles. Spiracular bristles present; sternopleural bristles scattered in scaled area and not in a row along upper to posterior margin. Wing with cell R_2 shorter than vein r_{2+3}; r_{4+5} bearing scaled basal spur which carries r-m; margin with a slight emargination just distad of termination of cu_2, a V-shaped thickening of membrane opposite the emargination. *Male genitalia.* Proctiger with strongly sclerotized paraproct.

LARVA. Head with setae 3, 4-C before anterior ecdysial line; 2-C absent; 5-8-C in a short transverse row on each side of frontoclypeus in front. Antenna with 2, 3-A proximad of 1-A. Mouth brush of 6-10 strong teeth. Hypostomal suture not reaching posterior tentorial pit. Mandible with only 2 slender spurs. Maxilla with cardo completely incorporated into cranium, its presence indicated only by presence of seta 1-Mx near ventroanterior margin of cranium. *Thorax.* and abdomen brown with reddish, purplish or pinkish tinge, ventrally paler, with well developed sclerotized calli, most of body setae arising from these calli in groups; segment VIII without comb scales; siphon distinct, without pecten; a single pair of 1-S; median dorsal valve not specialized.

The tribe Toxorhynchitini consists of a single genus, *Toxorhynchites*.

TAXONOMIC DISCUSSION. In the current treatment of the family Culicidae (excluding Dixidae and Chaoboridae), toxorhynchitines are given subfamily rank as the Toxorhynchitinae and placed between the Anophelinae and Culicinae (e.g. Stone et al. 1959). Among the characters of toxorhynchitines, the evenly rounded scutellum is shared with *Anopheles* and *Bironella* of the Anophelinae, but the 3rd genus of this subfamily, *Chagasia,* has the scutellum trilobed; thus this cannot be characteristic of the subfamily. Also, from a study of the other morphological and behavioral characters, a close phylogenetic relationship between them is difficult to assume. Many characters of toxorhynchitines are seen, however, in Sabethini, and to a lesser extent, in Uranotaeniini and some genera of Culicini. The male genitalia of toxorhynchitines do not exhibit any intrinsic difference from those of Culicini and Sabethini. Most of the characters of toxorhynchitines seem to be essentially of culicines. Though toxorhynchitines have some very distinctive features, as stated by Belkin (1962), they are secondary adaptive characters related to the large size and the feeding habits, and thus must not be overemphasized. However, such characters as proboscis, larval cranium, mouth brush, cardo, etc., are more highly specialized than the most modified types in other culicines. Thus the differentiation of toxorhynchitines appears more ancient than other culicines, and it may be reasonably ranked as one of the tribes of the subfamily Culicinae and arranged last in this subfamily.

14. GENUS *TOXORHYNCHITES* THEOBALD

Megarhinus Robineau-Devoidy, 1827 (*non* Rafinesque 1820). Type-species; *Culex haemorrhoidalis* Fabricius, 1787.
Megarhina auct. (*nec* St. Fargeau).
Toxorhynchites Theobald, 1901b: 234. Type-species: *Toxorhynchites brevipalpis* Theobald, 1901d; Natal.

FEMALE. *Head.* Eyes contiguous above and below. Decumbent scales of vertex all broad; erect scales on posterior margin; 2-8 vertical and 0-2 temporal bristles on each side. Antennal flagellum much shorter than proboscis; flagellomere 1 1.2-1.5 length of Flm 2, with scales. Palpus variable in length,

about 0.25 length of proboscis in subgenus *Toxorhynchites*, 0.67 or longer in subgenera *Lynchiella* and *Ankylorhynchus*. Proboscis with many fine ventrobasal bristles. *Thorax*. Pronotal lobes covered with broad scales; anterior lobe moderately separated, with many stout dark and fine yellowish bristles on anterior margin; posterior lobe without bristles. Scutum moderately arched, covered with rather broad scales on disk, broad scales on margins; 1, 2 pairs of acrostichals on anterior promontory, many bristles on anterior margin at termination of dorsocentral line, supraalars rather few anteriorly, numerous posteriorly, other scutal bristles absent. Postnotum bare. Paratergite very wide, bare. Pleura with broad scales covering propleuron, most sternopleuron and most mesepimeron, often also lower prealar knob; spiracular bristles well developed, usually dark; other pleural bristles pale to yellowish brown, many on propleuron, prealar knob and sternopleuron; mesepimeron with several upper and many posterior bristles, lower mesepimerals present or absent; no postspiraculars. Base of mesomeron on level of that of hindcoxa. *Wing*. Squama with some fine hair-like marginal scales; alula with minute marginal scales. Membrane with distinct microtrichia. Vein scales broad. Cell R_2 very short, 0.25-0.40 length of vein r_{2+3} shorter than M_{1+2}; 1a reaching about level of r-m. *Legs*. Fore- and midtarsomere 5 equal to or slightly shorter than 4. Claws equal and simple. *Abdomen*. Tergum I basally and sublaterally hirsute; laterotergite scaled or unscaled; II-VII with fringe of scales on lateral margin, with a row of fine bristles above the lateral marginal scales, these bristles on VI-VIII often strongly developed forming a conspicuous tuft. Seminal capsules 3, equal.

MALE. Vertex with a deep median groove. Antennal flagellum strongly plumose; flagellomeres 12 and 13 elongate, both together much shorter than Flm 1-11. Palpus 1.7-2.0 length of antenna, with dorsolaterally turned apex, segment 5 longest, tapered, 2-5 without tufted bristles. Wing relatively longer than in female. Fore- and midtarsomere 4 shortened; 5 moderately modified, much longer than 4, with 4 rows of stout ventrobasal setae. Hindtarsomere 1 shorter than tibia. Anterior claw of fore- and midtarsi longer than posterior claw, with a median tooth; hindtarsal claws equal and simple. *Genitalia*. Rather simple and fairly homogenous within the genus. Tergum IX medially produced, with many apical bristles on each side, lobes not distinctly differentiated. Sternum IX without bristles. Basistyle apically tapering, sternally and laterally scaled, densely covered with bristles including many fairly strong ones, with complete mesal membrane; claspette a triangular lobe, tergally bristled, with one to a few stronger apical setae, apicalmost usually strongest; no basal or apical tergomesal lobe. Dististyle slender, long, almost straight, with many minute setae at least apically; claw slightly subterminal, long, simple. Cercal setae present; paraproct strongly sclerotized, with apex 1-3-cuspid. Aedeagus ampul-shaped, tergoapically closed, tergobasally and sternally open, apex a pair of strongly sclerotized lanceolate lateral structures connected by tergal membrane. Paramere short.

LARVA. *Head* rectangular, strongly sclerotized; lateral lobe of median labral plate well developed; seta 0-C very short and transparent, basally thick; 14-C similar to 0-C. *Antenna* short, less than 0.5 length of head, smooth; seta 1-A inserted distal to middle; 4-6-A apical; 6-A thickened. *Mandible* without seta 1-Md; mandibular brush of a single row of stout curved simple hairs; mandibular comb lacking. Cutting organ without dorsal spine, with very strongly developed dorsal tooth longer than ventral tooth, which has 3 mesal denticles but no lateral denticle; piliferous process undeveloped, without hair groups; mandibular hairs in a single group. *Maxilla*. Mesostipes wider than long,

deeply concave on cephalic margin at middle, with mesal division extending more cephalad; dorsal surface apparently membranous, with a diagonal broadly sclerotized band from laterocephalic to mesocaudal corner, with cephalic border densely covered with spiny hairs, stronger hairs on mesal division; mesal membranous area with short stiff hairs; ventral surface sclerotized except narrow area on mesal and caudal margins; twin stipital sensoria located on lateral 0.33 near cephalic margin; 4 ring-based setae; 2 ventromesosubapical setae (2, 6-Mx), one ventrolateroapical seta (4-Mx), and dorsomesal seta (5-Mx). Palpostipes large, length of mesostipes, fused mesobasally with mesostipes, without seta 2-Mx, apex with ampulla and 3 sensoria: lateral $S_{1,2}$, and mesal S_4. *Mentum plate* short and broad, with irregular teeth. *Thorax.* Prothorax with 2 major calli on each side: dorsolateral callus bearing setae 5-7-P, and ventrolateral callus bearing 8-12-P, occasionally 8-P free from the callus; 5, 7, 9-P stiff; 13-P lacking. Mesothorax with 3 major calli on each side: dorsolateral callus bearing 5-7-M and also occasionally 3, 4-M, lateral callus 13-M, and ventrolateral callus 8-12-M; 6, 9, 13-M stiff. Metathorax with 4 major calli on each side: dorsolateral callus bearing 5, 6-T, lateral callus 7-T, ventrolateral callus 8-12-T, and ventral callus 13-T; 6, 7, 9, 13-T stiff. *Abdomen.* Segments I-VII each with 3 calli on each side: dorsal callus bearing setae 1, 3-5, lateral callus setae 6, 7, 9, and ventral callus setae 10-13; 8-V-VII on lateral callus; 1-I-V, VII, 3-VI, 4-I, V, 11-I, III-V, and 13-II-VII stiff. Segment VIII with a large sclerotized plate on each side, 2-5-VIII on posterior edge of the plate, 4, 5-VIII stiff. *Siphon* with seta 1-S inserted basal to middle. *Saddle* complete, slightly apically broadened, apex densely fringed with needle-like hairs except for dorsomedian portion and beneath the stiff seta 1-X; 2, 3-X branched; 4-X of subplumose hairs on grid, apical 2 shorter and typically plumose; grid joined with saddle on midventral line. Anal gills very short, globose.

DISTRIBUTION. Manchurian subregion. Macedonia. Oriental region. Australian region. Ethiopian region. Southern Nearctic region. Neotropical region.

The genus is composed of 3 subgenera, *Toxorhynchites* of the Old World, and *Ankylorhynchus* and *Lynchiella* confined to the New World.

SUBGENUS *TOXORHYNCHITES* THEOBALD

Toxorhynchites Theobald, 1901b: 234. Type-species: *Tx. brevipalpis* Theobald, 1901d; Natal.

The subgeneric characters are given in the foregoing generic descriptions.

DISTRIBUTION. Manchurian subregion. Oriental, Australian and Ethiopian regions. Macedonia.

KEYS TO SPECIES OF *TOXORHYNCHITES (TOXORHYNCHITES)**

FEMALE ADULT

1. Pedicel and laterotergite not scaled; scaling of posterior pronotal lobe smooth; lateral tufted bristles of abdominal terga VI-VIII inconspicuous. . . . . *manicatus* (p. 493)
   Pedicel and laterotergite scaled; scaling of posterior pronotal lobe shaggy; lateral tufted bristles of abdominal terga VI-VIII conspicuous. 2

2(1). Lateral tufted bristles of abdominal tergum VII orange. *christophi* (p. 502)
   Lateral tufted bristles of abdominal tergum VII blackish. *towadensis* (p. 498)

MALE GENITALIA

1. Aedeagus with several teeth on apical lanceolate part. *manicatus* (p. 493)
   Aedeagus without teeth on apical lanceolate part. 2

2(1). Aedeagus without a sclerotized tergomedian band. . *christophi* (p. 502)
   Aedeagus with a sclerotized tergomedian band. . . *towadensis* (p. 498)

LARVA

1. Setae 3, 4-M on a single common or divided small callus separated from dorsolateral callus. . . . . *manicatus* (p. 493)
   Setae 3, 4-M on dorsolateral callus. 2

2(1). Seta 11-II apically filamentous, with hair-like barbs; 5-T 6-16 branched. *christophi* (p. 502)
   Seta 11-II stiff, with strong spiny or stiff barbs; 5-T 2-7 branched. *towadensis* (p. 498)

110. *TOXORHYNCHITES (TOXORHYNCHITES) MANICATUS* (EDWARDS)**

Megarhinus manicatus Edwards, 1921a: 630 (♀). Type-locality: Toa Tsui Kutsu, Taiwan.

DISTRIBUTION. RYUKYU ARCHIPELAGO. TAIWAN.

*Specimens of *Toxorhynchites* sp. are not available.
**One or more subspecies (in some species they are not fully studied) do not occur in this region. The nominal subspecies does not occur in this region.

110A. *TOXORHYNCHITES (TOXORHYNCHITES) MANICATUS YAMADAI* (OUCHI) NEW STATUS

(Figs. 158, 161, 259; Table 142)

Megarhinus yamadai Ouchi, 1939: 223 (♂). Type-locality: Mt. Yuwan, Amami Ôshima, Ryukyu Archipelago.

FEMALE (Fig. 259). Wing length 6.1-6.6 mm. *Head.* Vertex covered with metallic purple and indigo-blue scales, with silvery white ones on eye margin; many, dark erect forked scales; tempus covered with somewhat golden white scales; 3, 4 vertical bristles on each side, no temporals, many pale yellow hairs on underside. Clypeus dark brown, medioapically light brown, with silvery tinge varying with light. Antenna: pedicel brown, partly dark brown, apparently tomentose with silvery reflection, without scales. Flagellomere 1 with dark scales. Palpus about 0.33 length of antenna, covered with metallic purple and indigo-blue scales. Proboscis covered with metallic purple and indigo-blue scales on basal rigid part, with more or less metallic blue, green or bronzy scales on apical slender portion. *Thorax.* Anterior pronotal lobe covered with pale golden scales; posterior pronotal lobe covered with metallic purple scales (indigo-blue scales intermixed) on upper 0.4-0.6, with pale golden scales otherwise. Scutum with integument blackish brown, mostly covered with metallic green scales, posterior scales bronze-tinged, scales on anterior margin metallic purple with indigo-blue scales intermixed; 1, 2 pairs of yellowish brown acrostichals on anterior promontory, anterior supraalars yellowish brown, posterior supraalars dark brown. Scutellum covered with bronzy-tinged metallic purple scales, with or without lateral pale scales; marginal bristles about 30, long and short, mostly dark brown, some bronze-brown. Paratergite with lower angle rounded. Pleural integument dark brown, lighter on metapleuron; slightly golden-tinged silvery white scales covering propleuron, sternopleuron (excepting cephalic lower oblong portion) and mesepimeron (except posterior margin and lower caudal triangular portion); about 10 yellowish brown propleural bristles, more than 10 bronze-brown spiraculars, more than 10 pale yellow prealars, sternopleurals (in scaled area) and posterior mesepimerals, 3-6 upper mesepimerals, 2-5 lower mesepimerals. *Wing.* Veins with metallic purple and indigo-blue scales, bronzy scales apically intermixed. Cell R_2 0.37 (2) length of vein r_{2+3} 0.61-0.63 (2) length of M_{1+2}; basal spur of r_{4+5} subequal to r-m in length; m-cu approximately in line with r-m (2). Halter knob with pale golden scales. *Legs.* Coxae each with a patch of scales similar to those of pleura. Femora with pale apical fringe; forefemur ventrally with a pale golden streak, this streak basally broadened and extending basally onto anterodorsal surface; midfemur pale golden on posterior and ventral surfaces, the pale area extending onto dorsal surface basally; hindfemur basally pale golden, the pale area extending to near apex on ventral surface as a narrow streak. Foretarsomere 1 with only a slight indication of pale scales basally on posterior surface, sometimes with a few distinct pale scales; 3 dorsoapically pale; 4 entirely pale or dark scales laterally and/or ventrally mixed. Midtarsomere 1 with a usually ill-defined pale subbasal band; 2 sometimes dorsoapically pale; 3 with pale scaled area variable, sometimes only dorsoapically and basally pale, dark scales mediodorsally mixed, sometimes entirely pale; 4 entirely pale, or sometimes with ventroapical dark spot. Hindtarsomere 1 with a subbasal spot on anterior surface, sometimes the spot yellowish and obscure; 4 pale except apex, occa-

sionally only basal 0.67 pale and dark scales mixed on pale area. Legs otherwise covered with metallic purple scales, with indigo-blue scales intermixed. Fore- and midtarsomeres 5 length of 4; hindtarsomere 1 0.80-0.82 (2) length of tibia. *Abdomen.* Tergum I medially covered with indigo-blue scales, white scales sublateroapically, with a small spot of white scales on lateral margin; laterotergite bristled but unscaled; II-VIII covered with indigo-blue scales, more or less purplish varying with light especially on posterior segments, scales on VIII most purplish; II-VIII with sublaterobasal patches of white scales, largest on VI, sometimes reduced on VII and often on VIII, occasionally the patches mesally extending as narrow usually incomplete bands, the bands more developed on VI than on other terga; lateral fringe scales pale golden on II-III and V-VI, purple on IV and VII; lateral marginal bristles fine and pale yellow on II-VI, occasionally the bristles rather dense and dark ones mixed at posterior corner of VI, VII with the bristles dark and rather stiff on posterior corner to posterior 0.33, VIII laterally and apically with golden yellow bristles. Sterna covered with golden scales, with a variable number of purple scales along median line, the purple scales from a scattered few to forming a very narrow but complete median line on II-III and V-VI, always forming a complete basally broadened median line on IV, forming a broad, occasionally apically abbreviated median line on VII, forming a mediobasal patch to covering entire surface on VIII.

MALE (Fig. 158). (Described from a single specimen). Wing length: 7.6 mm. Antenna about length of basal rigid part of proboscis. Palpus with apical half of segment 4 extending beyond false joint of proboscis, covered with metallic purple, indigo-blue and golden yellow scales, the golden yellow scales forming an apical band on 2, a very broad median band on 3, and rather long (reaching apical 0.4) ventrobasal patch on 4. Cell R_2 0.33 length of vein r_{2+3}, 0.55 length of M_{1+2}. Foretarsomere 3 entirely dark; 4 dark scaled, with mixed white scales on posterior surface. Midtarsomere 1 with white subbasal band dorsally incomplete; 3 only dorsoapically white; 4 white dorsally and laterally in basal 0.67. Hindtarsomere 4 white in basal 0.75 of posterior surface, basal 0.5 of anterior and dorsal surfaces, dark scales intermixed. Hindtarsomere 1 0.78 length of tibia. Abdominal tergum V with a few anterior lateral marginal scales dark; lateral bristles of VI-VII slightly more developed than in female, dark bristles on posterior half of VII rather dense. Sterna II-VIII with complete median line of purple scales, the line rather irregular on II, moderately broad on III, V, VI, very broad on IV, VIII, strongly basally broadened on VII. *Genitalia.* Tergum IX transversely oblong-quadrate, with straight apical margin, bearing 21, 22 rather long bristles on each side (these characters of tergum IX likely variable). Basistyle 2.8 as long as broad; claspette 0.96-1.09 as wide as long, with apex reaching basal 0.48 of basistyle, bearing 2 subequal strong apical setae (probably variable), a weaker (but distinctly stronger than basal bristles) seta laterotergal to the apical setae on left lobe, many weak bristles on tergal surface and mesal and lateral margins. Dististyle shorter than basistyle, with 13, 14 minute setae in apical 0.6. Paraproct with apex unicuspid on the left, bicuspid on the right; apparently 2 cercal setae on each side. Aedeagus 2.70 as long as wide, with a sclerotized tergal band proximad of middle, apical lanceolate part sternally with several retrorse hooks.

LARVA (Fig. 161). *Head.* antenna, siphon and saddle brown; thorax and abdomen brown with a weak reddish tinge, underside paler. *Head.* Width: 1.44-1.68 mm; 1.06-1.15 as wide as long (length measured from apex of frontoclypeus); frontoclypeus 1.06-1.20 mm long (measured on median line),

1.26-1.49 mm wide, 1.19-1.34 as wide as long; seta 1-C longer than 3-C, subequal to 4-C; 14-C usually single. Mouth brush of 6-8 curved rods. *Antenna* 0.53-0.60 mm long, 0.36-0.42 length of head, 0.46-0.52 of frontoclypeus, slender, slightly curved; seta 1-A inserted at apical 0.13-0.17, with 7 to more than 10 dendritic branches; 2,3-A inserted at apical 0.20-0.27; 4-A longer than 5,6-A; 5-A with distal division longer than proximal division; 6-A thick, slightly larger than proximal division of 5-A. *Mandible* with a broad spinose area proximally on dorsolateral surface, the microspines broad-based, very short, rather blunt or with apex reduced; otherwise indistinguishable from *towadensis*. *Maxilla* with $S_{1,2}$ somewhat pigmented, S_2 longer but more slender than S_1; basal ring of S_4 shorter than the sensorium; ampulla very small; otherwise indistinguishable from *towadensis*. *Mentum plate* with 15 stout teeth. *Thorax*. Prothorax with 3 small calli on each side in addition to 2 major calli: more mesal dorsal callus larger than other 2, bearing setae 1-3-P; laterocephalic dorsal callus bearing 4-P, laterocaudal dorsal callus 0-P; 8-P usually free, rarely on ventrolateral callus; 5,7,9-P very stiff, with strong spiny barbs; 7-P, when double, with dorsal branch shorter than ventral one; 14-P usually single. Mesothorax with 2 small dorsal calli on each side in addition to 3 major lateral calli: more mesal dorsal callus bearing 1,2-M, more lateral dorsal callus 3,4-M, occasionally divided; 6,9,13-M very stiff, with strong spiny barbs; 13-M, when double, with dorsal branch longer than ventral one. Metathorax with 3 small dorsal calli on each side in addition to 4 major calli: mesodorsal, laterocephalic-dorsal and laterocaudal-dorsal calli bearing 1-T, 3-T and 2-T respectively; 4,5-T not on callus or on very small callus, rarely 4-T on common callus with 3-T; 6,7,9,13-T very stiff, with strong spiny barbs, $9 \geq 6 > 7 \geq 13$ in length; 11-13-T usually single. *Abdomen*. Setae 1-I-V, VII, 3-VI, 4-I, V, 7-VII, 11-I, III-V, and 13-II-VII with strong spiny barbs; 11-II slender, apically filamentous, with fine hair-like barbs, equal to or longer than 13-II; 6,7-VI and 11-VI, VII with rather stiff barbs; 2-I, III usually free, occasionally on dorsal callus; 2-II, IV, V either free or on dorsal callus; 2-VI, VII consistently on dorsal callus; 8-II, III free; 8-IV usually free, sometimes on lateral callus; 8-V-VII always on lateral callus; 0-II-IV, VI, VIII, 11-III, 8,9-IV, 10-VI and 14-VII usually single; 3-V usually double; 4,5-VIII with strong spiny barbs. *Siphon* 0.74-0.89 mm long, 1.52-1.85 as long as broad; seta 1-S located at basal 0.29-0.36, $x = 0.32$. *Saddle* longer than siphon, 0.82-1.08 mm long, microsculpture very fine, but more distinct than in *towadensis*, consisting of apparently flattened tubercles, each apically fringed with several minute spicules; 1-X at apex of and shorter than saddle, with strong large spiny barbs; 2-X always with more branches than 3-X; 4-X of 15-18 hairs.

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 1♂, 4♀; with associated skins (3 l, 3 p), 3 L, 1 l: Amami Guntô (I-0240, I-0256, I-1829, I-1840, I-1849, I-1853, I-1861, I-2271).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Amami Guntô).

110B. *TOXORHYNCHITES (TOXORHYNCHITES) MANICATUS YAEYAMAE* BOHART (NEW COMBINATION)

(Figs. 158, 260; Table 142)

Toxorhynchites yaeyamae Bohart, 1956: 29 (♂, ♀, P, L). Type-locality: East fork of Nakara River, Iriomote Is., Ryukyu Archipelago.
Toxorhynchites yamadai yaeyamae: Tanaka, 1971a: 4.

FEMALE. Wing length 5.4-6.7 mm. Head with vertical bristles 3-5, most often 4. Antennal flagellomere 1 1.43-1.50 (2) length of Flm 2. Palpus 0.34-0.35 (2) length of flagellum; segment 3 1.81-1.87 of 2; 4 0.06-0.09 of 3. Posterior pronotal lobe with upper 0.17-0.25 purple scaled, otherwise pale-golden or silvery scaled. Sternopleural bristles about 10 or less. Cell R_2 0.30-0.38 (5) length of vein r_{2+3}, 0.49-0.61 (5) length of M_{1+2}. Pale scaling of tarsomeres in general slightly more developed than in *manicatus yamadai*. Foretarsomere 1 usually with subbasal patch of white scales on posterior surface; 2 sometimes with dorsoapical 0.25 white; 3 usually with dorsal and posterior surfaces mostly white; 4 entirely white. Midtarsomere 1 with white basal band usually more distinctly defined than in *m. yamadai;* 2 with dorsoapical 0.33-0.67 white; 3 and 4 entirely white; 5 occasionally narrowly white at base. Hindtarsomere 1 with white subbasal anterior patch; 3 often with pale apical fringe; 4 often entirely white, apex often with dark scales or a dark spot. Foretarsomere 5 slightly shorter than or nearly length of 4; midtarsomere 5 shorter than 4; hindtarsomere 1 0.76-0.81 (5) length of tibia. *Abdomen.* Only tergum III of one specimen out of 11 examined with an incomplete dorsal band of white scales, otherwise dorsal band undeveloped; IV with posterior lateral fringe scales golden; lateral marginal bristles of VI-VIII less developed, finer and sparser. Sterna with purple scales fewer than in *m. yamadai,* II-III entirely golden or sometimes with only a few purple scales at middle; IV most often with a mediobasal patch of purple scales, sometimes with only a few mediobasal purple scales, or with a complete median band; V entirely golden, or at most with an obscure incomplete narrow median line of purple scales; purple scales none to forming a distinct mediobasal patch on VI, forming a narrow to broad, complete or almost complete median line on VII, none to forming a broad median line on VIII.

MALE (Figs. 158, 260). Wing length 6.5-8.5 mm. Antennal flagellomere 12 1.25-1.41 (2) length of Flm 13, both together 0.49-0.58 length of Flm 1-11. Palpus 1.79-1.99 (2) length of flagellum; length ratio of segments 2-5 : 0.32-0.34 : 0.48-0.51 : 0.52-0.55: 1.00. Cell R_2 0.24-0.32 (8) length of vein r_{2+3}, 0.50-0.57 (8) length of M_{1+2}; m-cu basal to or in line with r-m. White scaling of tarsi less developed than in female. Hindtarsomere 1 0.75-0.79 (5) length of tibia. Purple scales on abdominal sterna more developed than in female, usually forming a complete or incomplete median line, broad on IV, VII and VIII, narrow on others. *Genitalia.* Tergum IX apically narrowed, slightly to deeply concave on apical margin, bearing 12-16 (6) bristles on each side. Basistyle 2.6-3.2 as long as wide; claspette 1.10-1.40 (5) as wide as long, with apex reaching basal 0.40-0.48 (5) of basistyle, usually bearing 2 strong apical setae, apicalmost seta usually stronger. Dististyle 0.72-0.81 (3) length of basistyle, with 10-13 (6) minute setae in apical half; claw 0.16-0.18 (3) length of dististyle. Cercal setae 2-4. Aedeagus 2.30-2.95 (5) as long as wide.

LARVA. Indistinguishable from *m. yamadai.*

SPECIMENS EXAMINED. RYUKYU ARCHIPELAGO. 19♂, 13♀; with associated skins (5 l, 5 p), 21 L, 6 l: Yaeyama Guntô (1 L: Saitancho, Iriomote Is., 15 I 1954, Gentry; 3 L: Inoda, Ishigaki Is., 9 V 1957, tree hole, Yaeyama Health Center, USNM. K-0114, K-0134, K-0146, K-0157, K-0158, K-0166, K-0169, K-0562, K-0563, K-0564, K-0579, K-0614, K-0684, K-0778, K-0779, K-0936, K-0957, K-0958, K-1214, K-1537, K-1610, K-1771, K-1772, K-1773, K-2270, K-2339).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Yaeyama Guntô).

TAXONOMIC DISCUSSION. The characteristics differentiating *yamadai, yaeyamae* and *manicatus* do not appear sufficient to consider them as 3 distinct

species. However, they may be recognized as 3 subspecies, because of the existence of rather distinct and not clinal local variations and their definite allopatricity. The posterior pronotal lobe is covered with dark metallic purple or indigo-blue scales on upper 0.5-0.6 in *yamadai* and *manicatus*, and the upper 0.25 or less in *yaeyamae*. White scaling on the tarsi is most developed in *manicatus*, least in *yamadai* and intermediate in *yaeyamae*; this may be clinal. Transverse bands of white scales on female abdominal terga are most developed in *yamadai*, least in *yaeyamae* and intermediate in *manicatus*, but these are also highly variable within each subspecies. Lateral bristles of abdominal terga VI-VIII are most developed in *manicatus*, the bristles are stiffer and denser than in the other 2 subspecies, though not so conspicuous as in the *towadensis* group; these bristles are nearly equal to those on anterior terga in *yaeyamae*, while in *yamadai*, they are more developed than in *yaeyamae* and less so than in *manicatus*. Purple scaling on the median line of the abdominal sterna is most developed in *manicatus*, IV is usually golden only in narrow lateral margins or small lateroapical patches, VII has a broad median line of purple scales, II, V and VI usually have complete, narrow to moderately broad median lines, II often has an incomplete one. The purple scaling is least developed in *yaeyamae* and intermediate in *yamadai*. Male tergum IX is broad, parallel-sided, with the apical margin straight, having 21, 22 bristles on each side in one specimen of *yamadai*. In *yaeyamae* and *manicatus*, it is fairly variable, but usually more or less apically narrowed, or having the more strongly rounded lateroapical angle, and the apical margin slightly to deeply concave; the setae are 12-16 (6) in *yaeyamae*, 10-14 (2) in *manicatus*. The claspette is 0.96-1.09 (1) as wide as long in *yamadai*, while it is 1.10-1.40 (7) in the other 2. The shape of tergum IX is usually quite variable in this genus. At present, we have only 1 male specimen of *yamadai*, and consider its 9th tergite as a case of individual variation which is rather more remarkable than other variable characters of this species.

BIONOMICS. Rather common in Yaeyama Guntô, less so in Amami Guntô. Larvae occur in tree holes, and devour larvae and pupae of mosquitoes and midges, but they do not feed on *Orthopodomyia anopheloides*. As the females do not take blood meals, they are of no medical importance.

111. *TOXORHYNCHITES (TOXORHYNCHITES) TOWADENSIS* (MATSUMURA)
(Figs. 159, 160, 260, 261; Table 143)

Megarrhina towadensis Matsumura, 1916: 444 (♂). Type-locality: Towada, Aomori Pref., Japan.
Megarhinus towadensis: LaCasse and Yamaguti, 1950: 38 (♂, ♀).

FEMALE (Fig. 261). Wing length 7.5-8.5 mm. *Head.* Vertex and tempus covered with metallic green, purple, bronzy or coppery tinged broad dark scales; scales of eye margin appear silvery in dorsal view, scales on underside of head apparently pale; erect forked scales few, dark, in a row; 4-8 vertical and one temporal dark bristles on each side; many fine pale yellow hairs on underside of head. Clypeus pale or dark gray according to light, 1.5 as wide as long. Antenna: pedicel dark, dorsally and laterally covered with silvery gray scales; flagellomere 1 1.25 (1) length of Flm 2, with dark scales. Palpus 0.4 length of antenna, covered with metallic blue or purple tinged dark scales; segment 3 1.91-2.12 (2) length of 2; 4 0.11-0.21 of 3, narrow. Proboscis covered with metallic purple or blue tinged dark scales. *Thorax.* Integument

very dark brown. Pronotal lobes covered with broad metallic green or bronzy scales, laterally with paler scales on anterior lobe and ventrally on posterior lobe, scaling of posterior lobe shaggy. Scutum medially covered with rather broad dark scales having weak metallic green, coppery, purple or bronzy reflections; anterior and lateral margins widely covered with broad pale golden green scales; bristles on anterior margin dark brown, supraalars all dark, or occasionally posterior bristles golden brown. Scutellum medially covered with metallic green or bronzy scales, heavily covered with pale, greenish golden lateral scales, bristles golden brown. Pleura: propleuron, lower prealar knob, sternopleuron except cephalic lower portion, and mesepimeron except posterior margin and lower caudal area covered with somewhat golden white scales; more than 10 dark spiracular bristles, more than 10 yellowish brown prealars, other pleural bristles mostly pale yellow, many on propleuron, scaled area of sternopleuron, and posterior margin of mesepimeron, 2-8 upper mesepimerals, 2-5 lower mesepimerals. *Wing*. Alula fringed with minute narrow pale scales. Veins lightly covered with dark metallic bluish scales. Cell R_2 0.35-0.41 (4) length of vein r_{2+3}, 0.56-0.58 (3) length of M_{1+2}; spur of r_{4+5} about 2.0-3.0 length of r-m; m-cu in line with 4-m or more or less apical. Halter with dark-scaled knob. *Legs*. Coxae covered with scales similar to those of pleura. Forefemur pale in basal half of ventral surface, with pale scales on anterior surface at base; midfemur pale in basal 0.67 of lower anterior surface to posterior surface, the pale area apically narrowed; hindfemur pale on basal 0.60-0.67 of lower anterior surface to posterior surface, the pale area broadened dorsad toward base. Mid- and hindtibiae occasionally with an obscure yellowish patch ventrally in middle. Foretarsomere 1 with tip to apical 0.5 white; 2 usually entirely white, often with small dark dorsoapical and/or dorsobasal spots, rarely broadly dark apically and basally on dorsal surface; 3 sometimes white at base. Midtarsomere 1 with pale apical fringe and a dorsally incomplete white basal band or a small ventrobasal patch; 2 entirely pale, but often with a small dark dorsobasal spot; 2-5 entirely white. Hindtarsomere 2 at least with some medially scattered pale scales, often almost entirely white except apex. Foretarsomere 5 about length of 4; hindtarsomere 1 0.76-0.80 (4) length of tibia. *Abdomen*. Terga covered with metallic blue or purple scales; I with median scales green or bronzy tinged, with small lateral patches of white scales; laterotergite white scaled; II and III with scales, slightly more bluish than in other terga, with sublateral patches of white scales, the patch larger on III than on II; IV and V with a slight indigo tinge; IV usually without sublateral patch, sometimes with a few pale scales instead, pale scales rarely forming a small patch which is definitely smaller than that of III; V with sublateral patches large, triangular, occasionally extending dorsally to form a barely complete dorsosubbasal band; VI-VIII slightly more purplish than other terga; VI with sublateral patches of white scales near base; I-VI with white lateral fringe-scales and pale yellow lateral hairs, the hairs becoming somewhat stouter and denser toward posterior segments; VI with blackish brown lateral tufted bristles on posterior 0.4-0.5; VII with lateral fringe-scales dark, and lateral tufted bristles blackish brown; VIII apically truncate, with lateral fringe-scales sparse and dark, and with lateral and apical orange tufted bristles. Sterna II-VIII covered with bluish purple scales intermixed with coppery ones, apical 0.50-0.75 of II, III, V and VI covered with white scales, these white-scaled areas often divided by a longitudinal median dark line; VII with a small patch of white scales at each posterior angle; VIII truncate at apex, bearing dark bristles on disk and fringed with orange ones at apex.

MALE (Figs. 159, 260). Wing length 7.8-10.5 mm. Antennal flagellomere

12 1.06-1.17 (3) length of Flm 13, both together 0.66-0.70 (2) of Flm 1-11. Palpus 1.80-1.97 (2) length of antenna, with apical 0.4 of segment 4 extending beyond basal rigid part of proboscis, 2 with apical band of pale golden scales, 3 with dorsolateral patch of pale golden scales distad of middle, palpus otherwise covered with metallic blue scales which show various colored reflections; length ratio of 2-5 : 0.42-0.44 : 0.56-0.60 : 0.57 : 1.00 (2). Cell R_2 0.31-0.37 (8) length of vein r_{2+3}, 0.52-0.57 (8) length of M_{1+2}; m-cu in line with r-m or somewhat basal. *Legs*. White scaling slightly less developed than in female. Tibiae without yellowish patch. Foretarsomere 1 entirely dark to white on apical 0.5; 2 with only ventral surface except base white to entirely white; 3 entirely dark to white on basal 0.5. Midtarsomere 1 with pale apical fringe, ventrobasally, basally or subbasally white scaled; 2 entirely pale, or with a small dorsobasal spot or a narrow dark basal band; 3-4 entirely white or with dark scales intermixed, 4 occasionally entirely dark; 5 varying from entirely dark to entirely white. Hindtarsomere 2 entirely dark to almost entirely white except apex. Foretarsomere 5 1.57 (1) length of 4; midtarsomere 5 1.27-1.38 (2) length of 4; hindtarsomere 1 0.75-0.76 (2) length of tibia. *Abdomen*. Tergum IV with distinct sublateral patches usually slightly smaller than those of III; VII rarely with sublateral patches of white scales near base, blackish brown and orange lateral tufted bristles of VI-VIII slightly longer than in female. Sternal white patches generally smaller than in female, divided by a dark broad median line. *Genitalia*. Tergum IX with apical margin almost straight to distinctly concave, bearing 16-27 bristles on each side. Sternum IX rather broadly crescent-shaped, with apical margin evenly rounded. Basistyle 2.2-2.5 as long as wide, with several tergoapical scales in addition to sternal and lateral scales; claspette 1.1-1.3 as wide as long, with apex reaching basal 0.38-0.55 (8) of basistyle, apical bristles strongest, 1,2 subapical bristles usually only slightly weaker than the apical. Dististyle slightly longer than basistyle, with 13-24 scattered minute setae on apical half; claw about 0.14 length of dististyle. Cercal setae 3-5. Aedeagus 2.09-2.86 (8) as long as wide, with a distinct sclerotized tergomedian band just distad of anterior border of apical closure, posterior margin of the band more or less concave, occasionally very deeply concave dividing the band into 2 triangular lateral pieces; apical lanceolate portion simple.

LARVA (Fig. 160). Head, antenna, siphon and saddle brown; thorax and abdomen brown with purplish tinge, underside paler. *Head*. Width: 2.1-2.3 mm; slightly wider than long; frontoclypeus 1.45-1.58 mm long (measured on median line), 1.70-2.02 mm wide, 1.14-1.27 as wide as long; seta 1-C usually single, longer than 3-C, shorter than 4-C; 12-C usually triple. Mouth brush of 7-9 curved rods. *Antenna* slender, 0.73-0.85 mm long, 0.4 length of head, 0.49-0.56 ($x = 0.53$) length of frontoclypeus; seta 1-A inserted at apical 0.09-0.14, with more than 10 dendritic branches; 2,3-A located at apical 0.15-0.22, usually 2-A very slightly proximad of 3-A; 4-A longer than 5, 6-A; 5-A with basal division slightly pigmented and longer than apical transparent division; 6-A thicker than 5-A but only slightly longer than proximal division of 5-A. *Mandible* proximally coriaceous on dorsolateral surface, without microspines; dorsal mandibular spur stouter than ventral one, bilaterally pectinate, ventral spur subequal to dorsal one in length, laterally pectinate. Cutting organ with dorsal tooth very strong, very dark, nearly 0.33 length of mandible, with a strong mesobasal denticle; ventral tooth also very strong and dark, bluntly pointed; VT_2 largest of 3 mesal denticles, somewhat pentagonal; VT_1 triangular, larger than VT_3. Mandibular hairs about 40, barbed. *Maxilla*. Seta 1-Mx single, rarely double. Mesostipes with short spiny spicules on lateral part of

dorsal sclerotized band; stipital sensoria subequal, on a common, slightly asymmetric, basal ring; 2 ventromesosubapical setae (2,6-Mx) short; one ventrolateroapical seta (4-Mx) rather long, 5-Mx shorter than 4-Mx. Palpostipes lateroventrally rugose; apex with $S_{1,2}$ equal, unpigmented, on a common, asymmetric, pigmented basal ring; S_4 on a pigmented basal ring longer than the sensorium. *Mentum plate* with 13-17, usually 15, teeth of various sizes. *Thorax*. Prothorax with 3 small dorsal calli on each side in addition to 2 major lateral calli: more mesal dorsal callus bearing setae 1-3-P; laterocephalic dorsal callus equal to or smaller than more mesal callus, bearing 4-P; laterocaudal dorsal callus bearing 0-P; 8-P consistently on ventrolateral callus; 5, 7, 9-P very stiff, with strong spiny barbs; 7-P with dorsal branch shorter than ventral one. Mesothorax with a small dorsal callus on each side in addition to 3 major lateral calli, 1, 2-M arising from the dorsal callus; dorsolateral callus bearing 3-7-M; 3, 4-M usually single; 6, 9, 13-M very stiff, with strong spiny barbs; 13-M with dorsal branch longer than ventral one. Metathorax with 3 small dorsal calli on each side in addition to 4 major calli: mesodorsal, laterocephalic dorsal and laterocaudal dorsal calli bearing 1-T, 3, 4-T and 2-T respectively; 6, 7, 9, 13-T very stiff, with strong spiny barbs. *Abdomen*. Setae 1-I-V, VII, 3-VI, 4-I, V, 11-I, III-V, and 13-II-VII with strong spiny barbs; 11-II similar to those, or with more slender but still stiff apex and barbs as well as 7-VII, usually double, equal to or only slightly longer than 13-II; 6, 7-VI with rather stiff barbs; 2-I usually free, rarely on dorsal callus; 2-II, V usually on dorsal callus, rarely free; 2-III, IV either free or on dorsal callus; 2-VI, VII always on dorsal callus; 8-II-IV free; 8, 9-II, 6, 8-V and 2-VI usually single; 3-V usually double; 1-VIII free, usually apically bifurcate; 3-VIII usually with more than 10 branches; 4, 5-VIII with acute apices and stiff barbs. *Siphon* 1.27-1.57 mm long, 1.9-2.1 as long as broad; seta 1-S located at basal 0.24-0.33 ($x = 0.28$). *Saddle* about 1length of siphon; microsculpture extremely fine, consisting of scarcely raised tubercles, each fringed with 1-6 minute spicules; seta 1-X at apex of and slightly shorter than saddle, with acute apex and stiff barbs; 2-X always with more branches than 3-X; 4-X of 20-24 hairs.

SPECIMENS EXAMINED. PALAEARCTIC JAPAN. 1♂, 1♀, 2 L: Hokkaido (1♂: Maruyama, 29 V 1935, Okada; 1♀: Sapporo, EHU. A-1679). 9♂ with associated skins (1 l, 1 p), 1 L: Honshu (Holotype ♂: Towada, Aomori Pref., VII 1905, EHU. 2♂: Mt. Takao, Tokyo, 11 VII 1969, net, Tachikawa, MSCOL. C-2266, C-2268, D-0052, D-2267, E-1699). 16♂, 10♀ with associated skins (14 l, 14 p), 21 L, 13 l: Yakushima (H-0085, H-0809).

DISTRIBUTION. PALAEARCTIC JAPAN (Hokkaido, Honshu, Shikoku, Kyushu, Yakushima, Tsushima).

TAXONOMIC DISCUSSION. The population of Yakushima, the southernmost island of Palaearctic Japan, has, in general, the less developed white scaling on the tarsi, the broader aedeagus, and the more posteriorly located claspette than in northern specimens; the apical margin of tergum IX is nearly straight in the Yakushima population, while it is distinctly concave in specimens from central Honshu. However, both Yakushima and northern populations are consistent in the more important characters; namely, the presence of the sclerotized tergomedian band of the aedeagus, entirely dark proboscis, usually entirely dark tibiae, absence of the sublateral patches of female abdominal tergum IV, dark lateral tufted bristles of abdominal terga VI-VII, and the stiff larval seta 11-II.

Stackelberg (1937) and Gutsevich et al. (1970) treated *towadensis* as a doubtful synonym of *christophi*. However, some distinct differences were

detected between them. The aedeagus of *towadensis* has a well sclerotized tergomedian band, its anterior and posterior borders are distinctly defined, the posterior border is usually concave, sometimes this concavity is very deep, almost dividing the band into 2 triangular pieces. The aedeagus of *christophi* does not have such a band. * In the adult *towadensis*, the proboscis is entirely dark, (with a pale median band in *christophi*), the posterior supra-alar bristles usually dark brown (yellow), the lateral tufted bristles of abdominal tergum VII are blackish brown (orange yellow) and the lateral tufts of abdominal segments V-VIII are more developed in Korean *christophi* than in *towadensis*. In the larva of *towadensis*, seta 11-II is stiff, with strong spiny or stiff barbs, and is equal to or only slightly longer than 13-II (slender, with hair-like barbs, distinctly longer than 13-II), and 4-X has 20-24 tufts (x = 21.5, mode = 22) (18-20); some other differences are also shown in tables 37 and 38.

TABLE 37. Comparison of larval characteristics between *Toxorhynchites (Toxorhynchites) towadensis* and *Tx. (Tox.) christophi*.

	towadensis			*christophi*		
	10 specimens from Yakushima			3 specimens from Siberia**		
Seta	Range	x	Mode	Range	x	Mode
2-IV	1-2	1.4	1	3-5	3.3	-
3-VIII	9-multiple	-	-	5-6	-	-

BIONOMICS. Mountain species; not very common throughout the range. Larvae occur usually in tree holes; one larva was found in a small cement tank with clean water and fallen leaves; one was obtained from a boot discarded on a mountain trail. Cannibalism is common, thus usually only a single larva can live in a container. However, in Yakushima, about 60 mature larvae were found in a fairly large hole (diameter about 50 cm) of a cut-down *Criptomeria*. They feed on mosquito larvae and pupae of most species. Adults are often observed flying up and down close to large tree trunks.

112. TOXORHYNCHITES *(TOXORHYNCHITES) CHRISTOPHI* (PORTSCHINSKY) (Figs. 159, 161, 262; Table 144)

Megarhina christophi Portschinsky, 1884: 122 (♀). Type-locality: Amur.
Megarhinus aurifluus var. *koryoensis* Ogasawara, 1939b: 242 (♂) (*nomen nudum*); Koryo (Kwangnung), Korea.
Megarhinus towadensis: Chu, 1956: 42.

*Dr. Danilov (1977, personal communication) confirmed this for Siberian specimens.
**After Danilov 1977 (personal communication).

Toxorhynchites (T.) christophi: Chow, 1973: 43 (based on Tanaka's identification).

FEMALE*. Wing length 5.1-7.2 mm. *Head.* Scales of vertex with golden yellow or green, partially purple luster; 2-4 vertical and 1, rarely 2, temporal bristles on each side (4). Antennal flagellomere 1 with dark or silvery scales. Proboscis with an obscure to distinct pale band (often dorsally incomplete) at curved portion. *Thorax.* Scales of anterior pronotal lobe golden yellow, those of posterior lobe golden yellow or green, scales on ventral corner pale. Marginal scales of scutum golden yellow, tinged with metallic green, or golden brown; anterior supraalar bristles dark brown, posterior supraalars golden brown. Both upper and lower mesepimeral bristles 2, 3 (5). *Wing.* Cell R_2 0.31-0.37 (2) length of vein r_{2+3}, 0.51-0.57 (2) length of M_{1+2}; m-cu basad of or almost in line with r-m (2). *Legs.* Midtibia usually yellowish brown except for dorsal surface, base and apex, occasionally yellowish brown area reaching base; hindtibia yellowish brown in median 0.33-0.40 ventrally and posteriorly. Foretarsomere 1 white in apical 0.5-0.6, usually with a white ventrobasal patch, occasionally entirely ventrally white; 2 entirely white; 3 ventrally white at base, occasionally also narrowly white dorsally. Midtarsomere 1 white in basal 0.33-0.40 except very narrow dark basal ring; 2-5 entirely white. Hindtarsomere 1 with a white ventrosubbasal patch, often this pale patch occupying basal 0.33 of the joint; 2 entirely pale. Hindtarsomere 1 0.77-0.78 (2) length of tibia. *Abdomen.* Tergal scales most frequently tinged with golden yellow or green on I, greenish or bluish on II-III, bluish on IV-VI, indigo on VII, and purplish on VIII; V usually and III sometimes with sublateral patches mesally extending to form a complete or incomplete band; lateral tufted bristles of apex more developed than in *towadensis;* lateral bristles at posterior corner of V also stronger, denser and more deeply yellowish than those proximad, though weaker and sparser than those distad; lateral tufted bristles very dense and blackish brown on VI, very dense and orange on VII-VIII, occasionally VII with some dark bristles anteriorly mixed; apical margin of both tergum and sternum VIII also with many orange bristles. Sterna II-III silvery scaled, anteriorly and medially with purple or blue scales; IV mostly purple or blue, with silvery lateral patches; V entirely silvery; VI laterally silvery, medially purple or blue; VII entirely purple or blue; VIII basally with some pale and purple scales.

*After the submission of the manuscript, Dr. V. N. Danilov, Martsinovsky Institute of Medical Parasitology and Tropical Medicine, Moscow, compared the specimens of *Tx. christophi* from the Soviet Far East (Prymorsky and Khabarovsk districts) with our draft of description and figures of *christophi* from Korea and found that they were identical. Some inconsistencies seen between Korean specimens and the descriptions and figures given by Portschinsky (1884), Stackelberg (1937), Gutsevick et al. (1970) and Shamrai and Gutsevich (1974) appear to be due to the inaccuracy of the latter. Dr. Danilov thus concluded that Korean *christophi* was true *christophi* (Danilov 1977, personal communication). According to this finding, we partially amended the taxonomic discussions for *Tx. towadensis* and *christophi,* and Tables 37 and 39 in the course of printing. This is the only exceptional case where changes were made in the taxonomic portions of the manuscript after the submission of the manuscript to the editor. All other such changes are shown as footnotes.

MALE (Figs. 159, 262). Wing length 5.2-9.0 mm. Vertical bristles 4, 5 (4). Pale median band of proboscis in general more distinct than in female. Upper mesepimeral bristles 3-8 (2) and lower ones 1-3 (3). Cell R_2 0.32 (1) length of vein r_{2+3}, 0.49 length of M_{1+2}. Tibia with yellowish brown median area less developed than in female. White scaling of tarsi slightly less developed than in female. Foretarsomere 1 with apical 0.25-0.40 white; 2 entirely white; 3 entirely dark, or at most white in ventrobasal 0.67. Midtarsomere 1 white in basal 0.25-0.40, with extreme base very narrowly dark, occasionally this basal white area obscure; 2-4 entirely white; 5 entirely white, or sometimes with dark dorsobasal spot. Hindtarsomere 1 usually entirely dark, sometimes with an ill-defined pale subbasal spot; 2 usually entirely white, sometimes with dark apical fringe. *Abdomen.* Sublateral white patch on IV subequal to that of III; that of V larger than others; dorsal bands on III and V undeveloped; sometimes a few dark bristles among golden yellow posterior rufted bristles on V, and a few brownish bristles mixed anteriorly in dark lateral tufted bristles on VI. Sterna covered with metallic purple or blue scales, IV with small lateroapical patch of silvery scales, V with moderate-sized laterobasal patches of silvery scales. *Genitalia.* Tergum IX more or less apically narrowed, with apical margin concave, bearing 11-19 bristles on each side (these characters of tergum IX probably variable). Basistyle 2.4-2.8 as long as wide; claspette 1.2-1.4 as wide as long, with apex reaching basal 0.46-0.53 (2) of basistyle, subapical bristles distinctly weaker than the apical one in 2 specimens examined (probably variable). Dististyle with 7-15 (2) minute setae; claw 0.15 (1) length of dististyle. Aedeagus 2.51-2.92 (2) as long as wide, without sclerotized band just distad of anterior border of tergoapical closure.

LARVA (Fig. 161). *Head.* Frontoclypeus 1.19-1.37 mm long, 1.37-1.60 mm wide, 1.16-1.25 as wide as long; seta 8-C usually single; 12-C 3, 4 branched. Mouth brush of 7, 8 curved rods, often bicuspid at tip. *Antenna* 0.58-0.66 mm long, 0.46-0.53 ($x = 0.51$) length of frontoclypeus; seta 1-A inserted at apical 0.12-0.16; 2, 3-A at apical 0.18-0.22; 6-A about as large as proximal division of 5-A. Mandible, maxilla and mentum plate not different from those of *towadensis*. *Thorax.* Usually, seta 3-M single and 13-M double; 6-M and 9-M, T with weaker barbs than in *towadensis*. *Abdomen.* Setae 8, 9-II, 4-V, 10-VI, 4, 9-VII usually single; 4-I and 1-VI usually double; 2-V usually triple; 2-I always free from dorsal callus, 2-II-VII consistently on dorsal callus; 10-I occasionally free from ventral callus; 11-II slender, distinctly longer than 13-II, with fine hair-like barbs; 3-VIII 2-7 ($x = 4.7$) forked; 1-S located at basal 0.20-0.26 ($x = 0.23$) of siphon; 4-X of 18-20 hairs.

SPECIMENS EXAMINED. KOREA. 6♂, 7♀; with associated skins (5 l, 5 p); 3 l: Korean Peninsula (1♂: National Forest, Kyongki Do, 20 VI 1954, 207 Prev. Med. Surv. Det.; 1♂, 1♀: National Forest, Kyongki Do, 15 VII 1954; 1♂: National Forest, Kyongki Do, 26 X 1954, pine tree hole, McFadden, USNM. L-0554, L-0822, L-2109, L-2110, L-2111, K-2112, L-2113)

DISTRIBUTION. KOREA (Korean Peninsula). PRYMORYE.

TAXONOMIC DISCUSSION. In addition to some of the characteristics described above, some other differences in branching of setae between *christophi* from Korea and *towadensis* are noted (Table 38).

Toxorhynchites christophi from Korea is distinct from *towadensis* but appears to be identical to *christophi* from Amur and Prymorye districts. *

*Danilov 1977, personal communication.

Differences found in the branching of some larval setae are mostly insignificant except for 12-II (Table 39). *Toxorhynchites christophi* appears to be very closely allied to *aurifluus* (Edwards) from Taiwan. The male genitalia are apparently identical. The aedeagus has no sclerotized tergomedian band in specimens studied (2 Korean *christophi* and 2 *aurifluus*); Lien (1965) does not show any band on the aedeagus of *aurifluus*; it appears the same in Siberian *christophi*. *

Korean specimens of *christophi* are identical with *aurifluus* (3 males and 4 females from Taiwan were examined) in the presence of a yellowish brown median area on the mid- and hindtibiae, but different from it in the existence of a pale median band on the proboscis, the golden color of the scutal marginal metallic scales (bluish green in *aurifluus*), the more developed white scaling of the tarsi, the lack of the sublateral patches on female abdominal tergum IV (occasionally a few white scales present) (*aurifluus* has sublateral patches subequal to those of III in size), and in that the lateral tufted bristles on female abdominal tergum VI are all dark (anterior 0.33-0.40 of lateral bristles are yellow in *aurifluus*). In the larvae, only minor differences are detected (Table 40).

The metallic coloration in insects in general is quite variable, it easily changes within a species between green, blue, purple, coppery golden, etc. Such variability must be considered. White scaling of the tarsi was found to be more developed in the northern populations of *towadensis* than in the southern ones. Differences in the tarsal white scaling between Korean *christophi* and Formosan *aurifluus* appear to be a similar case. All the differences in the larvae are in the branching of minor setae, and their significance may not be very great. Thus, important characters will be: (1) the pale median band of the proboscis, (2) the yellowish brown median area of the mid- and hindtibiae, (3) the sublateral patches of female abdominal tergum IV and (4) the lateral tufted bristles of female abdominal tergum VI. Korean *christophi* differs from *aurifluus* in (1), (3) and (4). They are, however, consistent in other essential characters, the tergomedian band of the aedeagus, the lateral tufted bristles of abdominal terga VII-VIII, and larval seta 11-II. On the basis of present knowledge, they appear allopatric. Thus, there might be 2 possible interpretations, they are either 2 distinct species, or local forms (subspecies) of a single species. For a final decision of their taxonomic statuses, much more material must be studied.

BIONOMICS. Apparently rare in Korea. Larvae are found in tree holes.

*Danilov 1977, personal communication.

TABLE 38. Comparison of larval setal branching between *Toxorhynchites (Toxorhynchites) christophi*, and *Tx. (Tox.) towadensis*.

	christophi			*towadensis*		
Specimens examined	6 from Korea			10 from Yakushima		
Seta	Range	Mode	x	Range	Mode	x
9-C	2-6	4	3.8	1-3	2	1.8
11-P	2-4	2	2.6	1-2	-	1.5
5-T	6-11	-	8.5	2-7	-	4.5
2-I	3-5	5	4.2	1-4	2	2.6
5-I	3-5	5	4.4	5-9	6	6.5
2-II	2-4	3	2.7	1-3	1	1.6
12-II	1-2	-	1.5	2-6	3	3.5
2-III	2-4	3	2.9	1-3	2	1.8
5-III	5-7	5	5.9	3-4	4	3.6
12-III	1-2	2	1.7	2-4	3	2.9
2-IV	2-4	3	2.9	1-2	1	1.4
12-IV	1-2	1	1.4	2-5	-	3.4
2-V	2-3	3	2.8	1-2	1	1.3
12-VI	1	-	-	1-3	2	1.7
12-VII	1	-	-	1-4	3	2.3
2-VIII	2-3	2	2.3	1-2	1	1.4

TABLE 39. Comparison of larval characteristics of *Toxorhynchites (Toxorhynchites) christophi* from Korea and Siberia.

6 specimens from Korea				3 specimens from Siberia (after Danilov 1977, personal communication)		
Seta	Range	x	Mode	Range	x	Mode
9-I	1-4	2.4	3	1-5	2.8	-
9-II	1-2	1.1	1	1-3	1.5	1
12-II	1-2	1.5	-	2-5	3.2	-
2-IV	2-4	2.9	3	3-5	3.3	-

TABLE 40. Comparison of larval characteristics between *Toxorhynchites (Toxorhynchites) christophi* and *Tx. (Tox.) aurifluus*.

	christophi			*aurifluus*
	6 specimens from Korea			Lien (1965)
Seta	Range	*x*	Mode	Range
11-P	2-4	2.6	2	1-2
2-II	2-4	2.7	3	3-7
12-II	1-2	1.5	-	2-6
12-III	1-2	1.7	2	2-7
12-IV	1-2	1.4	1	2-6
2-VII	1	-	-	1-5
3-VIII	2-7	4.7	6	4-19

113. *TOXORHYNCHITES (TOXORHYNCHITES)* SP.
(Table 145)

Toxorhynchites sp. Gentry, 1957: 82 (L), Ada, Okinawa Is., Ryukyu Archipelago.

3RD STAGE LARVA. Similar to *towadensis*. Head 1.27 mm wide, relatively narrower. Antenna 0.44 mm long. Seta 10-P length of and as stout as 9-P, with spiny barbs as in 9-P. Setae 3, 6, 7-I-IV, 4-II, 10-II-V and 11-I single.

The 4th stage larvae and adult specimens were not available for examination.

SPECIMEN EXAMINED. RYUKYU ARCHIPELAGO. 1 3rd stage larva: Okinawa Guntô (Ada, Okinawa Is., 20 IV 1955, tree stump, Nakata, USNM).

DISTRIBUTION. RYUKYU ARCHIPELAGO (Okinawa Guntô).

TAXONOMIC DISCUSSION. This species is closely allied to *towadensis*, belonging to a separate group from *manicatus*. Detailed discussions will be made elsewhere. It is intriguing that *manicatus* occurs in both the northern (Amami Guntô) and southern (Yaeyama Guntô) Ryukyu Archipelago, but it is replaced by a species allied to *towadensis* on Okinawa Is., central Ryukyus.

BIONOMICS. Apparently a very rare species. One larva was found in a tree stump.

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1978. Taxonomical and biological studies in *Aedes (Stegomyia) scutellaris* group from Japan. 5. Hybridization experiments between *Aedes riversi* from Okinawa Island and *Aedes alcasidi* from Taiwan (abstract, in Japanese). Jpn. J. Sanit. Zool. 29: 26.

LIST OF FIGURES

Figures 1 through 10 are in the body of the text. The remaining figures follow this listing.

*After LaCasse and Yamaguti 1950.

39. *Cx. (Cux.) tritaeniorhynchus* - larva
40. *Cx. (Cux.) pseudovishnui* - larva
41. *Cx. (Cux.) pseudovishnui* and *sitiens* - male genitalia
42. *Cx. (Cux.) sitiens* - larva
43. *Cx. (Cux.) whitmorei* - larva
44. *Cx. (Cux.) whitmorei* and *jacksoni* - male genitalia
45. *Cx. (Cux.) jacksoni* - larva
46. *Cx. (Cux.) mimeticus* - larva
47. *Cx. (Cux.) mimeticus* and *orientalis* - male genitalia
48. *Cx. (Cux.) orientalis* - larva
49. *Cx. (Cux.) boninensis* - larva
50. *Cx. (Cux.) boninensis* and *bitaeniorhynchus* - male genitalia
51. *Cx. (Cux.) bitaeniorhynchus* - larva
52. **Cx. (Cux.) sinensis* - larva
53. *Cx. (Neoculex) rubensis* - larva
54. *Cx. (Ncx.) rubensis* and *Cx. (Eumelanomyia) hayashii hayashii* - male genitalia
55. *Cx. (Eum.) hayashii hayashii* - larva
56. *Cx. (Eum.) okinawae* - larva
57. *Cx. (Eum.) okinawae* and *brevipalpis* - male genitalia
58. *Cx. (Eum.) brevipalpis* - larva
59. *Cx. (Lophoceraomyia) infantulus* - larva
60. *Cx. (Lop.) infantulus* and *cinctellus* - male genitalia
61. **Cx. (Lop.) rubithoracis* - larva
62. *Cx. (Lop.) rubithoracis* and *bicornutus* - male genitalia
63. *Cx. (Lop.) bicornutus* - larva
64. *Cx. (Lop.) tuberis* - larva
65. *Cx. (Lop.) tuberis* and *Cx. (Culiciomyia) ryukyensis* - male genitalia
66. *Cx. (Cui.) ryukyensis* - larva
67. *Cx. (Cui.) nigropunctatus* - larva
68. *Cx. (Cui.) nigropunctatus* and *pallidothorax* - male genitalia
69. *Cx. (Cui.) pallidothorax* - larva
70. *Cx. (Cui.) kyotoensis* - larva
71. *Cx. (Cui.) kyotoensis* and *sasai* - male genitalia
72. *Cx. (Cui.) sasai* - larva
73. *Cx. (Barraudius) inatomii* - larva
74. *Cx. (Bar.) inatomii* and *Cx. (Lutzia) fuscanus* - male genitalia
75. *Cx. (Lut.) fuscanus* - larva
76. *Cx. (Lut.) halifaxii* and *shinonagai* - male genitalia
77. *Cx. (Lut.) shinonagai* - larva
78. *Heizmannia (Heizmannia) lii* - male genitalia and claws
79. *Aedes (Ochlerotatus) vigilax* - larva
80. *Ae. (Och.) dorsalis* - larva
81. *Ae. (Och.) dorsalis* and *excrucians* - male genitalia
82. *Ae. (Och.) excrucians* - larva
83. *Ae. (Och.) impiger daisetsuzanus* - larva
84. *Ae. (Och.) impiger daisetsuzanus* and *sticticus* - male genitalia
85. *Ae. (Och.) sticticus* - larva
86. *Ae. (Och.) communis* - larva
87. *Ae. (Och.) communis* and *punctor* - male genitalia

*After LaCasse and Yamaguti 1950.

88. *Ae. (Och.) punctor* - larva
89. *Ae. (Och.) hexodontus hokkaidensis* - larva
90. *Ae. (Och.) hakusanensis* - larva
91. *Ae. (Och.) hakusanensis* and *Ae. (Och.)* sp. - male genitalia
92. *Ae. (Och.) intrudens* - larva
93. *Ae. (Och.) intrudens* and *diantaeus* - male genitalia
94. *Ae. (Och.) diantaeus* - larva
95. *Ae. (Finlaya) japonicus japonicus* - larva
96. *Ae. (Fin.) koreicus* - larva
97. *Ae. (Fin.) japonicus japonicus* and *hatorii* - male genitalia
98. *Ae. (Fin.) hatorii* - larva
99. *Ae. (Fin.) togoi* - larva
100. *Ae. (Fin.) togoi* and *savoryi* - male genitalia
101. *Ae. (Fin.) savoryi* - larva
102. *Ae. (Fin.) seoulensis* - larva
103. *Ae. (Fin.) seoulensis* and *kobayashii* - male genitalia
104. *Ae. (Fin.) kobayashii* - larva
105. *Ae. (Fin.) aureostriatus okinawanus* - larva
106. *Ae. (Fin.) aureostriatus okinawanus* and *koreicoides* - male genitalia
107. *Ae. (Fin.) koreicoides* - larva
108. *Ae. (Fin.) nipponicus* - larva
109. *Ae. (Fin.) nipponicus* and *nishikawai* - male genitalia
110. *Ae. (Fin.) nishikawai* - larva
111. *Ae. (Fin.) oreophilus* - larva
112. *Ae. (Fin.) oreophilus* and *watasei* - male genitalia
113. *Ae. (Fin.) watasei* - larva
114. *Ae. (Stegomyia) riversi* - larva
115. *Ae. (Stg.) riversi* and *galloisi* - male genitalia
116. *Ae. (Stg.) galloisi* - larva
117. *Ae. (Stg.) albopictus* - larva
118. *Ae. (Stg.) albopictus* and *flavopictus flavopictus* - male genitalia; *flavopictus miyarai* - claspette
119. *Ae. (Stg.) flavopictus flavopictus* - larva
120. *Ae. (Stg.) aegypti* - larva
121. *Ae. (Stg.) aegypti* and *wadai* - male genitalia
122. *Ae. (Stg.) wadai* - larva
123. *Ae. (Stg.) chemulpoensis* - larva
124. *Ae. (Stg.) chemulpoensis* and *alboscutellatus* - male genitalia
125. *Ae. (Stg.) alboscutellatus* - larva
126. *Ae. (Aedimorphus) vexans nipponii* - larva
127. *Ae. (Adm.) vexans nipponii* and *Ae. (Geoskusea) baisasi* - male genitalia
128. *Ae. (Geo.) baisasi* - larva
129. *Ae. (Neomelaniconion) lineatopennis* - larva
130. *Ae. (Neo.) lineatopennis* - male genitalia; *Ae. (Edwardsaedes) imprimens* - male and female genitalia and male palpus
131. *Ae. (Aedes) esoensis* - larva
132. *Ae. (Aed.) esoensis, yamadai, sasai* and *cinereus* - male siphon
133. *Ae. (Aed.) esoensis* and *yamadai* - male genitalia
134. *Ae. (Aed.) yamadai* - larva
135. *Ae. (Aed.) sasai* - larva
136. *Ae. (Aed.) sasai* and *Ae. (Verrallina) nobukonis* - male genitalia
137. *Ae. (Ver.) nobukonis* - female genitalia
138. *Ae. (Ver.) nobukonis* - larva

139. *Ae. (Ver.) iriomotensis* - female genitalia
140. *Ae. (Ver.) atriisimilis* - male and female genitalia
141. *Ae. (Ver.) atriisimilis* - larva
142. *Armigeres (Armigeres) subalbatus* - larva
143. *Ar. (Arm.) subalbatus* and *Uranotaenia (Pseudoficalbia) jacksoni* - male genitalia
144. *Ur. (Pfc.) jacksoni* - larva
145. *Ur. (Pfc.) ohamai* - larva
146. *Ur. (Pfc.) ohamai* and *yaeyamana* - male genitalia
147. *Ur. (Pfc.) yaeyamana* - larva
148. *Ur. (Pfc.) novobscura novobscura* - larva
149. *Ur. (Pfc.) novobscura novobscura* and *nivipleura* - male genitalia
150. *Ur. (Pfc.) nivipleura* - larva
151. *Ur. (Uranotaenia) annandalei* - larva
152. *Ur. (Ura.) annandalei* and *macfarlanei* - male genitalia
153. *Ur. (Ura.) macfarlanei* - larva
154. *Tripteroides (Tripteroides) bambusa bambusa* - larva
155. *Tp. (Trp.) bambusa bambusa* and *Topomyia (Suaymyia) yanbarensis* - male genitalia
156. *To. (Sua.) yanbarensis* - larva
157. *Malaya genurostris* - larva
158. *Ml. genurostris* and *Toxorhynchites (Toxorhynchites) manicatus yaeyamae* - male genitalia; *Tx. (Tox.) manicatus yamadai* - tergum IX
159. *Tx. (Tox.) towadensis* and *christophi* - male genitalia
160. *Tx. (Tox.) towadensis* - larva
161. *Tx. (Tox.) manicatus yamadai* - larval thorax, setae 10-13-II, 4, 5-VIII and 1-X; *towadensis* - larval setae 10-13-II; *christophi* - larval setae 10-13-II, 4, 5-VIII and 1-X
162. *Anopheles (Cellia) minimus* - adult
163. *An. (Cel.) tessellatus* - female palpus, proboscis and hindleg; *An. (Anopheles) lindesayii japonicus* - female palpus, proboscis and hind-femur; *An. (Ano.) koreicus* and *lesteri* - female palpus, proboscis and hindtarsus; *An. (Ano.) yatsuchiroensis* - female palpus and proboscis; *An. (Ano.) sineroides* - female hindtarsus
164. *An. (Cel.) tessellatus, An. (Ano.) lindesayii japonicus An. (Ano.) koreicus* and *An. (Ano.) koreicus (edwardsi*-type) - female wing
165. *An. (Ano.) bengalensis* - adult
166. *An. (Ano.) omorii* - adult
167. *An. (Ano.) saperoi saperoi* - adult
168. *An. (Ano.) sinensis* - adult
169. *An. (Ano.) sinensis, pullus, sineroides* and *lesteri* - female wing
170. *An. (Ano.) lesteri* - adult
171. *Mimomyia (Etorleptiomyia) luzonensis* - adult
172. *Mi. (Eto.) elegans* - adult
173. *Culiseta (Culicella) nipponica* - adult
174. *Cs. (Culiseta) kanayamensis* - adult
175. *Orthopodomyia anopheloides* - adult
176. *Mansonia (Mansonioides) uniformis* - adult
177. *Ma. (Coquillettidia) ochracea* - adult
178. *Ma. (Coq.) crassipes* - adult
179. *Culex (Culex) fuscocephala* - adult
180. *Cx. (Cux.) vagans* - adult

181. *Cx. (Cux.) pipiens pallens* - adult; *pipiens quinquefasciatus* - female abdomen
182. *Cx. (Cux.) tritaeniorhynchus* - adult
183. **Cx. (Cux.) pseudovishnui* - adult
184. *Cx. (Cux.) sitiens* - adult
185. *Cx. (Cux.) whitmorei* - adult
186. *Cx. (Cux.) jacksoni* - adult
187. *Cx. (Cux.) mimeticus* - adult
188. *Cx. (Cux.) orientalis* - adult
189. *Cx. (Cux.) boninensis* - adult
190. **Cx. (Cux.) bitaeniorhynchus* - adult
191. **Cx. (Cux.) sinensis* - adult
192. **Cx. (Neoculex) rubensis* - adult
193. **Cx. (Eumelanomyia) hayashii hayashii* - adult
194. *Cx. (Eum.) okinawae* - adult
195. *Cx. (Eum.) brevipalpis* - adult
196. **Cx. (Lophoceraomyia) infantulus* - adult
197. *Cx. (Lop.) cinctellus* - adult
198. **Cx. (Lop.) rubithoracis* - adult
199. *Cx. (Lop.) bicornutus* - adult
200. *Cx. (Lop.) tuberis* - adult
201. *Cx. (Culiciomyia) ryukyensis* - adult
202. *Cx. (Cui.) nigropunctatus* - adult
203. **Cx. (Cui.) pallidothorax* - adult
204. *Cx. (Cui.) kyotoensis* - adult
205. *Cx. (Cui.) sasai* - adult
206. *Cx. (Barraudius) inatomii* - adult
207. *Cx. (Lutzia) fuscanus* - adult
208. **Cx. (Lut.) halifaxii* - adult
209. *Cx. (Lut.) shinonagai* - adult
210. *Heizmannia (Heizmannia) kana* - adult
211. *Hz. (Hez.) lii* - adult
212. *Aedes (Ochlerotatus) dorsalis* - adult
213. *Ae. (Och.) excrucians* - adult
214. *Ae. (Och.) impiger daisetsuzanus* - female thorax; *communis* - female thorax and abdomen; *hexodontus hokkaidensis* and *diantaeus* - female abdomen
215. *Ae. (Och.) sticticus* - adult
216. *Ae. (Och.) punctor, hakusanensis, intrudens* and *diantaeus* - female thorax
217. *Ae. (Finlaya) japonicus japonicus* - adult
218. *Ae. (Fin.) koreicus* - female thorax and hindleg; *japonicus shintienensis, japonicus yaeyamensis, japonicus amamiensis* and *japonicus japonicus* - female hindfemur
219. *Ae. (Fin.) hatorii* - adult
220. *Ae. (Fin.) togoi* - adult
221. *Ae. (Fin.) savoryi* - adult
222. *Ae. (Fin.) seoulensis* - adult
223. *Ae. (Fin.) kobayashii* - adult
224. *Ae. (Fin.) aureostriatus okinawanus* - adult; *aureostriatus taiwanus* - female wing and legs

*After LaCasse and Yamaguti 1950.

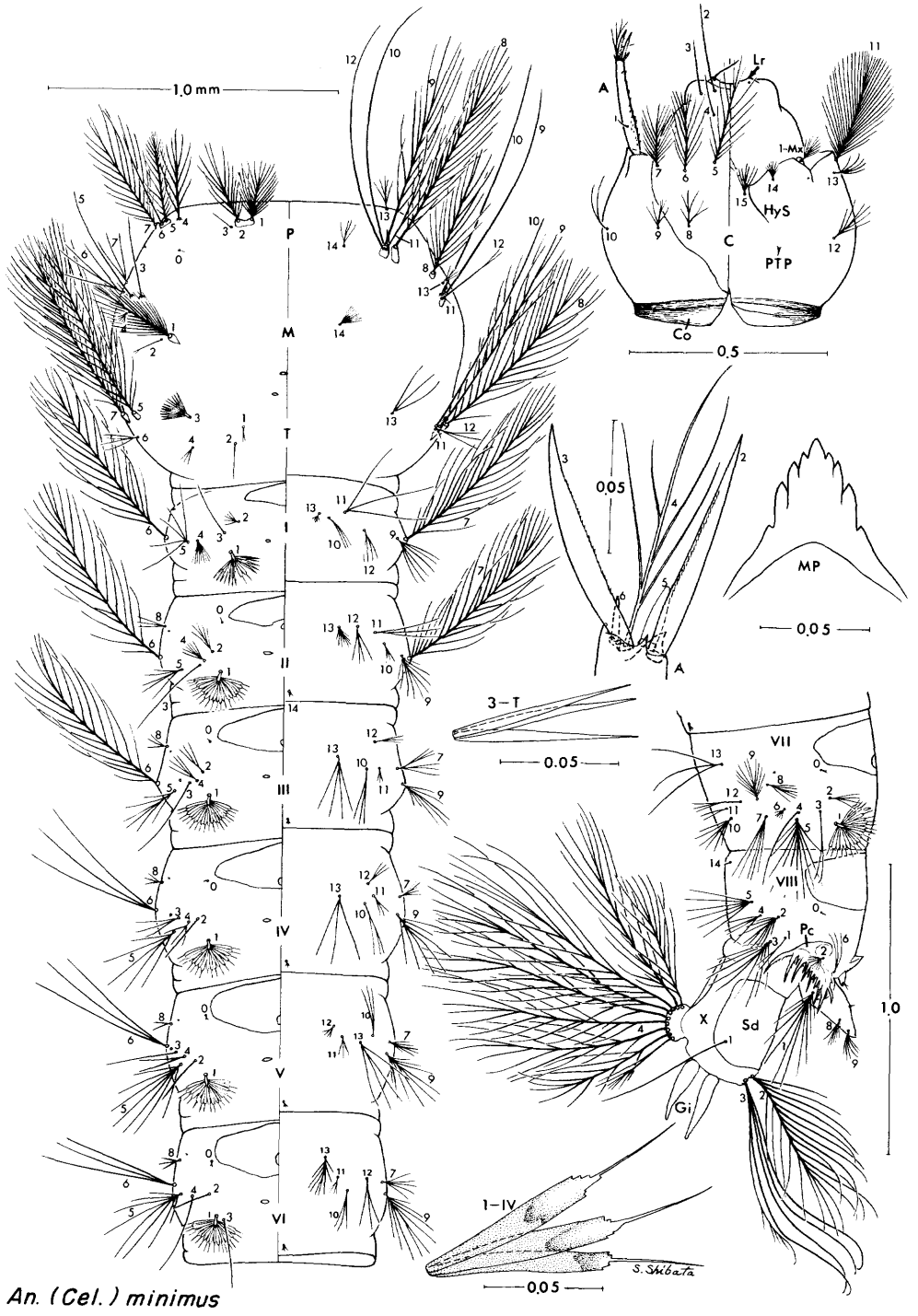
225. *Ae. (Fin.) koreicoides* - adult
226. *Ae. (Fin.) nipponicus* - adult
227. *Ae. (Fin.) nishikawai* - adult
228. *Ae. (Fin.) oreophilus* - adult
229. *Ae. (Fin.) watasei* - adult
230. *Ae. (Stegomyia) riversi* - adult
231. *Ae. (Stg.) galloisi* - adult
232. *Ae. (Stg.) albopictus* - adult
233. *Ae. (Stg.) flavopictus downsi* - adult; *flavopictus miyarai* - female wing
234. *Ae. (Stg.) aegypti* - adult
235. *Ae. (Stg.) wadai* - adult
236. *Ae. (Stg.) chemulpoensis* - adult
237. *Ae. (Aedimorphus) alboscutellatus* - adult
238. *Ae. (Adm.) vexans nipponii* - adult
239. *Ae. (Geoskusea) baisasi* - adult
240. *Ae. (Neomelaniconion) lineatopennis* - adult
241. *Ae. (Edwardsaedes) imprimens* - adult
242. *Ae. (Aedes) esoensis* - adult
243. *Ae. (Aed.) yamadai* - adult
244. *Ae. (Aed.) sasai* - adult
245. *Ae. (Verrallina) nobukonis* - adult
246. *Ae. (Ver.) iriomotensis* - adult
247. *Ae. (Ver.) atriisimilis* - adult
248. *Armigeres (Armigeres) subalbatus* - adult
249. *Uranotaenia (Pseudoficalbia) jacksoni* - adult
250. *Ur. (Pfc.) ohamai* - adult
251. *Ur. (Pfc.) yaeyamana* - adult
252. *Ur. (Pfc.) novobscura novobscura* - adult; *novobscura ryukyuana* - female thorax
253. *Ur. (Pfc.) nivipleura* - adult
254. *Ur. (Uranotaenia) annandalei* - adult
255. *Ur. (Ura.) macfarlanei* - adult
256. *Tripteroides (Tripteroides) bambusa bambusa* - adult; *bambusa yaeyamensis* - female thorax
257. *Topomyia (Suaymyia) yanbarensis* - adult
258. *Malaya genurostris* - adult
259. *Toxorhynchites (Toxorhynchites) manicatus yamadai* - adult
260. *Tx. (Tox.) manicatus yaeyamae* and *towadensis* - male adult
261. *Tx. (Tox.) towadensis* - female adult
262. *Tx. (Tox.) christophi* - male adult

LIST OF FIGURE ABBREVIATIONS (Figs. 11-262)

A	Antenna
Ac	Acus
Ae	Aedeagus
Au	Aulaeum
BP	Basal plate
Bs	Basistyle
BT	Basal tergomesal lobe
C	Head
CA	Cibarial armature
Cd	Claspettoid
Ce	Cercus
Cl	Claw
CO	Cutting organ
Co	Collar
Cp	Claspette
CS	Comb scale
Cy	Clypeus
d	dorsal
Ds	Dististyle
Em	Empodium
Ex	Spiny excrescence
Ff	Forefemur
Fl	Foreleg
Flm	Flagellomere
Ftb	Foretibia
Ftm	Foretarsomere
Fts	Foretarsus
G	Genitalia
Gi	Gill
Gl	Galea
Hf	Hindfemur
Hl	Hindleg
Htb	Hindtibia
Htm	Hindtarsomere
Hts	Hindtarsus
HyS	Hypostomal suture
IF	Interbasal fold
L	Labium
l	lateral
Lf	Leaflet
LP	Labral process
Lr	Labrum
LVL	Lower vaginal lip
LVS	Lower vaginal sclerite
M	Mesothorax
m	mesal
MB	Mouth brush
Md	Mandible
Mf	Midfemur
Ml	Midleg
MP	Mentum plate
Mp	Mouthpart
Mtb	Midtibia
Mtm	Midtarsomere
Mts	Midtarsus
Mx	Maxilla
O	Opisthophallus
P	Prothorax
Pc	Pecten
Pe	Prementum
Pf	Palpifer
Pg	Postgenital plate
Ph	Phallus
Pl	Palpus
Pm	Paramere
Po	Prosophallus
Pp	Paraproct
Pr	Proboscis
Ps	Phallosome
PT	Pecten tooth
Pt	Proctiger
PTP	Posterior tentorial pit
S	Siphon
s	sternal
SC	Seminal capsule
sc	Subcosta
Sd	Saddle
SE	Spermathecal eminence
SL	Subapical lobe
Sp	Spiracle
St	Sternum

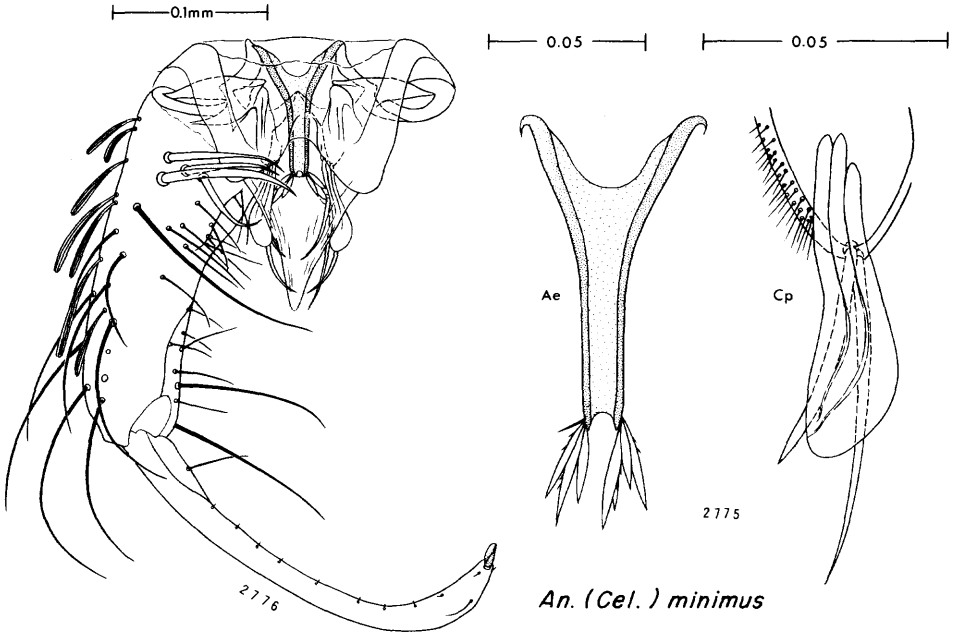
T	Metathorax	v	ventral
t	tergal		
Tg	Tergum	I-X	referring to segments of flagellum, palpus, tarsus and abdomen.
Tp	Pupal trumpet		
UVL	Upper vaginal lip		
UVS	Upper vaginal sclerite		

Fig. 11

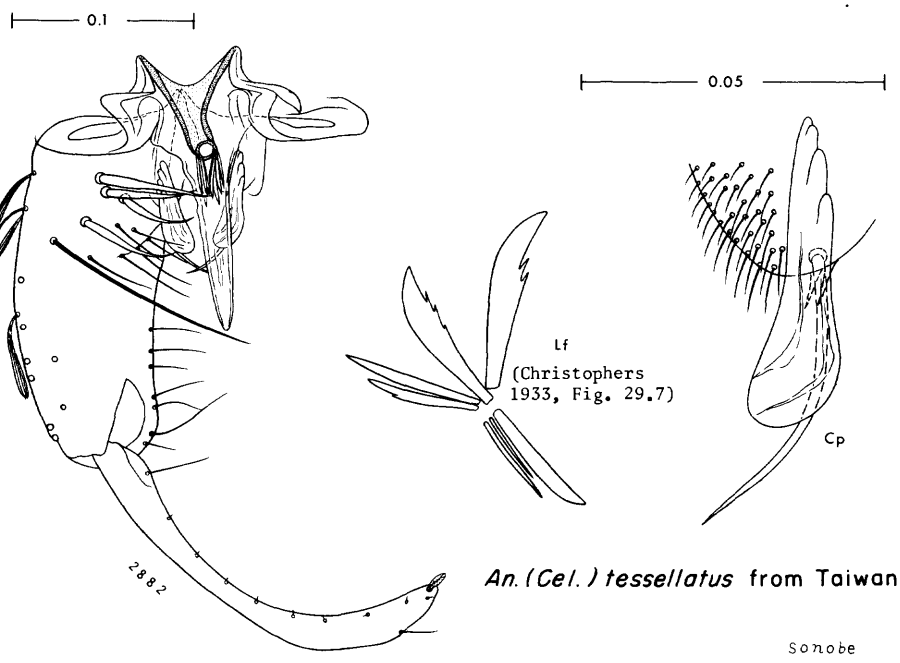


An. (Cel.) minimus

Fig. 12



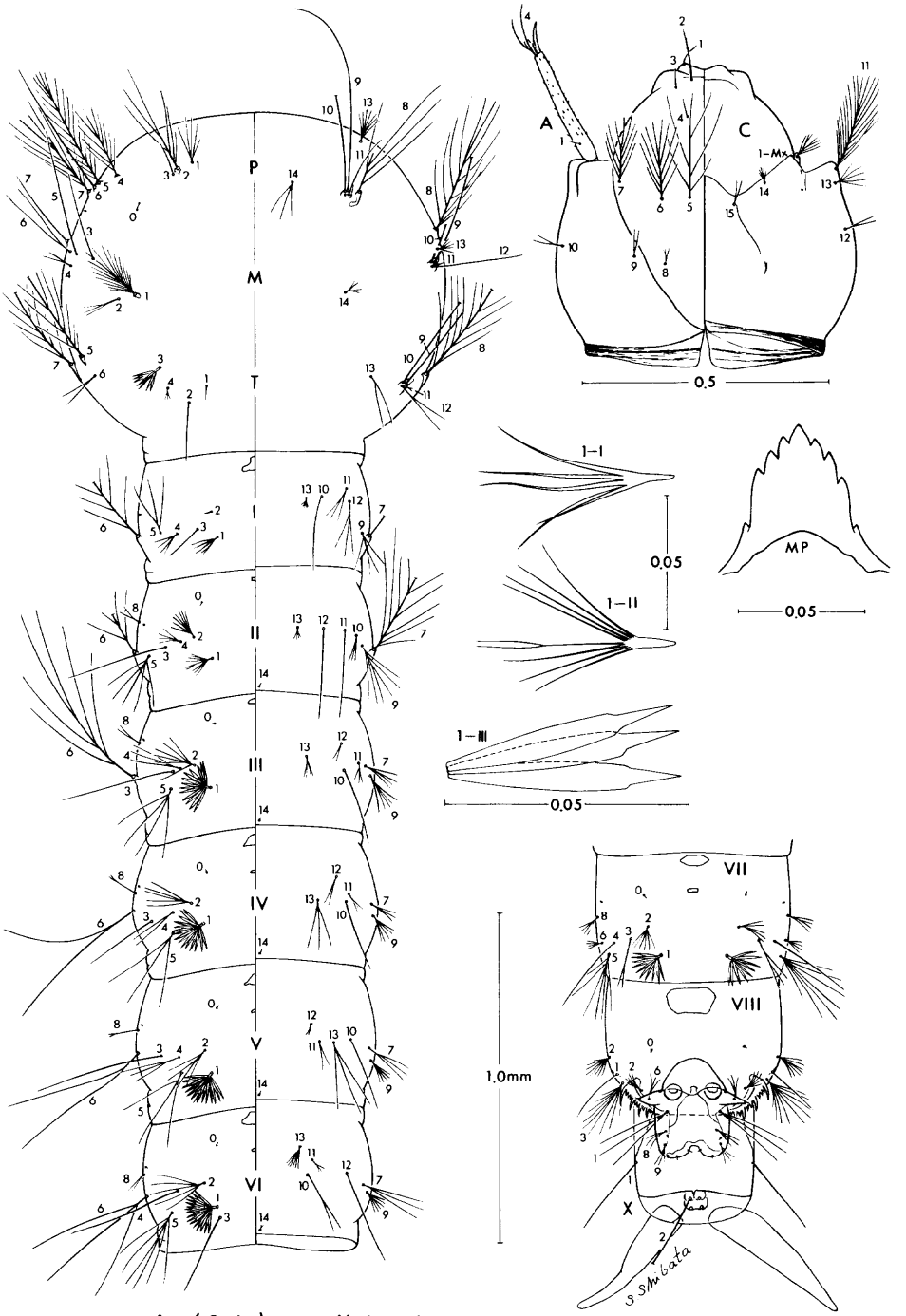
An. (Cel.) minimus



An. (Cel.) tessellatus from Taiwan

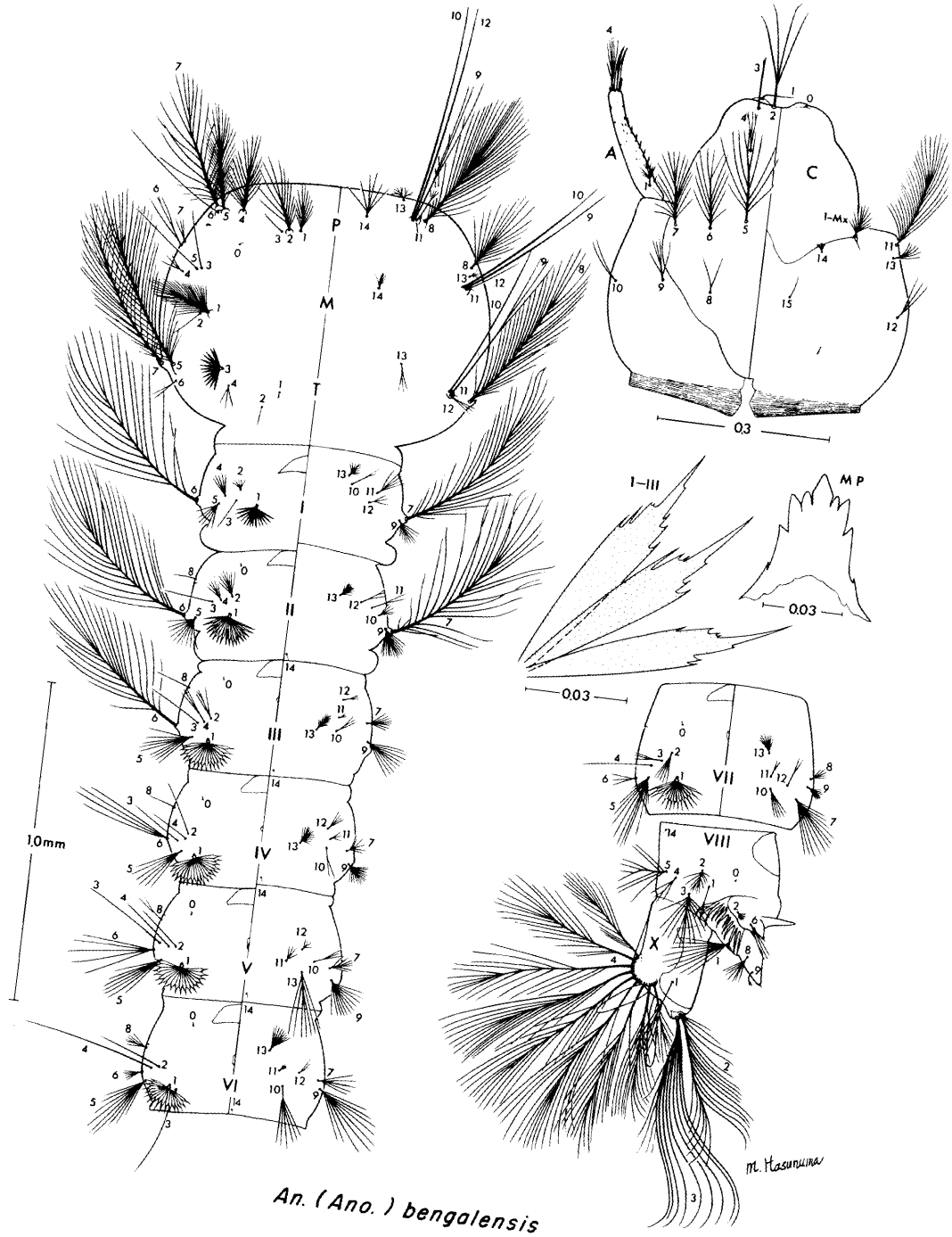
Sonobe

Fig. 13



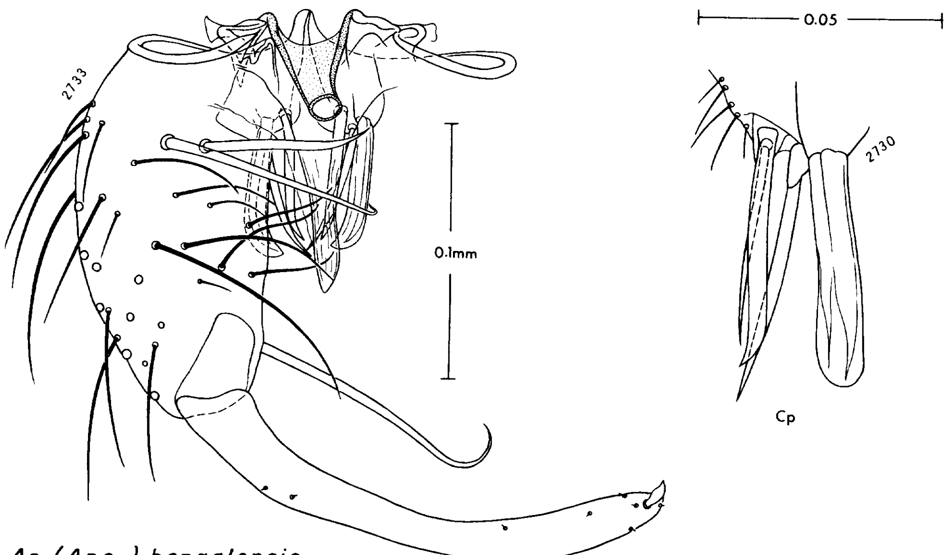
An. (Cel.) tessellatus from Taiwan

Fig. 14



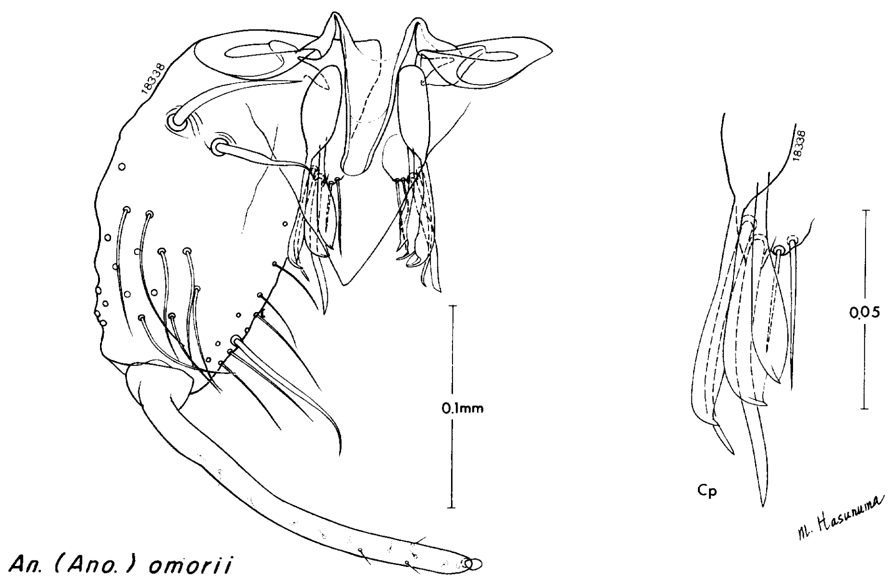
An. (Ano.) bengalensis

Fig. 15



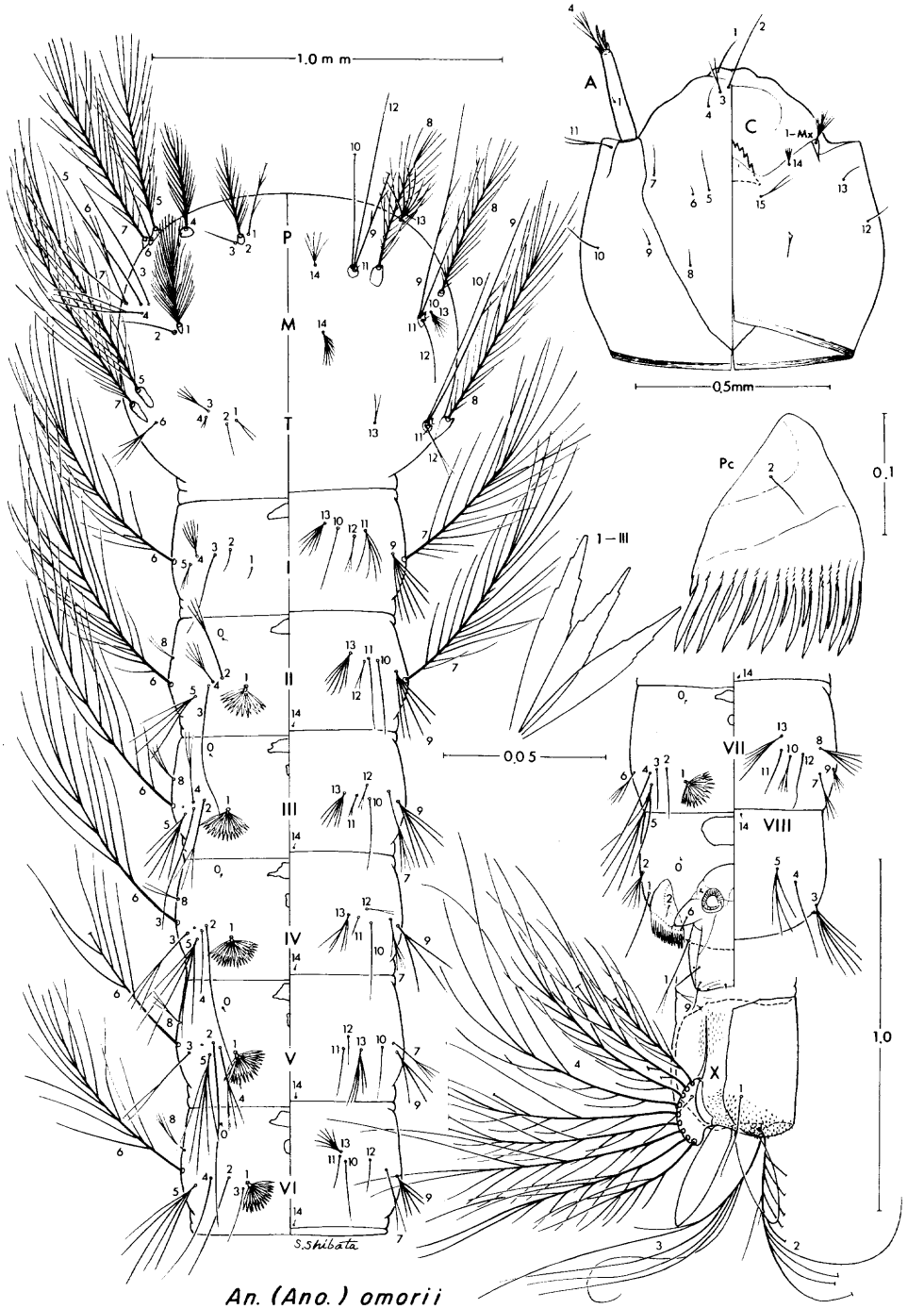
An. (Ano.) bengalensis

Sonobe



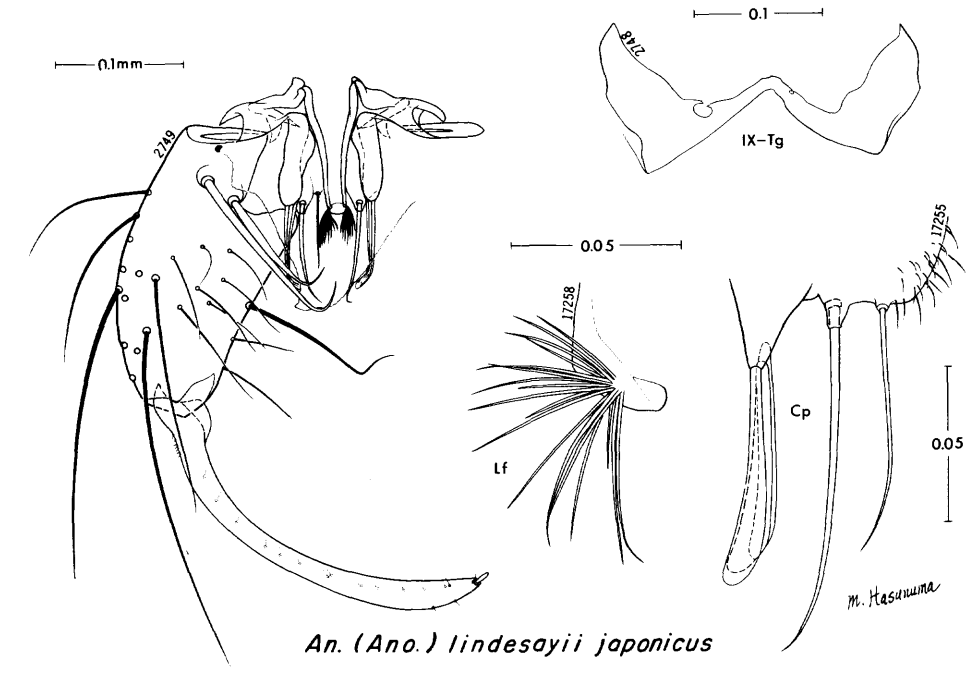
An. (Ano.) omorii

Fig. 16



An. (Ano.) omorii

Fig. 17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0.1
2148
IX-Tg
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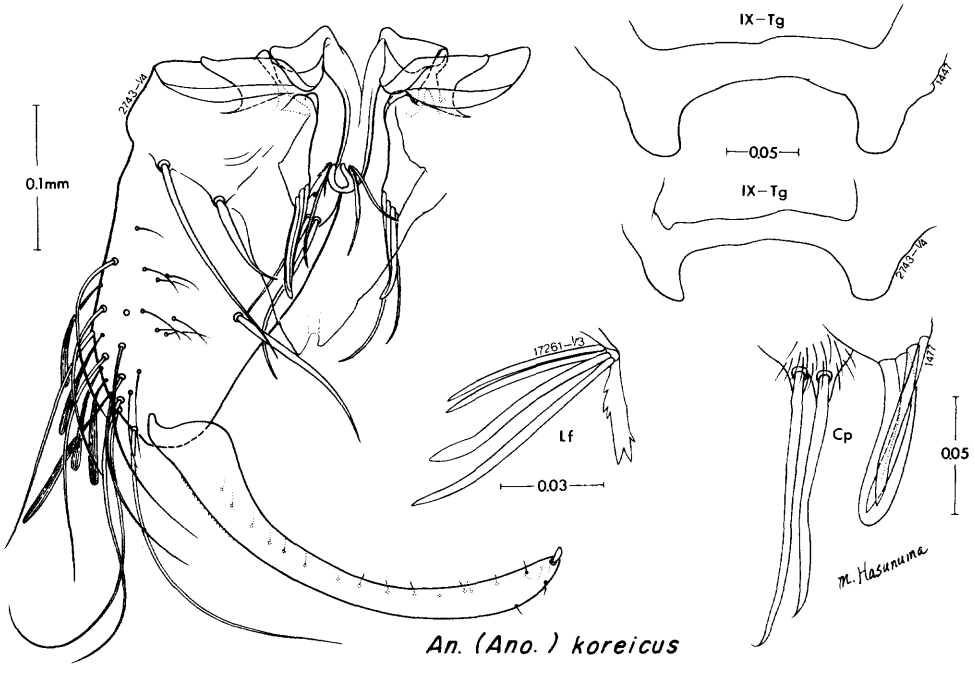
17258
Lf
17255
Cp
0.05
m. Hasuuma
An. (Ano.) lindesayii japonicus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IX-Tg
2143-VA
0.1mm
17261-V3
Lf
0.03
Cp
1497
0.05
m. Hasuuma
An. (Ano.) koreicus

Fig. 18

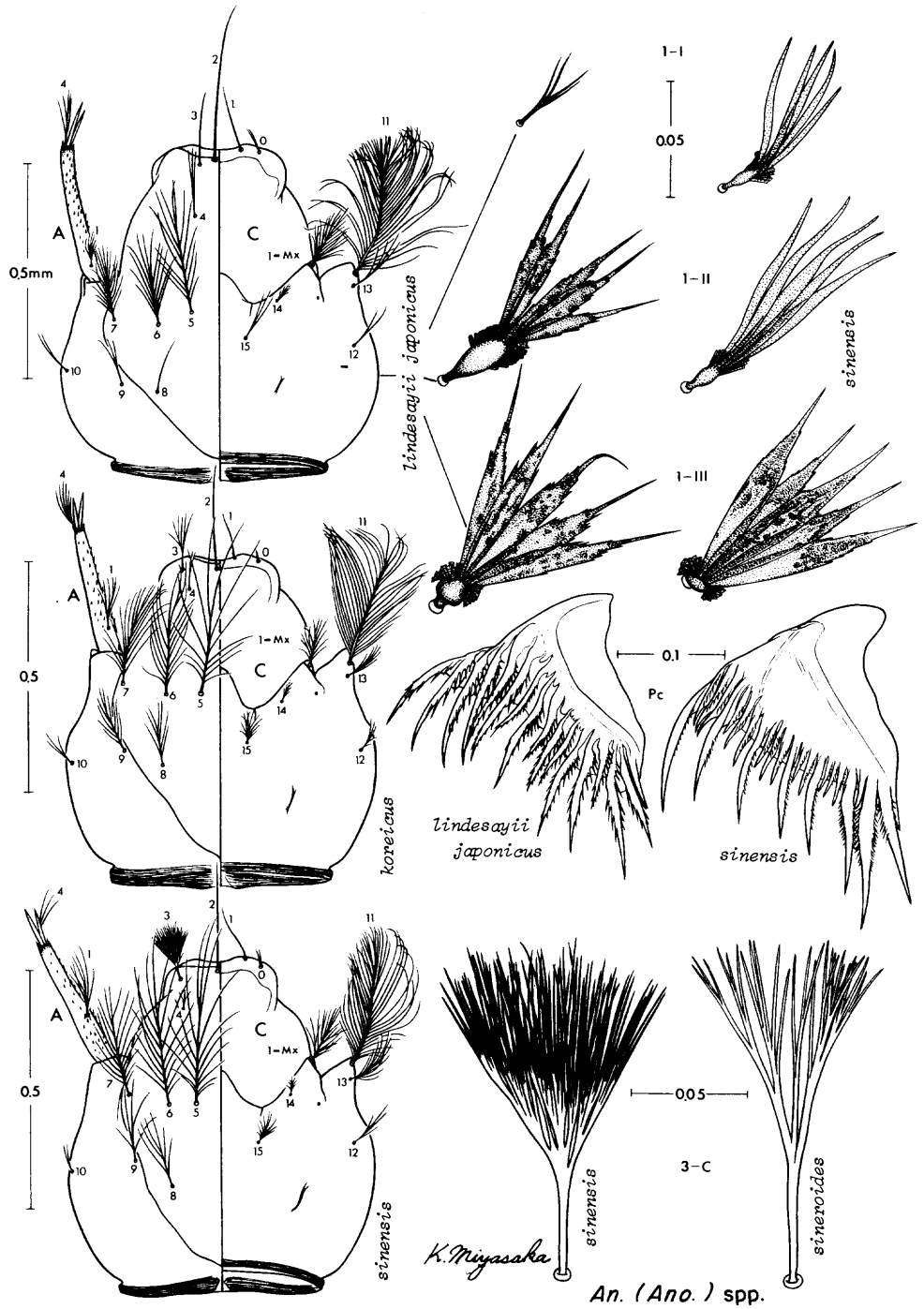
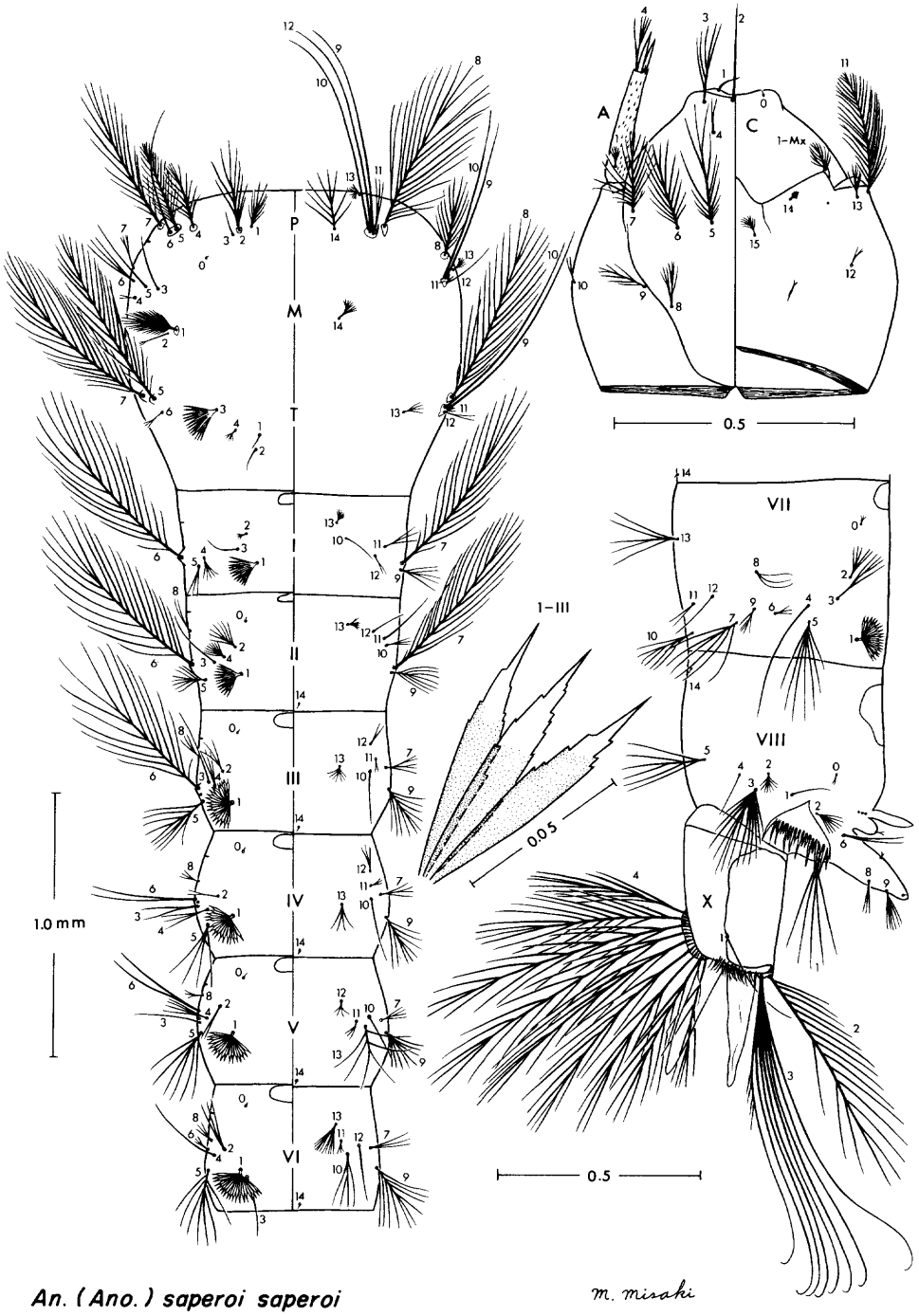

0.5mm
A
C
1-Mx
lindesayii japonicus
koreicus
sinensis
1-I
1-II
1-III
0.05
0.1
Pc
lindesayii japonicus
sinensis
0.5
0.05
3-C
sinensis
sinensis
sinensis
K. Miyasaka
An. (Ano.) spp.

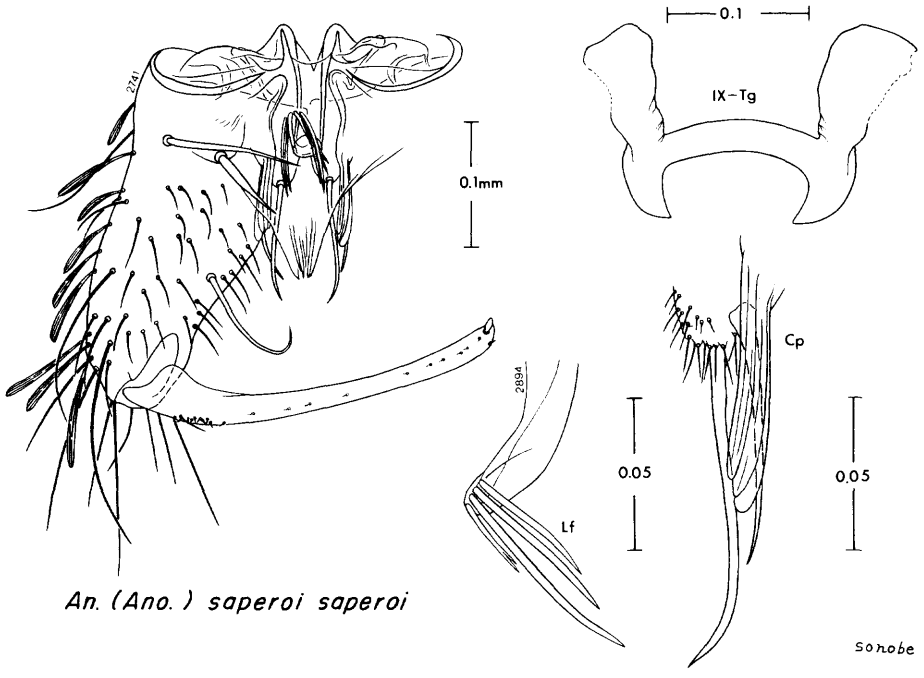
Fig. 19



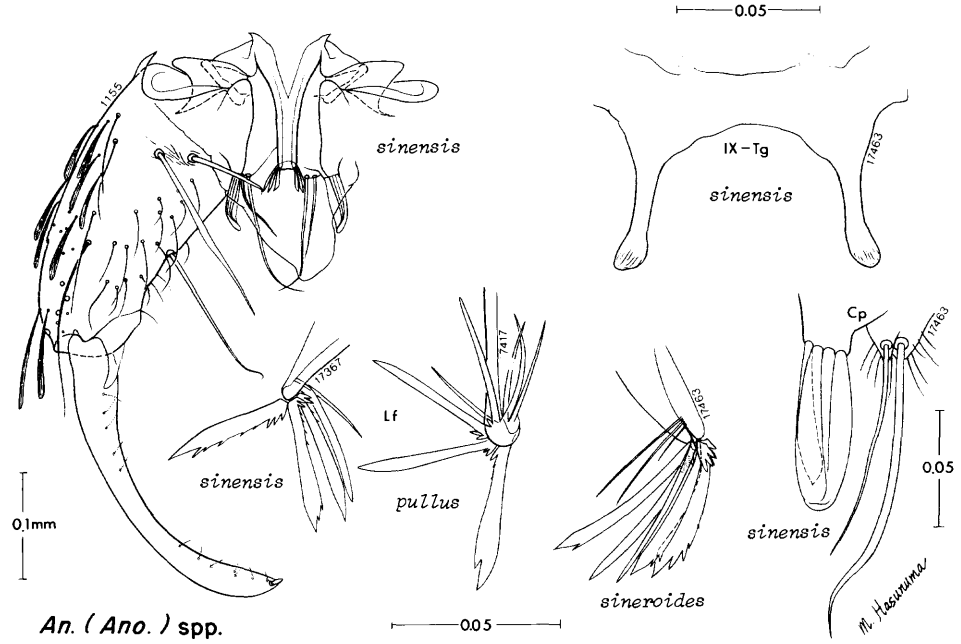
An. (Ano.) saperoi saperoi

M. Misaki

Fig. 20

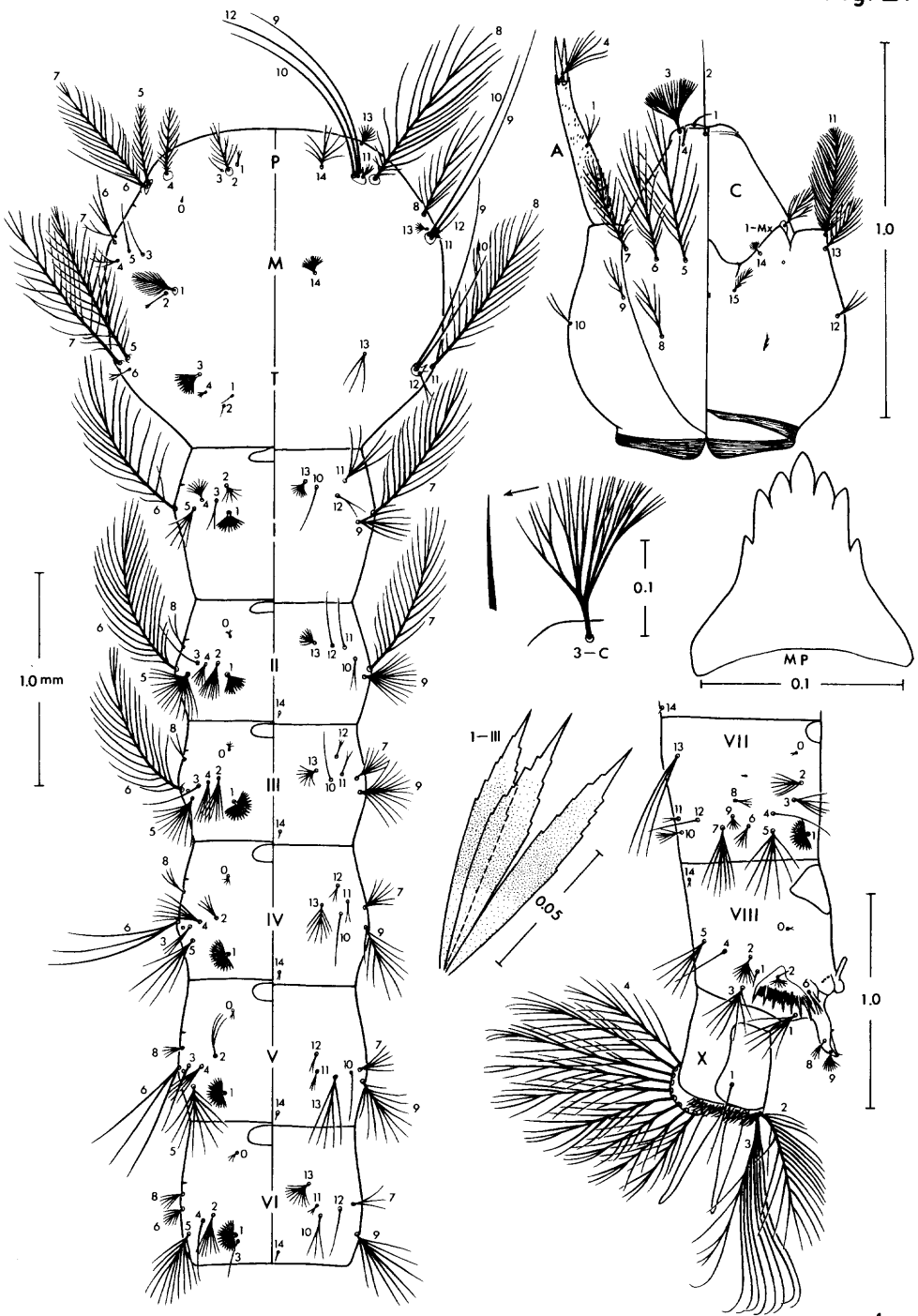


An. (Ano.) saperoi saperoi



***An. (Ano.)* spp.**

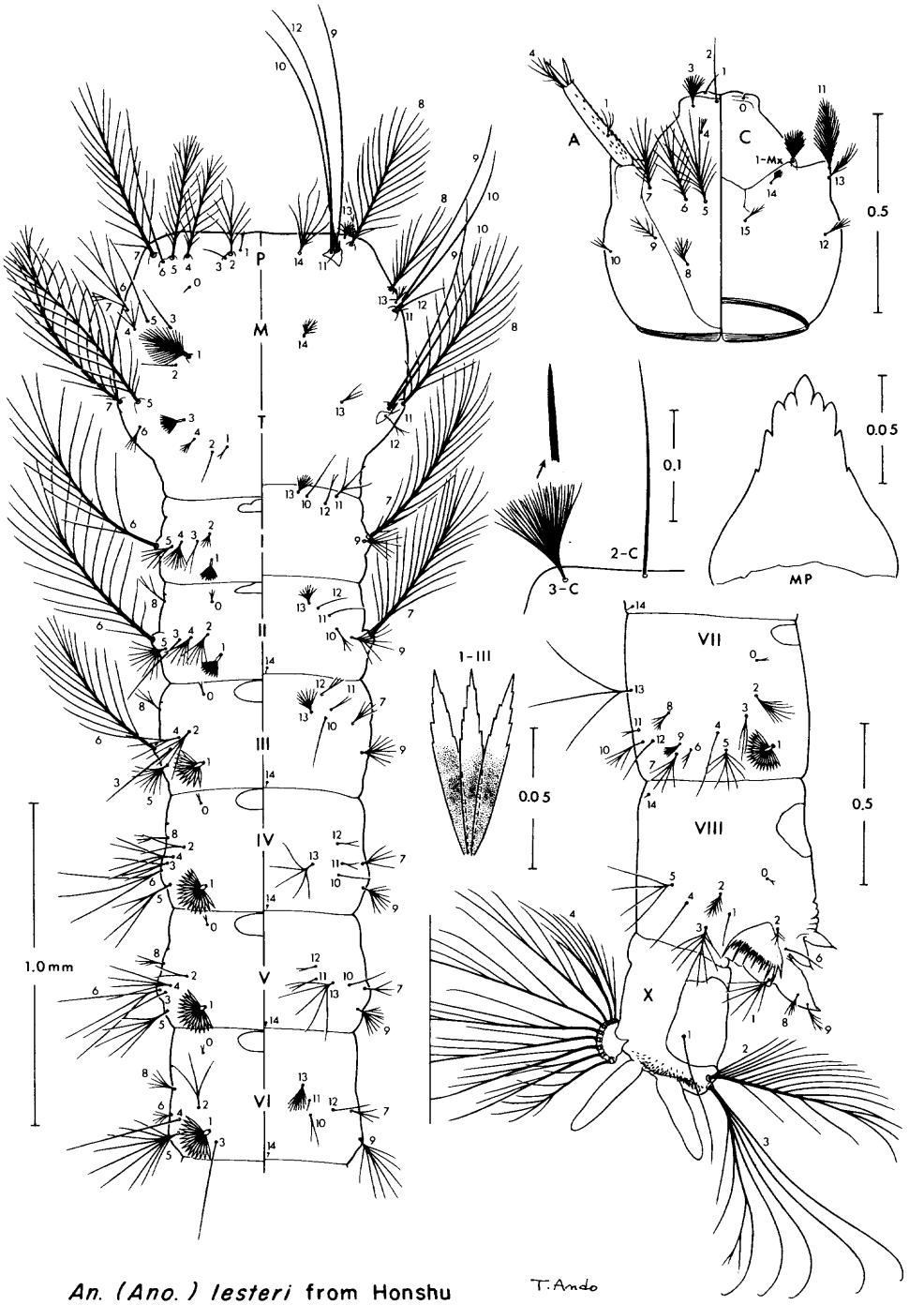
Fig. 21



An. (Ano.) sp. (Engaru race)

M. Misaki

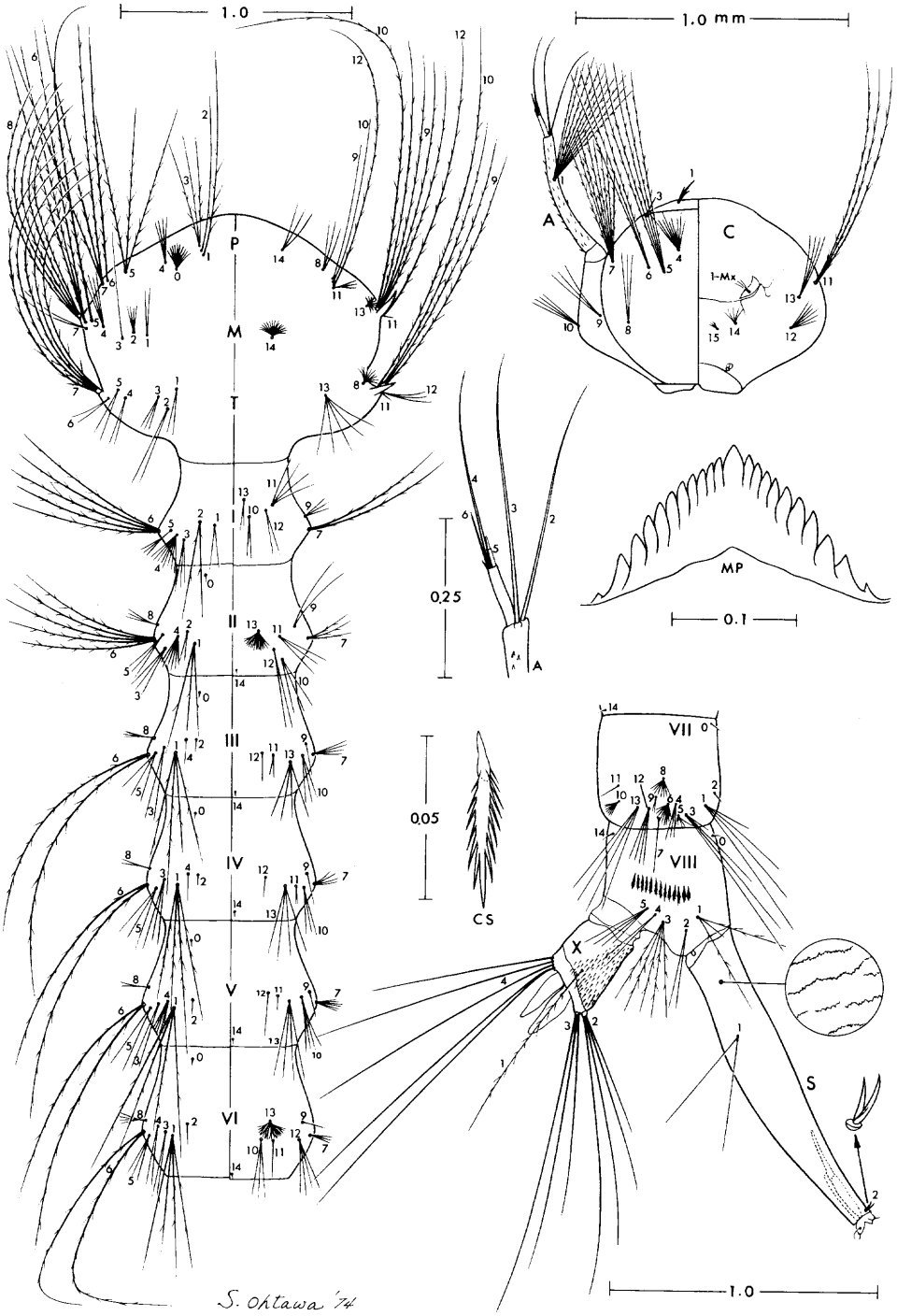
Fig. 22



An. (Ano.) lesteri from Honshu

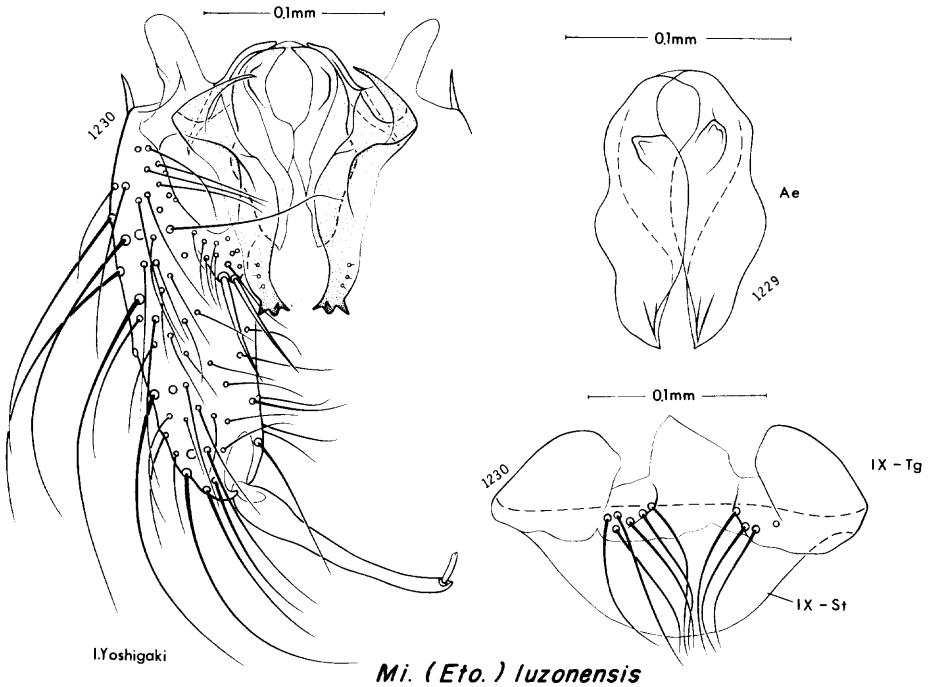
T. Ando

Fig. 23

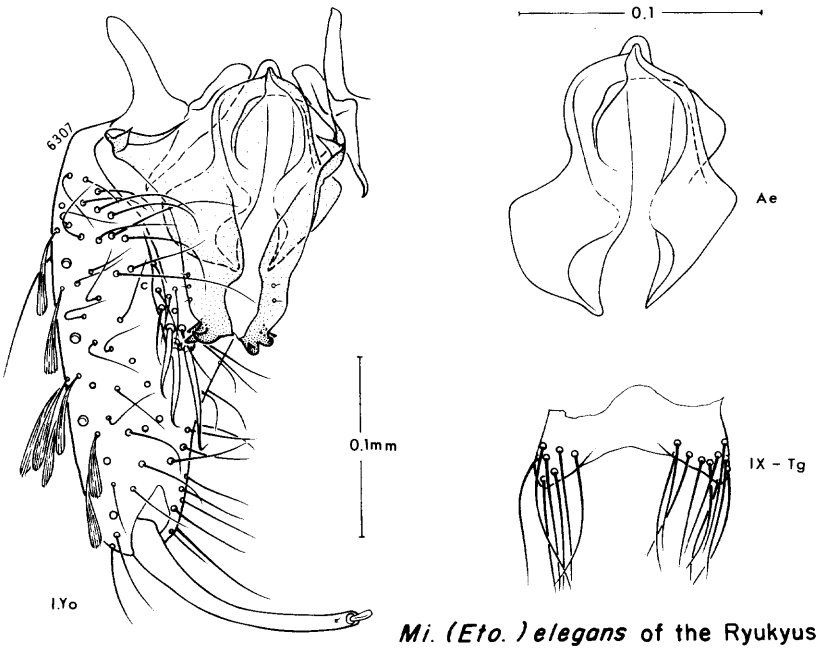


Mi. (Eto.) luzonensis from Taiwan

Fig. 24



Mi. (Eto.) luzonensis



Mi. (Eto.) elegans of the Ryukyus

Fig. 25

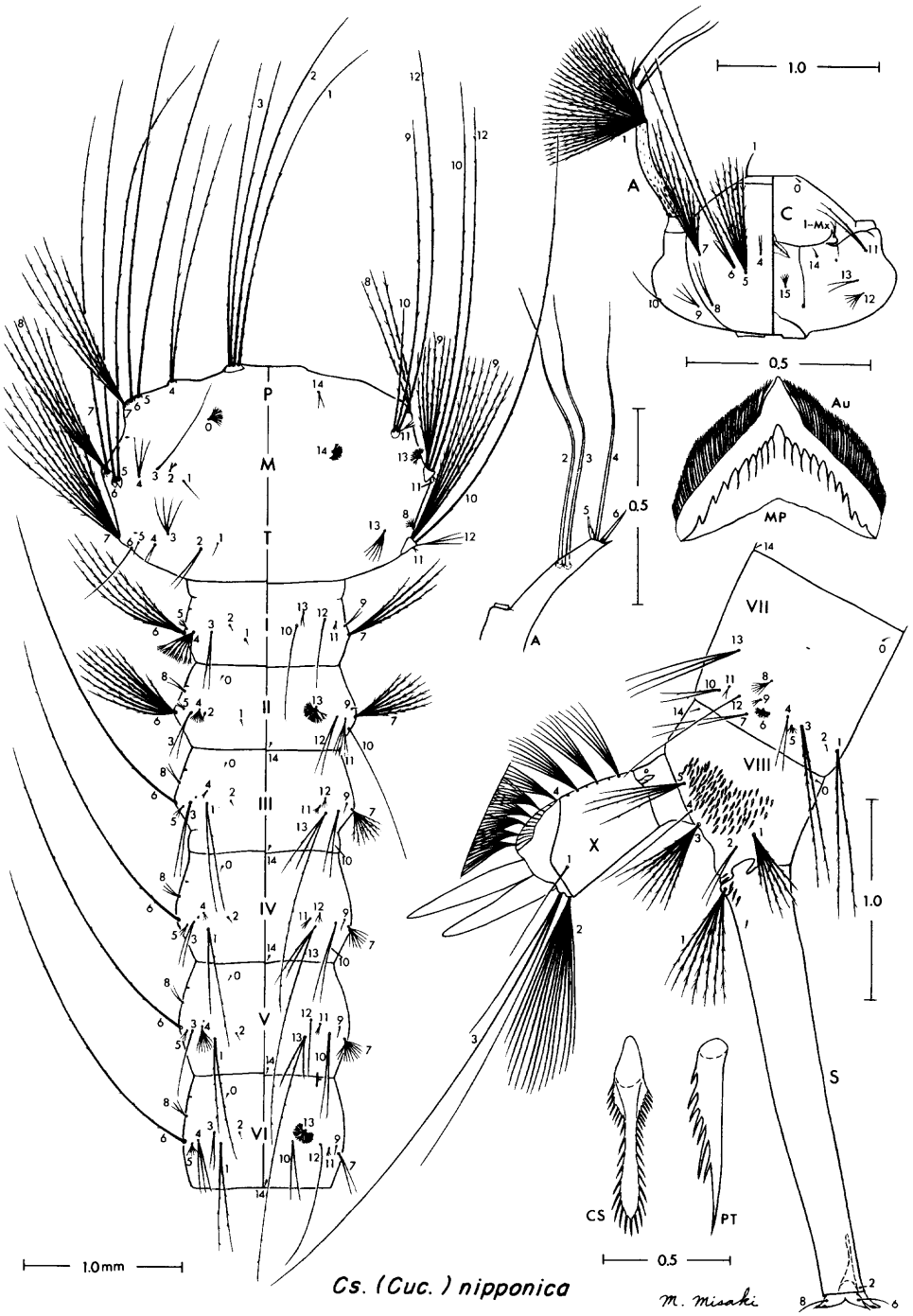

1.0
A
C
1-Mx
0.5
Au
MP
0.5
A
VII
VIII
X
1.0
S
CS
PT
0.5
P
M
T
II
III
IV
V
VI
1.0mm
Cs. (Cuc.) nipponica
M. Misaki

Fig. 26

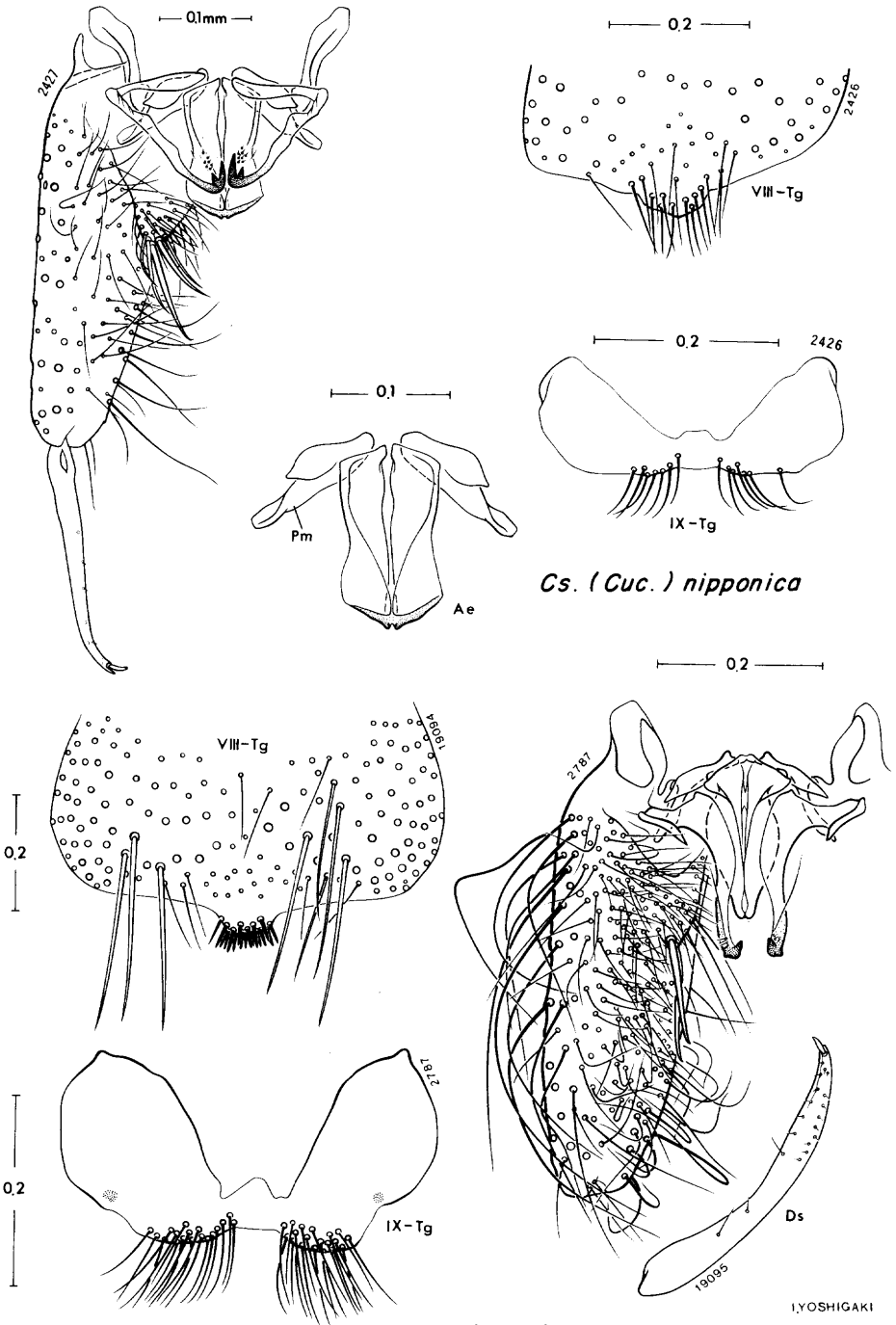
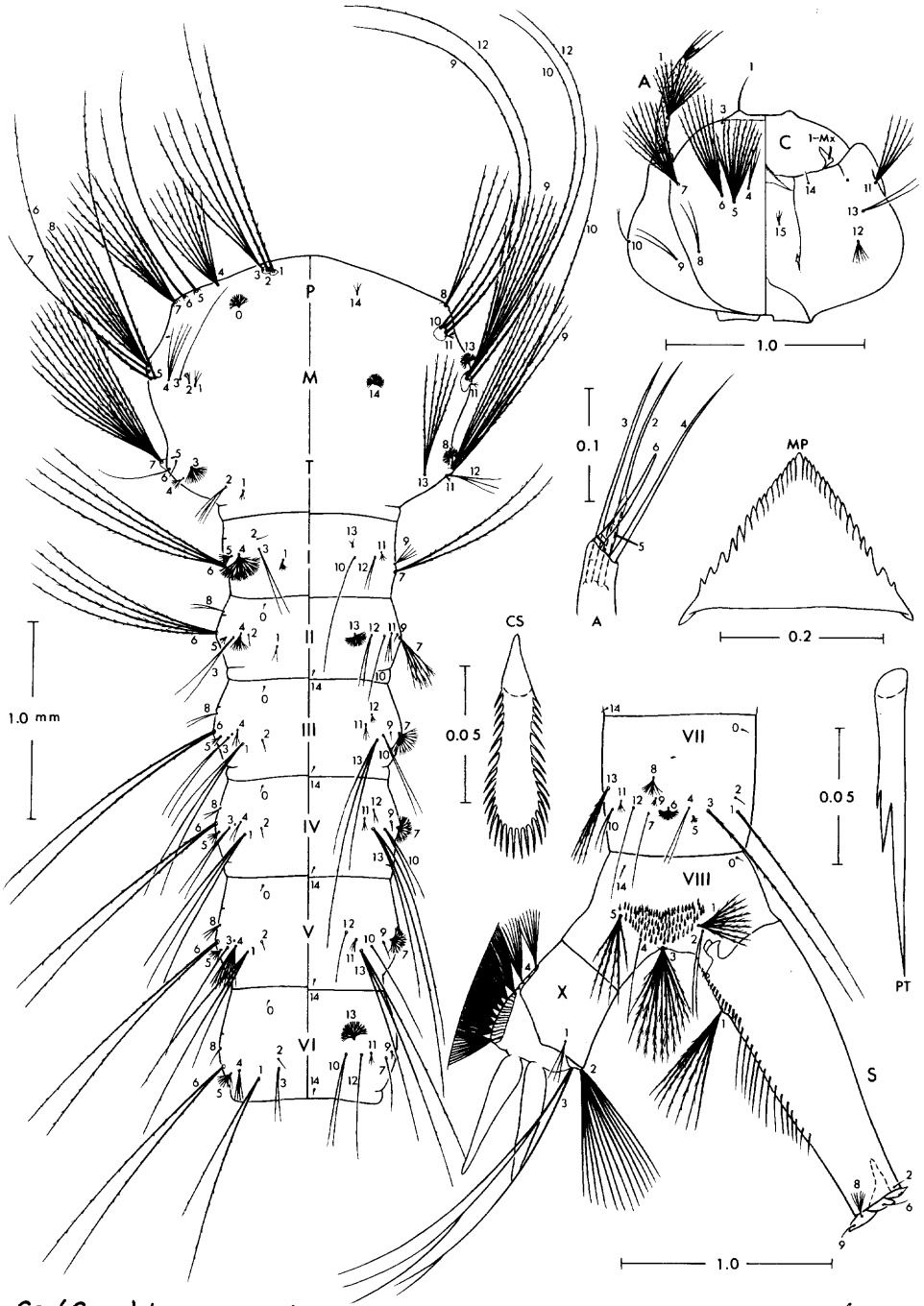

0.1mm
2427
0.2
2426
VIII-Tg
0.2
2426
0.1
Pm
Ae
IX-Tg
Cs. (Cuc.) nipponica
0.2
VIII-Tg
19094
0.2
2787
2787
0.2
IX-Tg
Ds
19095
I.YOSHIGAKI
Cs. (Cus.) kanayamensis

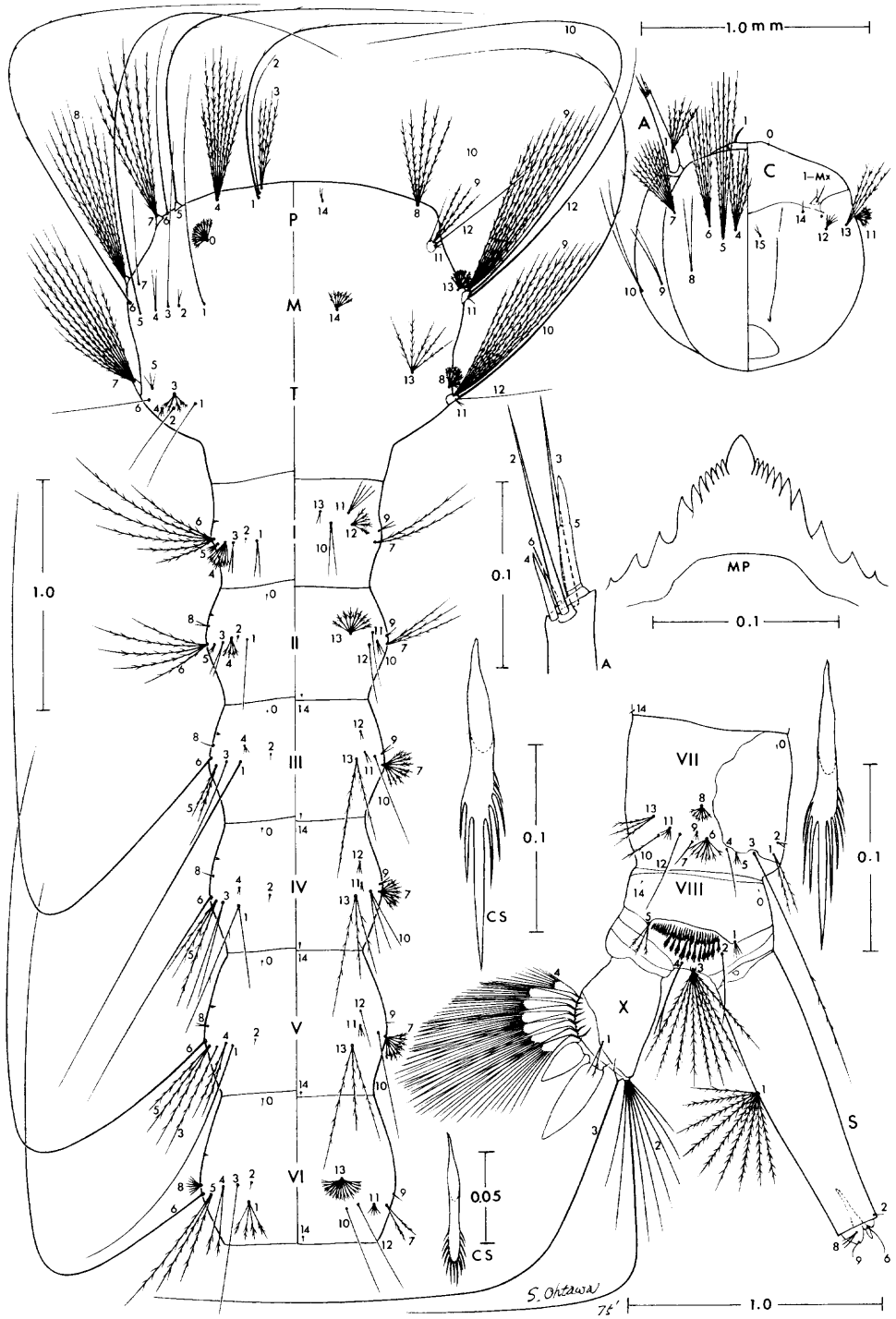
Fig. 27



Cs. (Cus.) kanayamensis

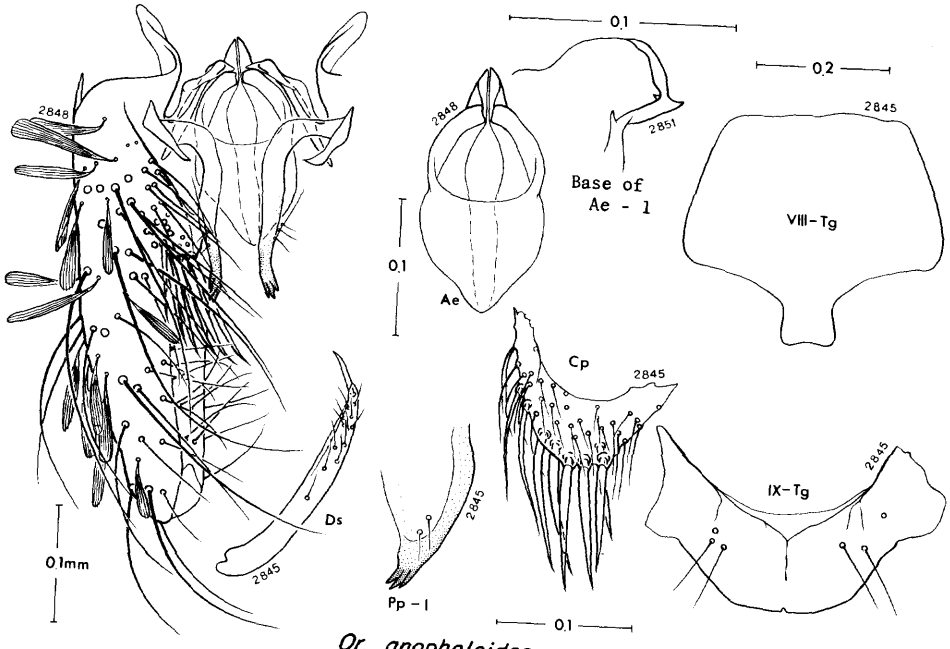
M. Misaki

Fig. 28



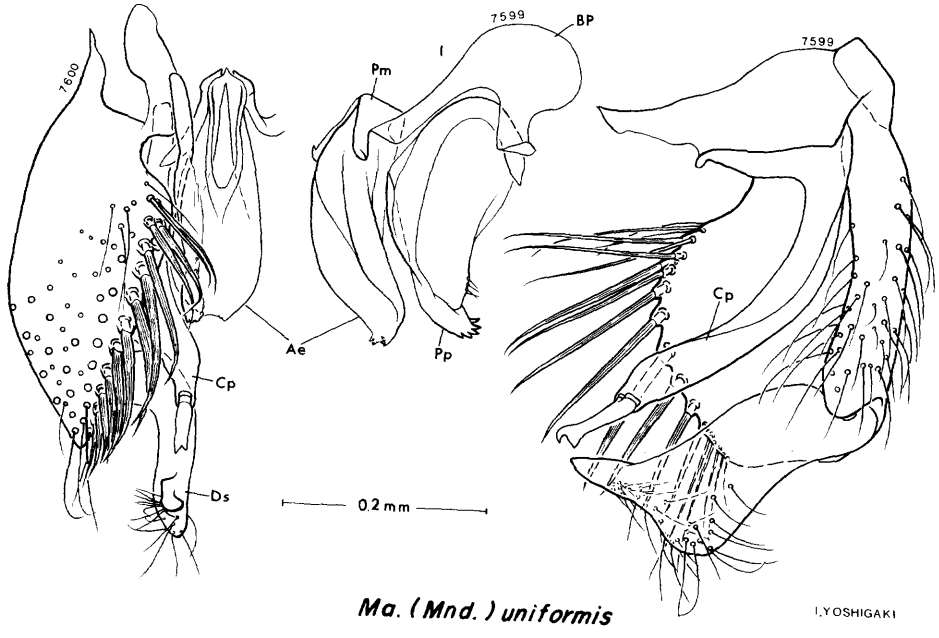
Or. anopheloides

Fig. 29



Or. anopheloides

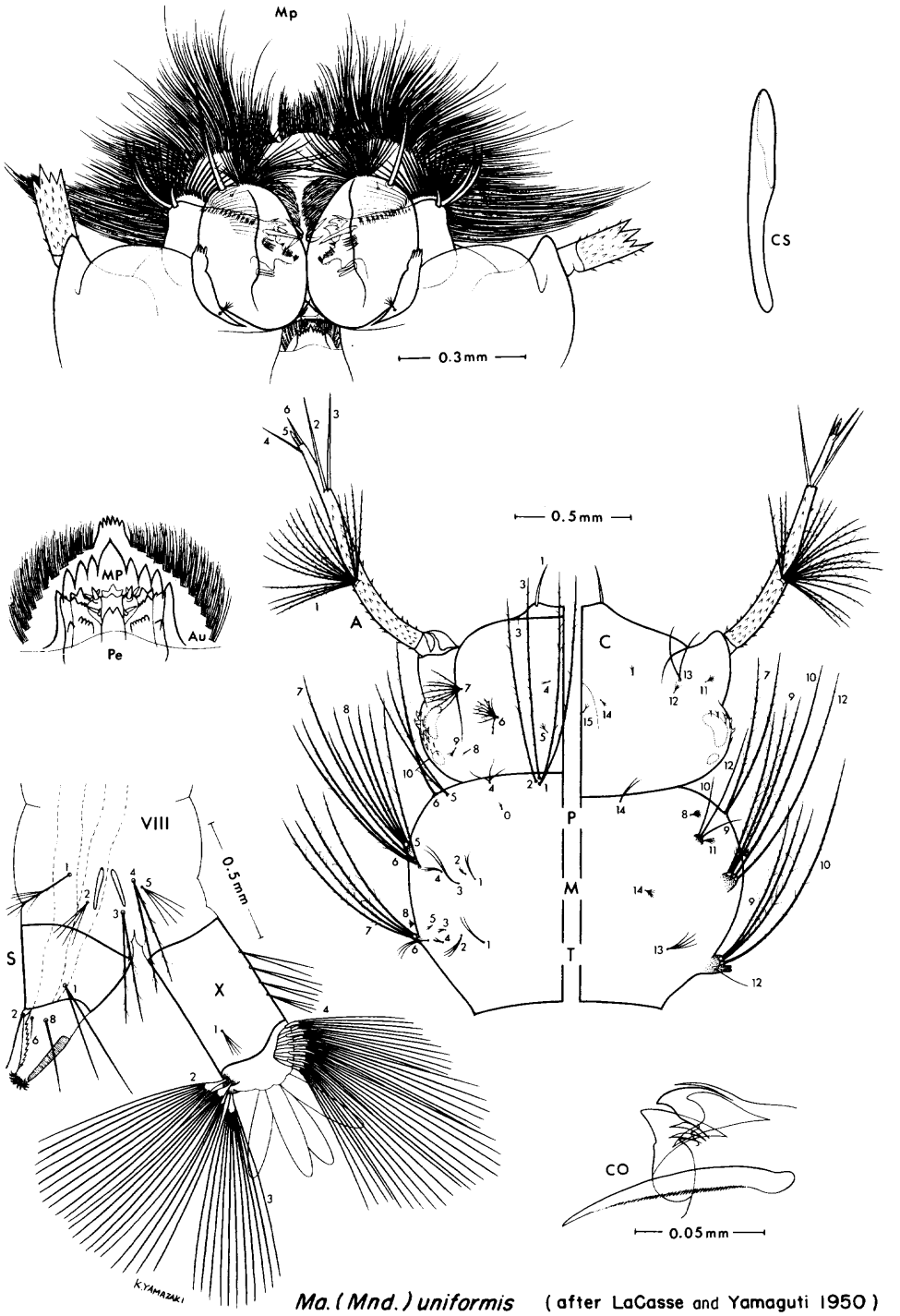
I.YO



Ma. (Mnd.) uniformis

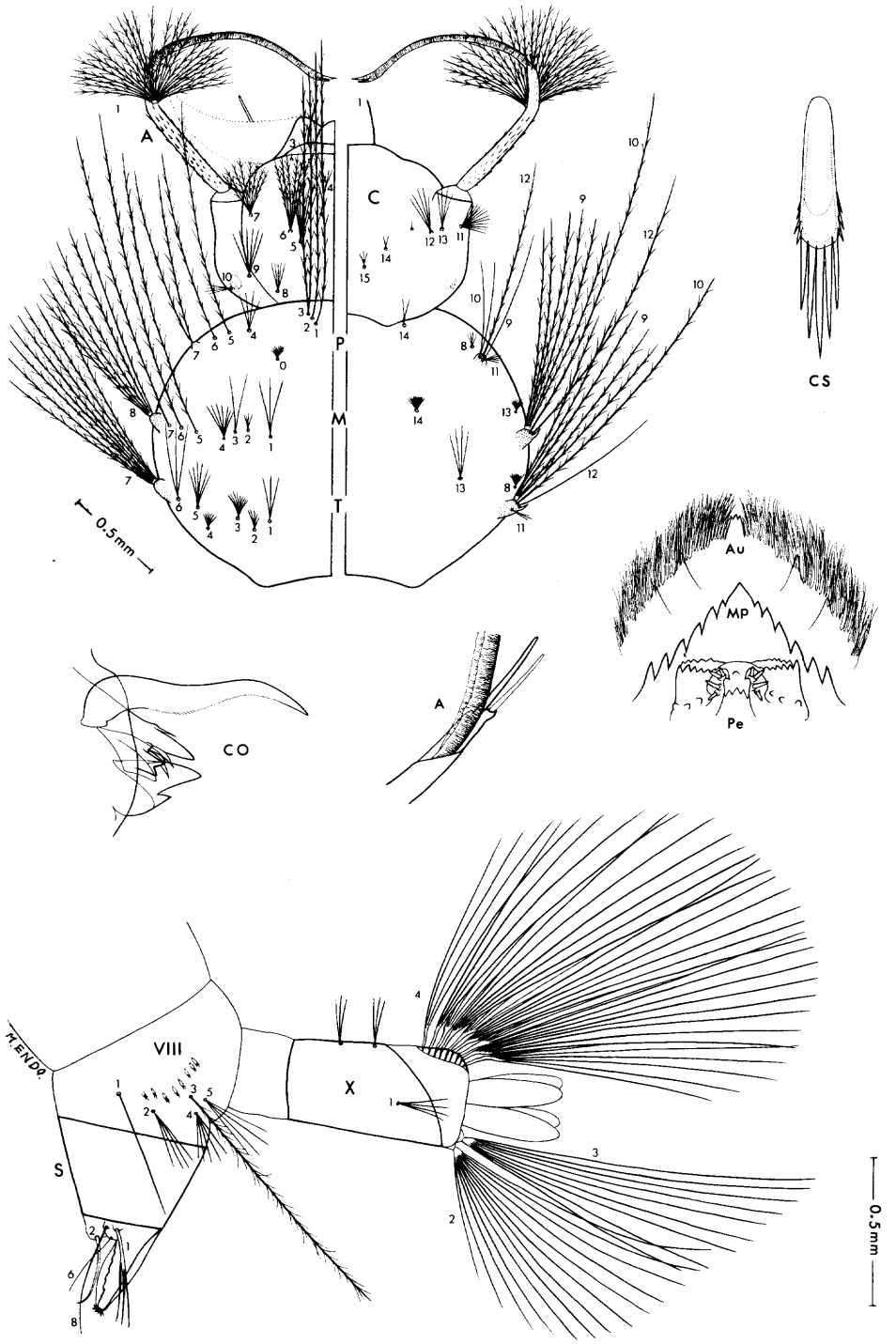
I.YOSHIGAKI

Fig. 30



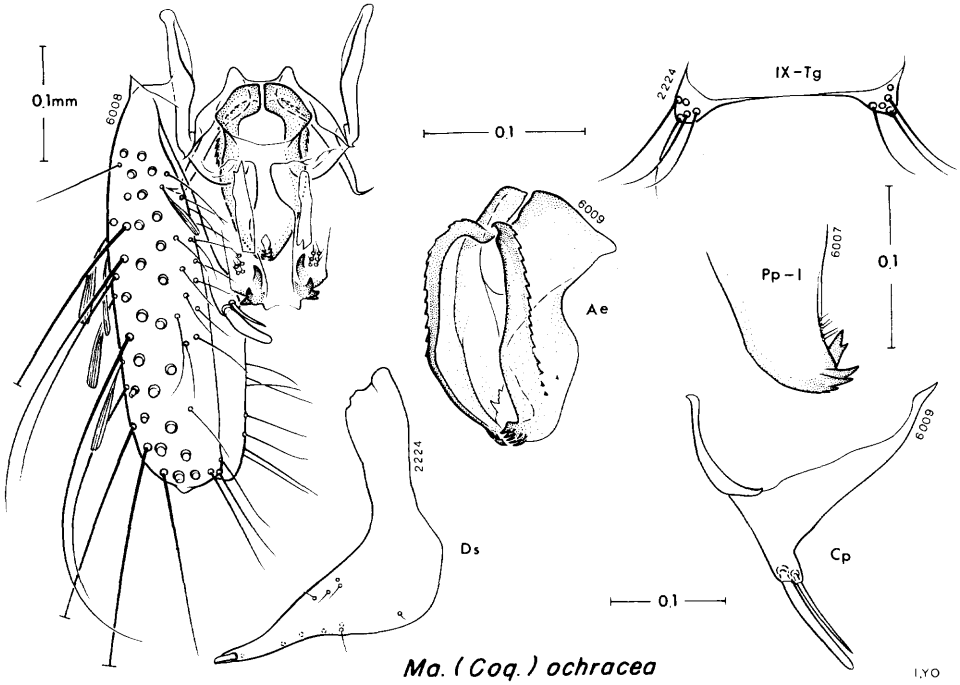
Ma. (Mnd.) uniformis (after LaCasse and Yamaguti 1950)

Fig. 31

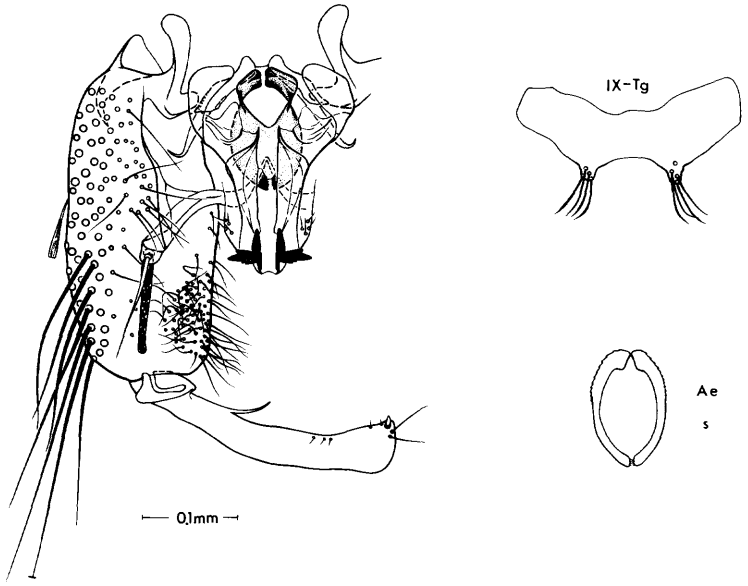


Ma. (Coq.) ochracea (after LaCasse and Yamaguti 1950)

Fig. 32



Ma. (Coq.) ochracea



Ma. (Coq.) crassipes

Fig. 33

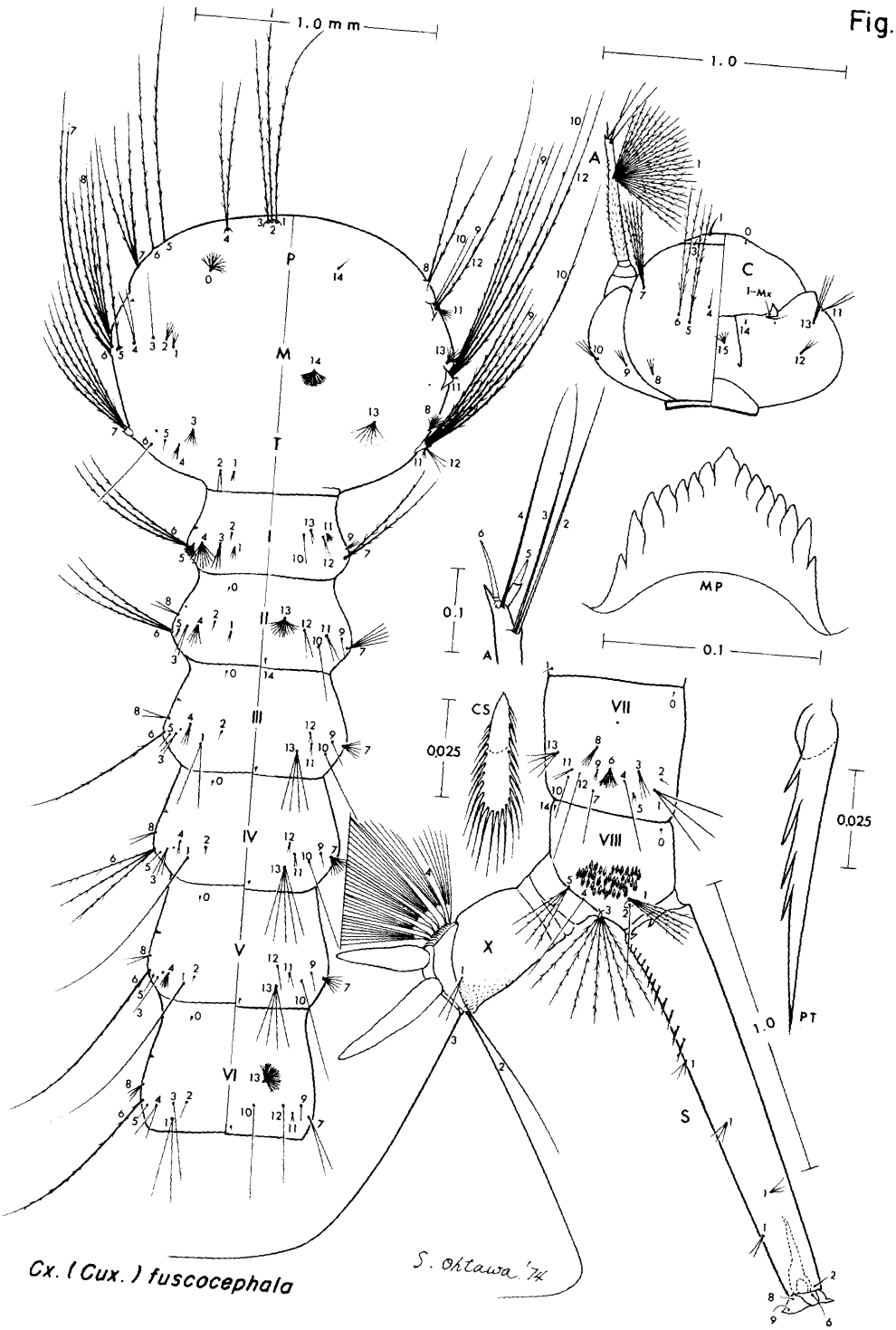
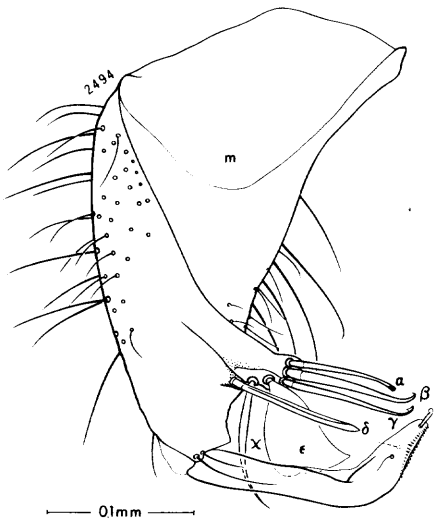
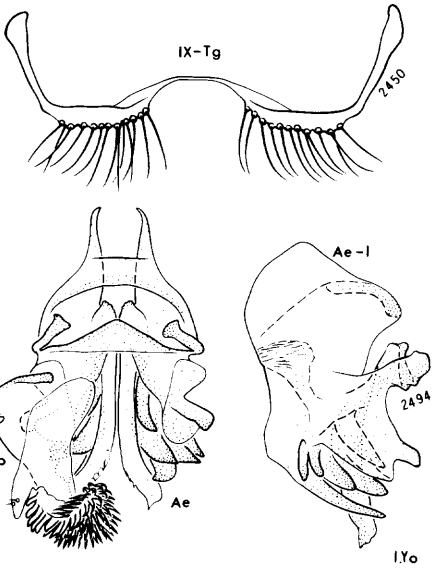
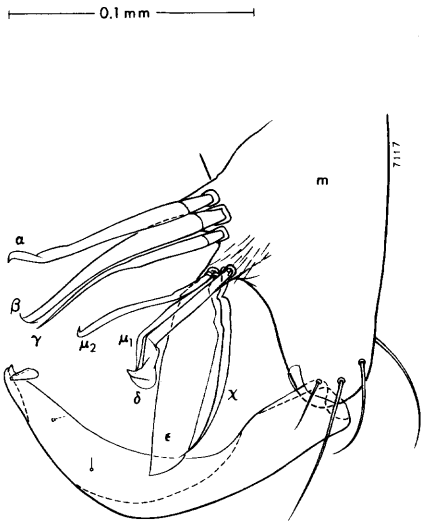

1.0 mm
1.0
A
C
1-Mx
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
CS
MP
PT
0.1
0.025
1.0
Cx. (Cux.) fuscocephala
S. Ohtawa '74

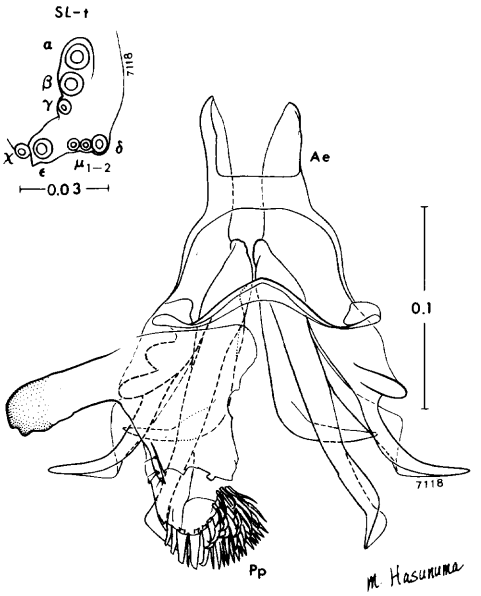
Fig. 34





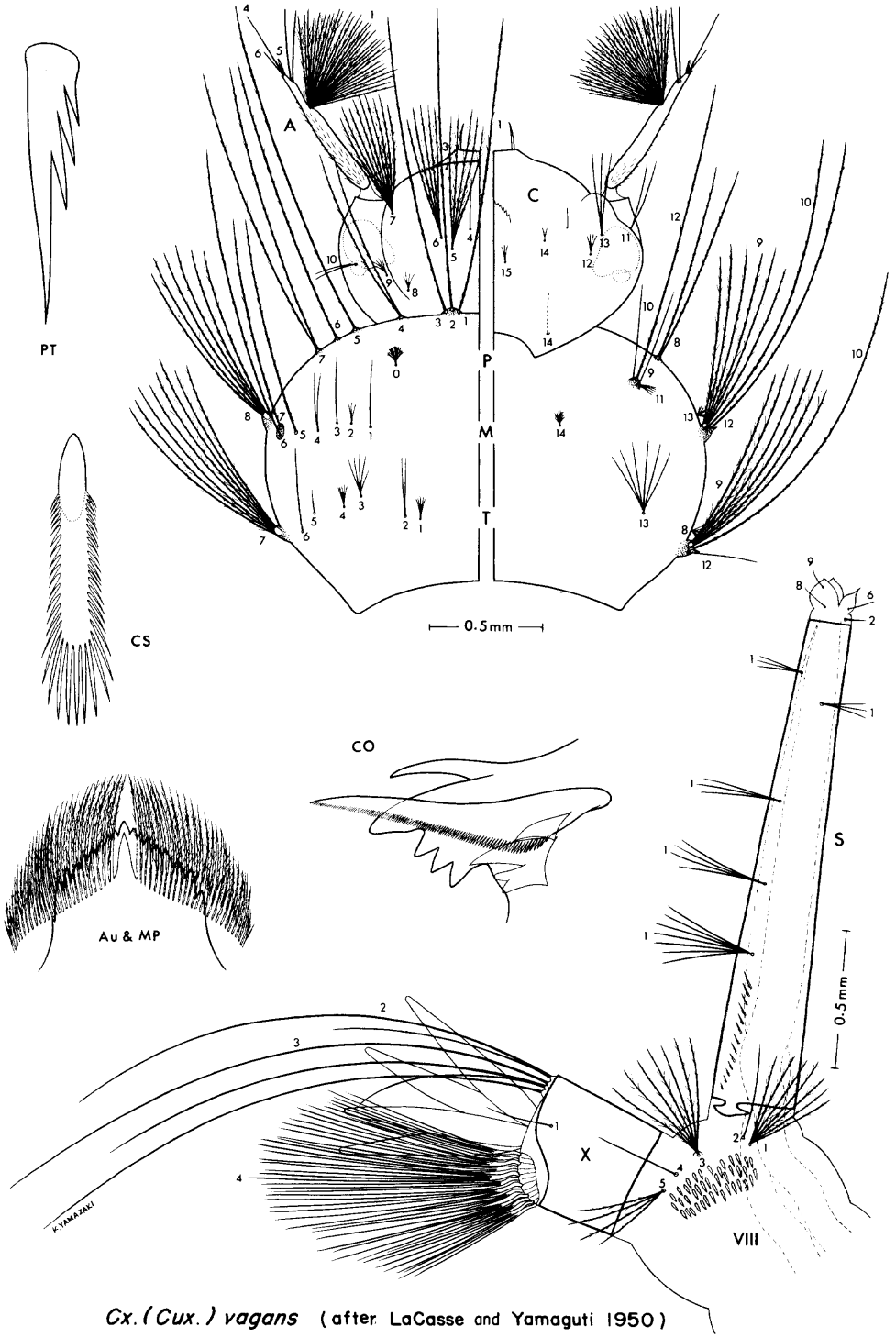
Cx. (Cux.) fuscocephala





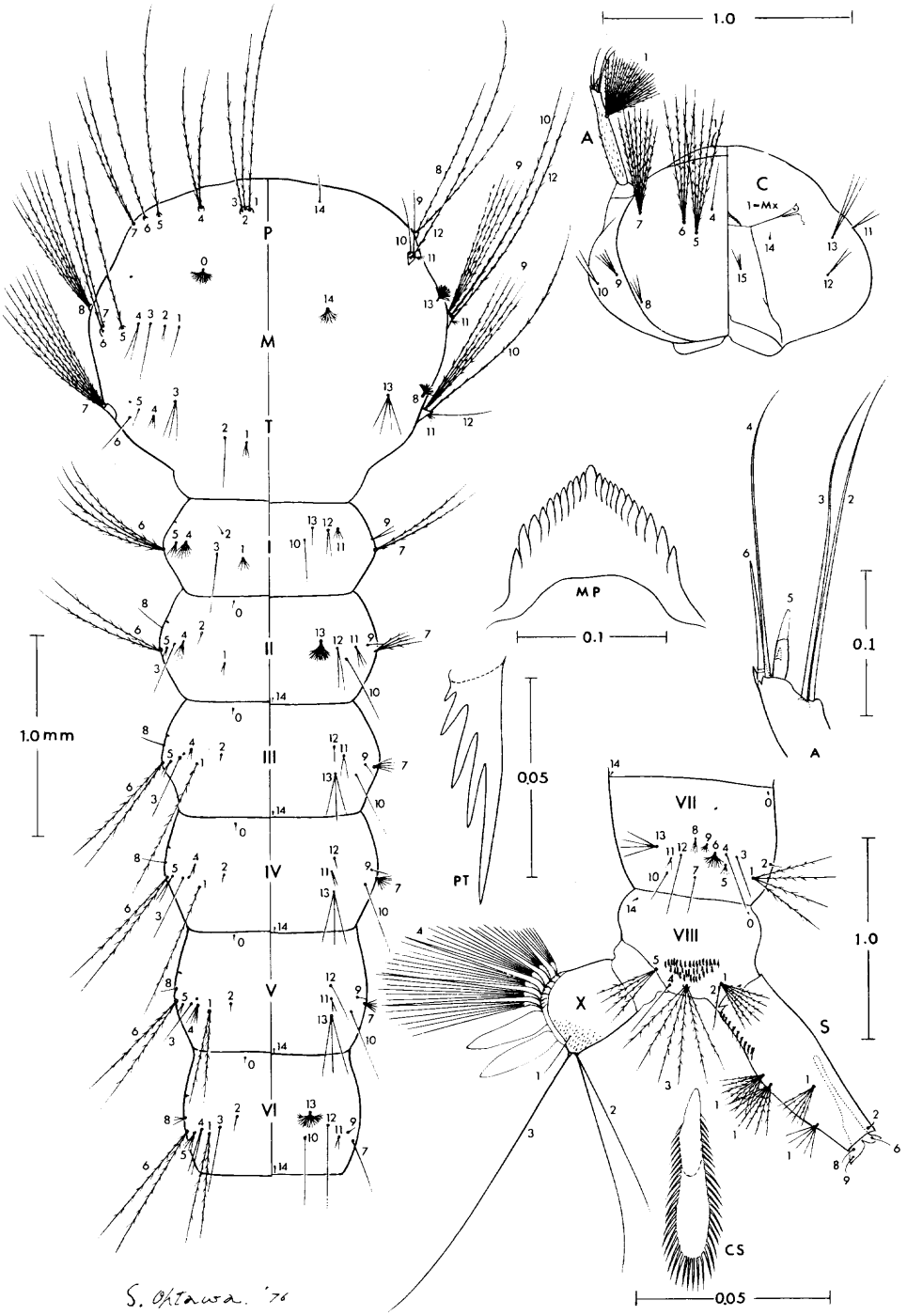
Cx. (Cux.) vagans

Fig. 35



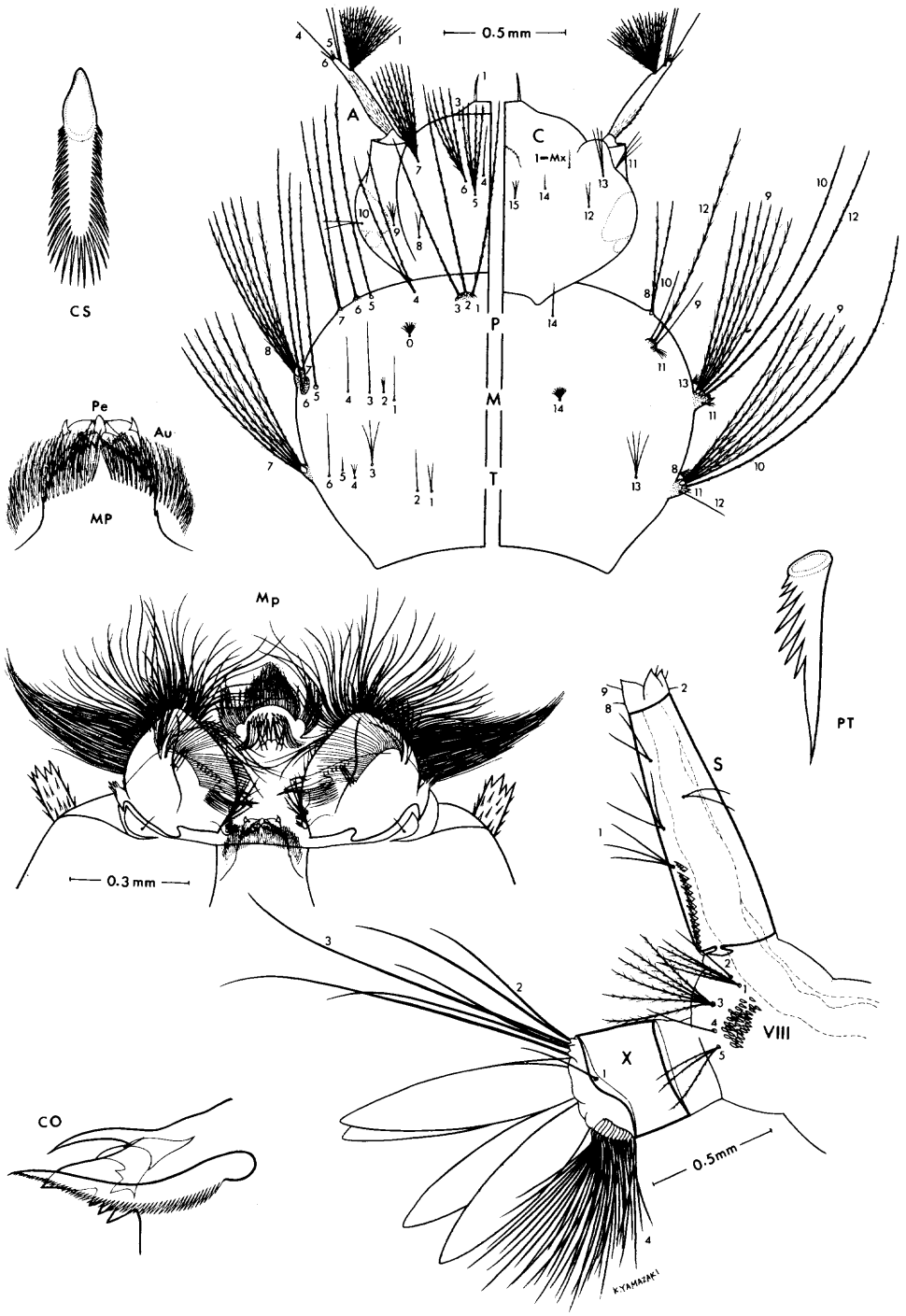
Cx. (Cux.) vagans (after LaCasse and Yamaguti 1950)

Fig. 36



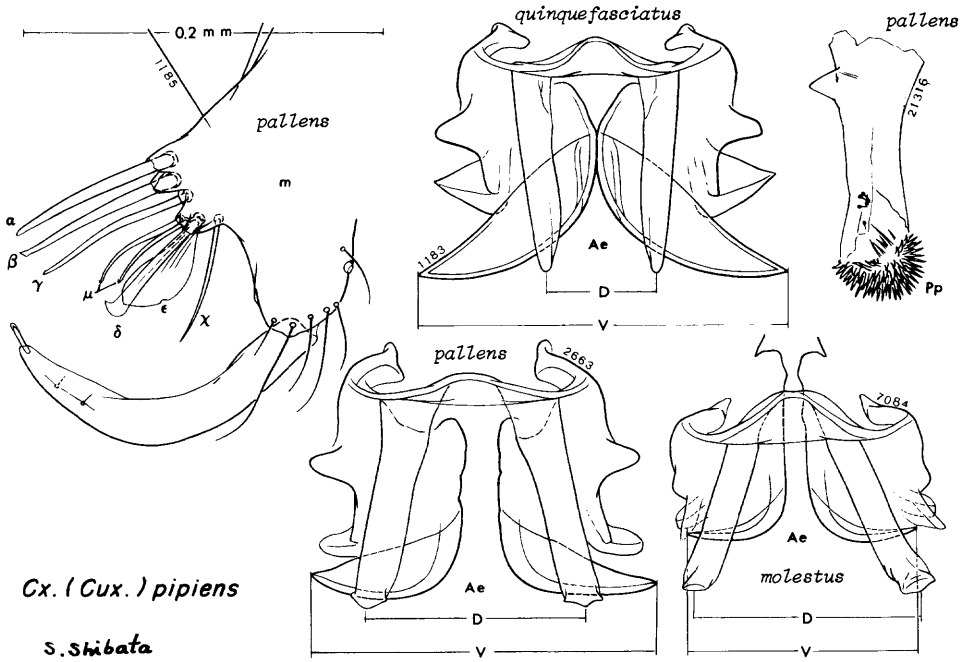
Cx. (Cux.) pipiens quinquefasciatus

Fig. 37



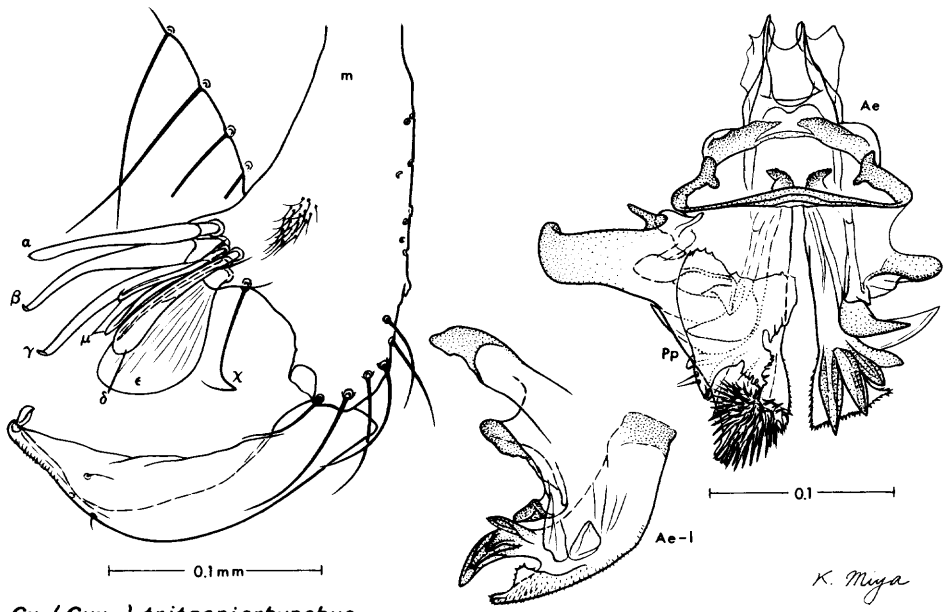
Cx. (Cux.) pipiens pallens (after LaCasse and Yamaguti 1950)

Fig. 38



Cx. (Cux.) pipiens

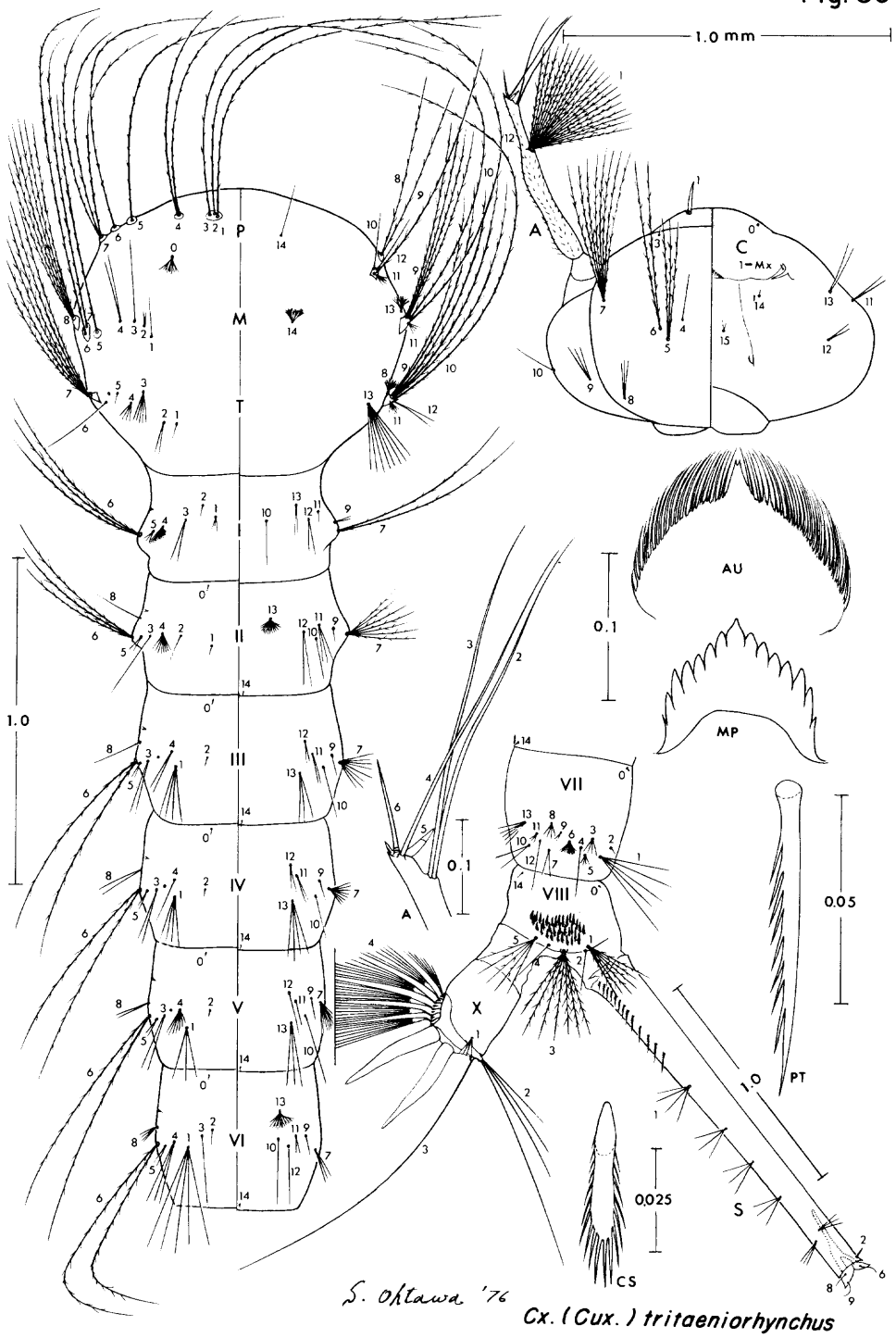
S. Shibata



K. Miya

Cx. (Cux.) tritaeniorhynchus

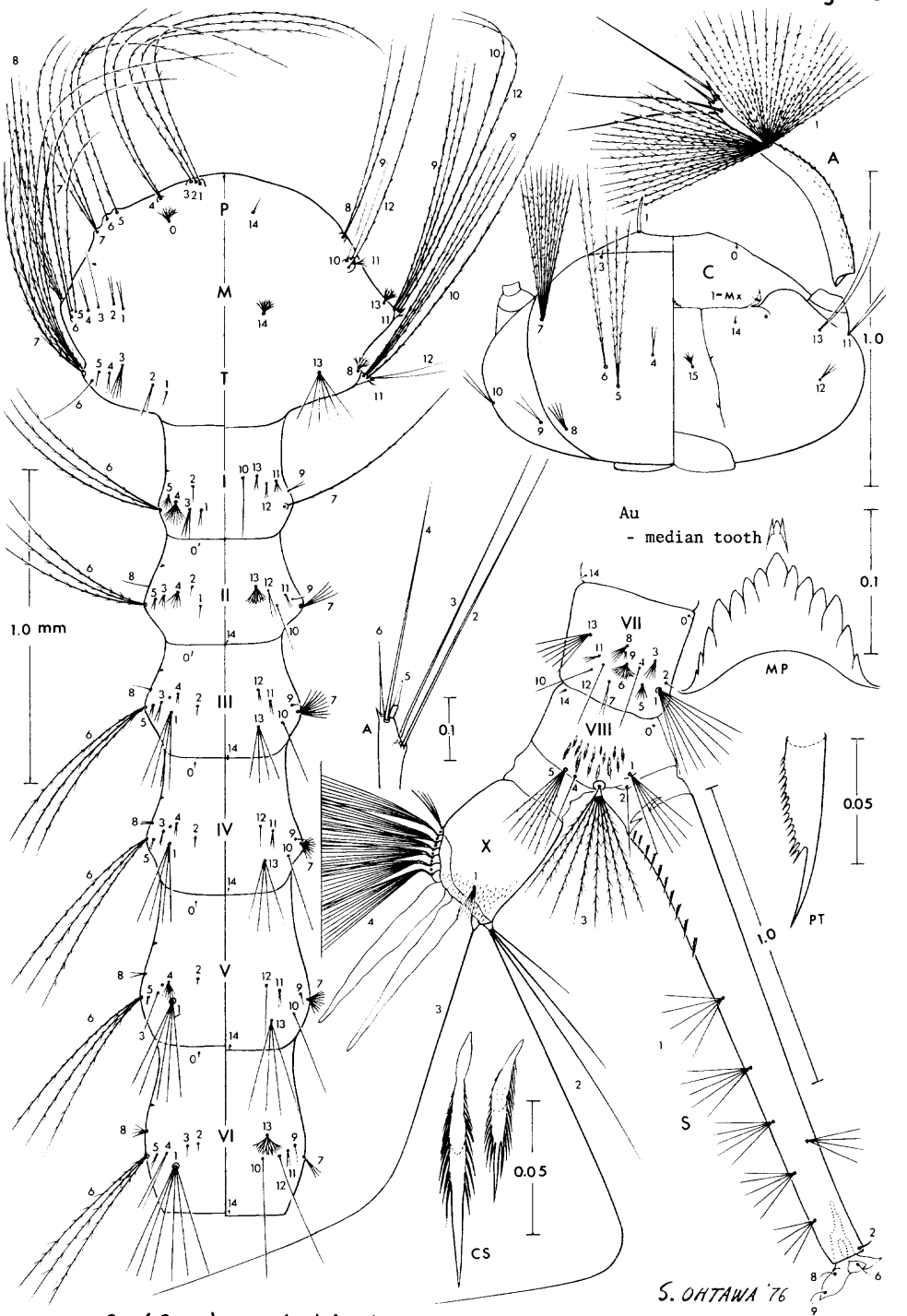
Fig. 39



S. Ohtaka '76

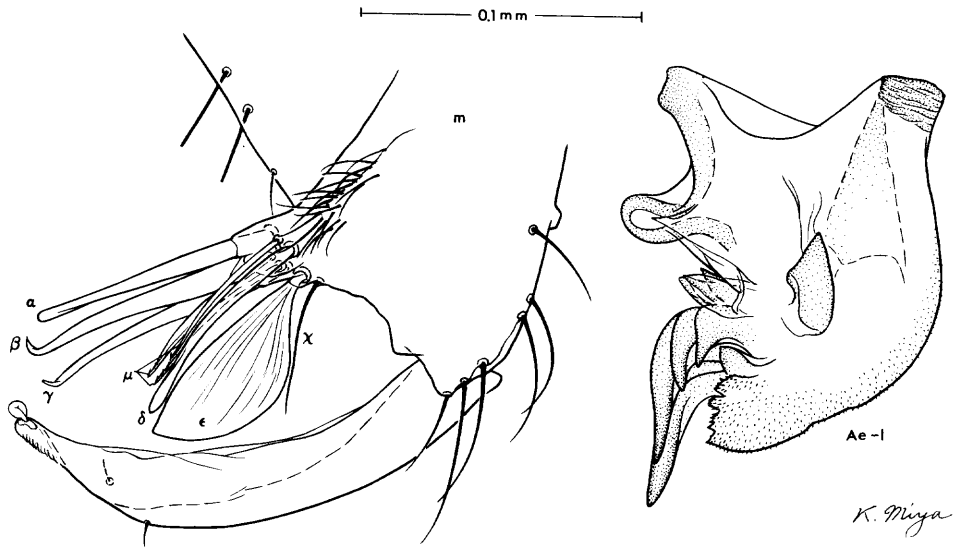
Cx. (Cux.) tritaeniorhynchus

Fig. 40

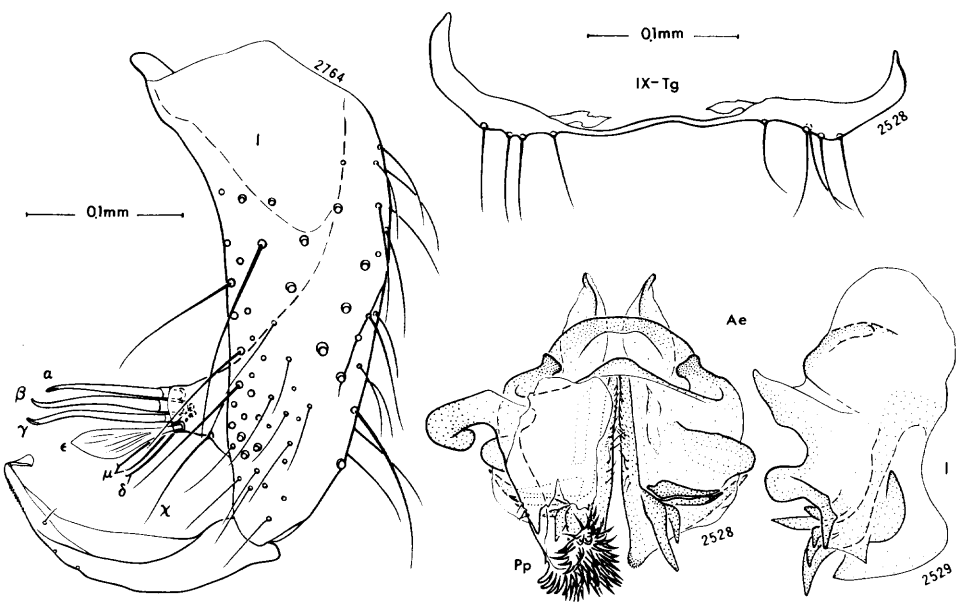


Cx. (Cux.) pseudovishnui

Fig. 41

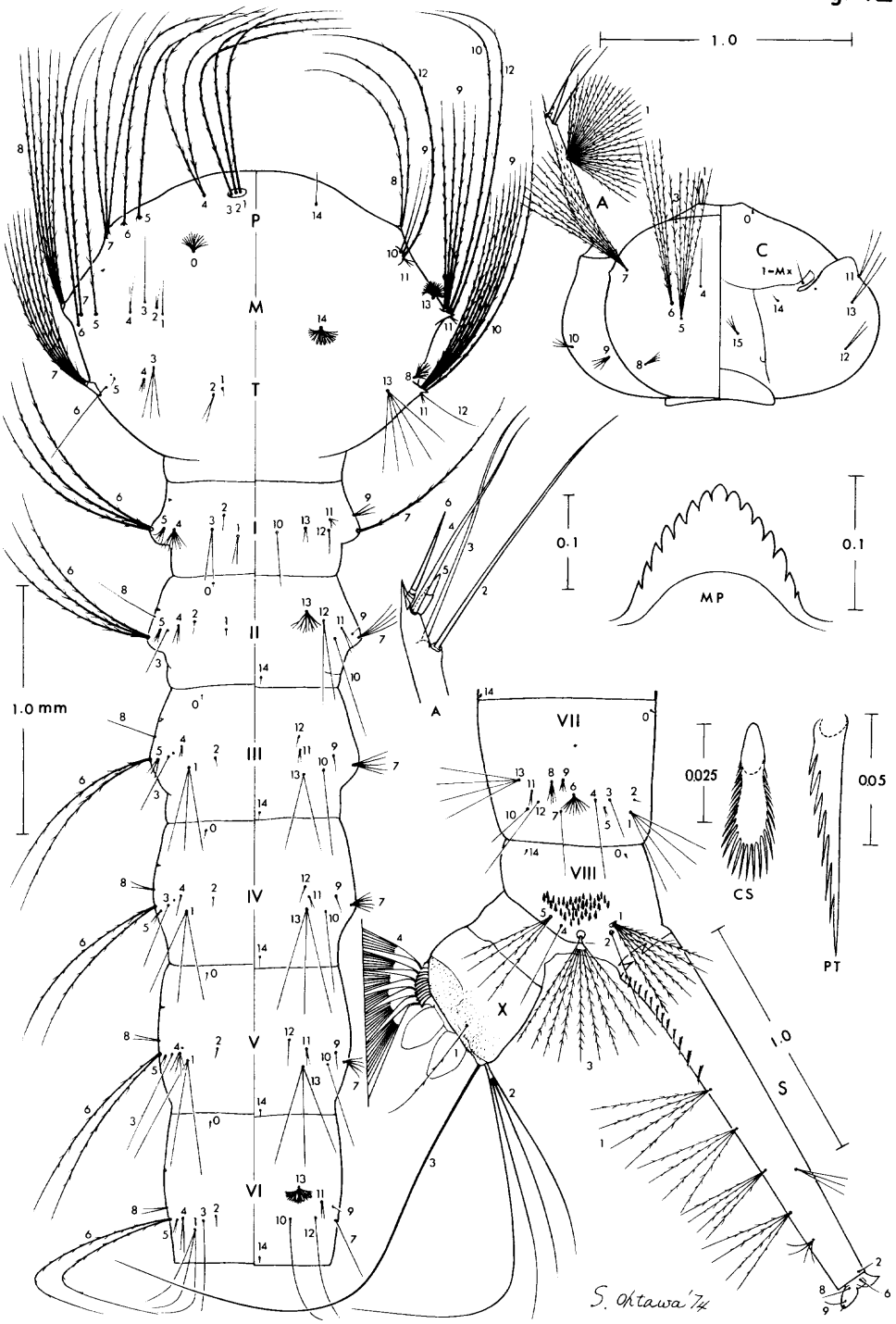


Cx. (Cux.) pseudovishnui



Cx. (Cux.) sitiens

Fig. 42



Cx. (Cux.) sitiens

Fig. 43

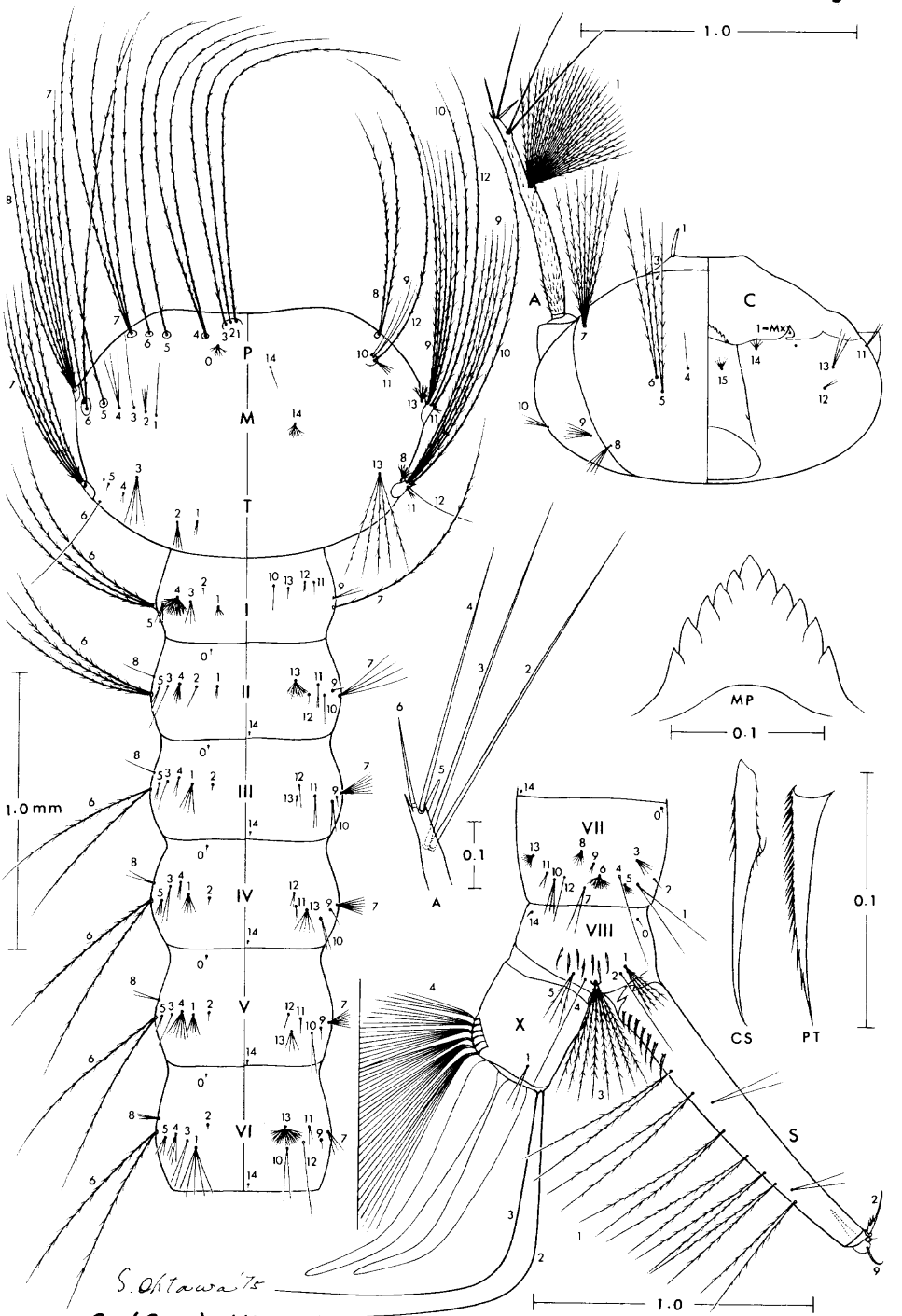
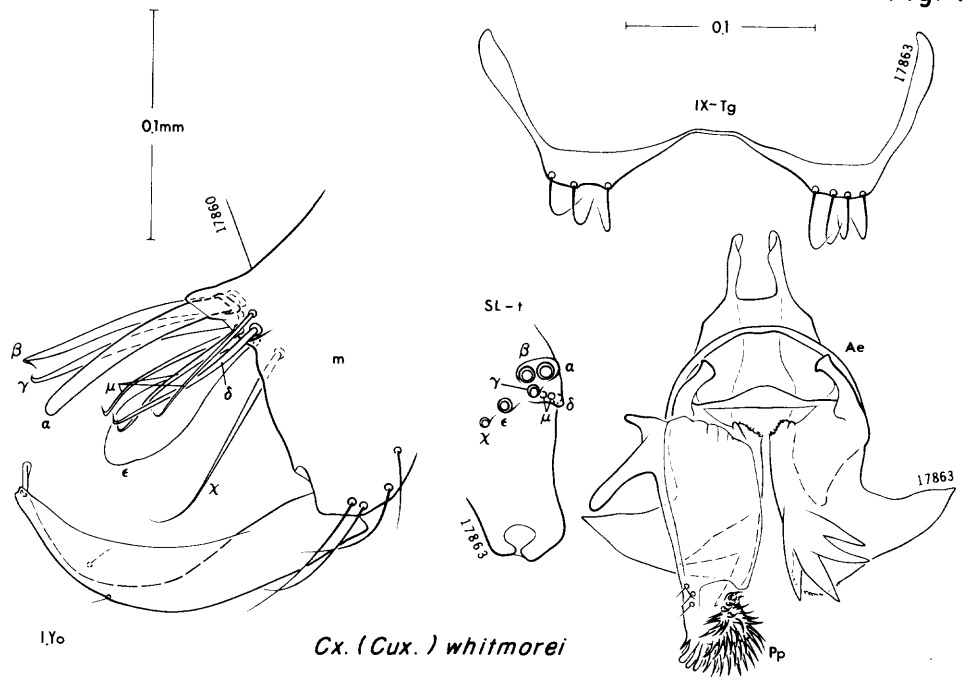

1.0
A
C
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
1.0 mm
0.1
MP
CS
PT
S. Ohtaki '75
Cx. (Cux.) whitmorei

Fig. 44


0.1mm
17860
m
I.Yo
Cx. (Cux.) whitmorei
0.1
IX-Tg
17863
SL-t
Ae
17863
Pp

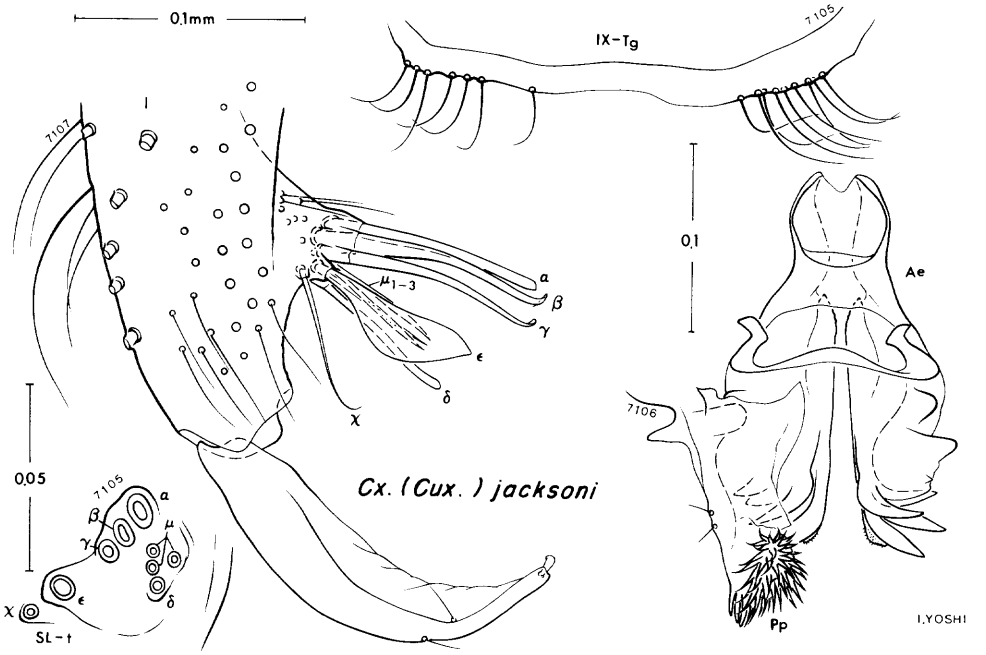
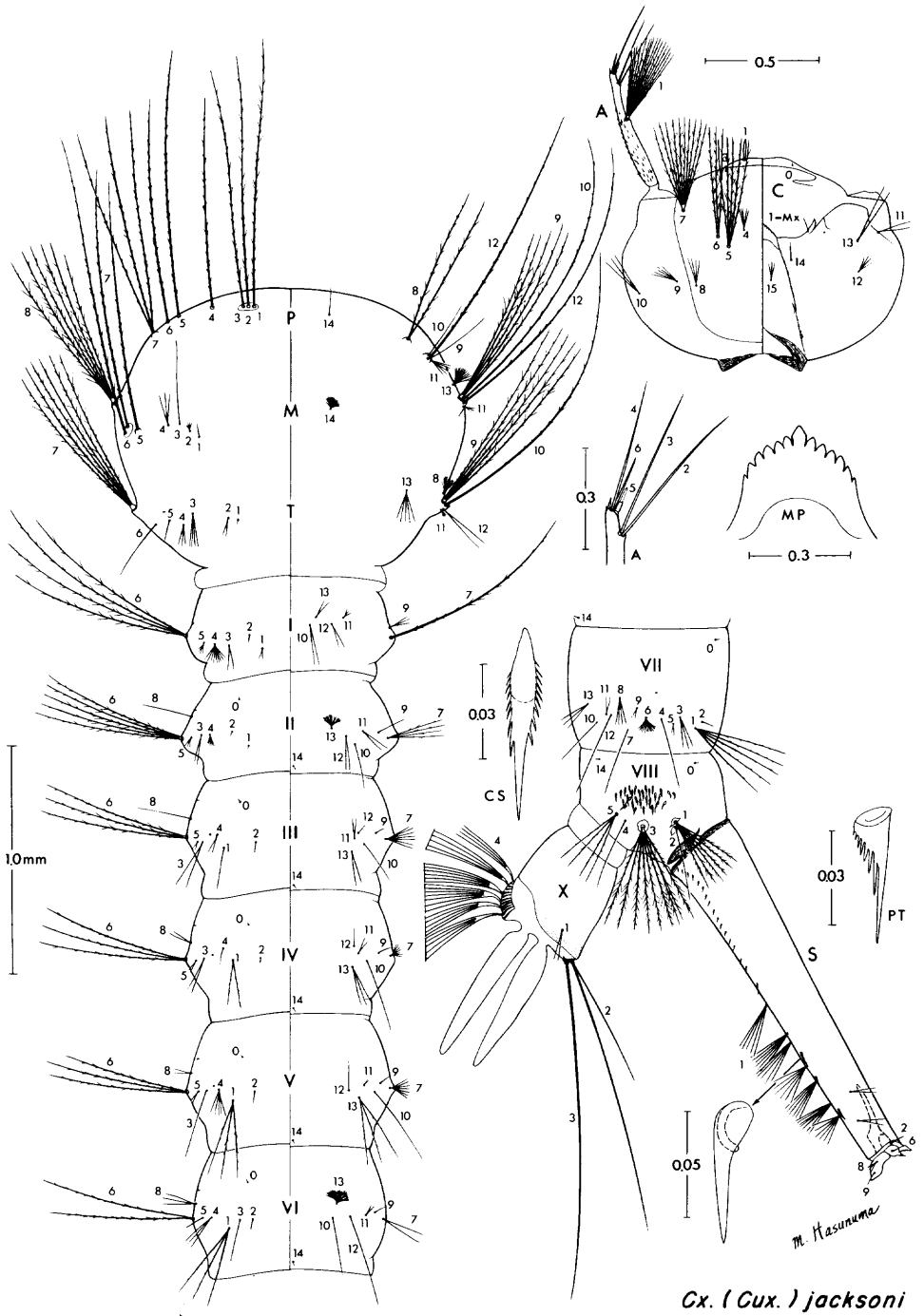
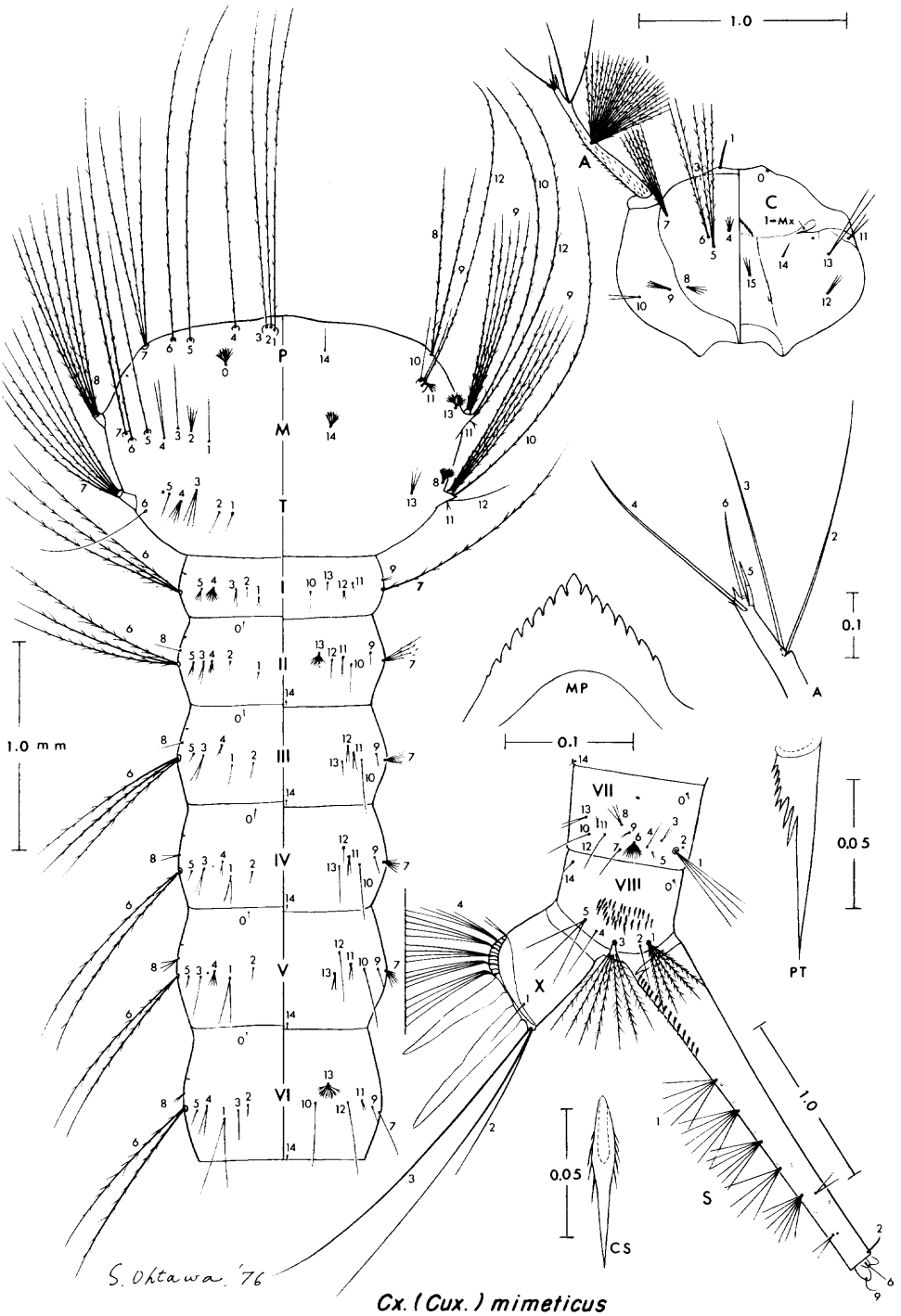

0.1mm
I
7107
IX-Tg
7105
0.1
Ae
7106
0.05
7105
SL-t
Cx. (Cux.) jacksoni
Pp
I.YOSHI

Fig. 45



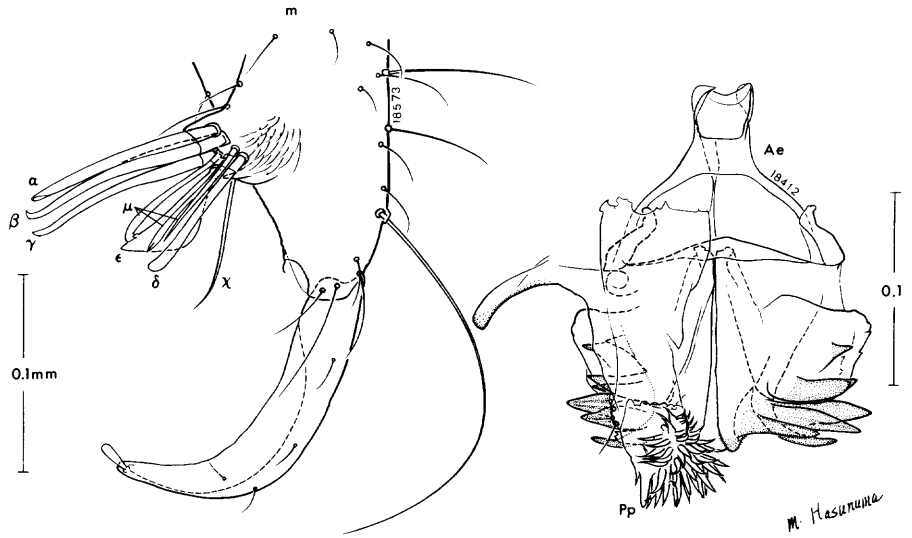
Cx. (Cux.) jacksoni

Fig. 46

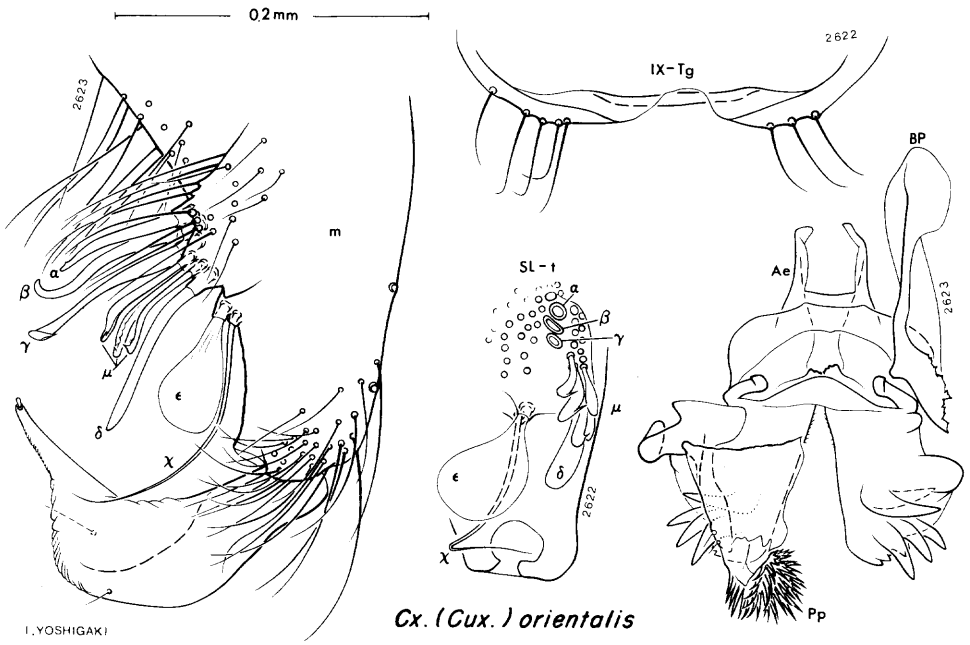


Cx. (Cux.) mimeticus

Fig. 47

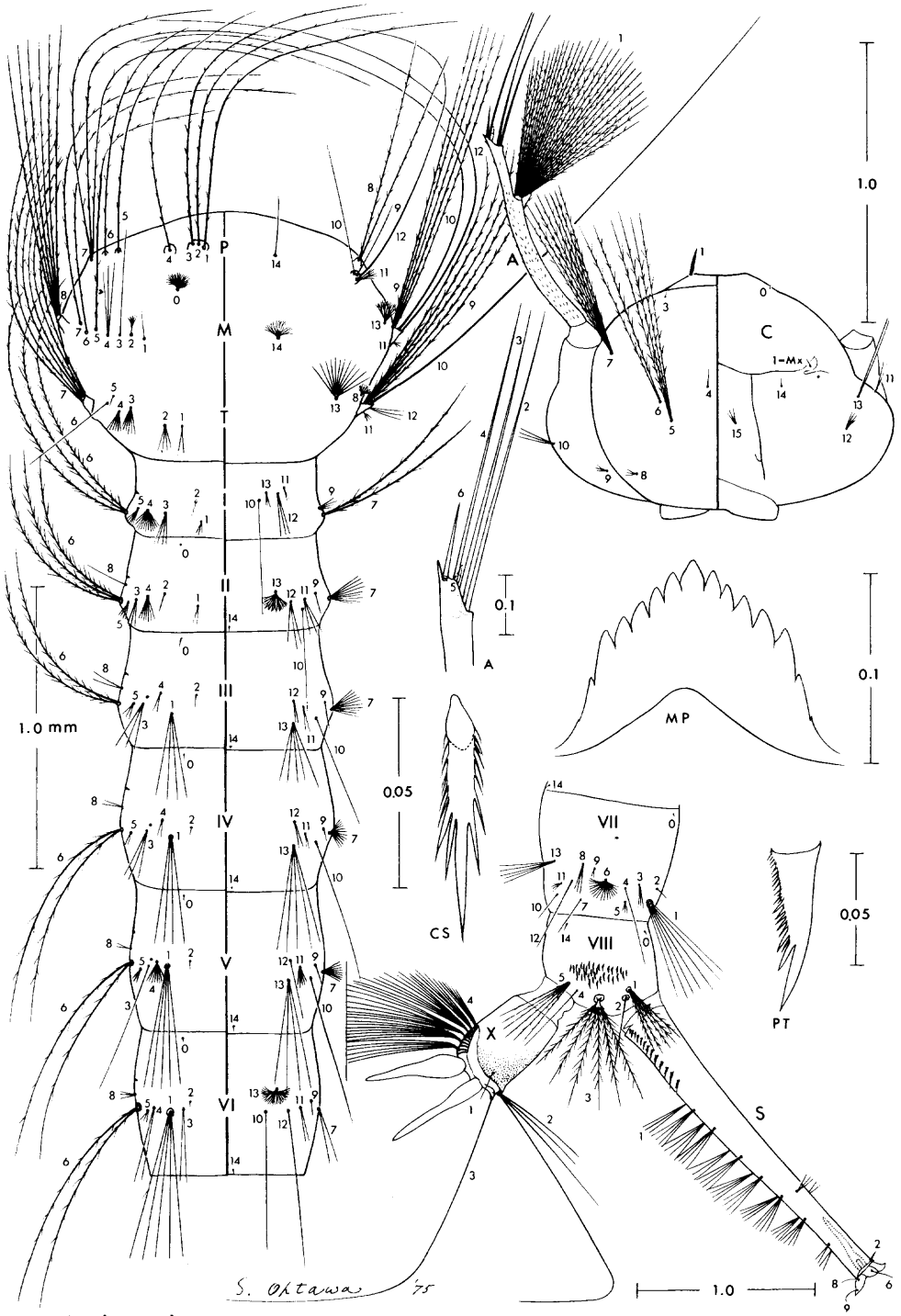


Cx. (Cux.) mimeticus



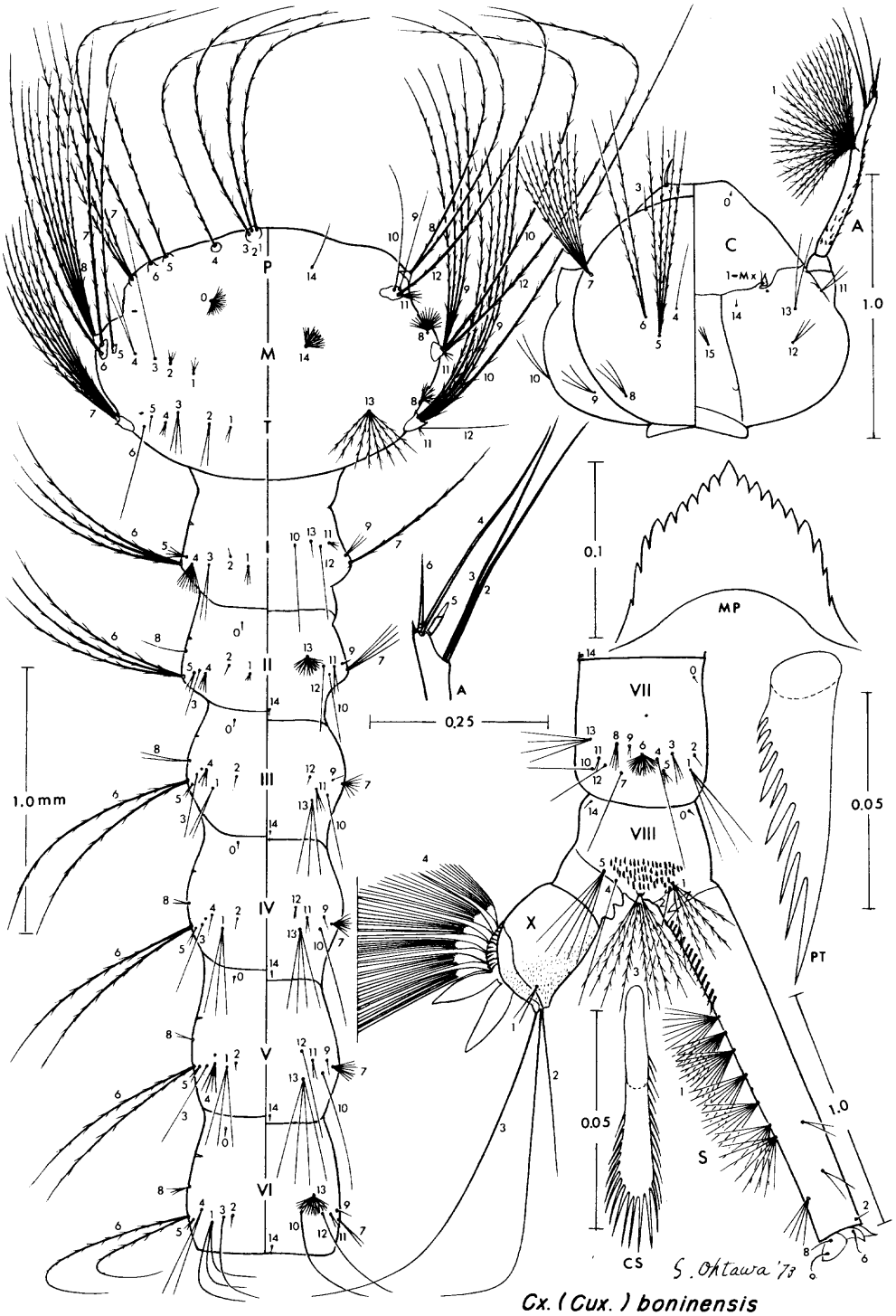
Cx. (Cux.) orientalis

Fig. 48



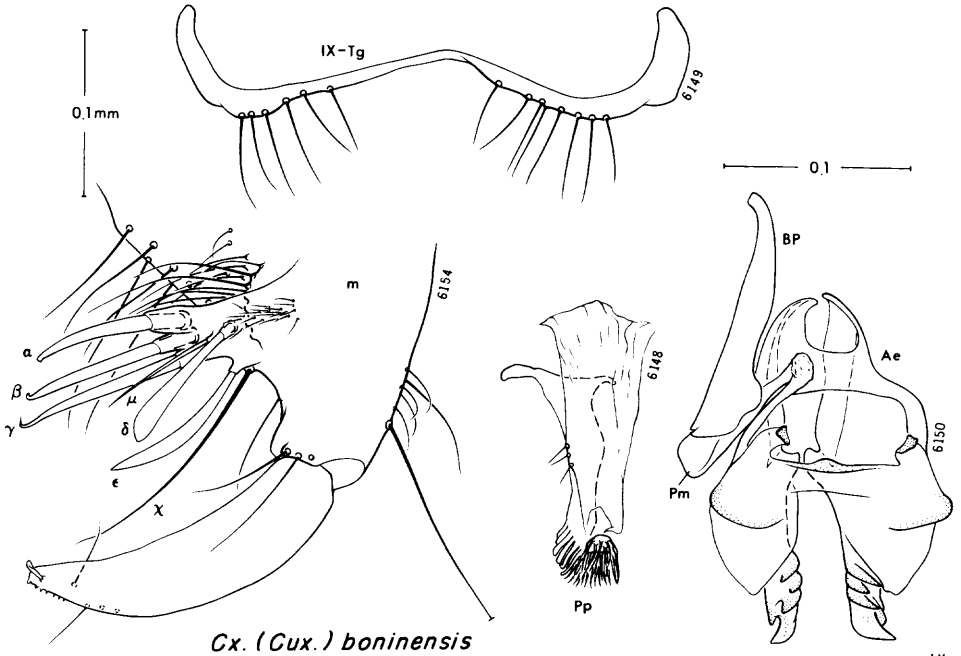
Cx. (Cux.) orientalis

Fig. 49

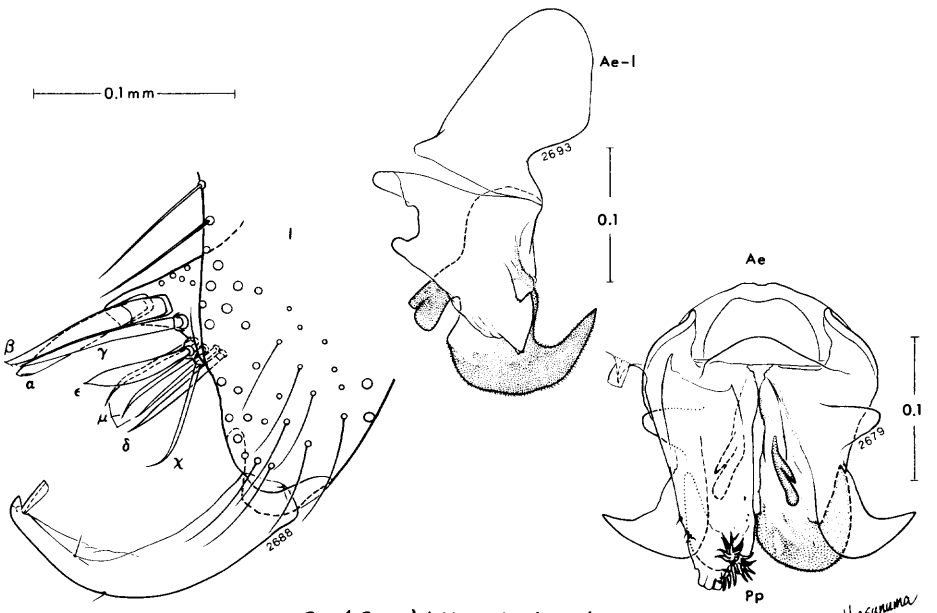


Cx. (Cux.) boninensis

Fig. 50



Cx. (Cux.) boninensis



Cx. (Cux.) bitaeniorhynchus

Fig. 51

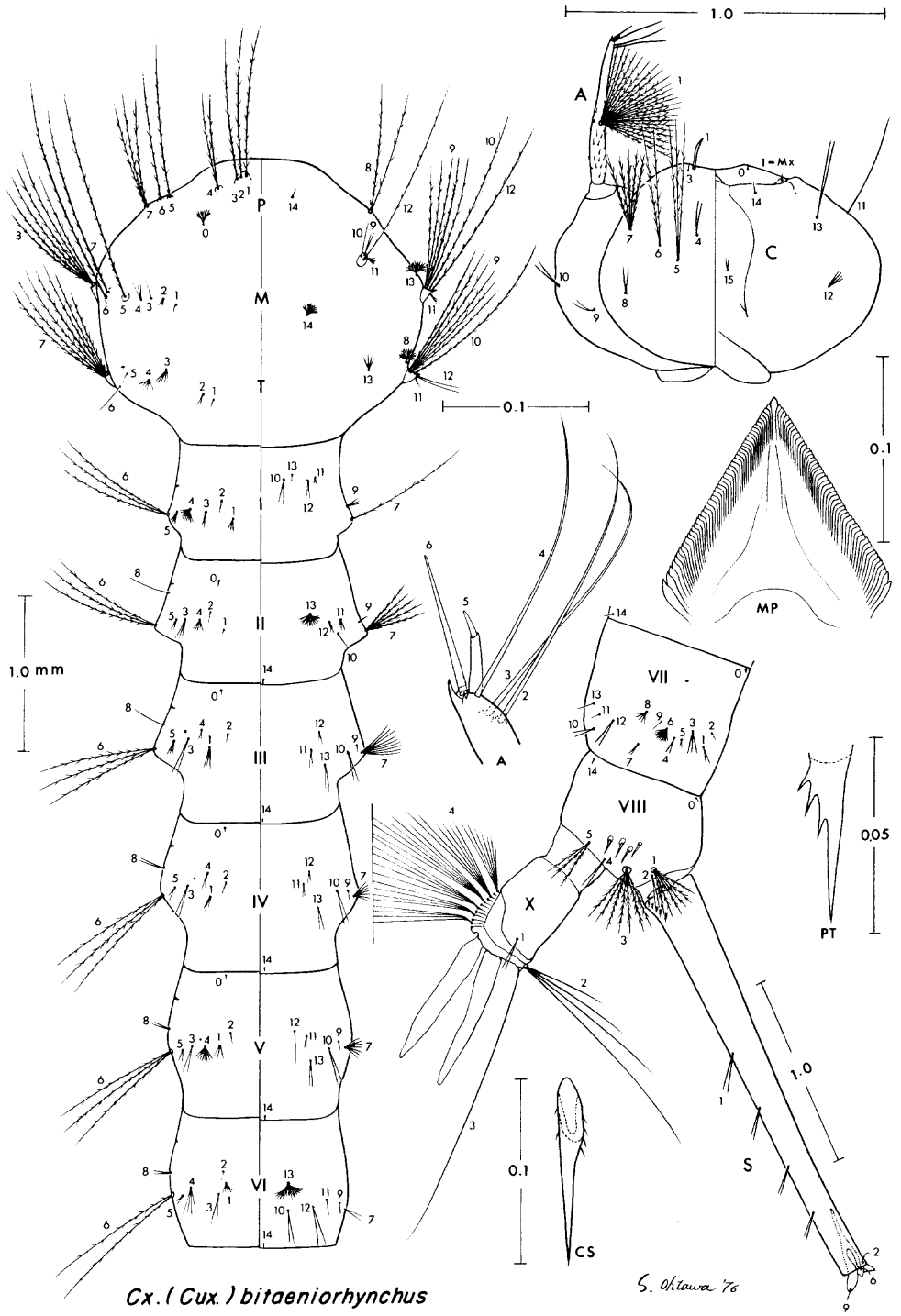
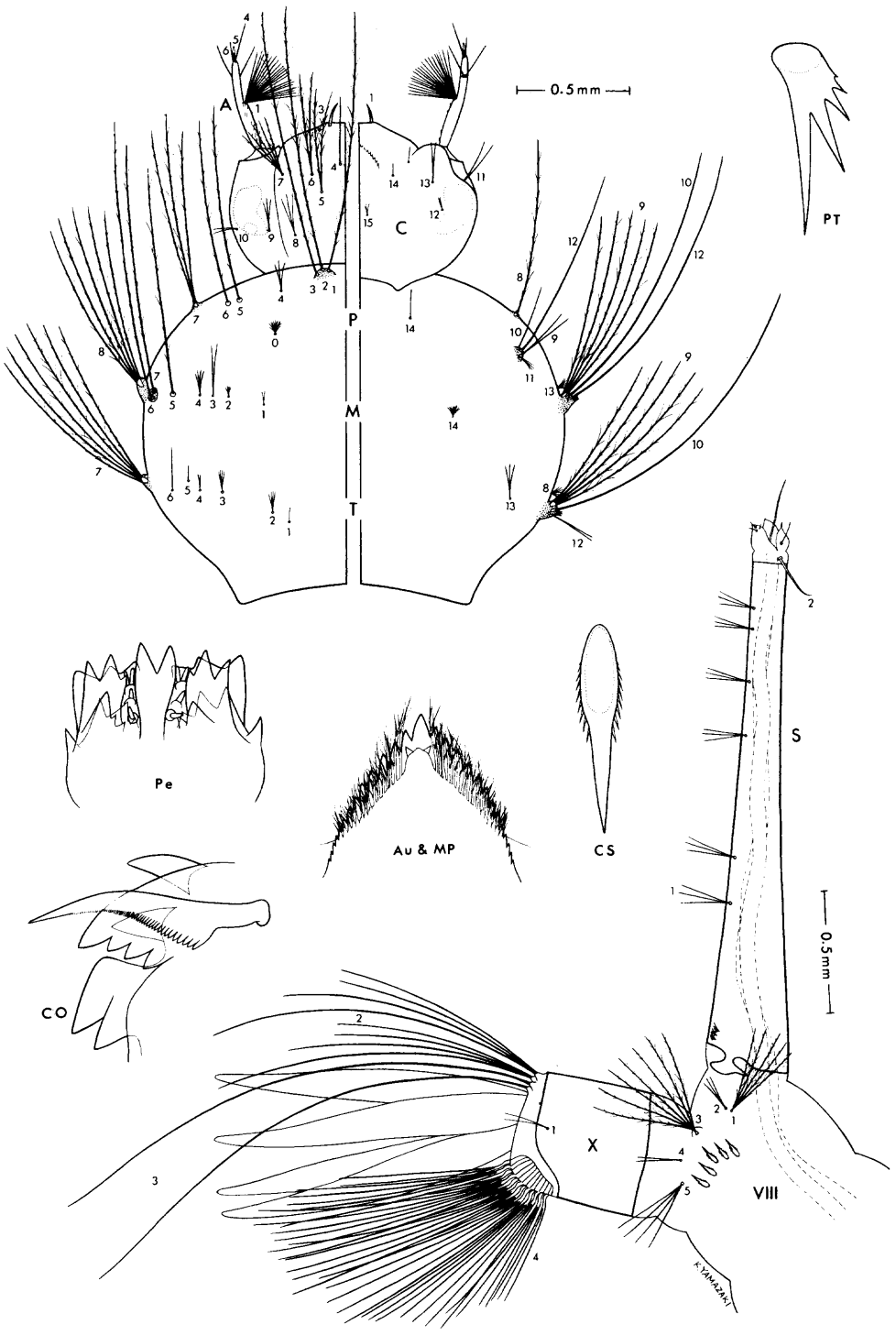
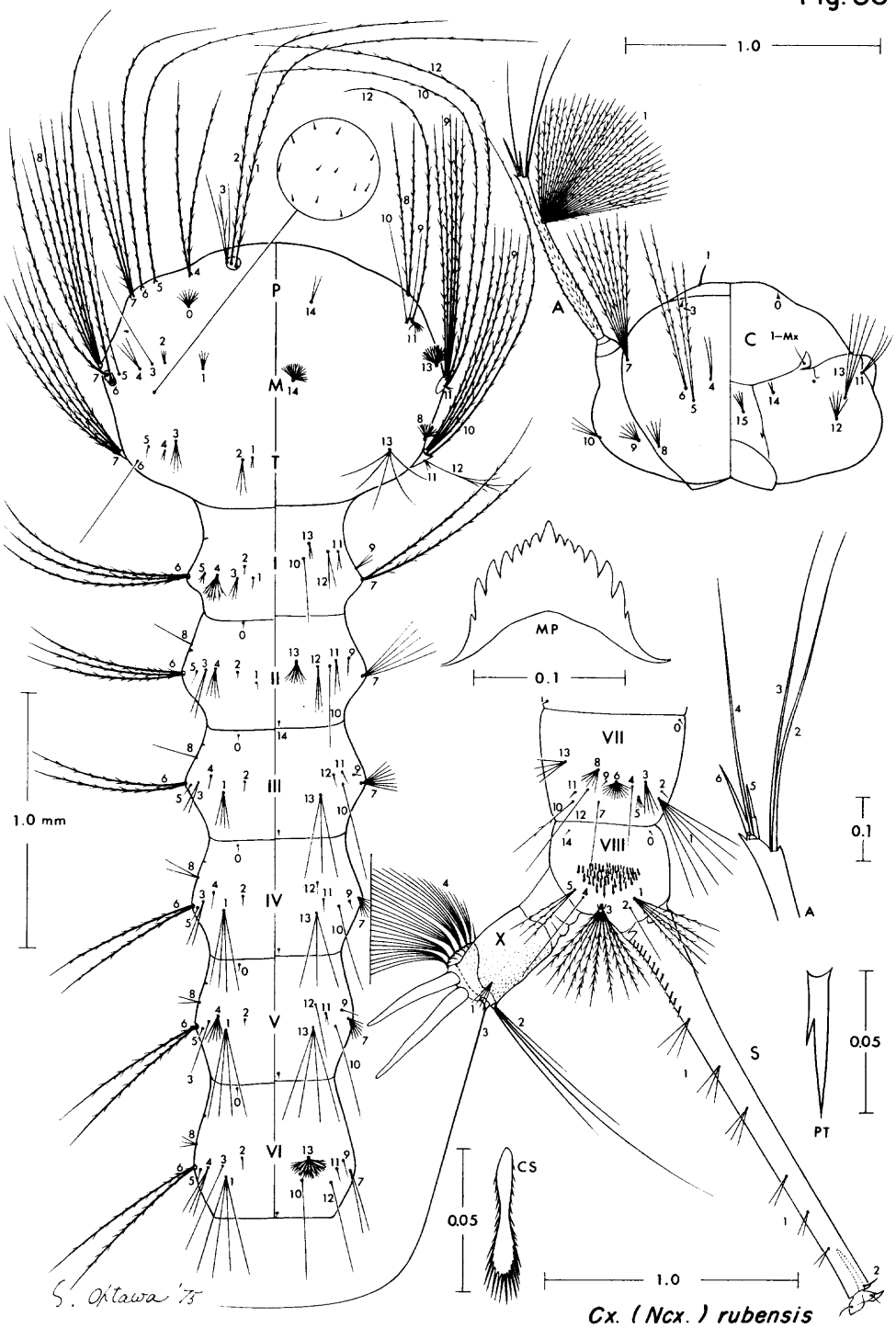

1.0
A
1-Mx
C
0.1
MP
1.0 mm
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
A
0.05
PT
1.0
S
0.1
CS
Cx. (Cux.) bitaeniorhynchus
S. Ohtaka '76

Fig. 52



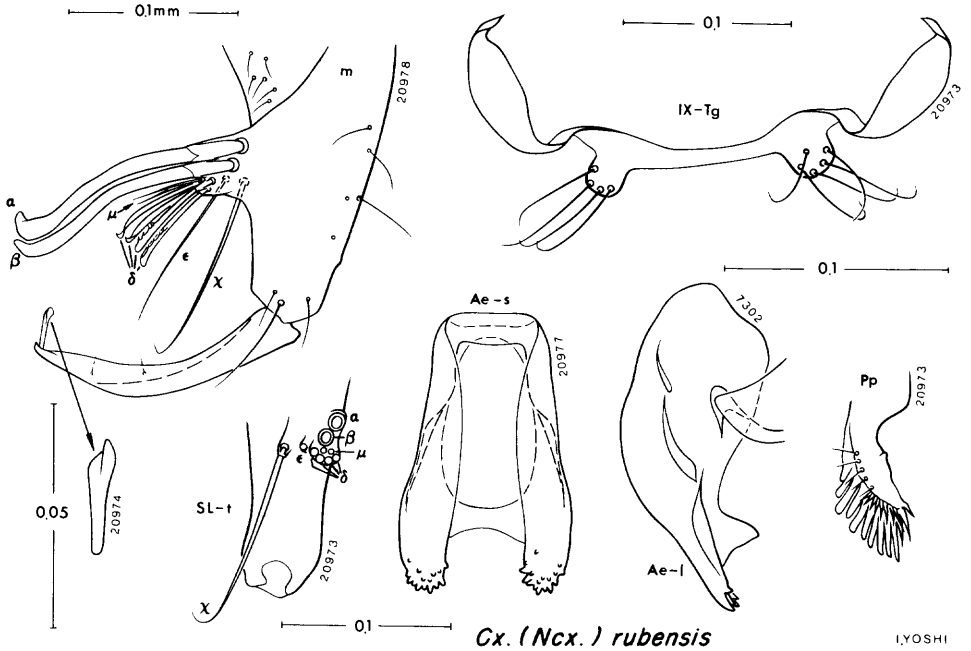
Cx. (Cux.) sinensis (after LaCasse and Yamaguti 1950)

Fig. 53



Cx. (Ncx.) rubensis

Fig. 54


0.1mm
m
20978
a
β
μ
δ
ε
χ
0.1
IX-Tg
20973
0.1
Ae-s
20977
7302
Pp
20973
0.05
20974
SL-t
20973
Ae-l
0.1
Cx. (Ncx.) rubensis
I.YOSHI

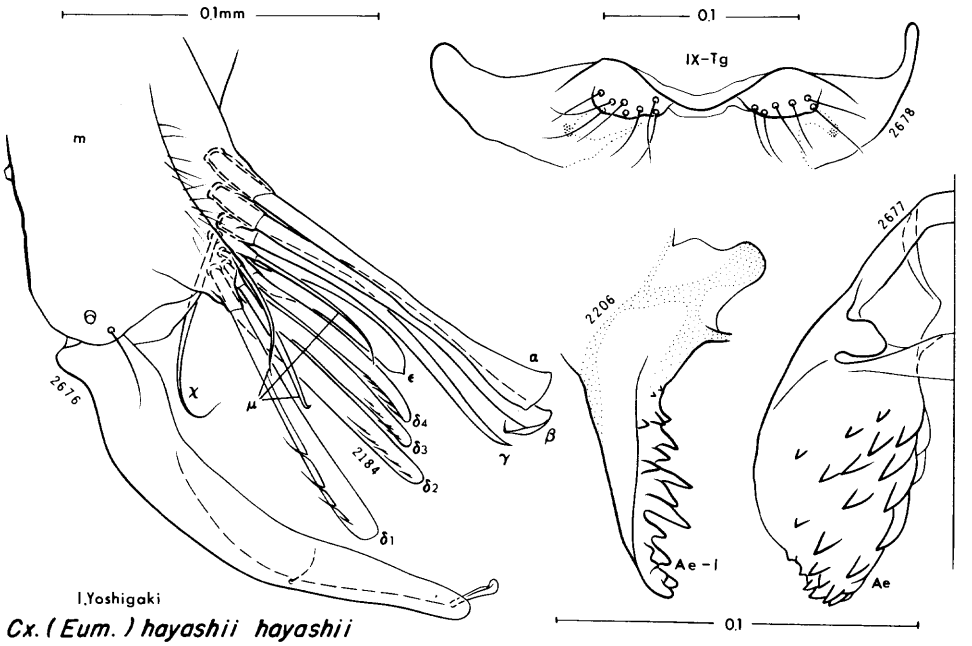
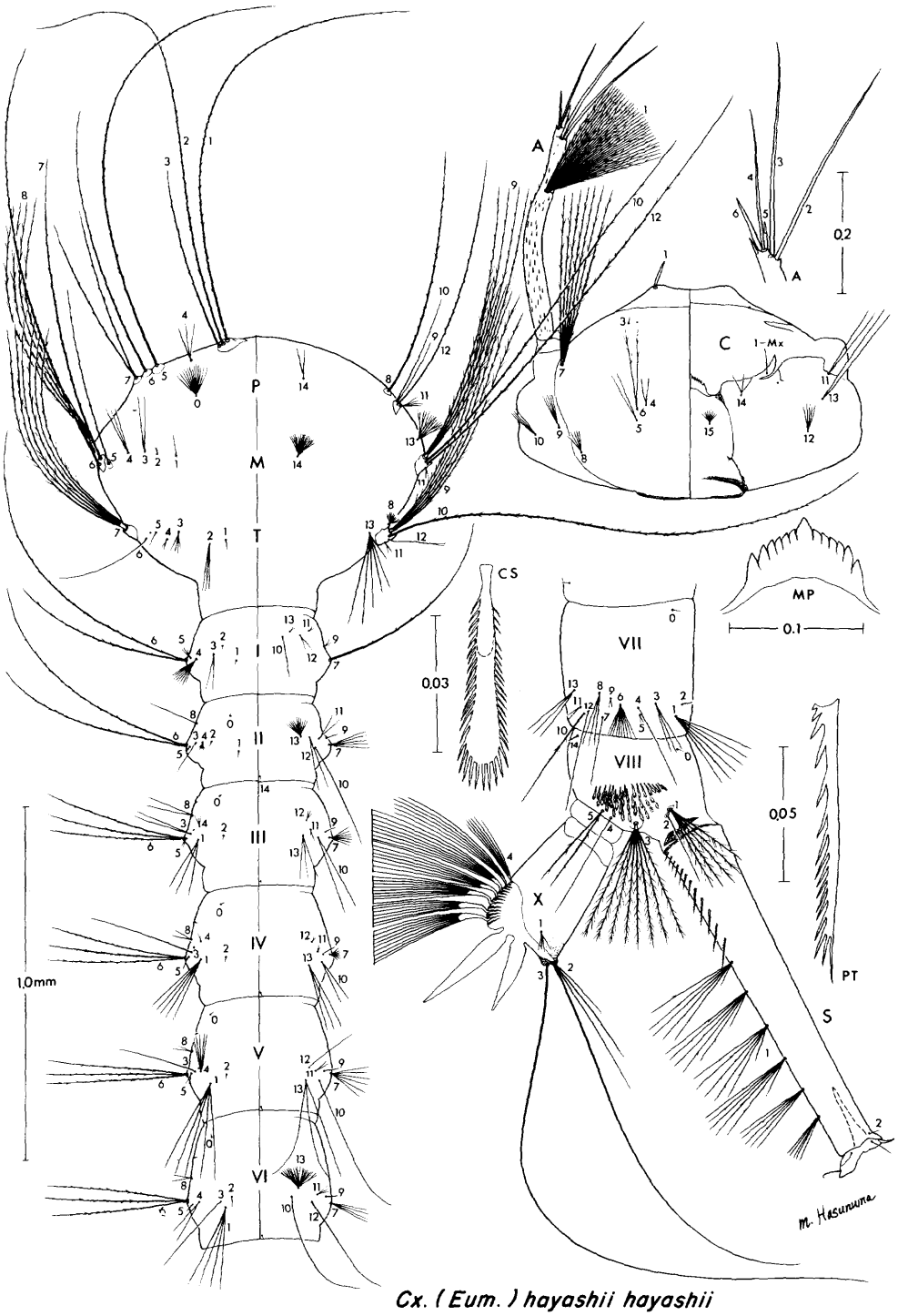

0.1mm
m
0.1
IX-Tg
2618
2677
2206
2676
a
ε
χ
μ
δ4
δ3
2184
δ2
δ1
β
γ
Ae-l
Ae
0.1
I.Yoshigaki
Cx. (Eum.) hayashii hayashii

Fig. 55



Cx. (Eum.) hayashii hayashii

Fig. 56

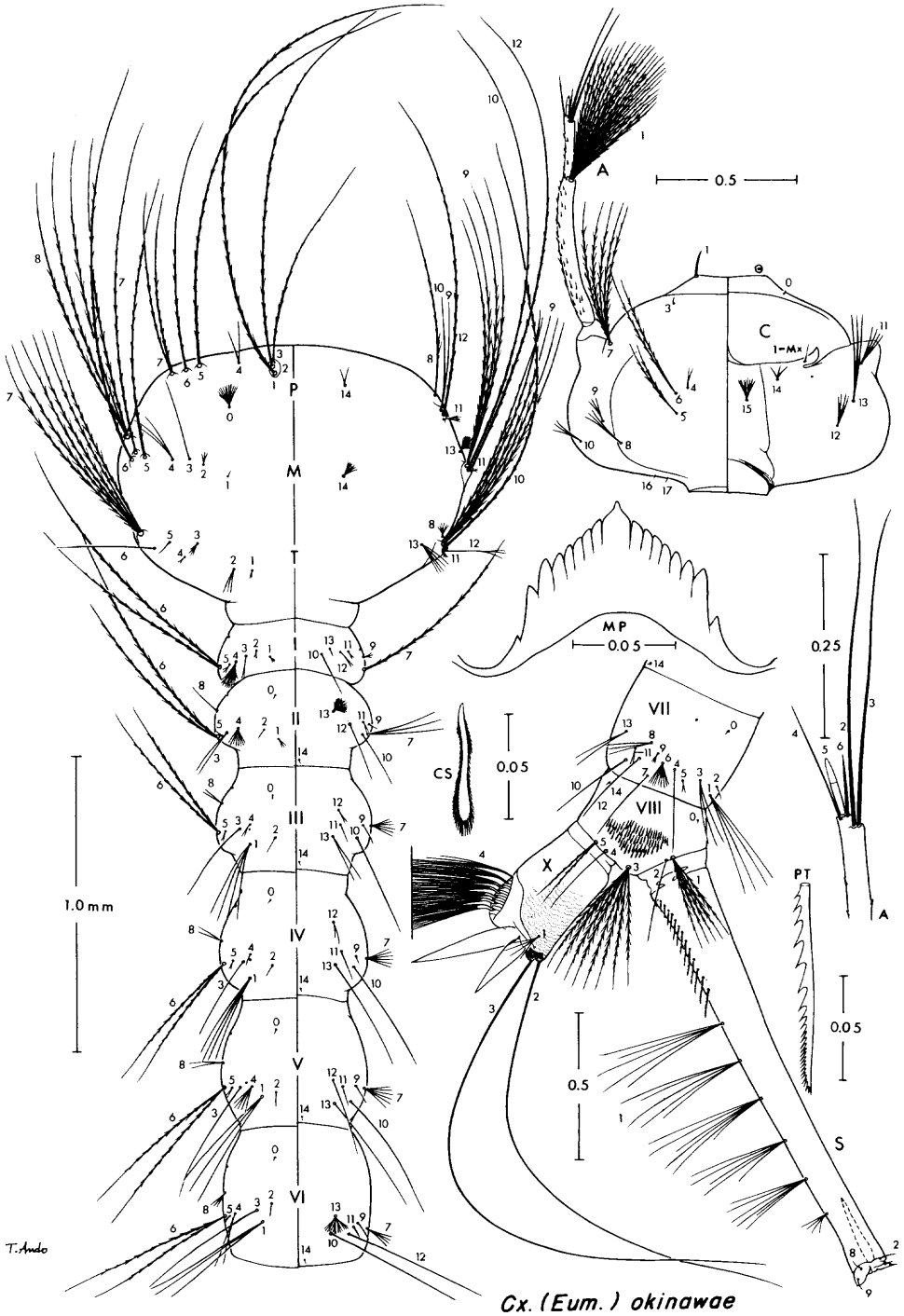
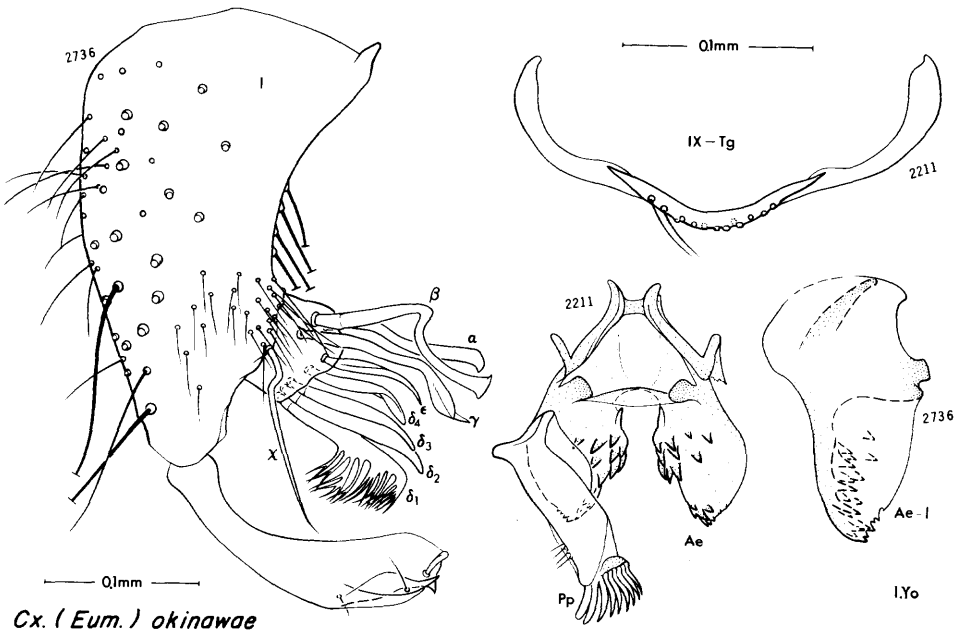
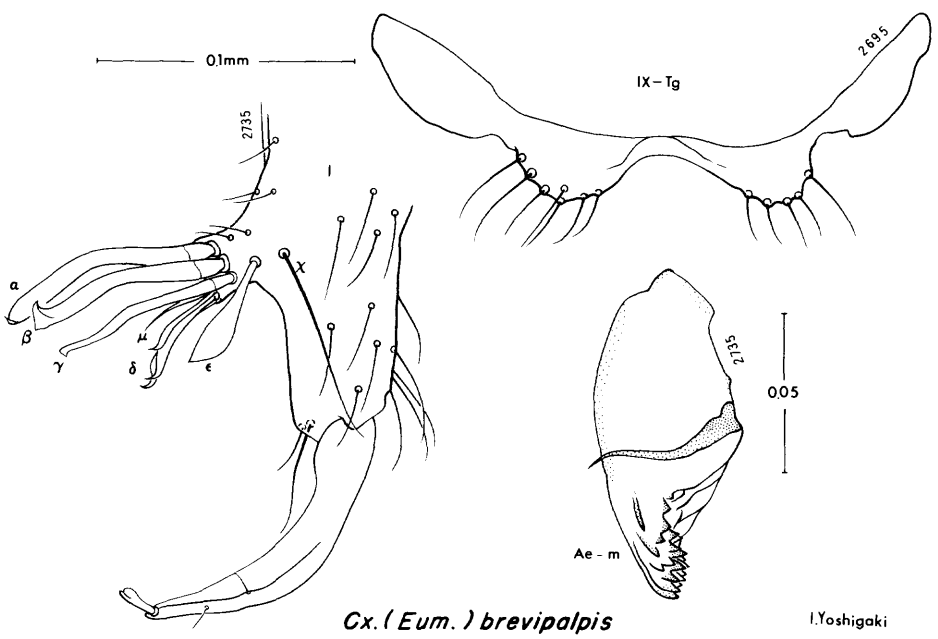

A
0.5
C
1-Mx
MP
0.05
0.25
CS
0.05
VII
VIII
X
PT
A
0.05
0.5
S
1.0 mm
P
M
T
I
II
III
IV
V
VI
T. Ando
Cx. (Eum.) okinawae

Fig. 57



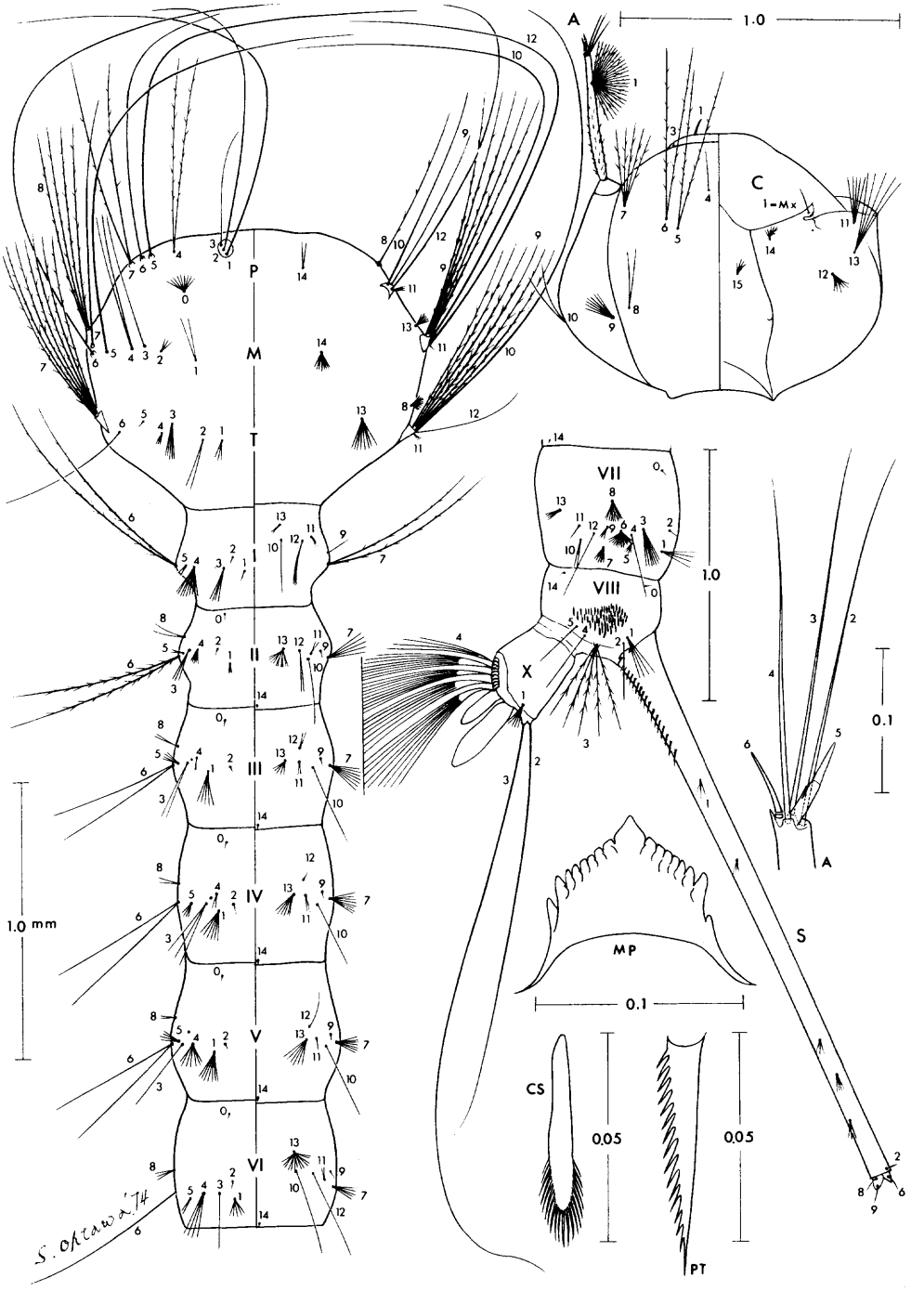
Cx. (Eum.) okinawae



Cx. (Eum.) brevipalpis

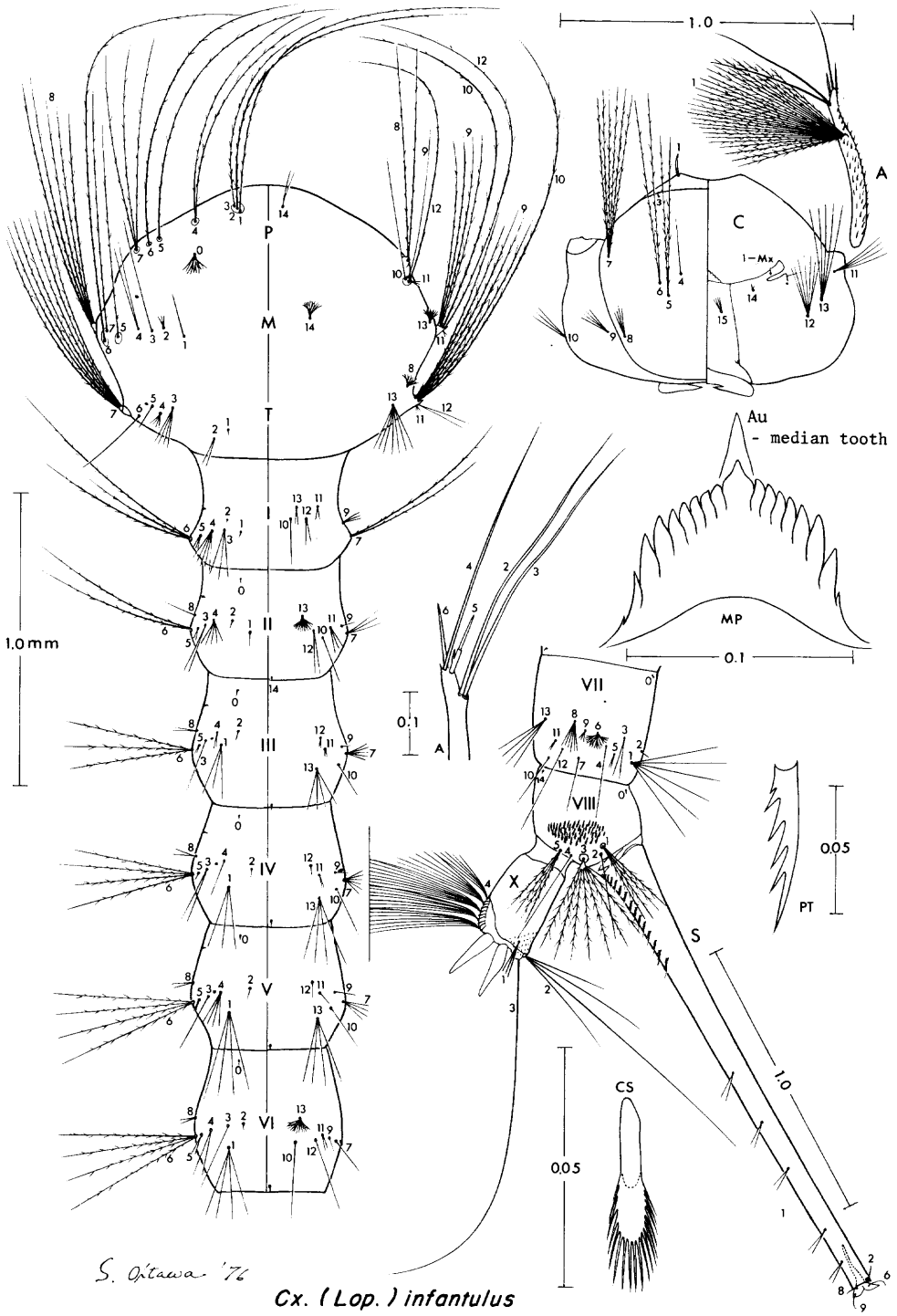
I.Yoshigaki

Fig. 58



Cx. (Eum.) brevipalpis

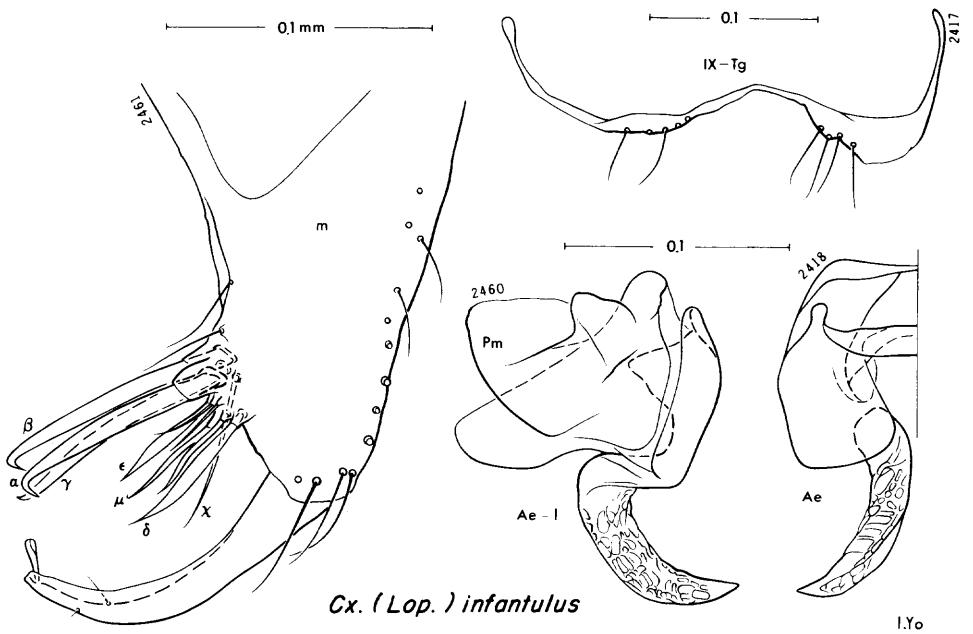
Fig. 59



S. Ottawa '76

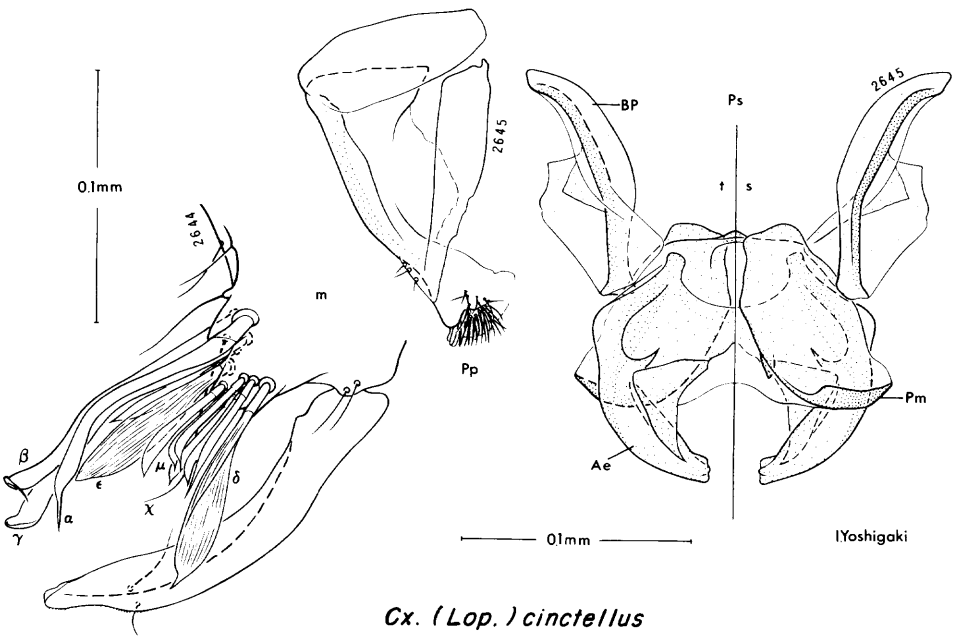
Cx. (Lop.) infantulus

Fig. 60



Cx. (Lop.) infantulus

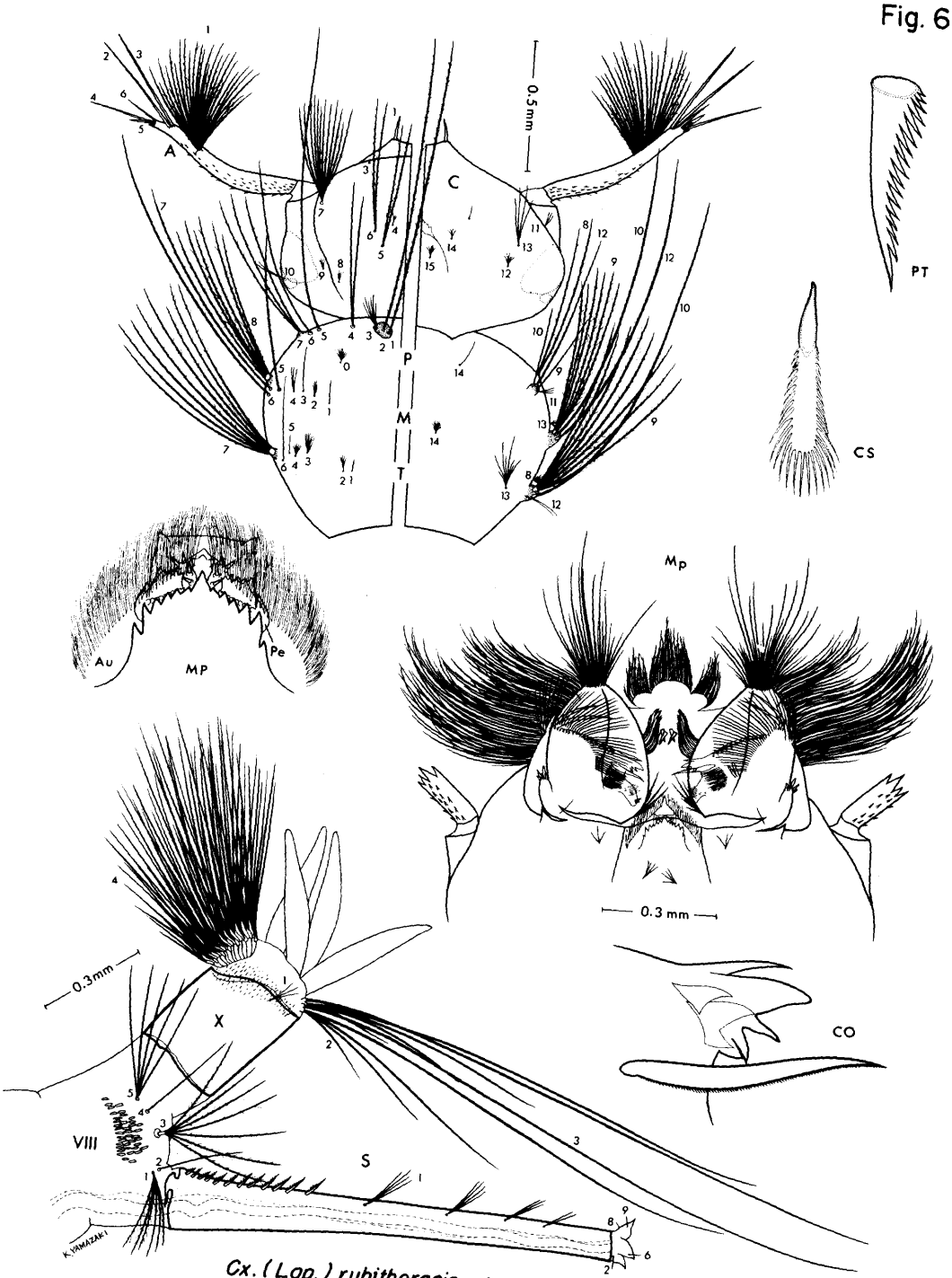
I.Yo



Cx. (Lop.) cinctellus

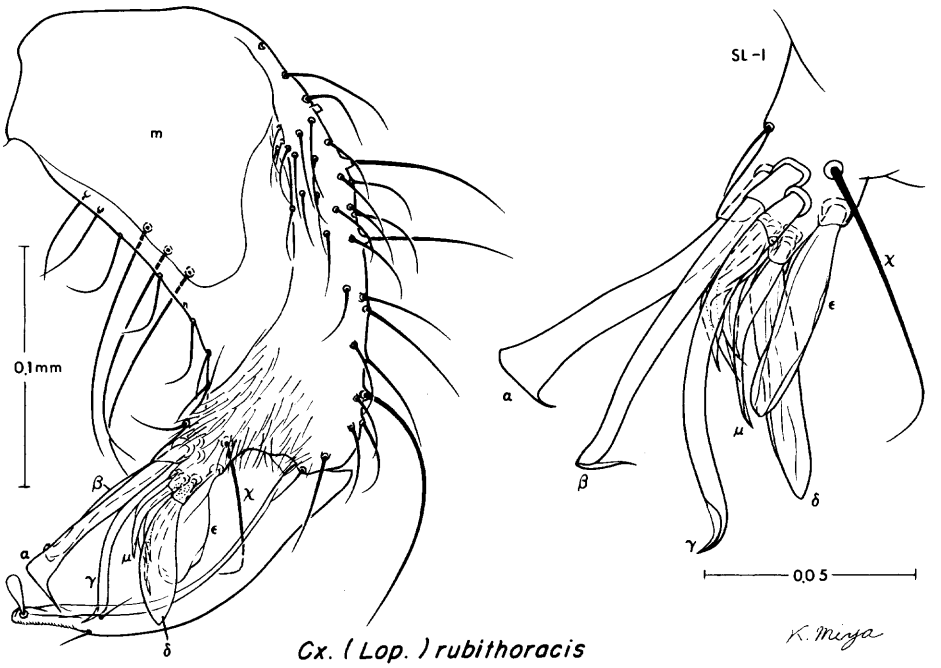
I.Yoshigaki

Fig. 61

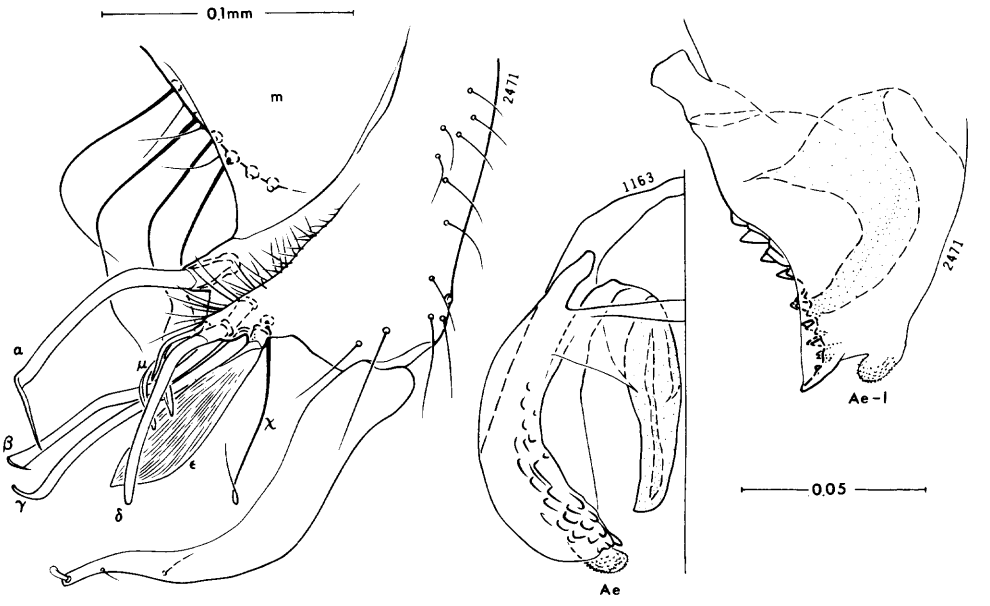


Cx. (Lop.) rubithoracis (after LaCasse and Yamaguti 1950)

Fig. 62



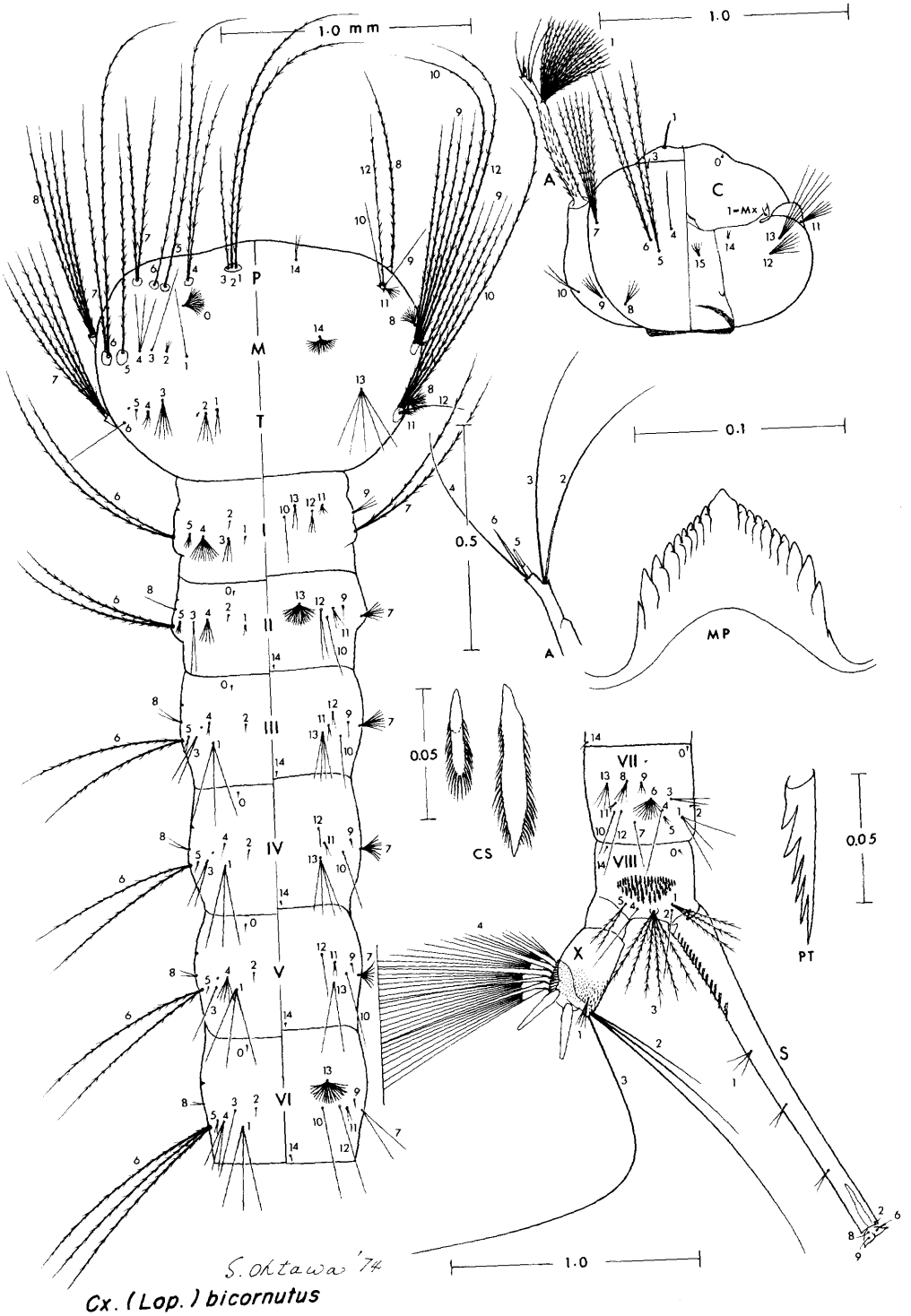
Cx. (Lop.) rubithoracis



Cx. (Lop.) bicornutus

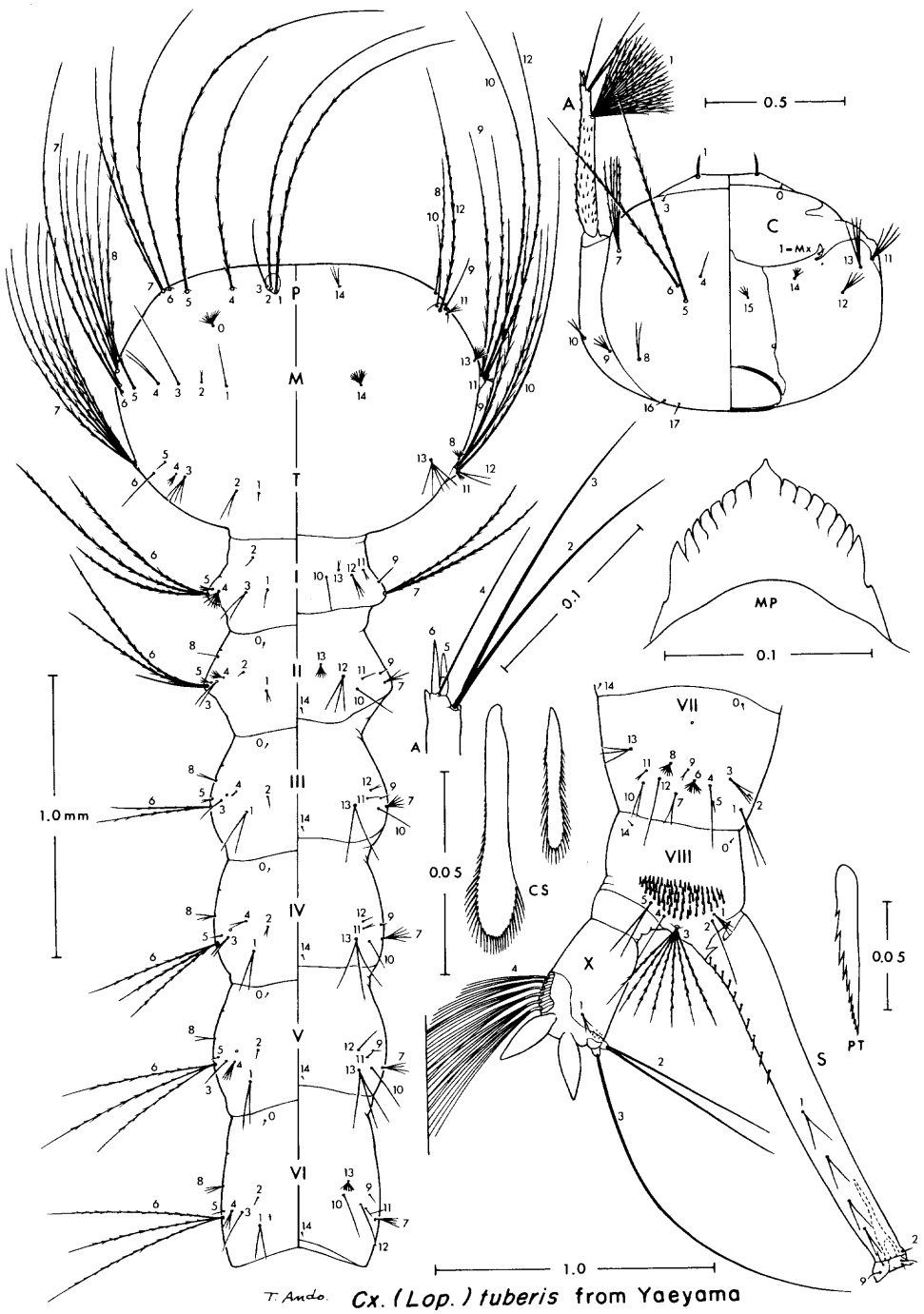
I.Yo

Fig. 63



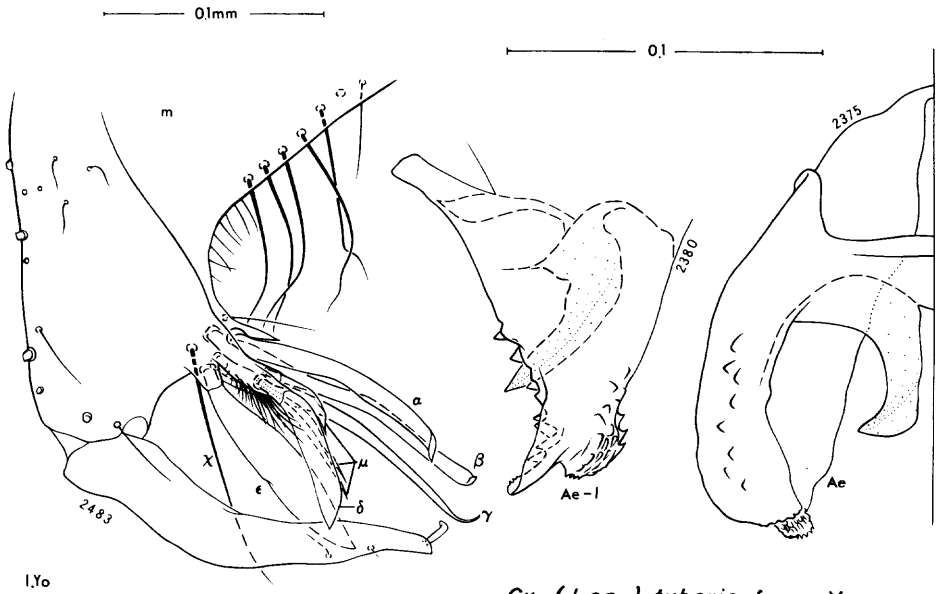
Cx. (Lop.) bicornutus

Fig. 64

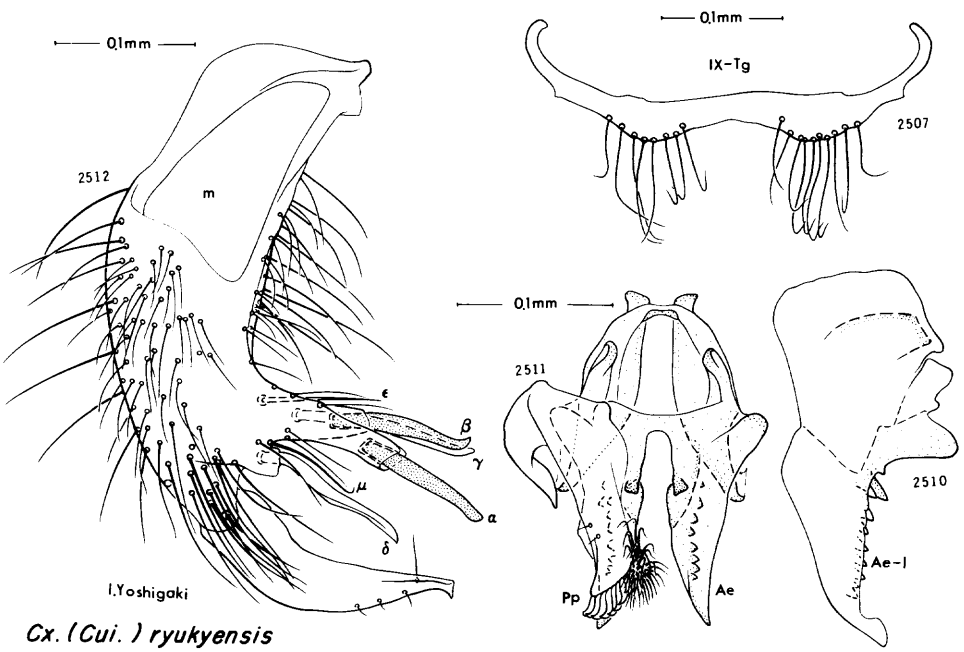


T. Ando. *Cx. (Lop.) tuberis* from Yaeyama

Fig. 65

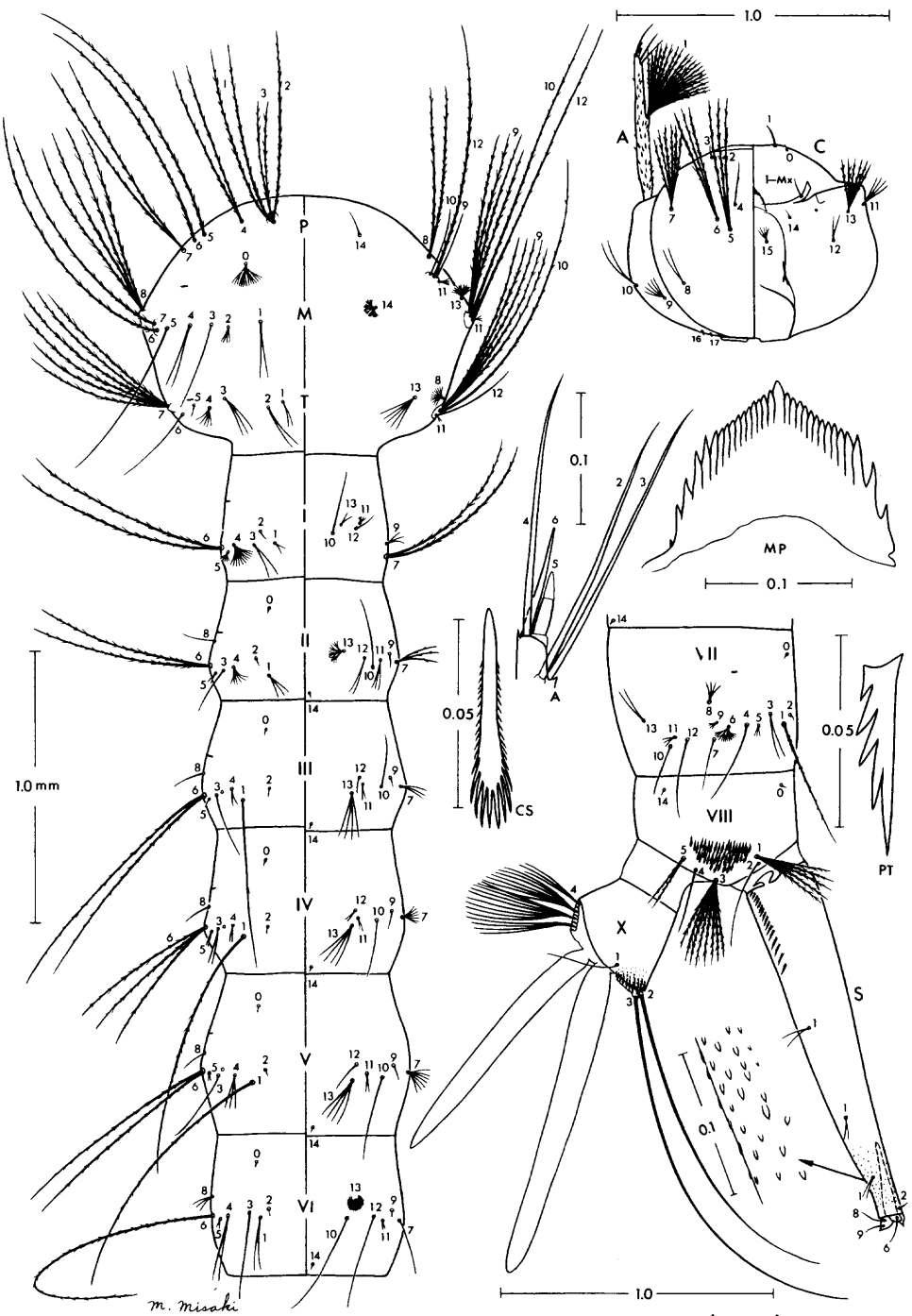


Cx. (Lop.) tuberis from Yaeyama



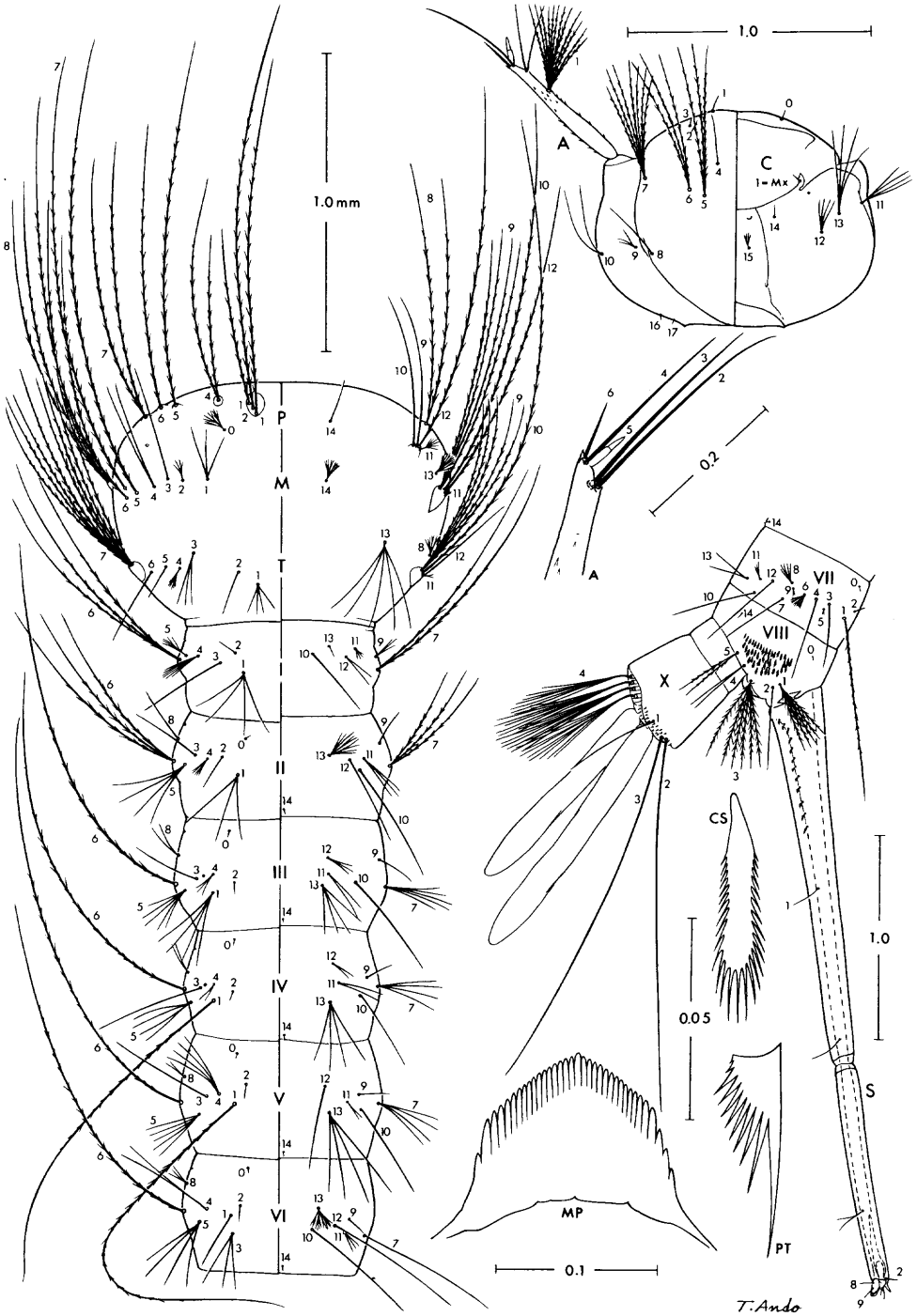
Cx. (Cui.) ryukyensis

Fig. 66



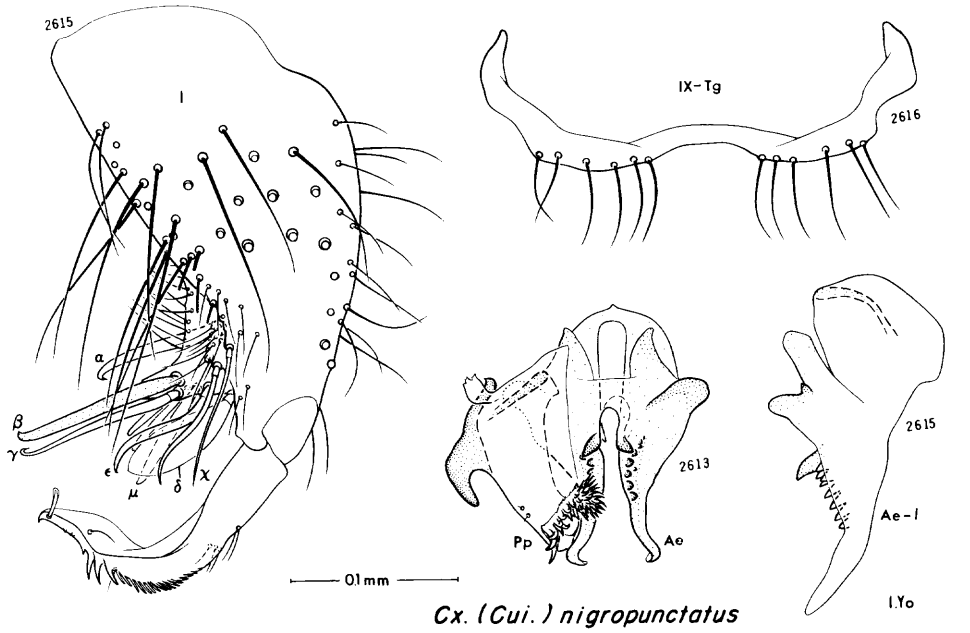
Cx. (Cui.) ryukyensis

Fig. 67

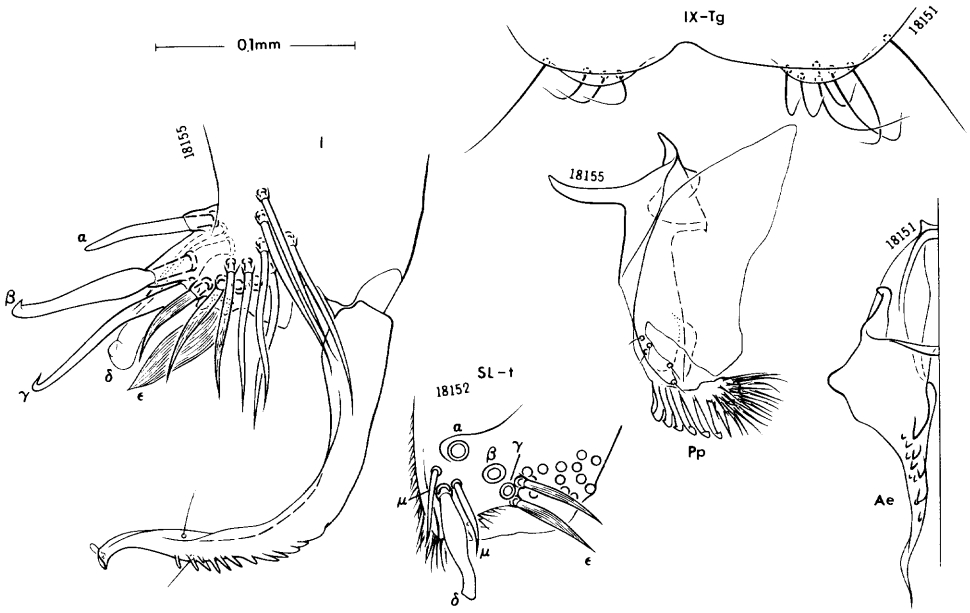


Cx. (Cui.) nigropunctatus

Fig. 68

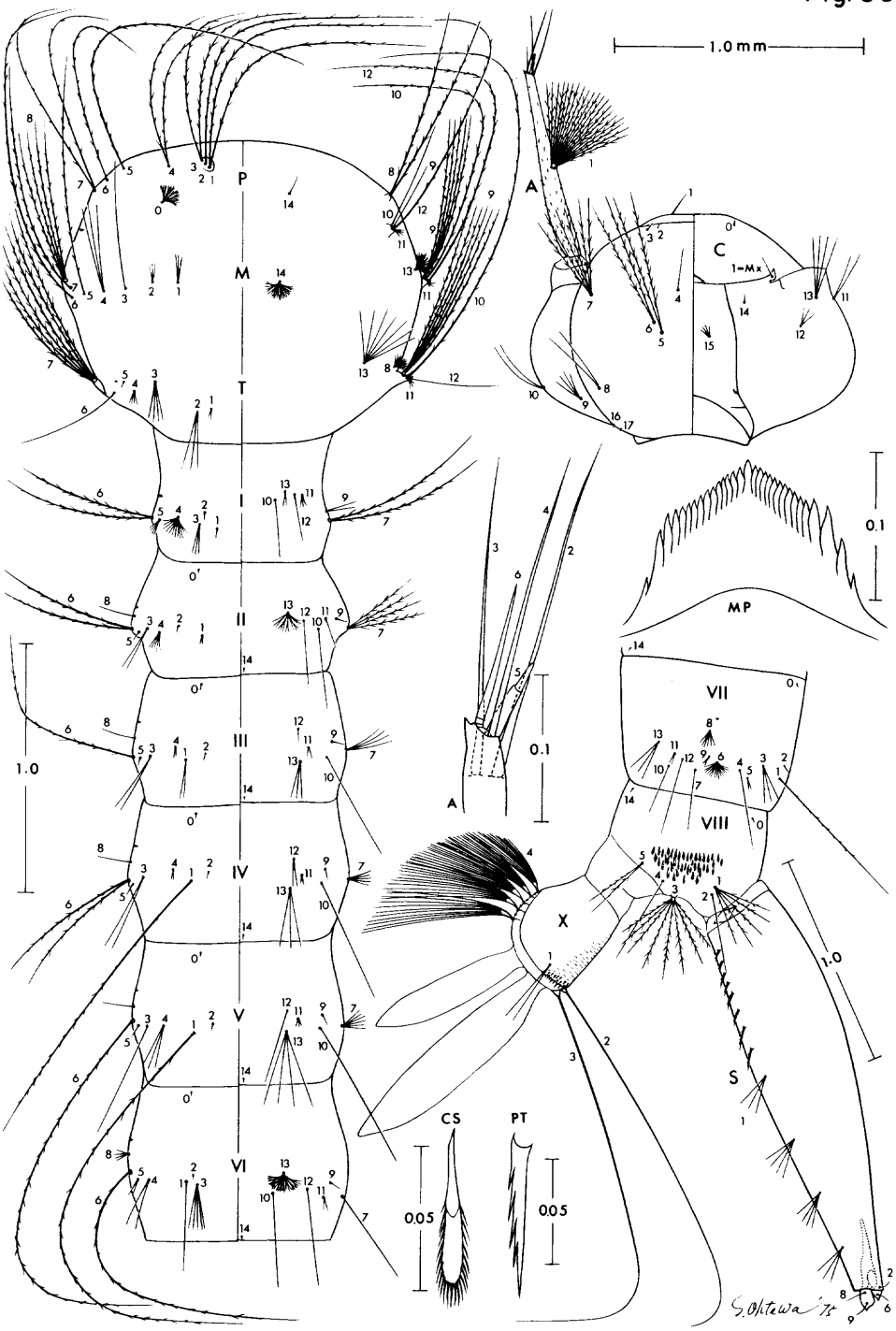


Cx. (Cui.) nigropunctatus



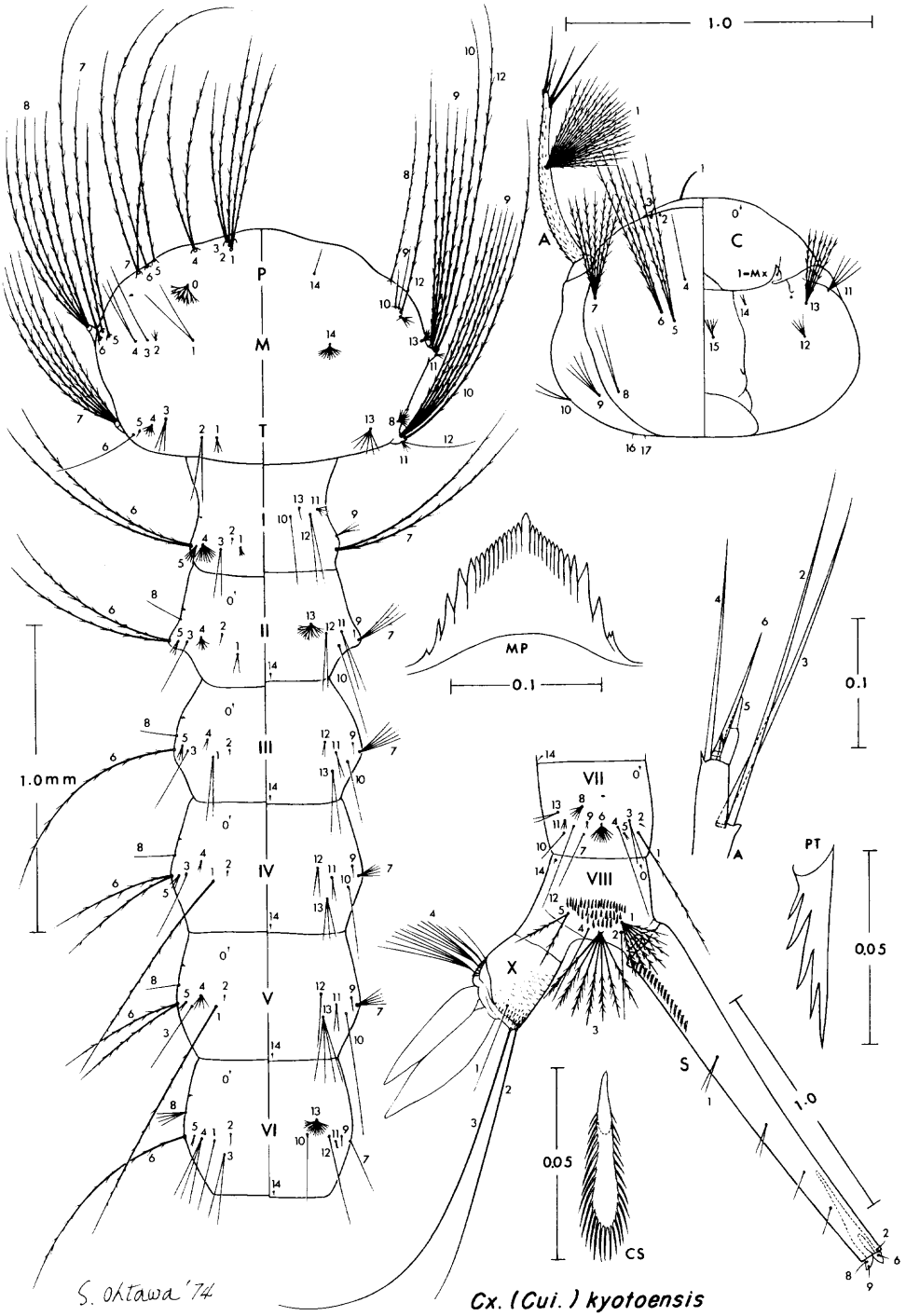
Cx. (Cui.) pallidothorax from Taiwan

Fig. 69



Cx. (Cui.) pallidothorax from Taiwan

Fig. 70



Cx. (Cui.) kyotoensis

Fig. 71

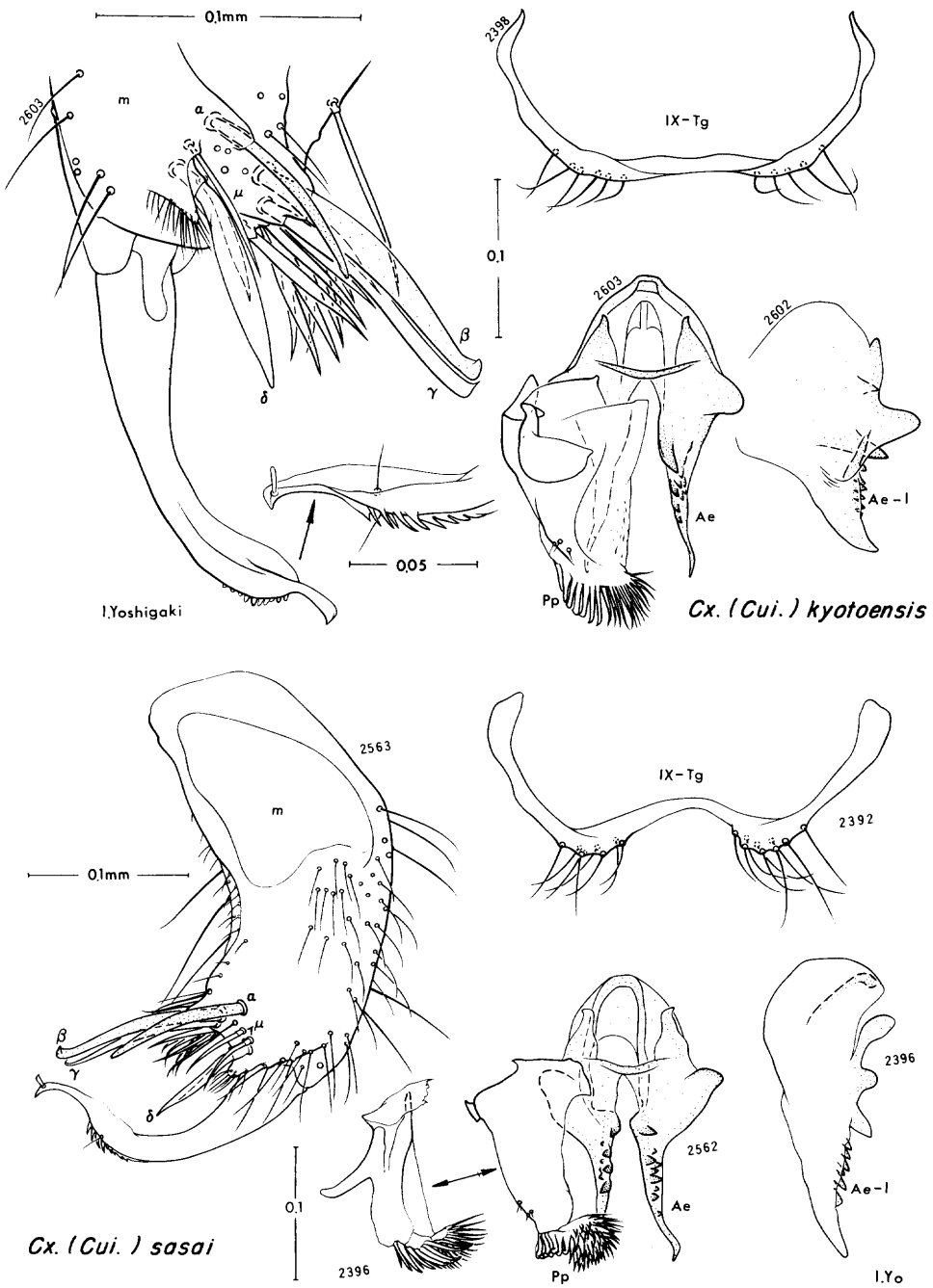

0.1mm
2603
m
α
μ
β
γ
δ
0.05
I.Yoshigaki
2398
IX-Tg
0.1
2603
2602
Ae
Ae-I
Pp
Cx. (Cui.) kyotoensis
2563
m
0.1mm
α
μ
β
γ
δ
0.1
2396
IX-Tg
2392
2562
Ae
Pp
2396
Ae-I
I.Yo
Cx. (Cui.) sasai

Fig. 72

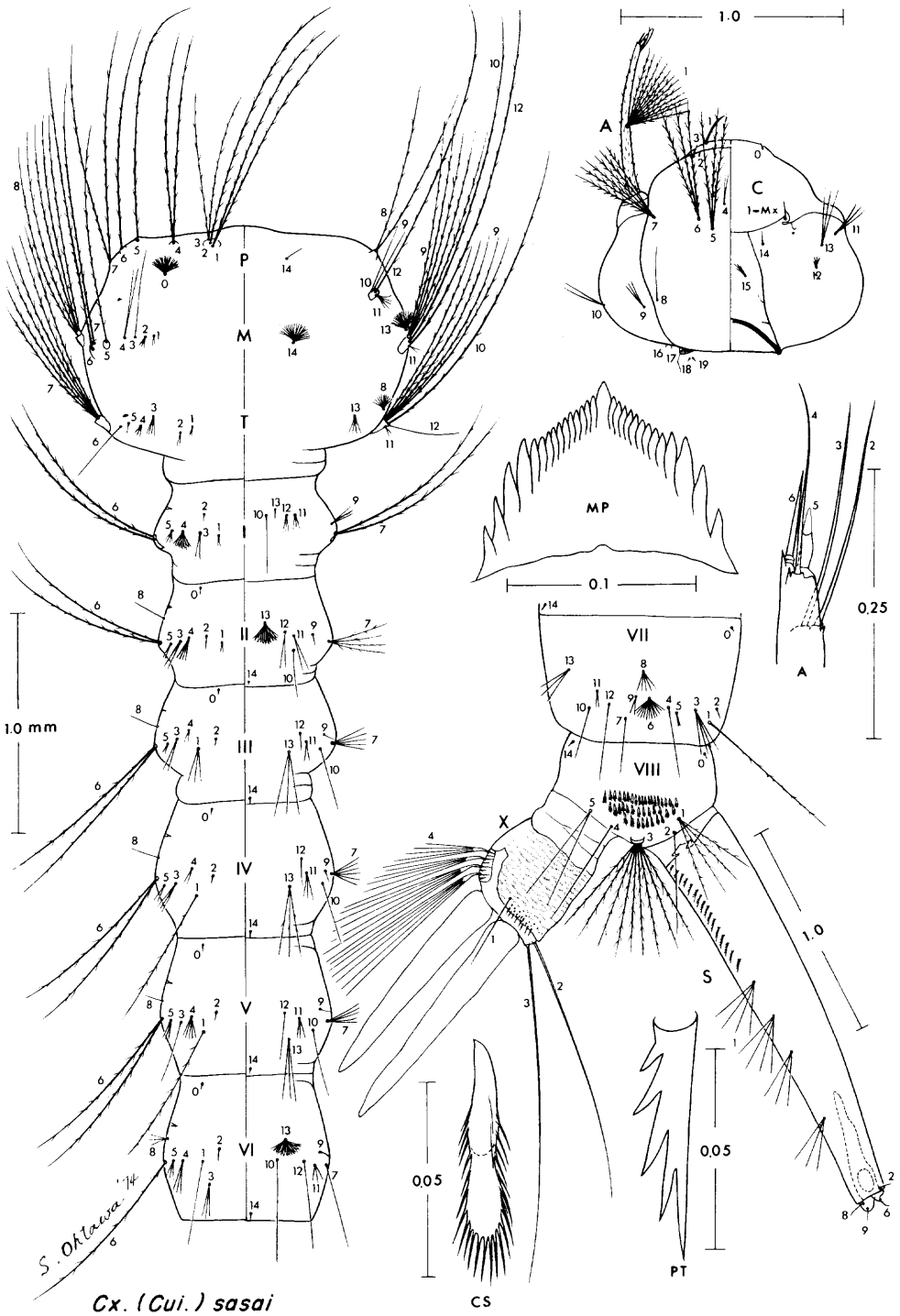

1.0
A
C
1-Mx
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
PT
CS
MP
0.1
0.25
A
1.0 mm
0.05
0.05
S. Ohtsuka
Cx. (Cui.) sasai

Fig. 73

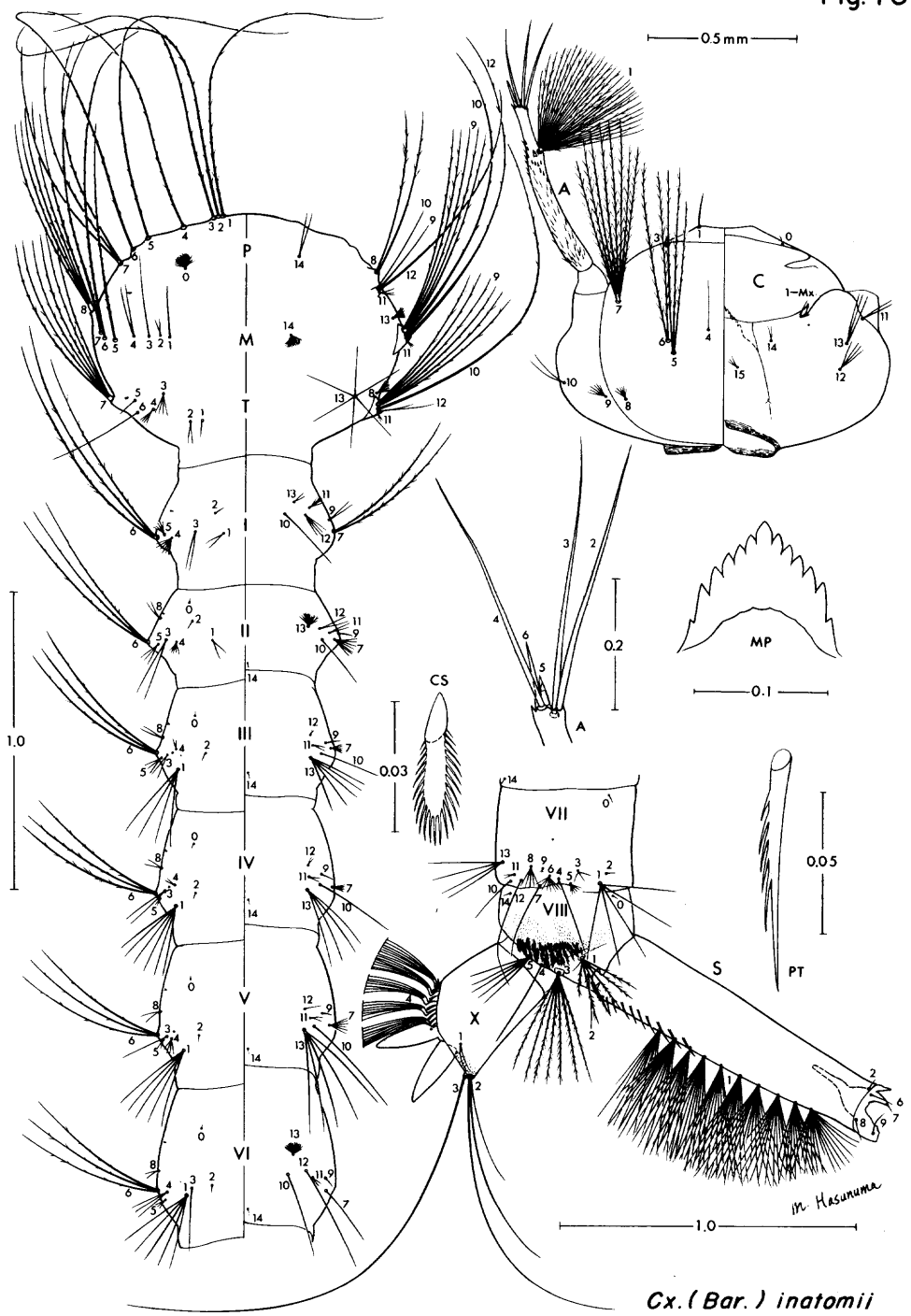
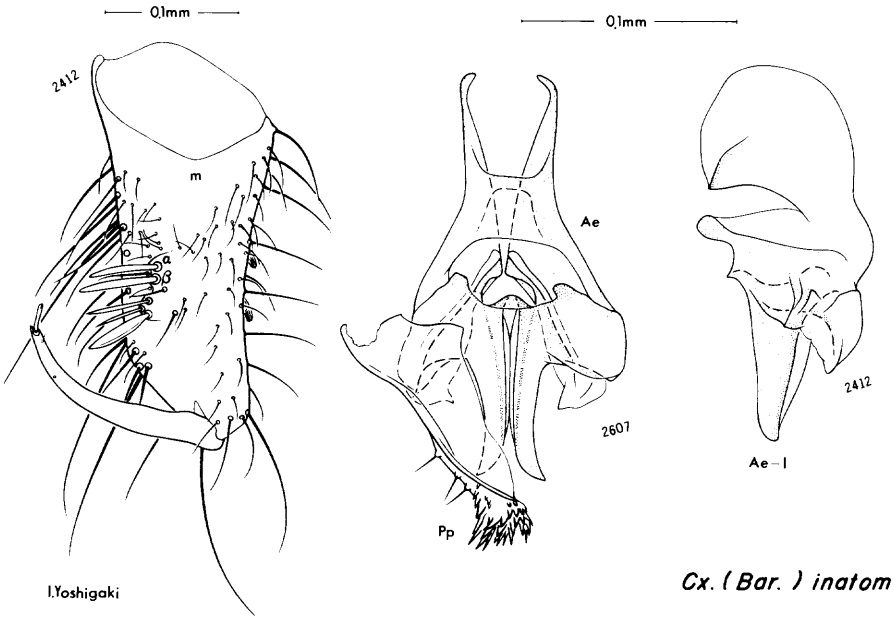
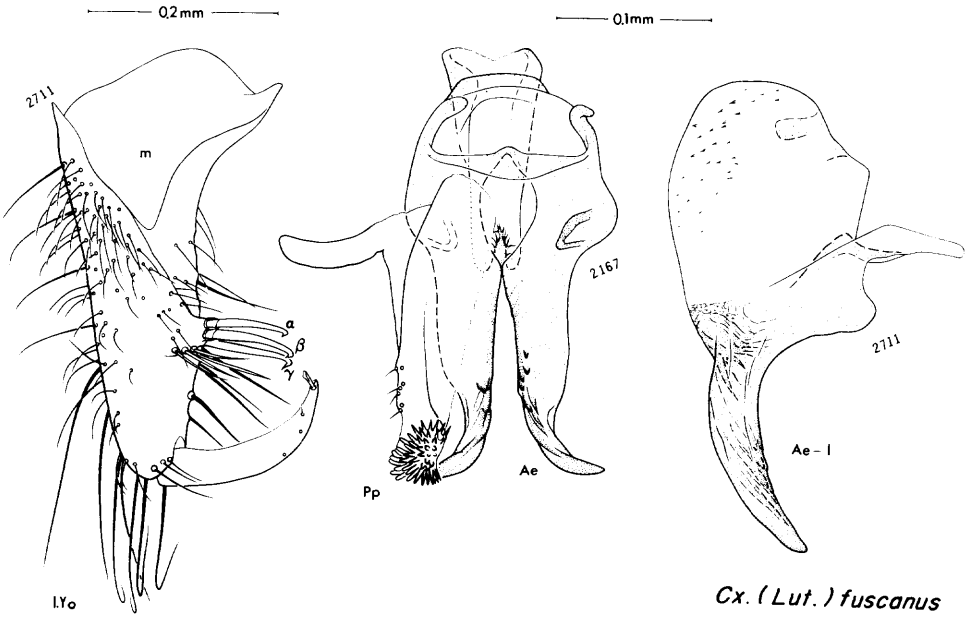

0.5 mm
A
C
1-Mx
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
PT
CS
MP
A
1.0
0.03
0.2
0.1
0.05
1.0
M. Hasunuma
Cx. (Bar.) inatomii

Fig. 74

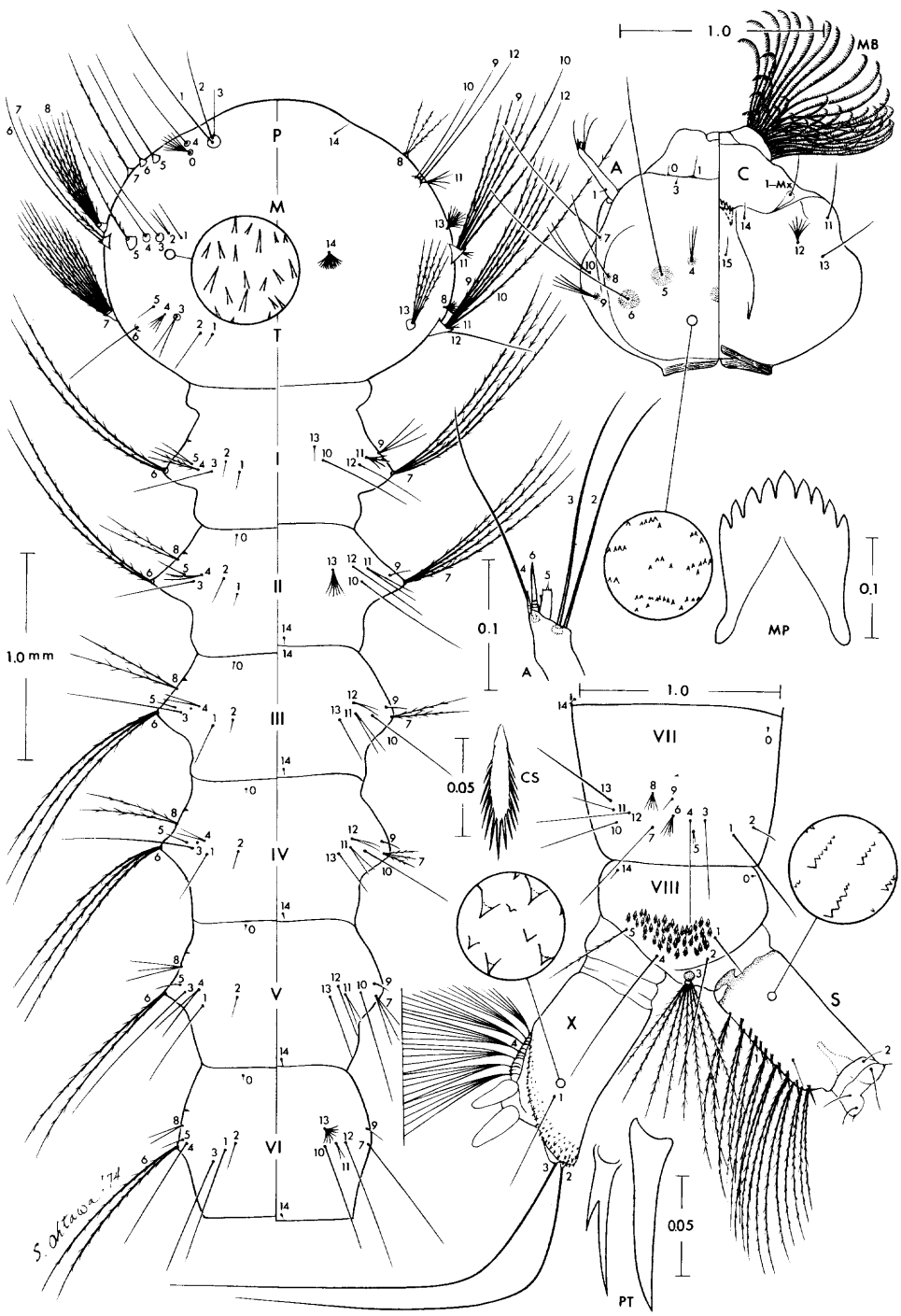


Cx. (Bar.) inatomii



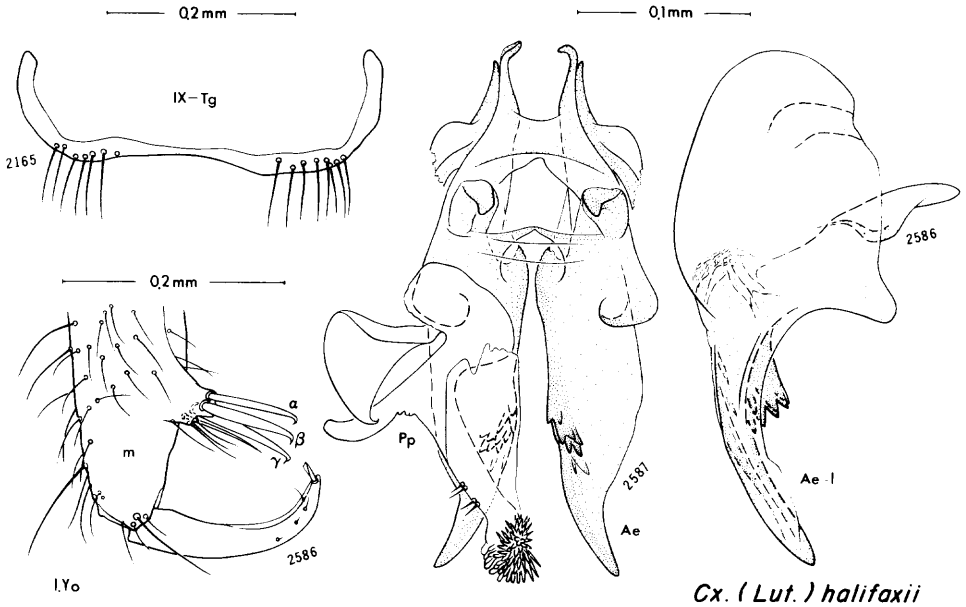
Cx. (Lut.) fuscanus

Fig. 75

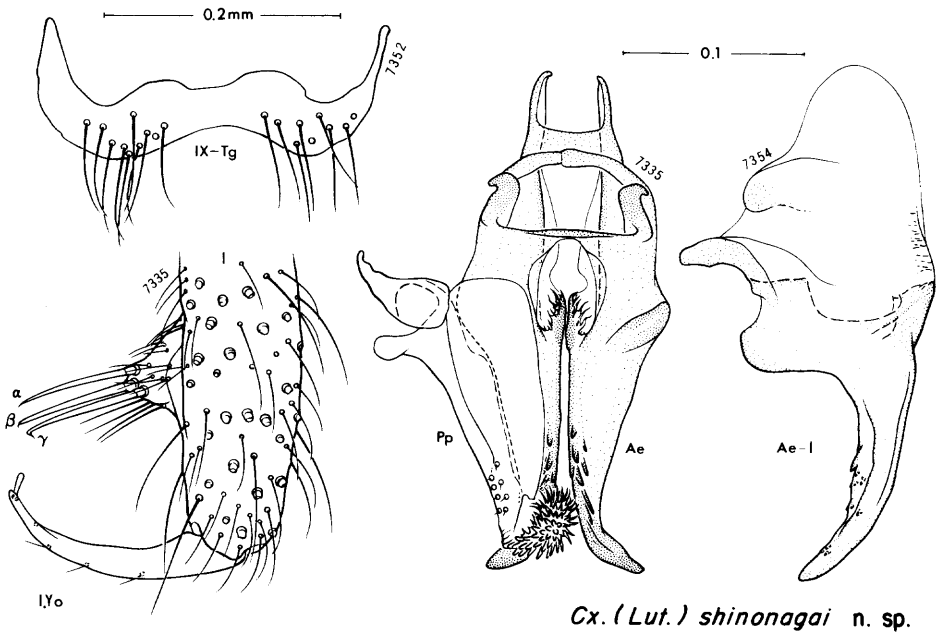


Cx. (Lut.) fuscanus from Taiwan

Fig. 76

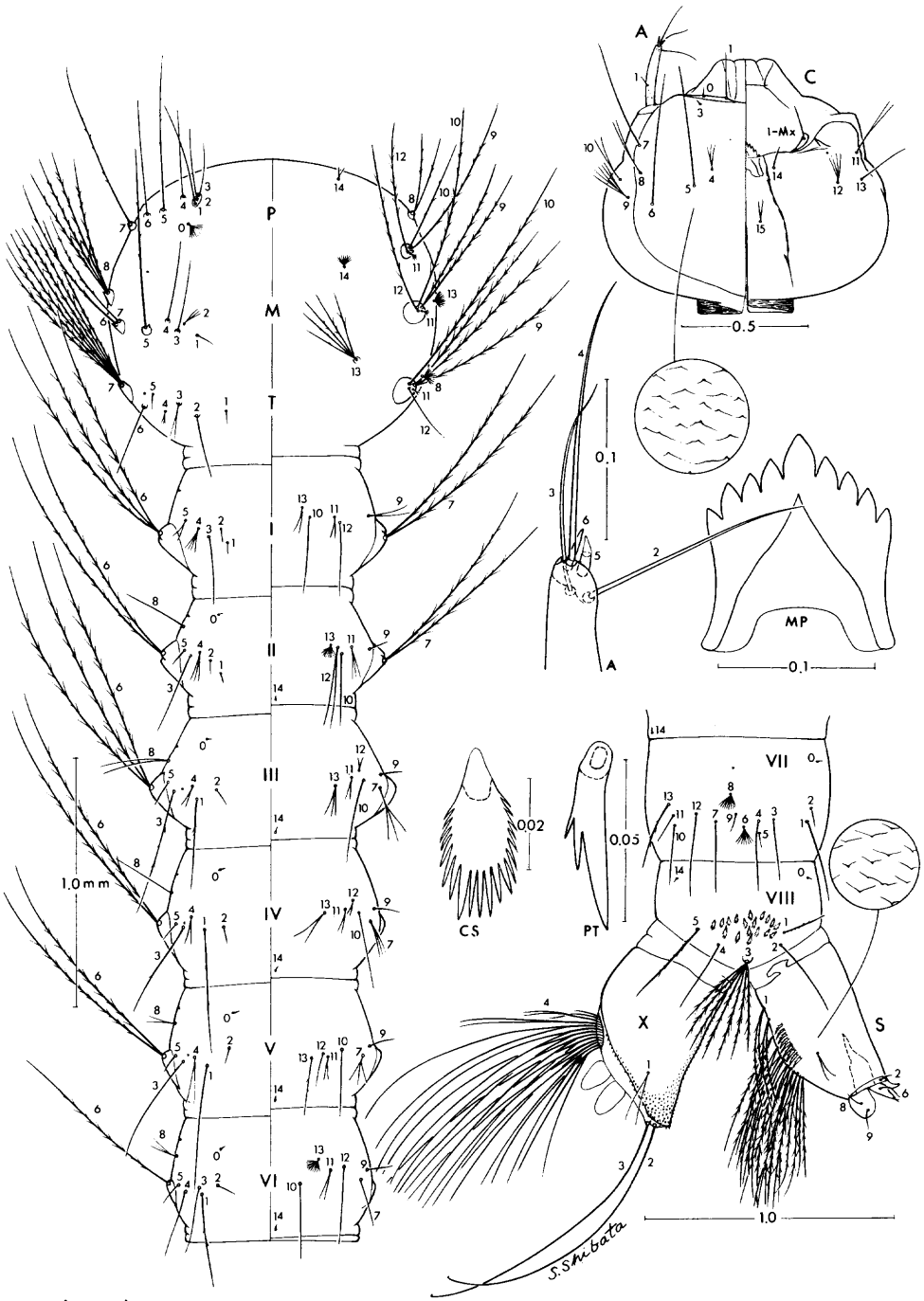


Cx. (Lut.) halifaxii



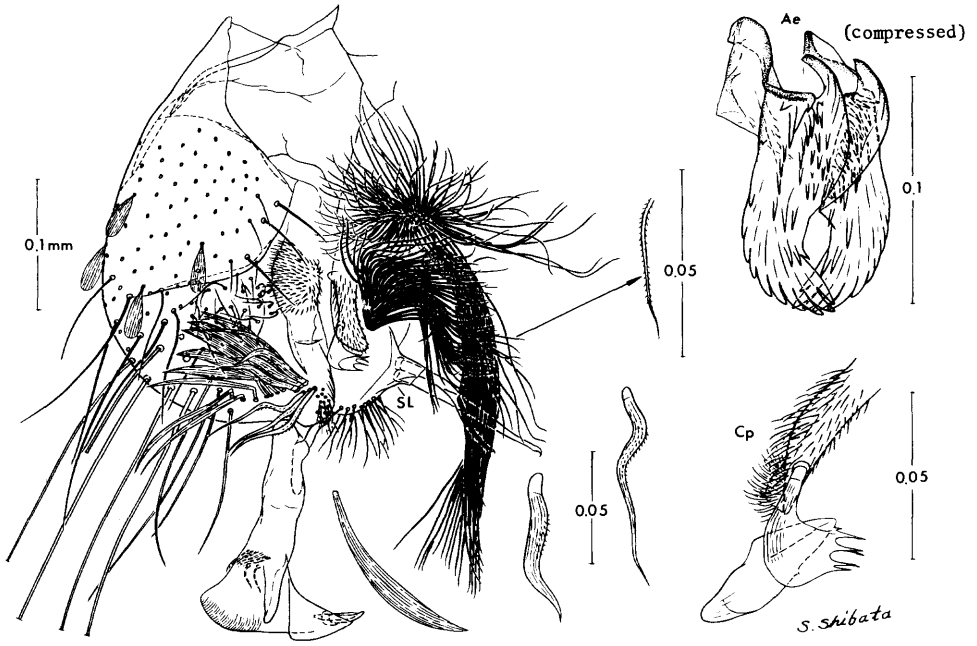
Cx. (Lut.) shinonagai n. sp.

Fig. 77

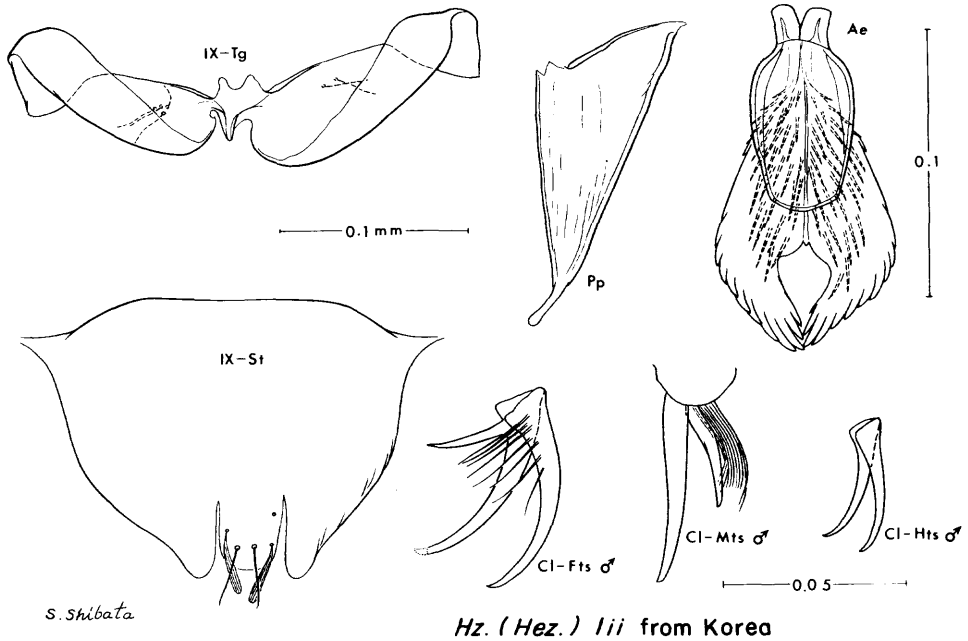


Cx. (Lut.) shinonagai **n. sp.**

Fig. 78

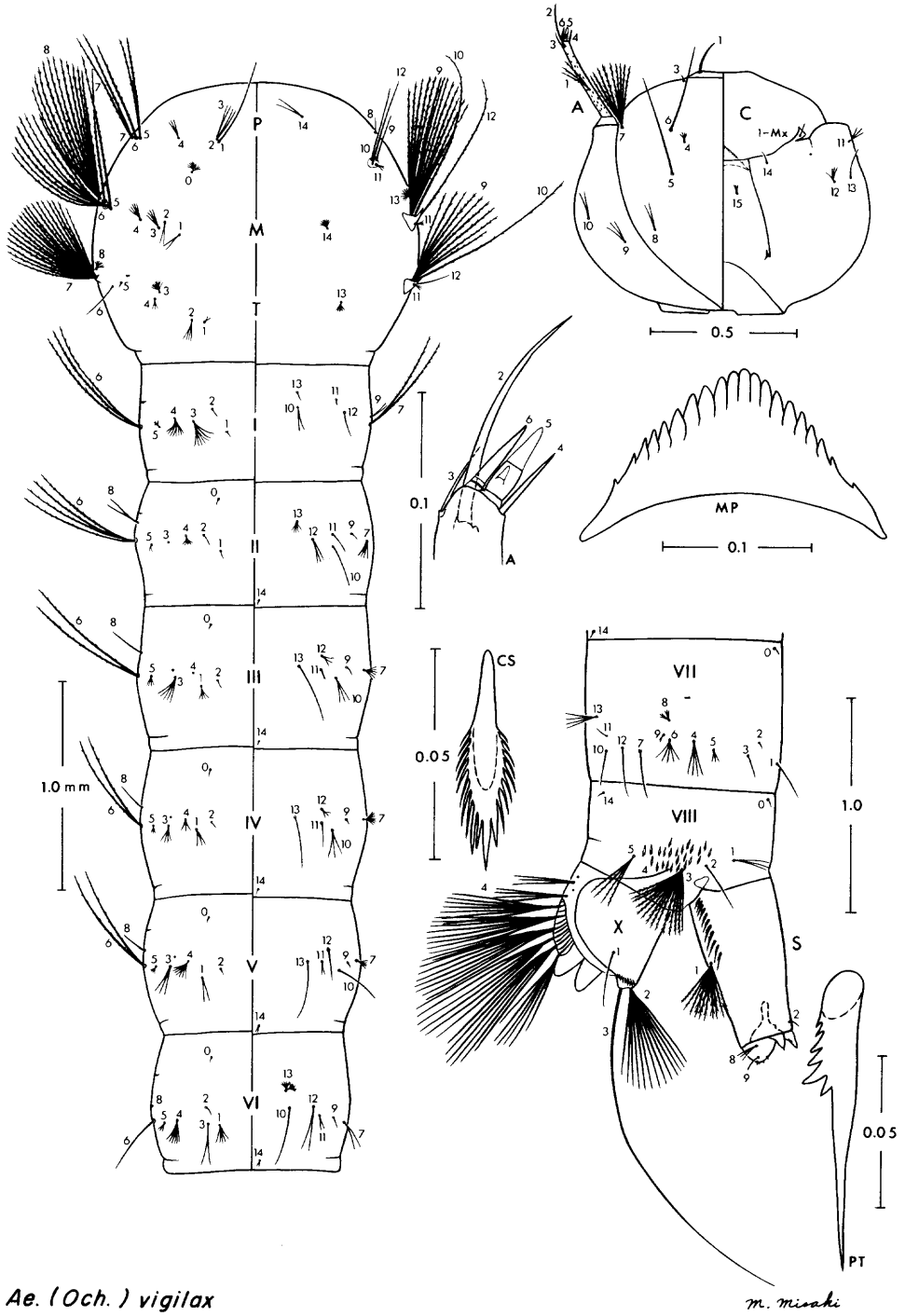


Hz. (Hez.) lii from Honchow, China (paratype)



Hz. (Hez.) lii from Korea

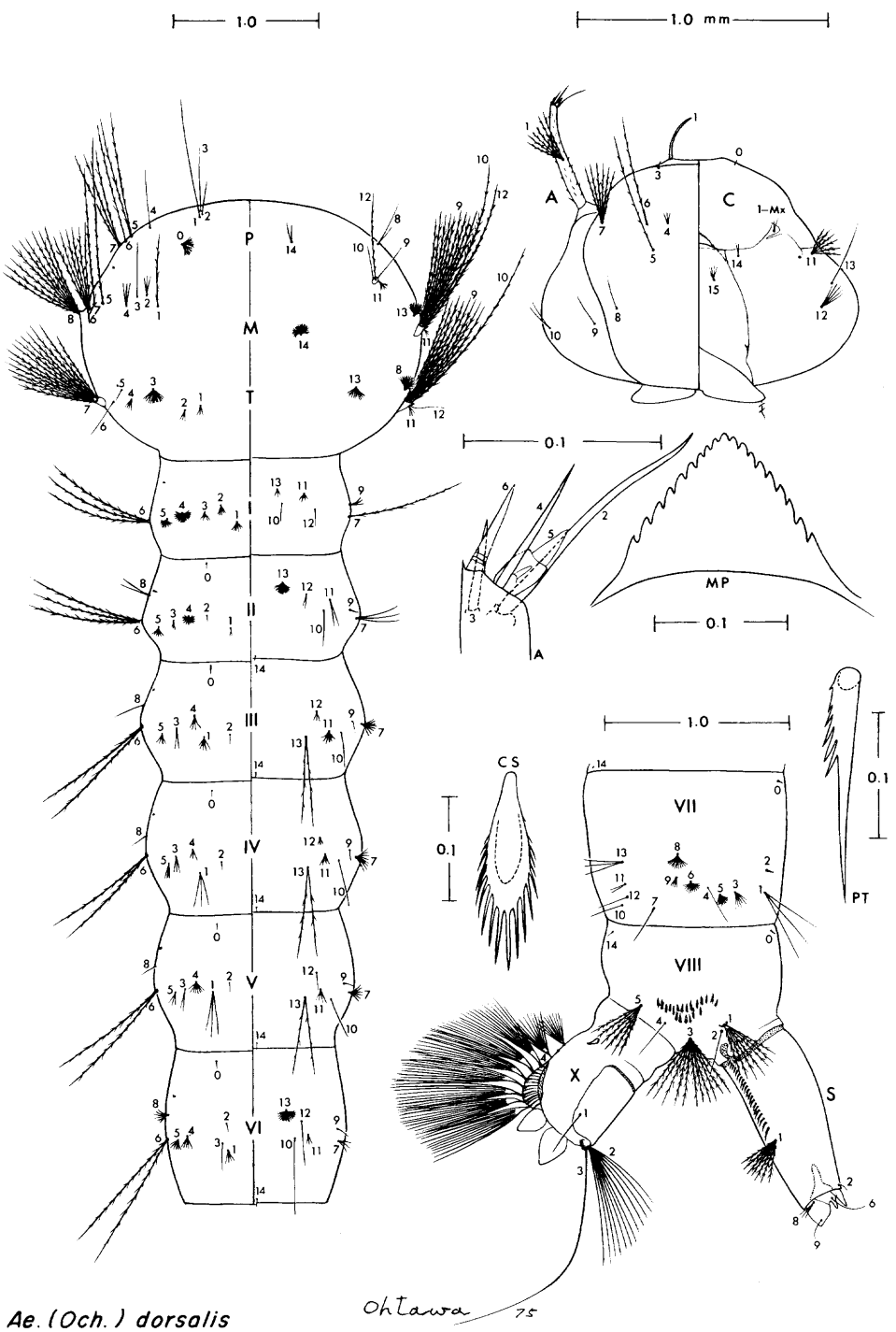
Fig. 79



Ae. (Och.) vigilax

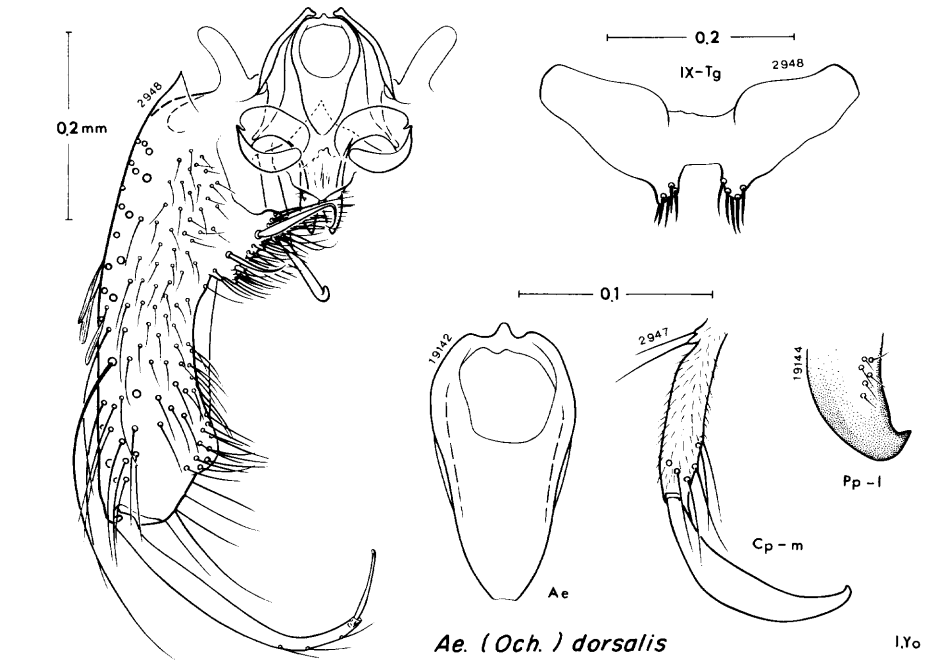
m. misaki

Fig. 80



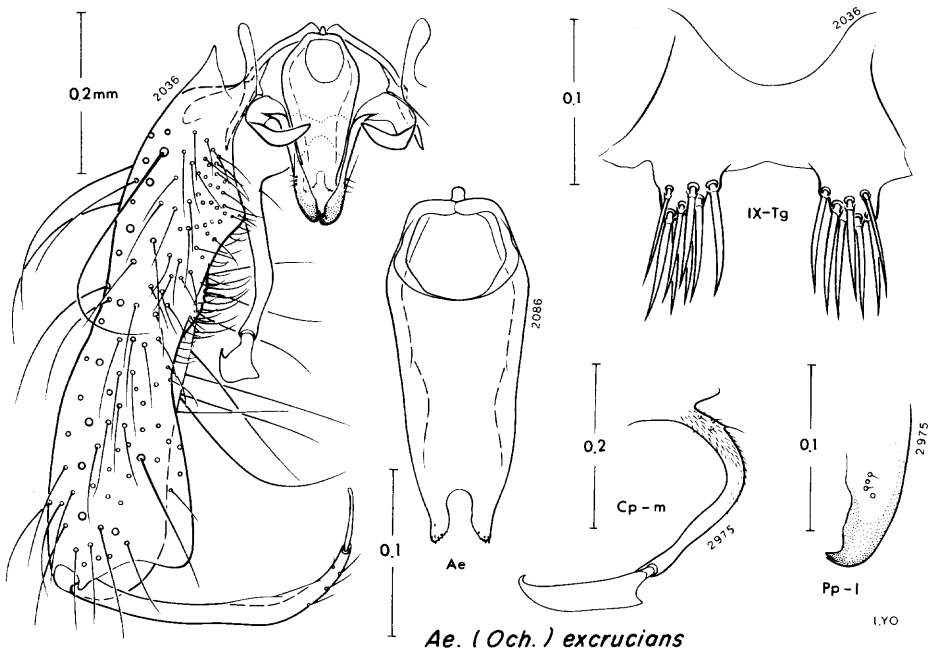
Ae. (Och.) dorsalis

Fig. 81



Ae. (Och.) dorsalis

I.Yo



Ae. (Och.) excrucians

I.YO

Fig. 82

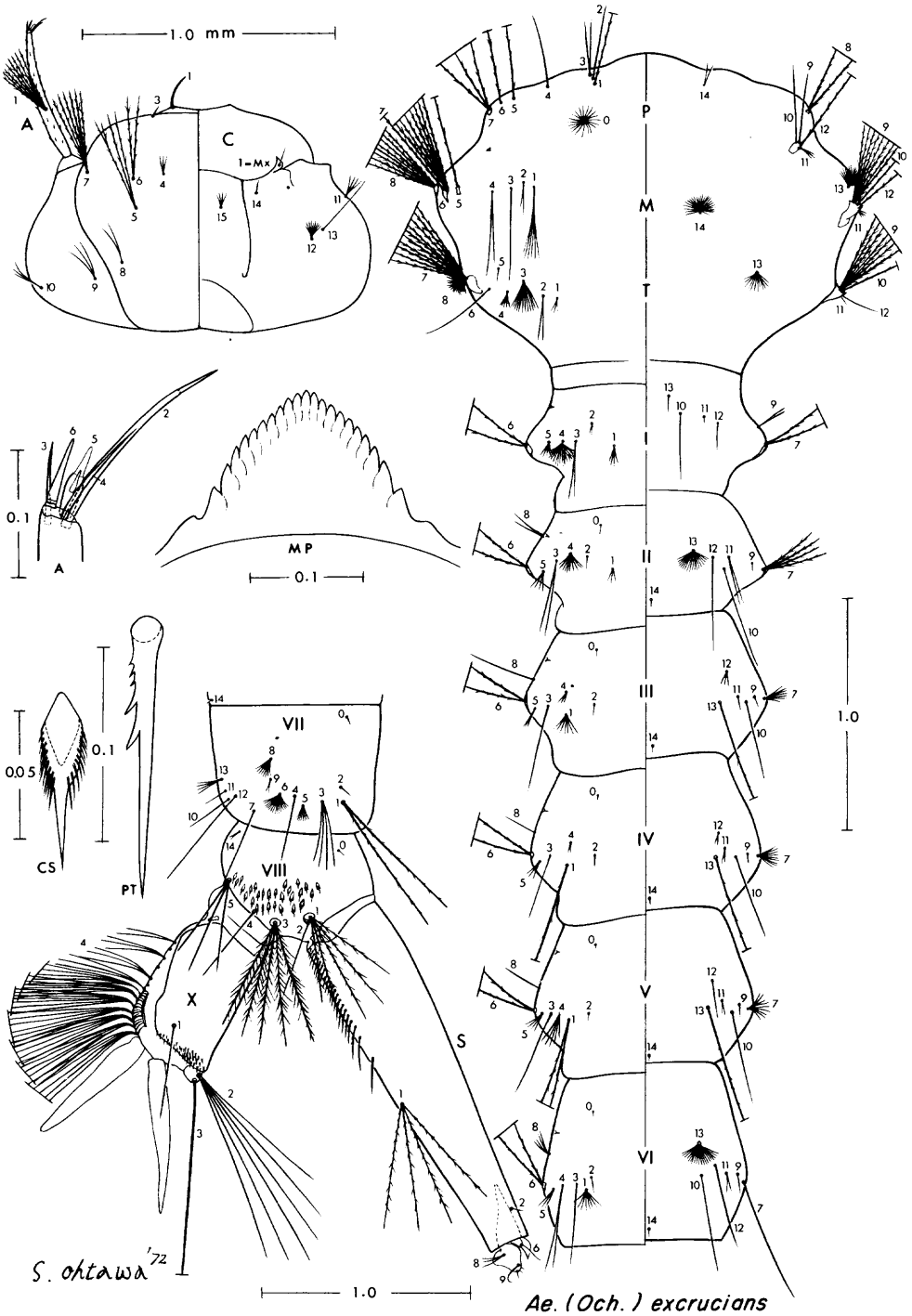
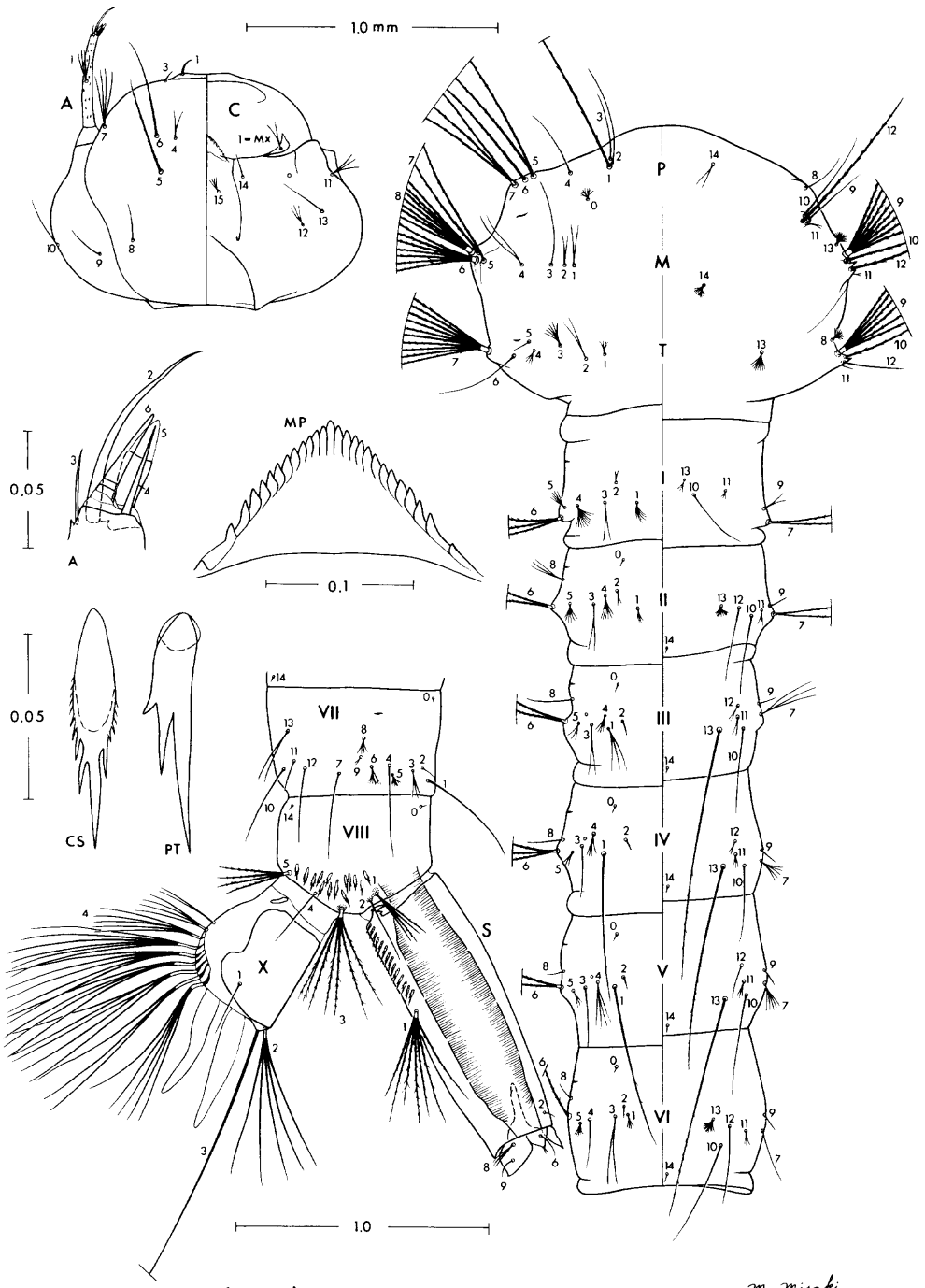

1.0 mm
A
C
1-Mx
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
MP
0.1
0.05
CS
PT
1.0
S. ohtawa '72
Ae. (Och.) excrucians

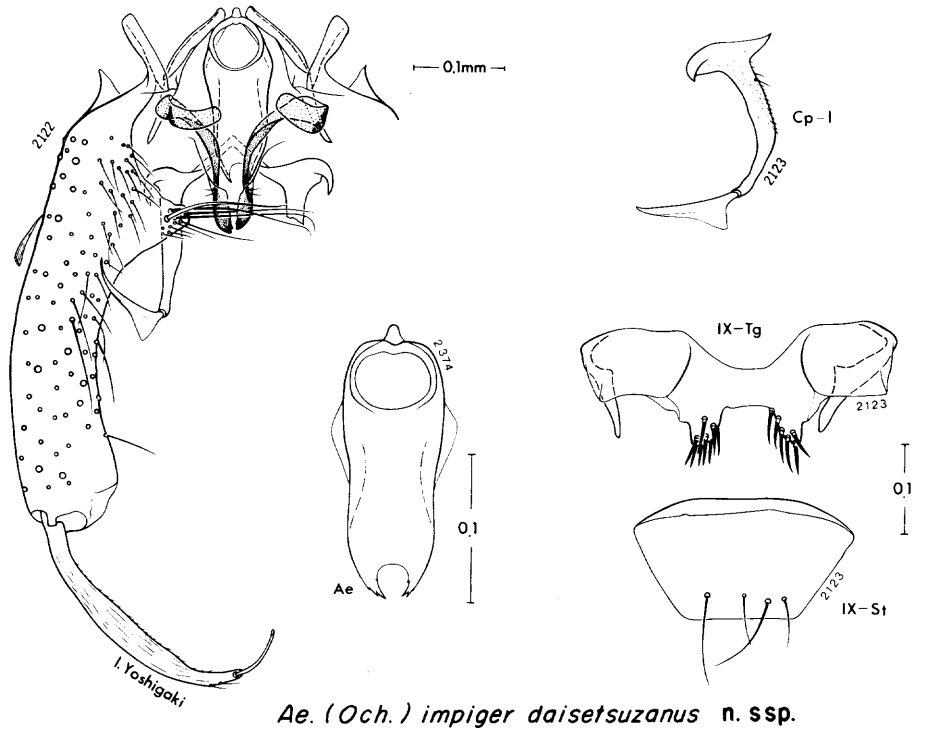
Fig. 83



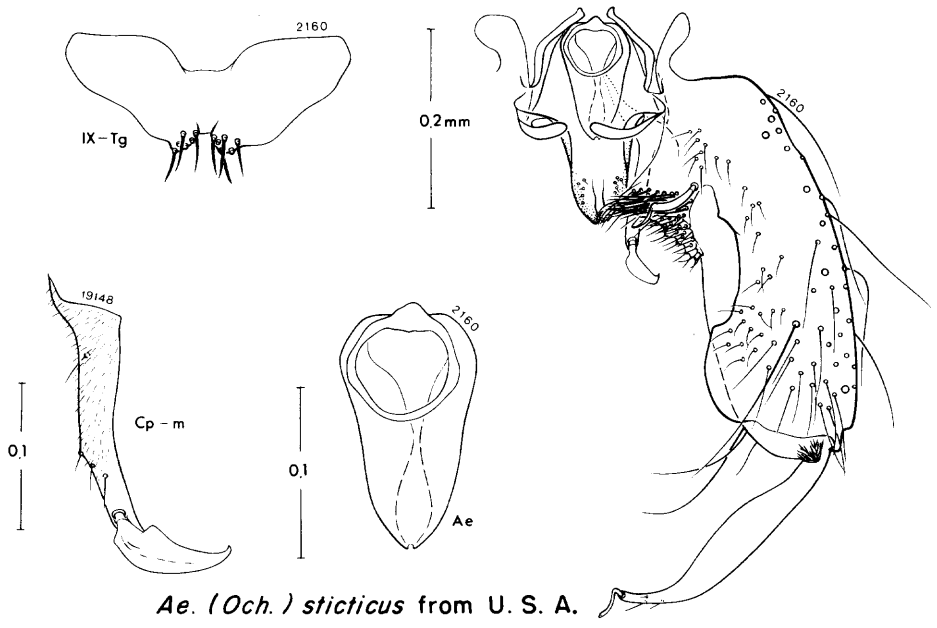
Ae. (Och.) impiger daisetsuzanus **n. ssp.**

m. misaki

Fig. 84

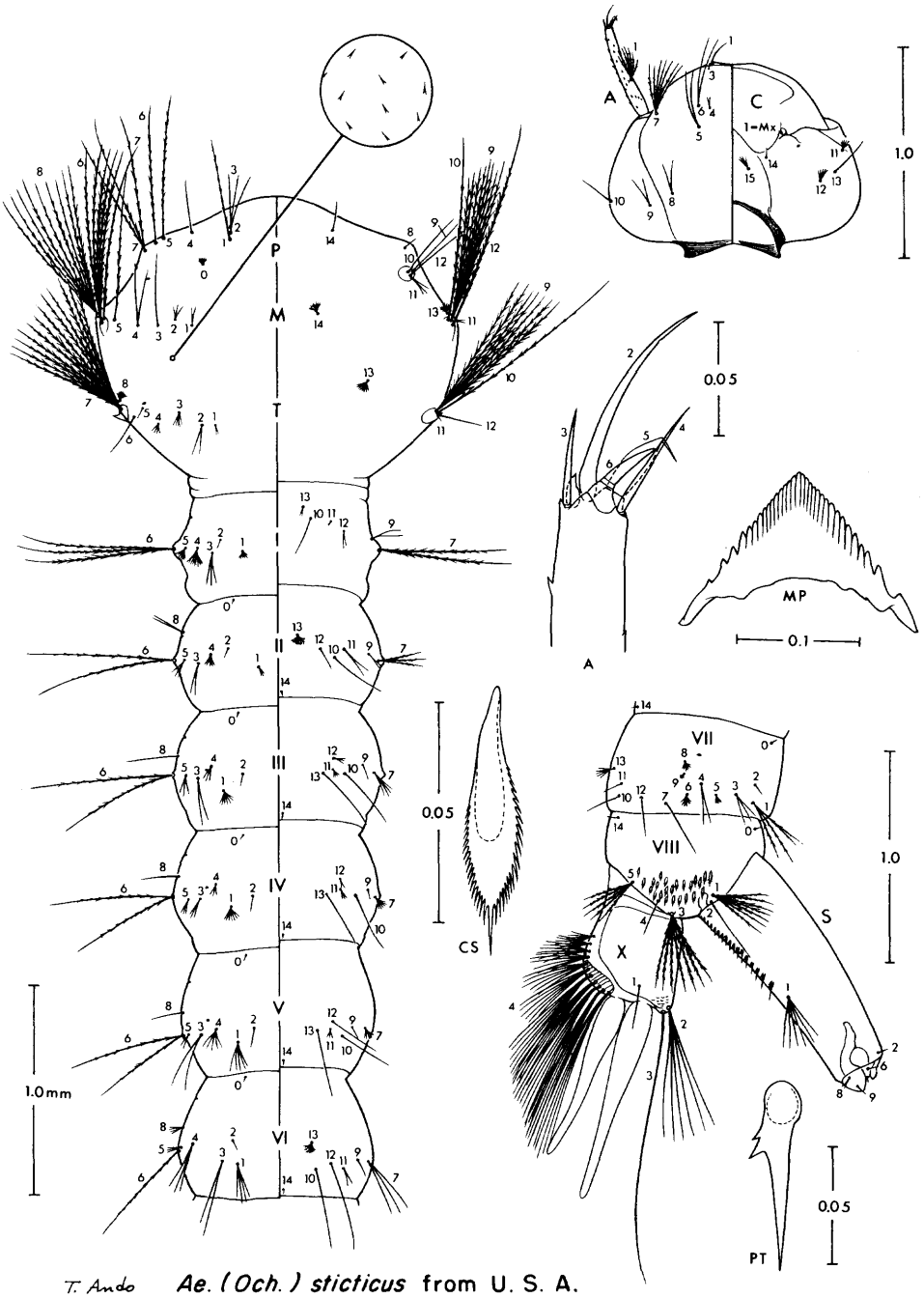


Ae. (Och.) impiger daisetsuzanus **n. ssp.**



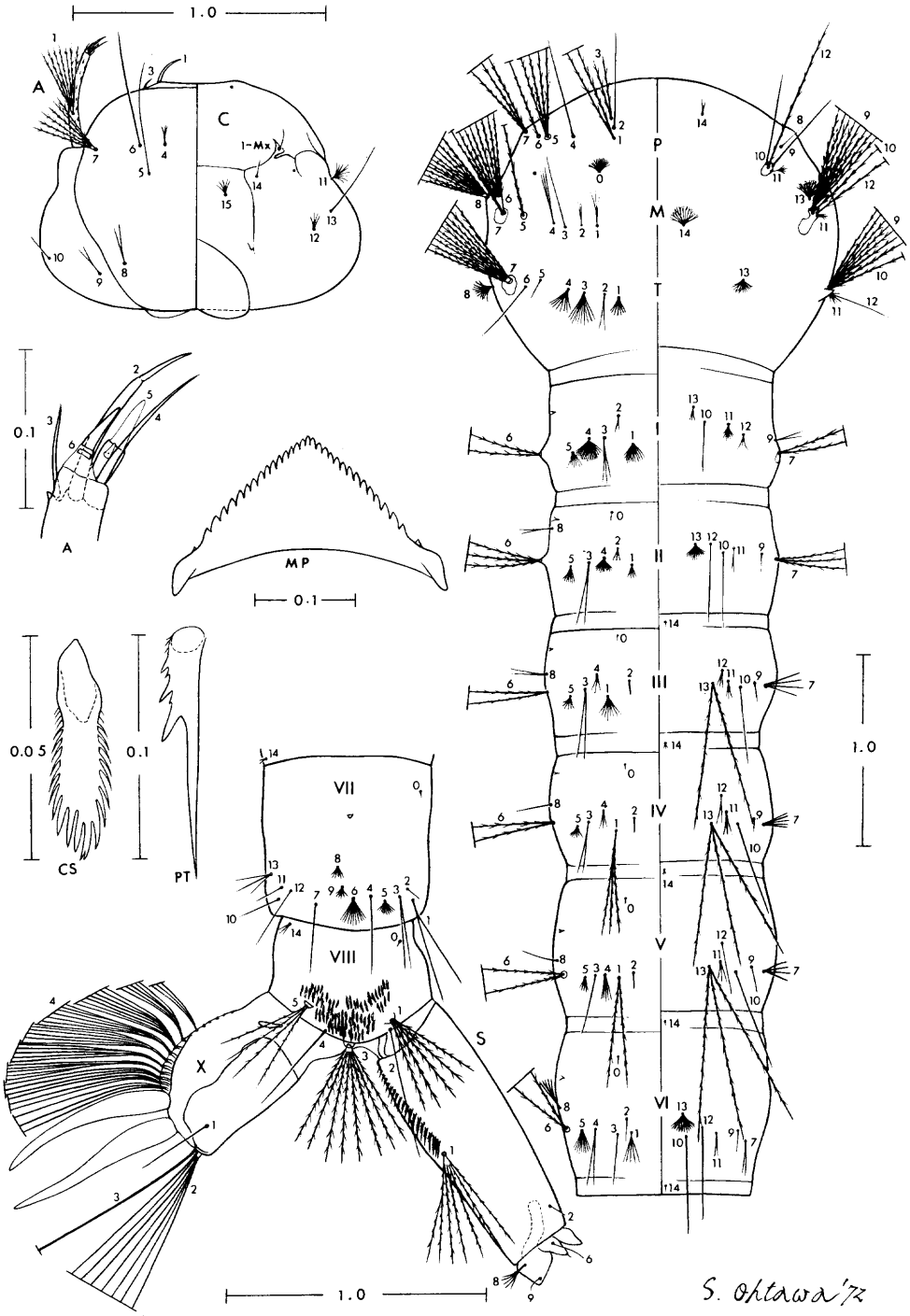
Ae. (Och.) sticticus **from U. S. A.**

Fig. 85



T. Ando *Ae. (Och.) sticticus* from U. S. A.

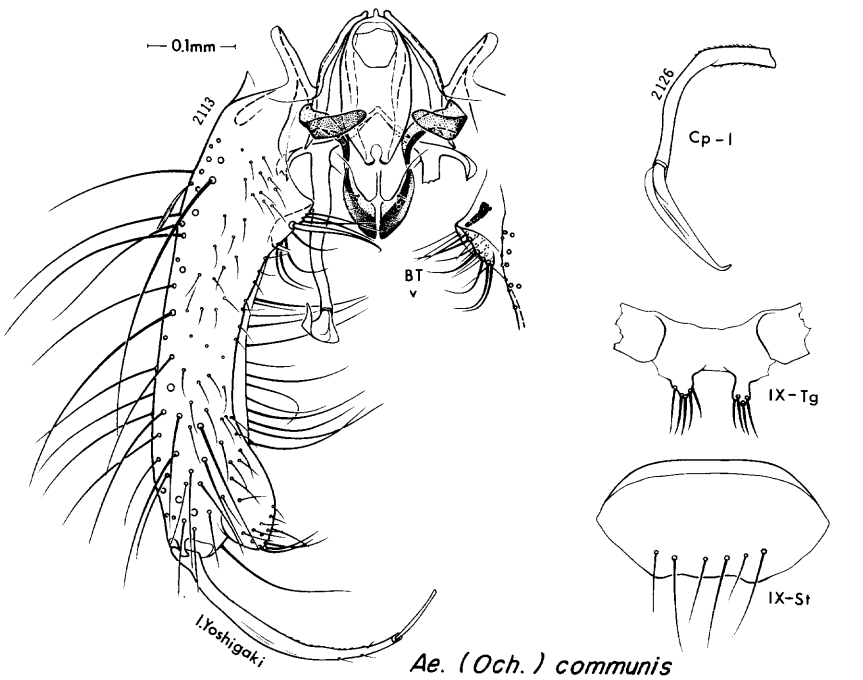
Fig. 86



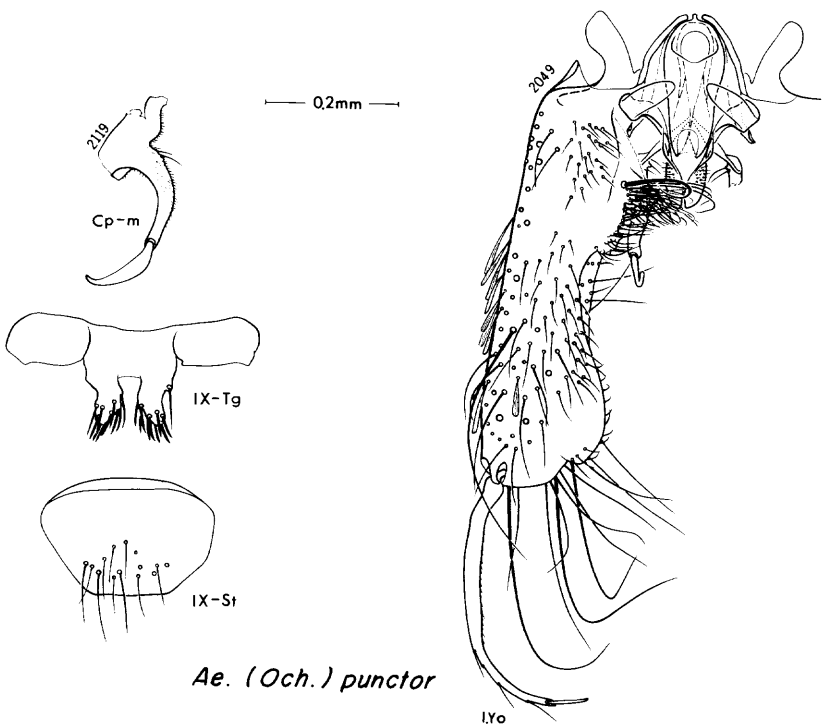
S. Ohtaki '72

Ae. (Och.) communis

Fig.87

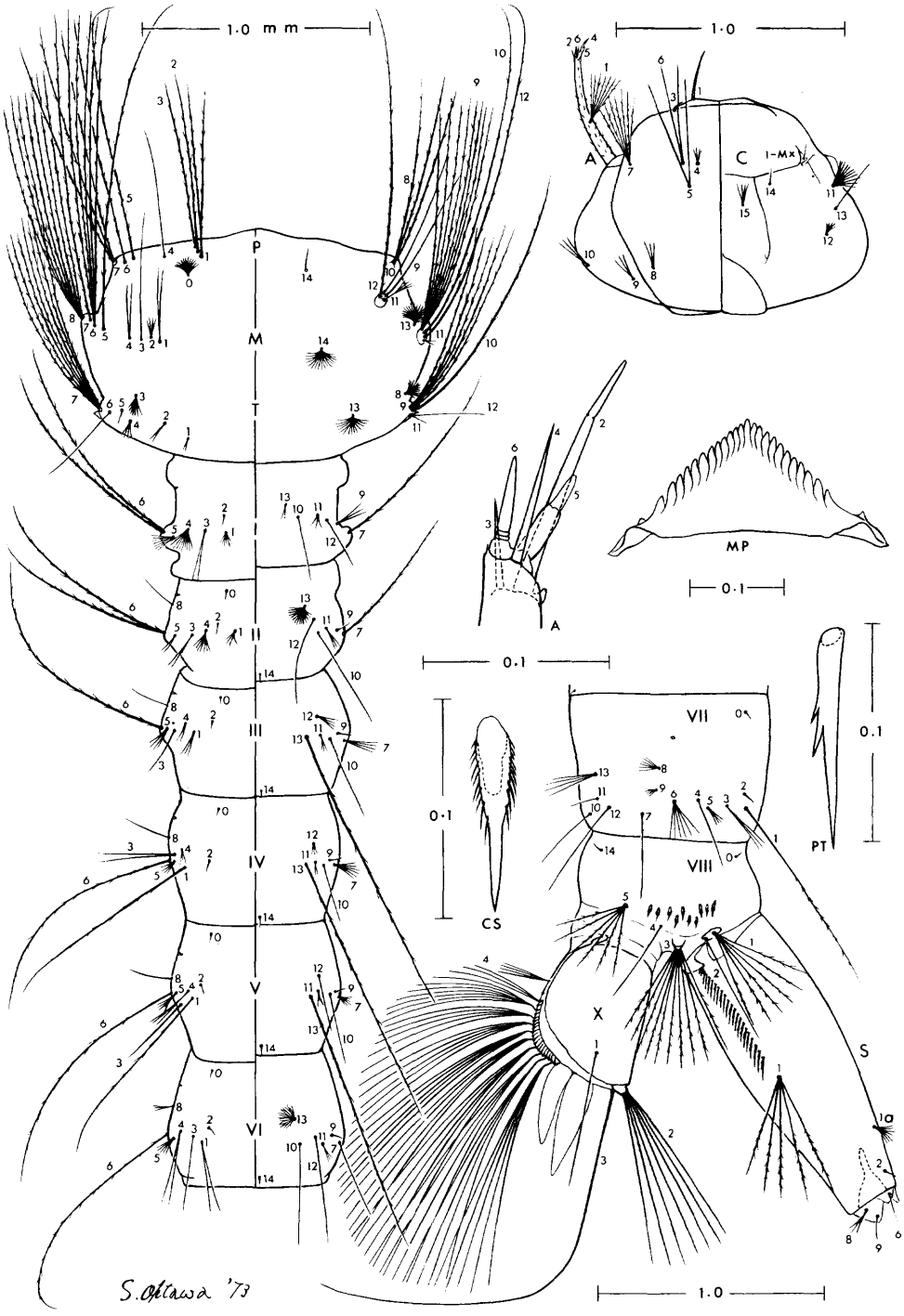


Ae. (Och.) communis



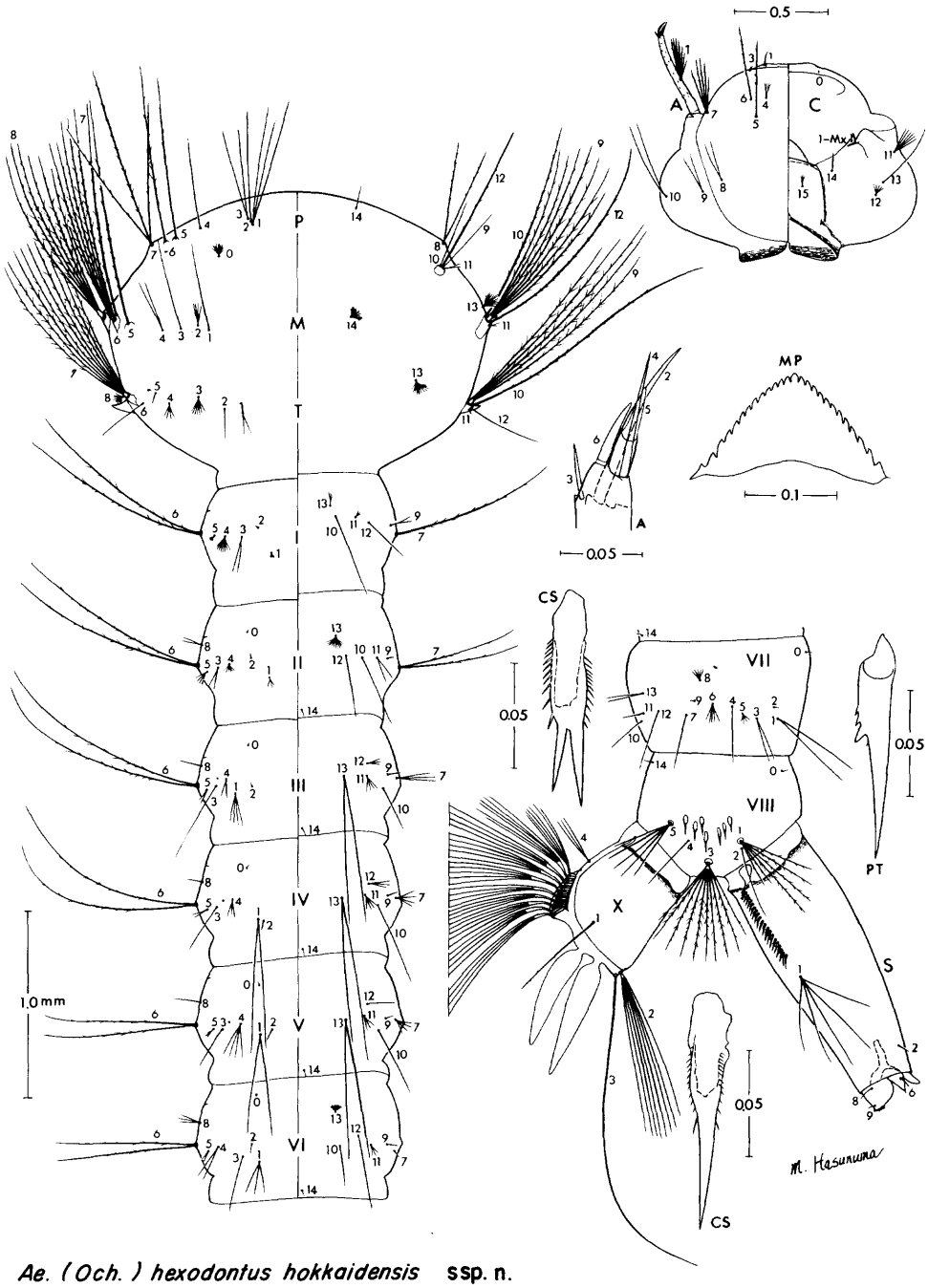
Ae. (Och.) punctor

Fig. 88



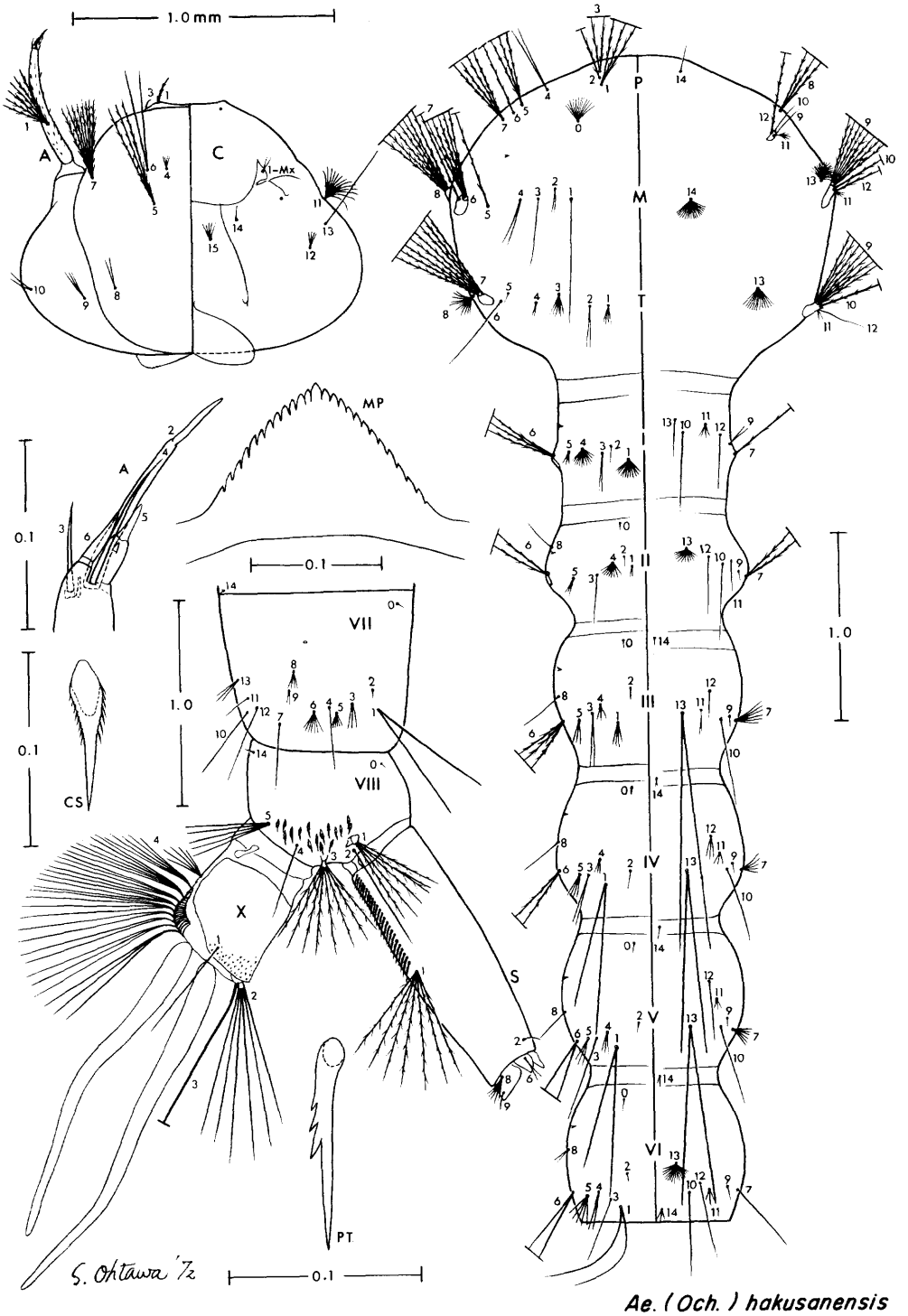
Ae. (Och.) punctor

Fig. 89



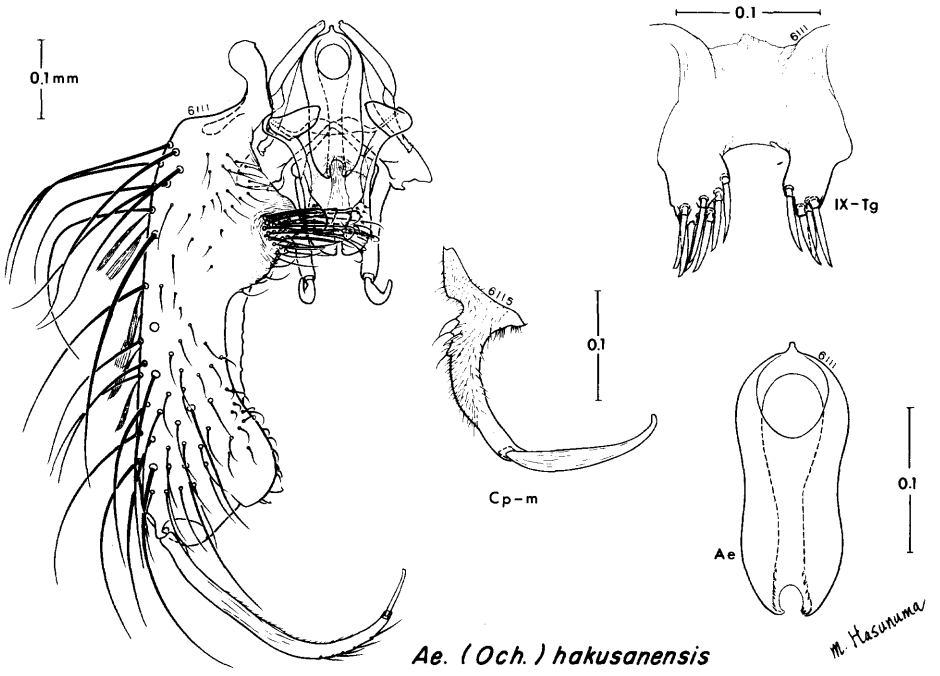
Ae. (Och.) hexodontus hokkaidensis **ssp. n.**

Fig. 90

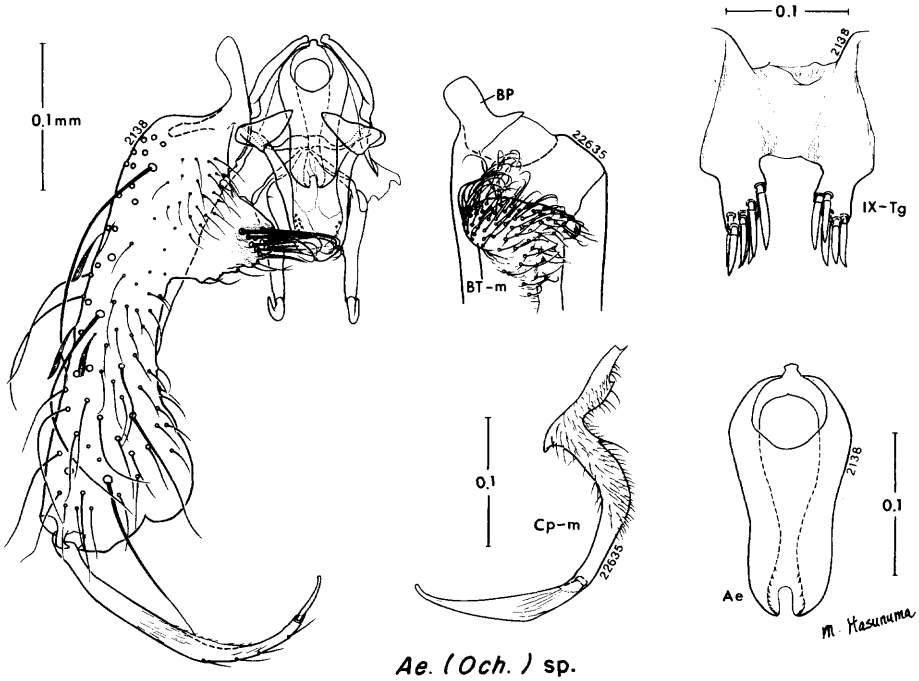


Ae. (Och.) hakusanensis

Fig. 91

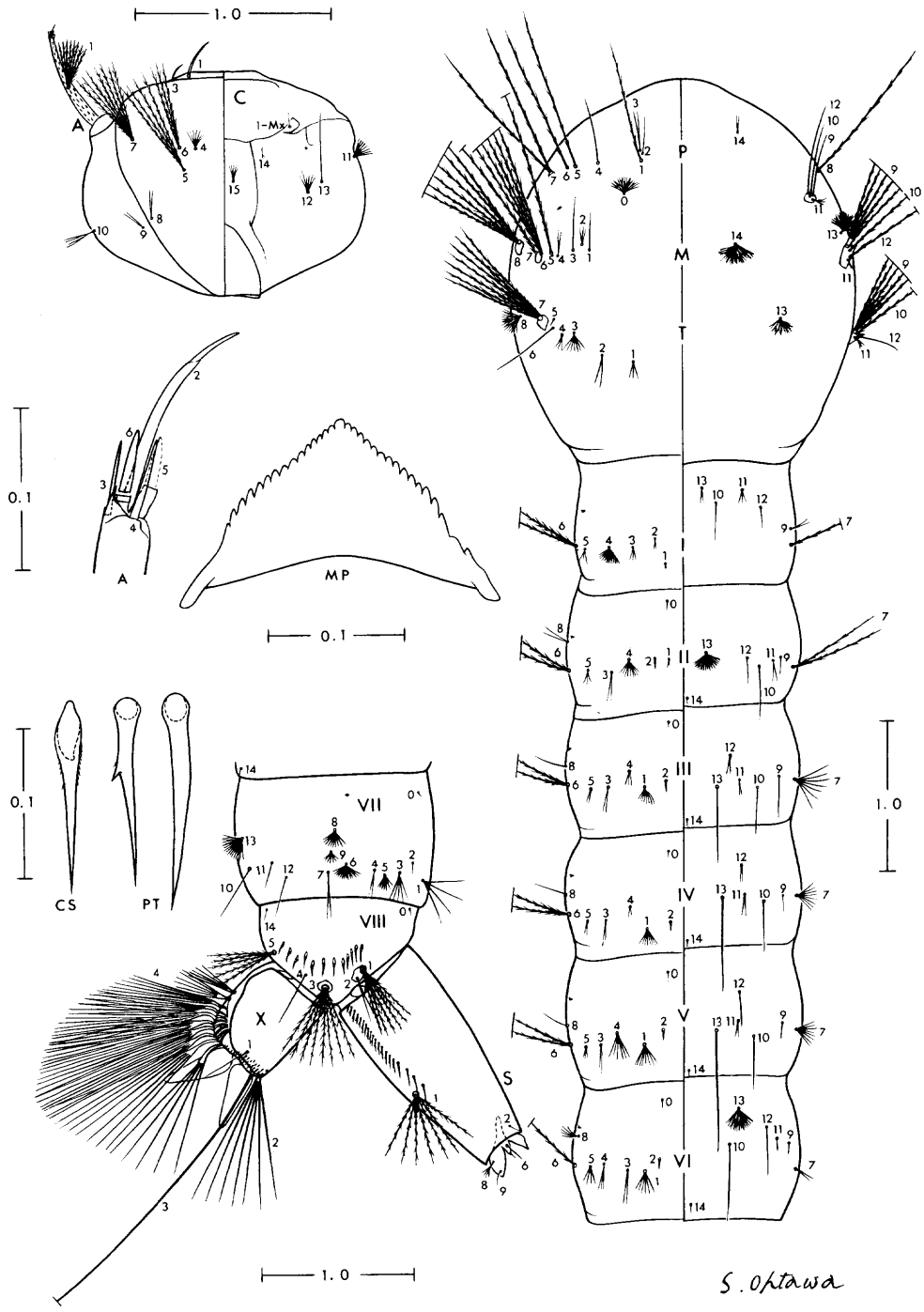


Ae. (Och.) hakusanensis



Ae. (Och.) sp.

Fig. 92



Ae. (Och.) intrudens

Fig. 93

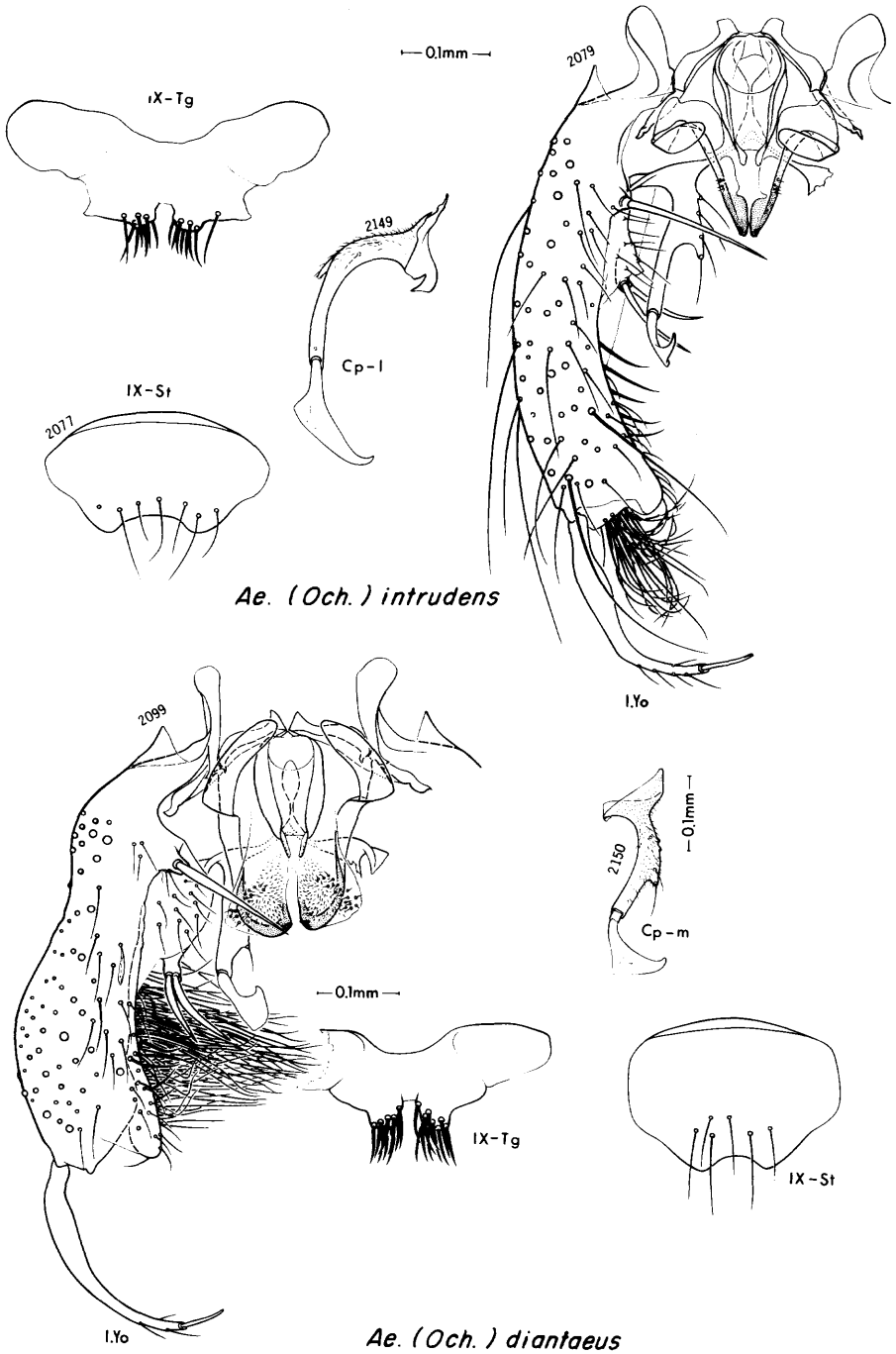
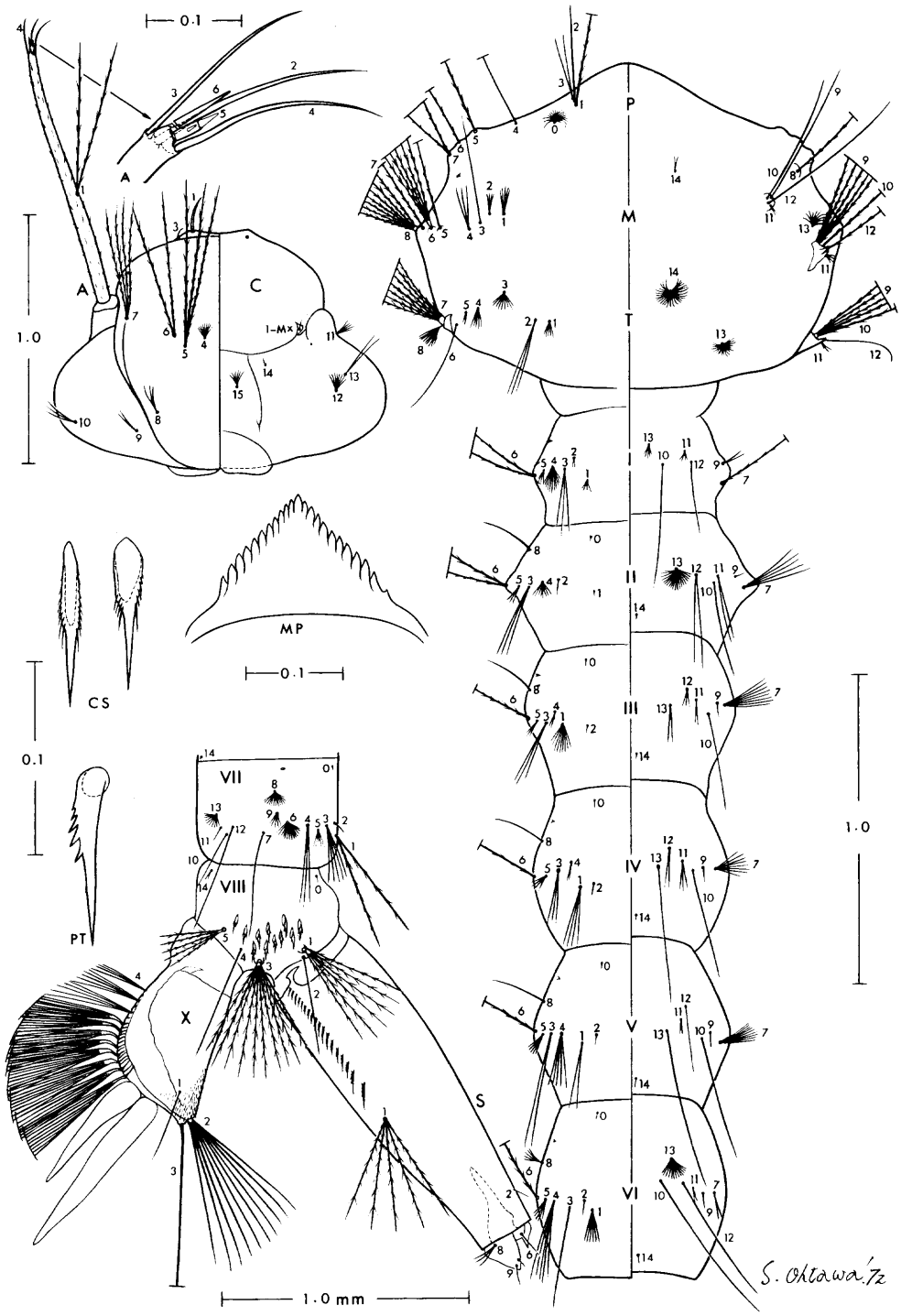
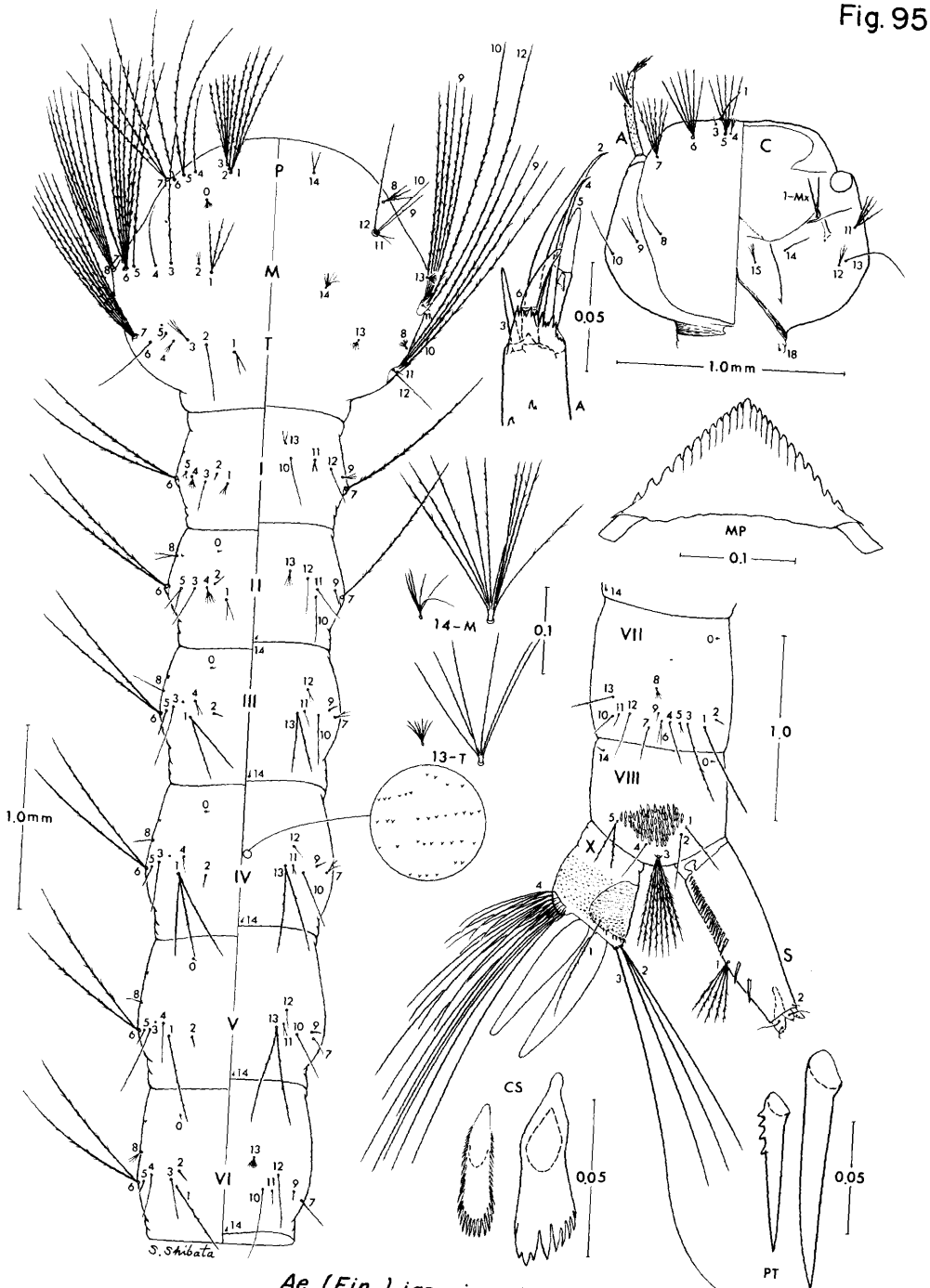

0.1mm
IX-Tg
2149
Cp-I
IX-St
2077
2079
I.Yo
Ae. (Och.) intrudens
2099
0.1mm
IX-Tg
I.Yo
2150
0.1mm
Cp-m
IX-St
Ae. (Och.) diantaeus

Fig. 94



Ae. (Och.) diantaeus

Fig. 95



Ae. (Fin.) japonicus japonicus

Fig.96

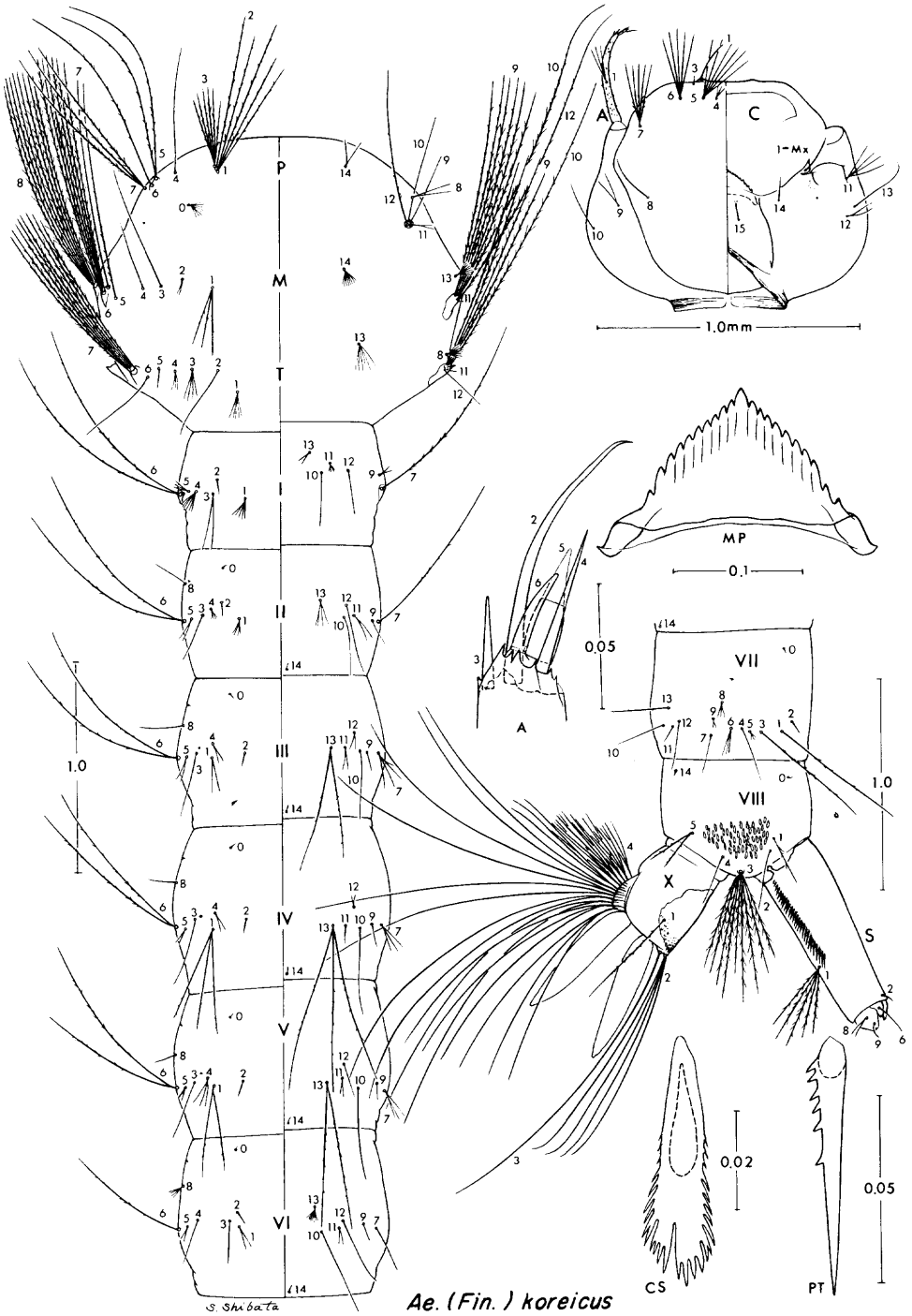
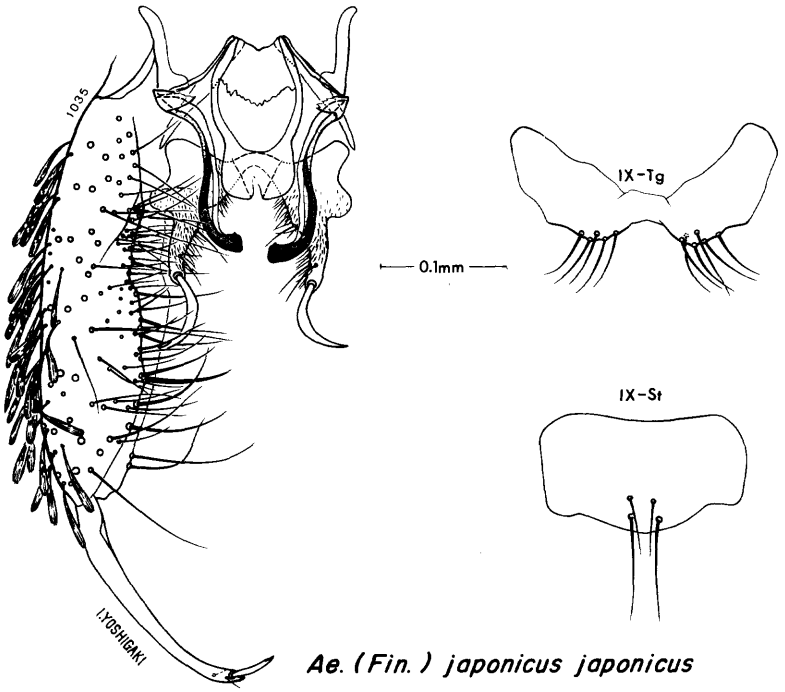
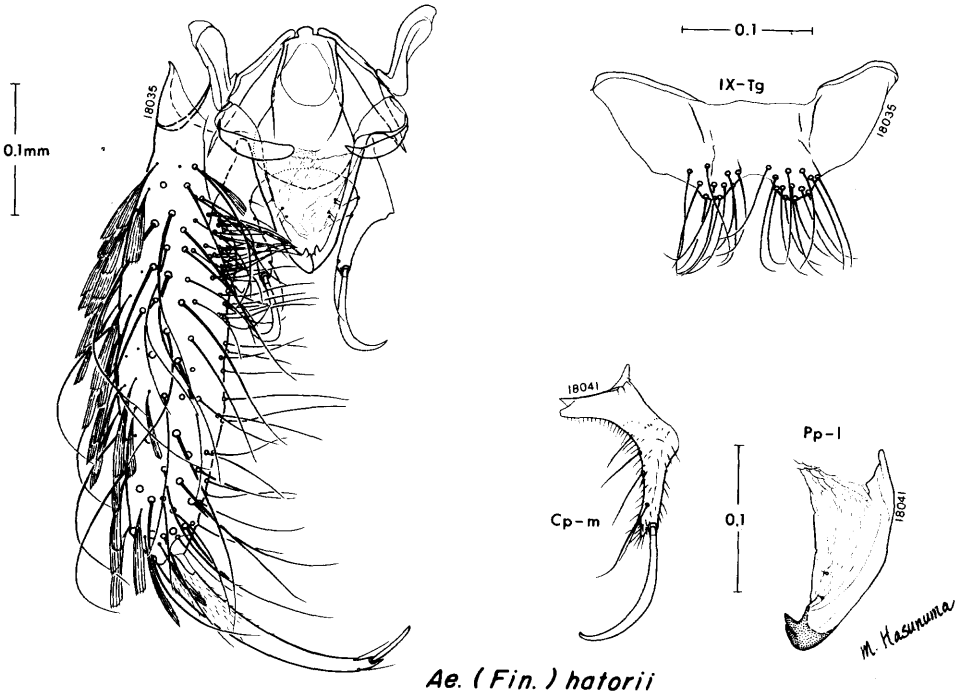

P
M
T
I
II
III
IV
V
VI
VII
VIII
X
S
A
C
1-Mx
MP
1.0mm
0.1
0.05
1.0
0.02
CS
PT
S. Shibata
Ae. (Fin.) koreicus

Fig. 97

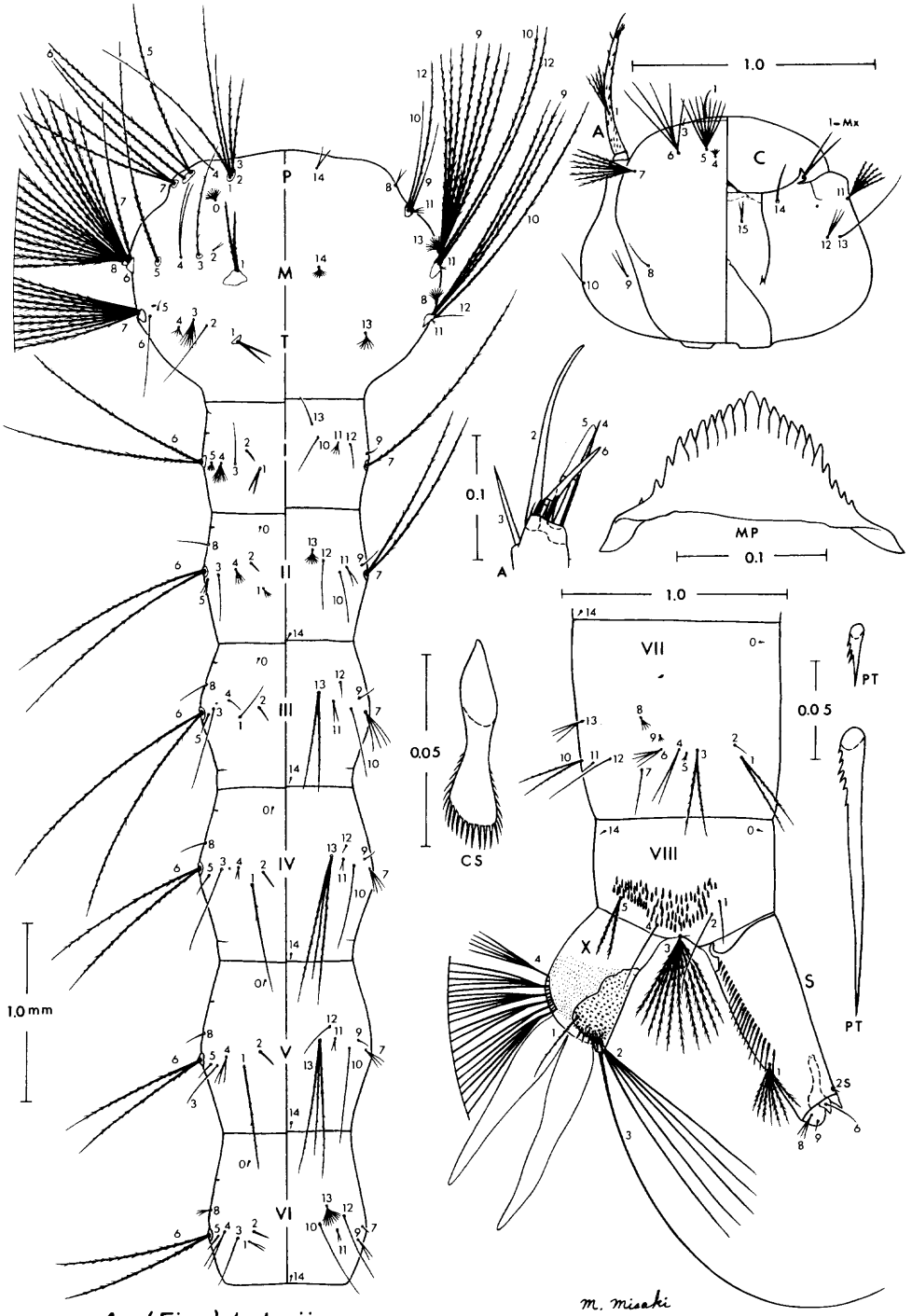


Ae. (Fin.) japonicus japonicus



Ae. (Fin.) hatorii

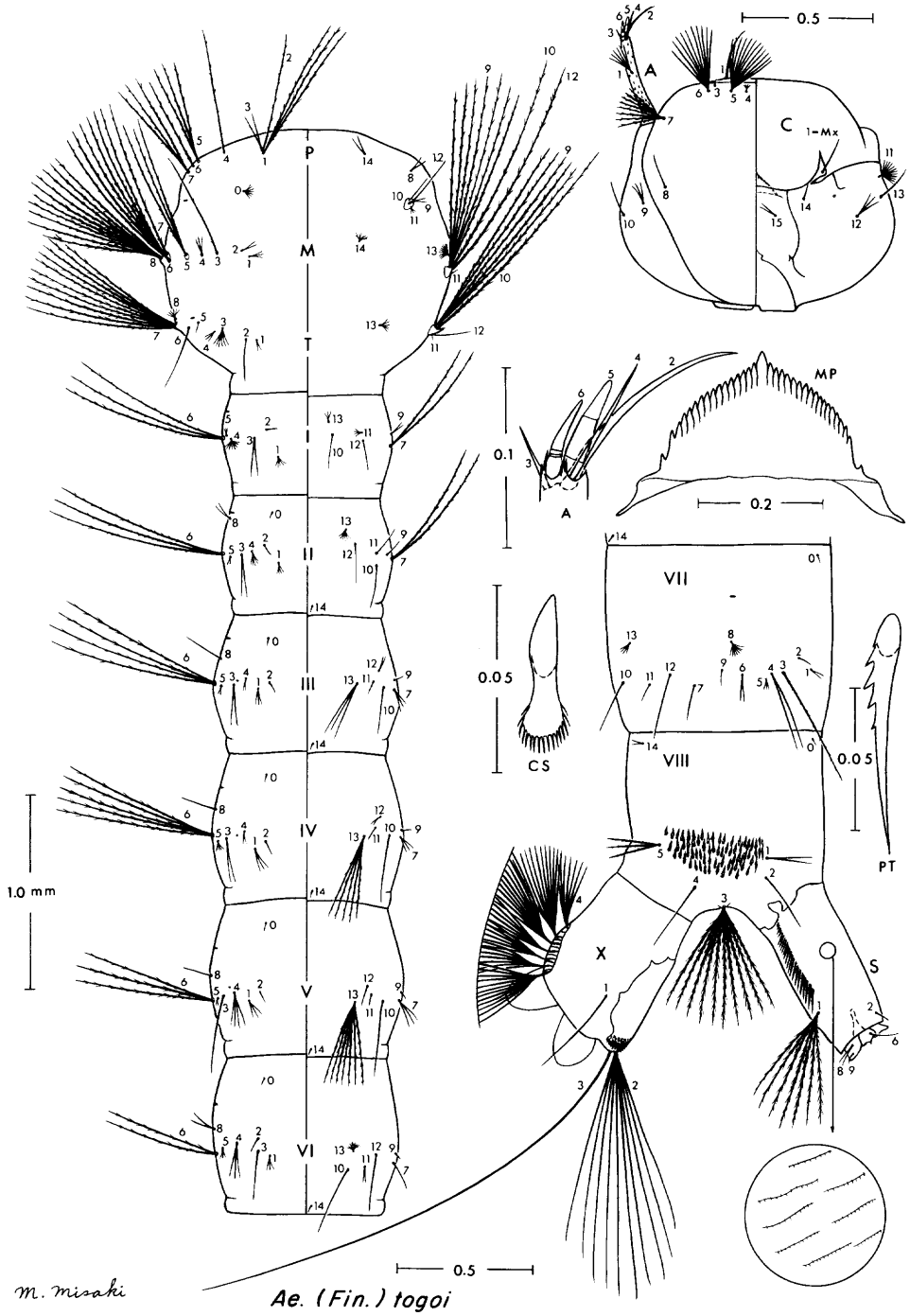
Fig. 98



Ae. (Fin.) hatorii

m. misaki

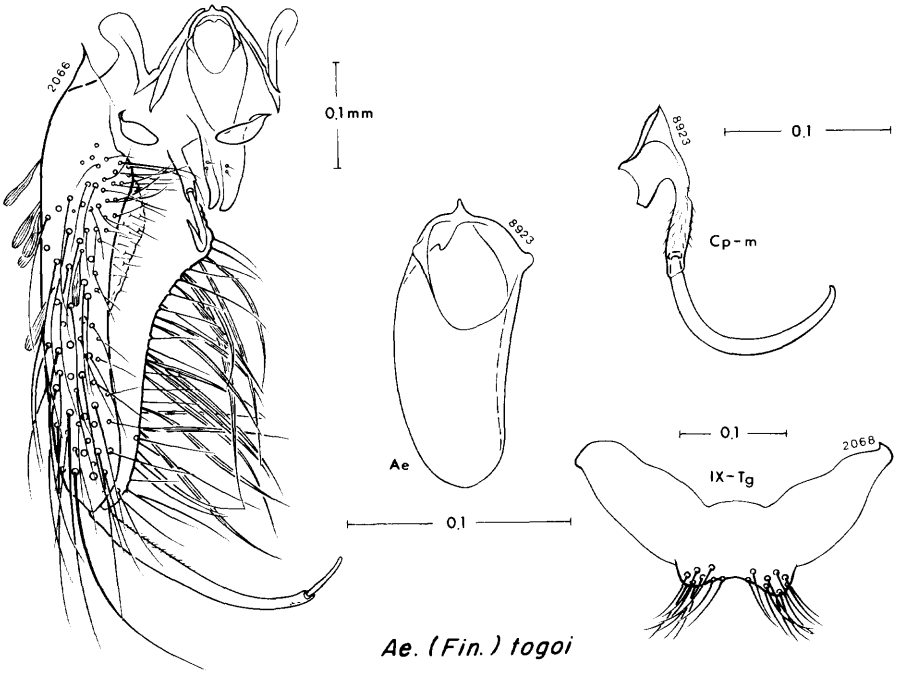
Fig. 99



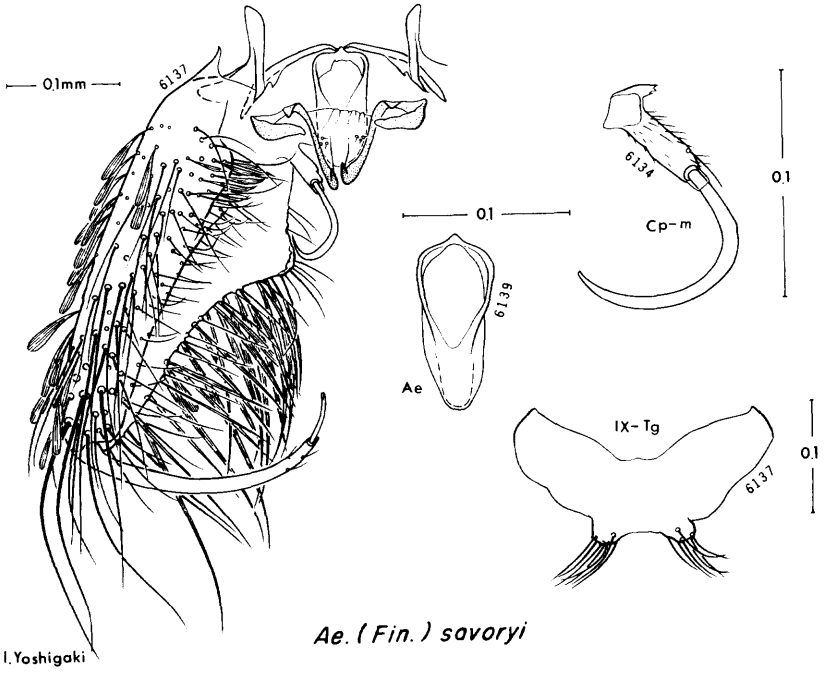
m. misaki

Ae. (Fin.) togoi

Fig. 100



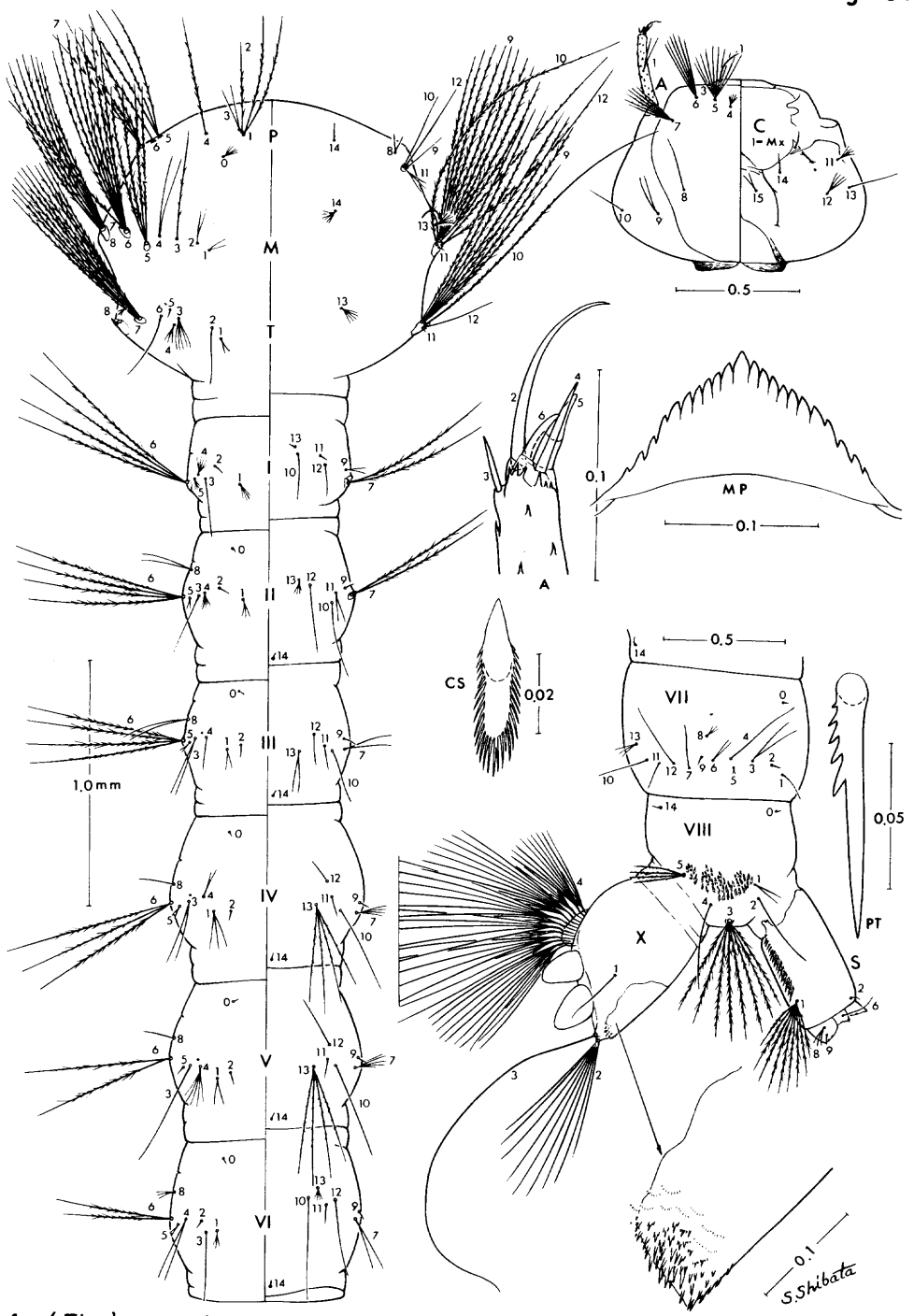
Ae. (Fin.) togoi



Ae. (Fin.) savoryi

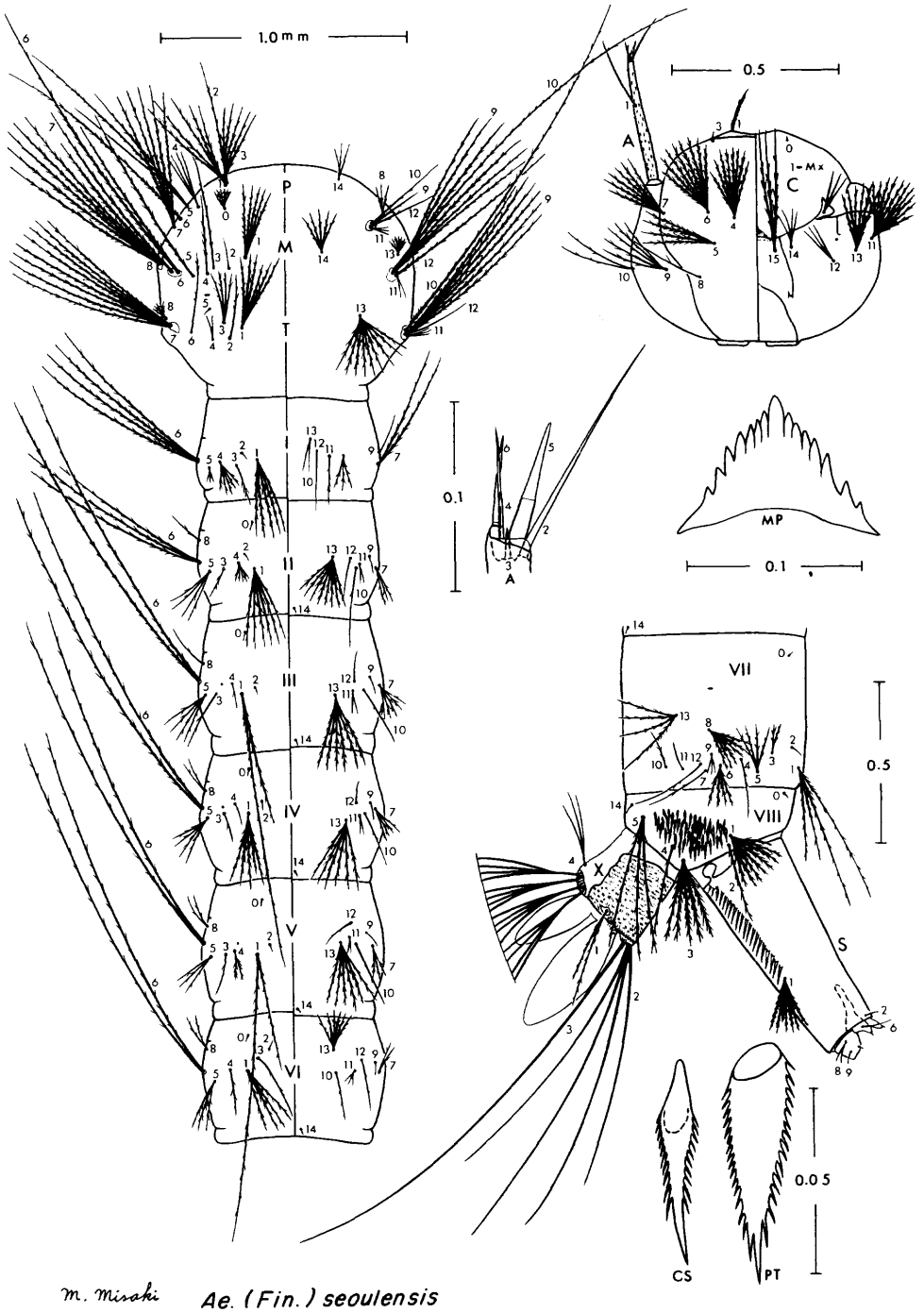
I. Yoshigaki

Fig. 101



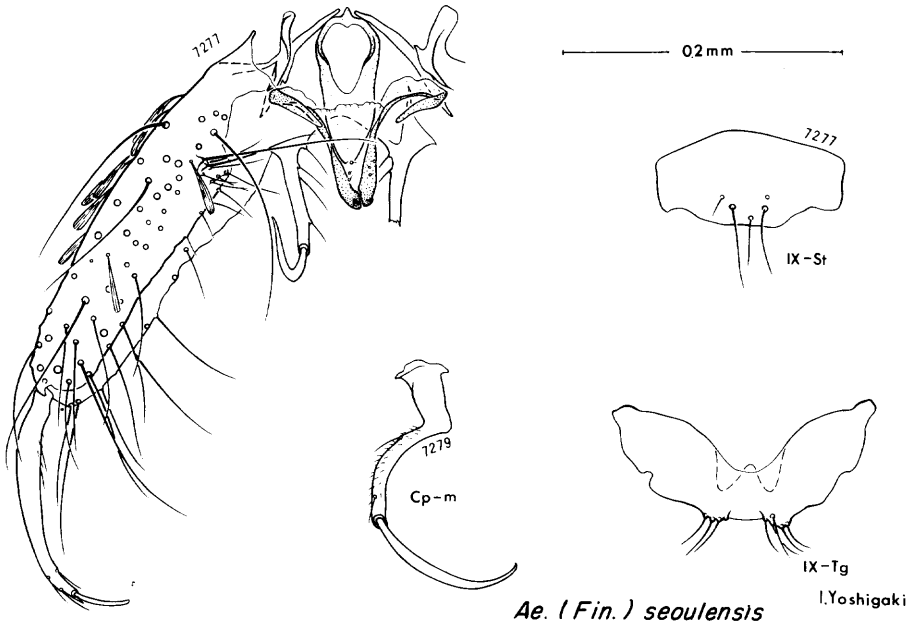
Ae. (Fin.) savoryi

Fig.102

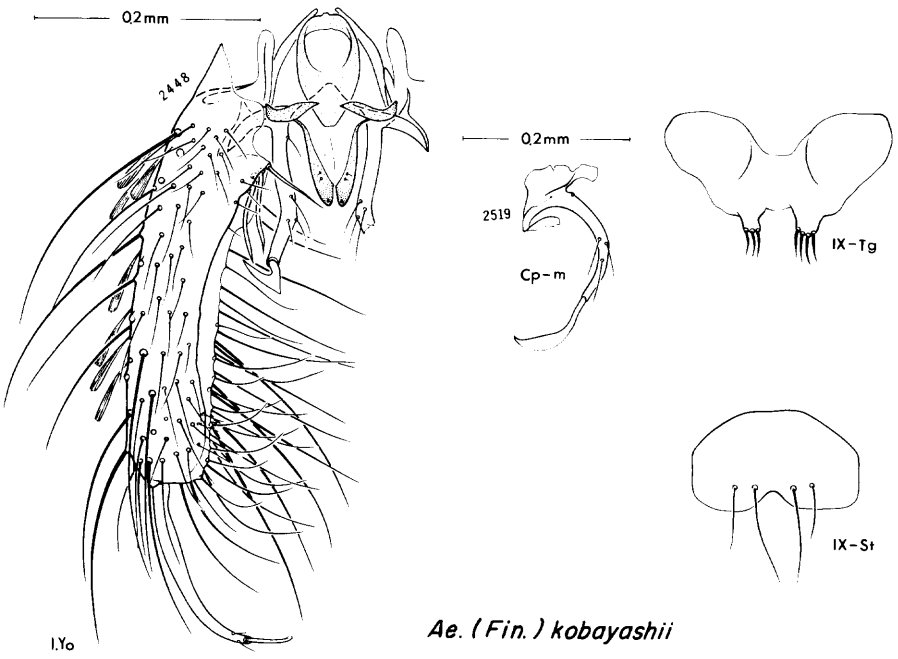


m. misaki *Ae. (Fin.) seoulensis*

Fig.103

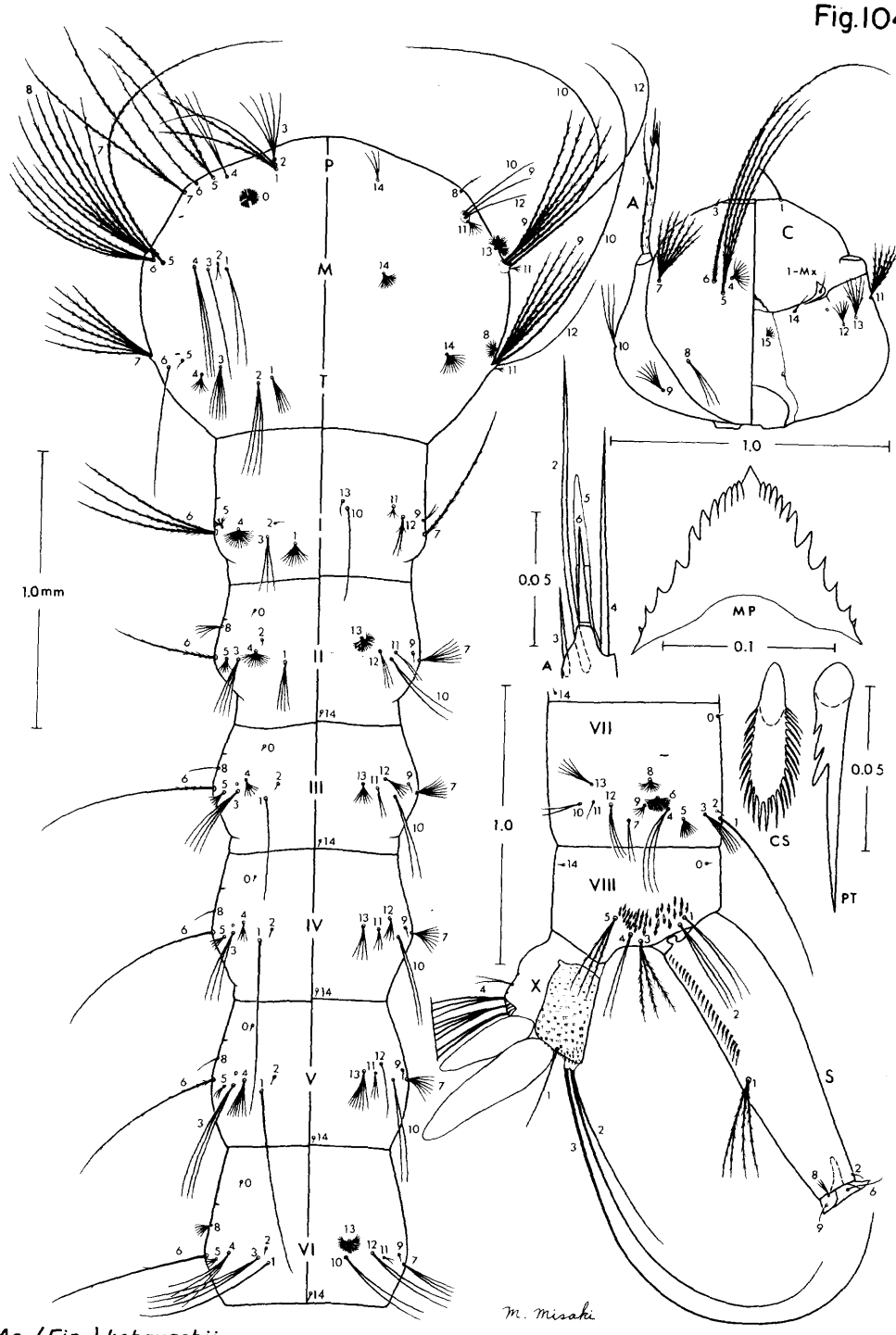


Ae. (Fin.) seoulensis



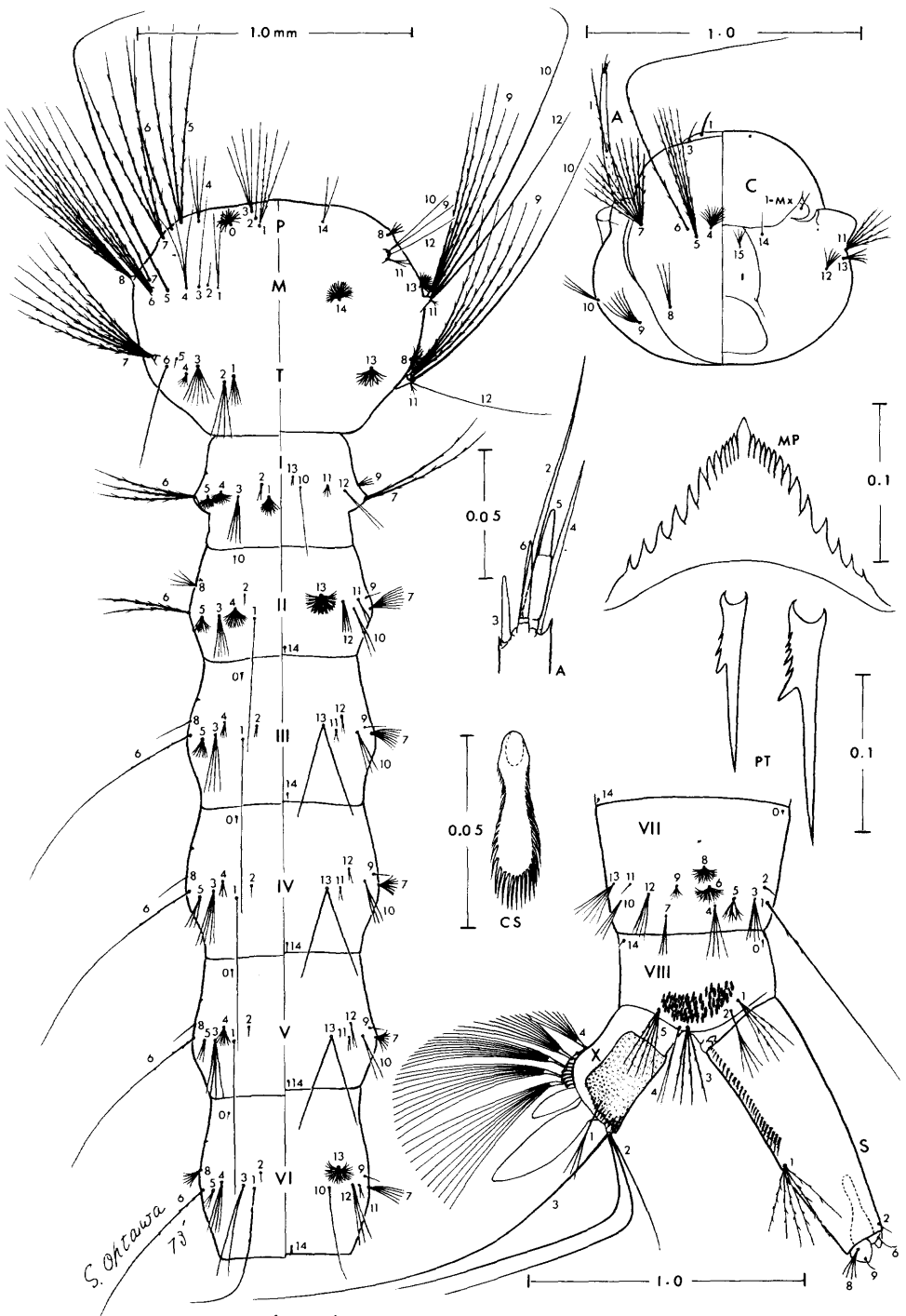
Ae. (Fin.) kobayashii

Fig.104



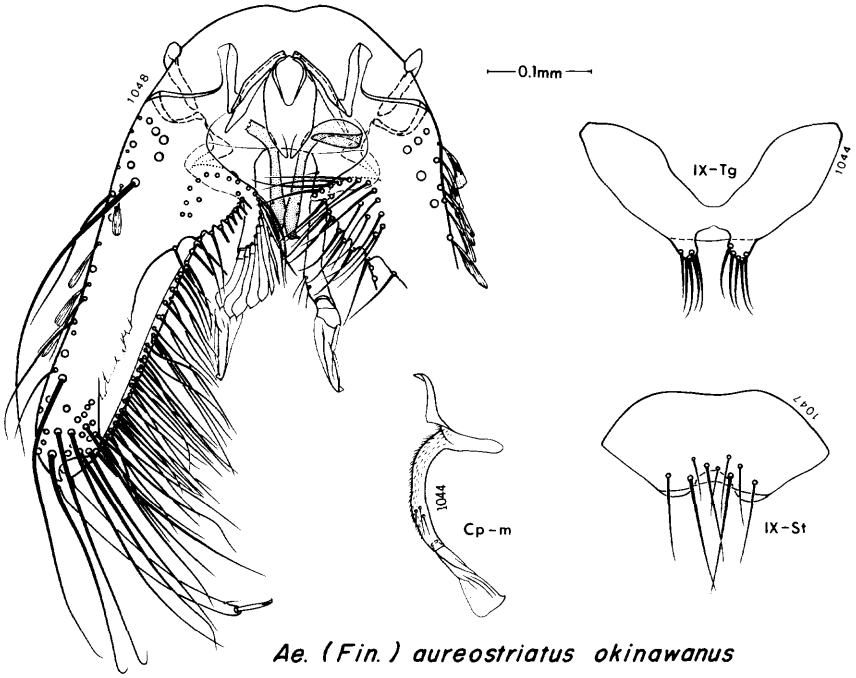
Ae. (Fin.) kobayashii

Fig.105

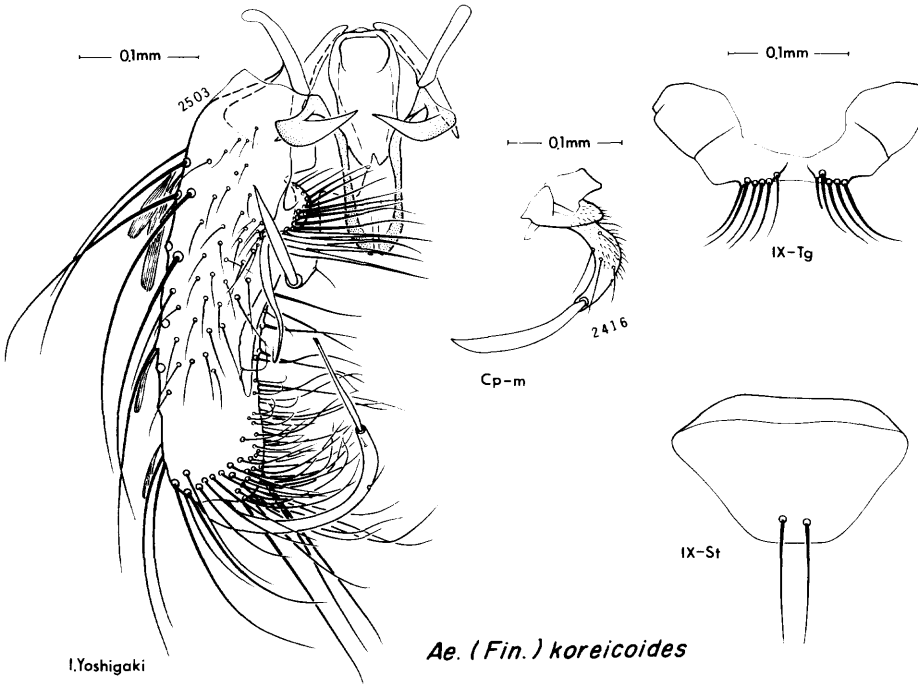


Ae. (Fin.) aureostriatus okinawanus

Fig.106

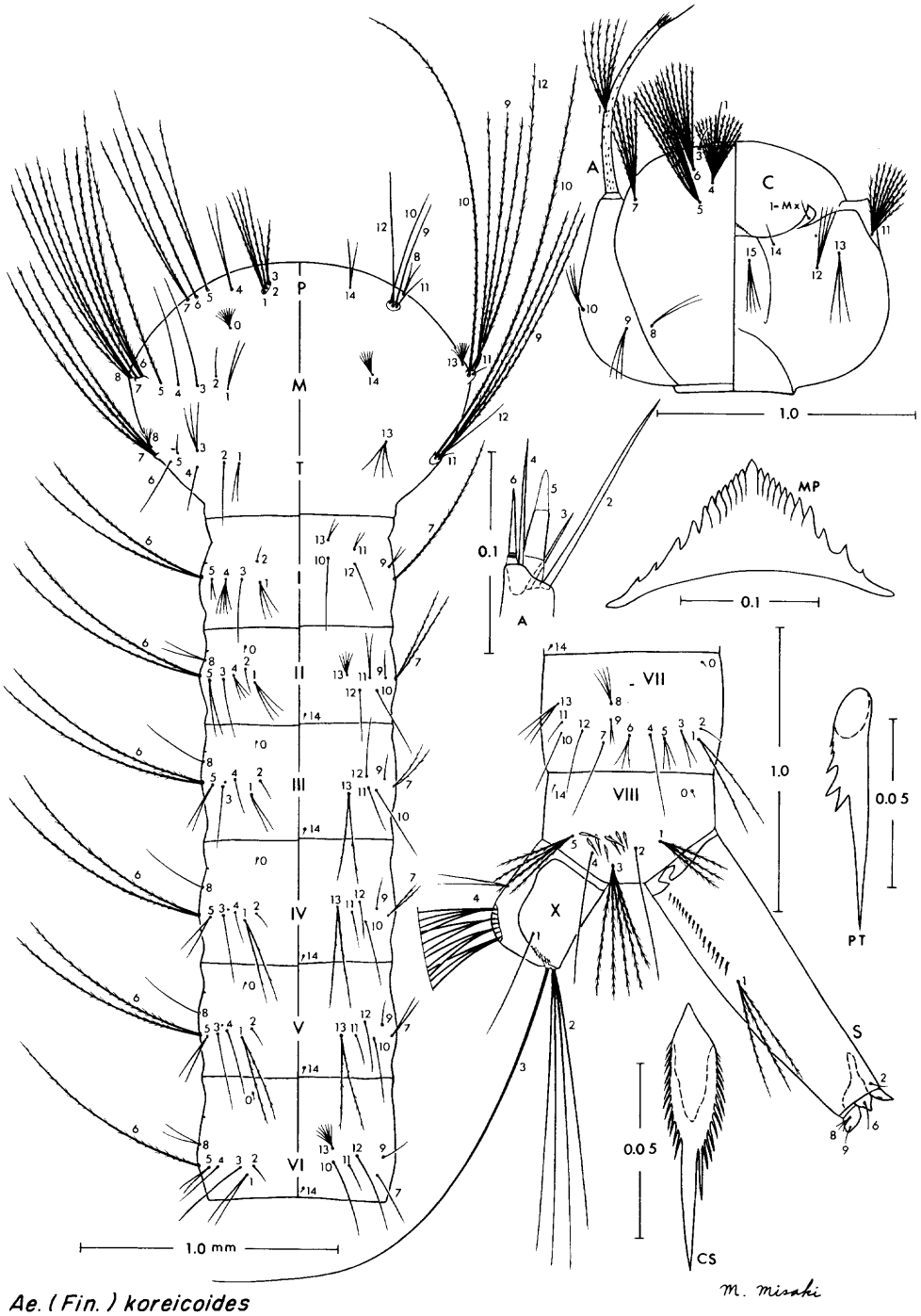


Ae. (Fin.) aureostriatus okinawanus



Ae. (Fin.) koreicoides

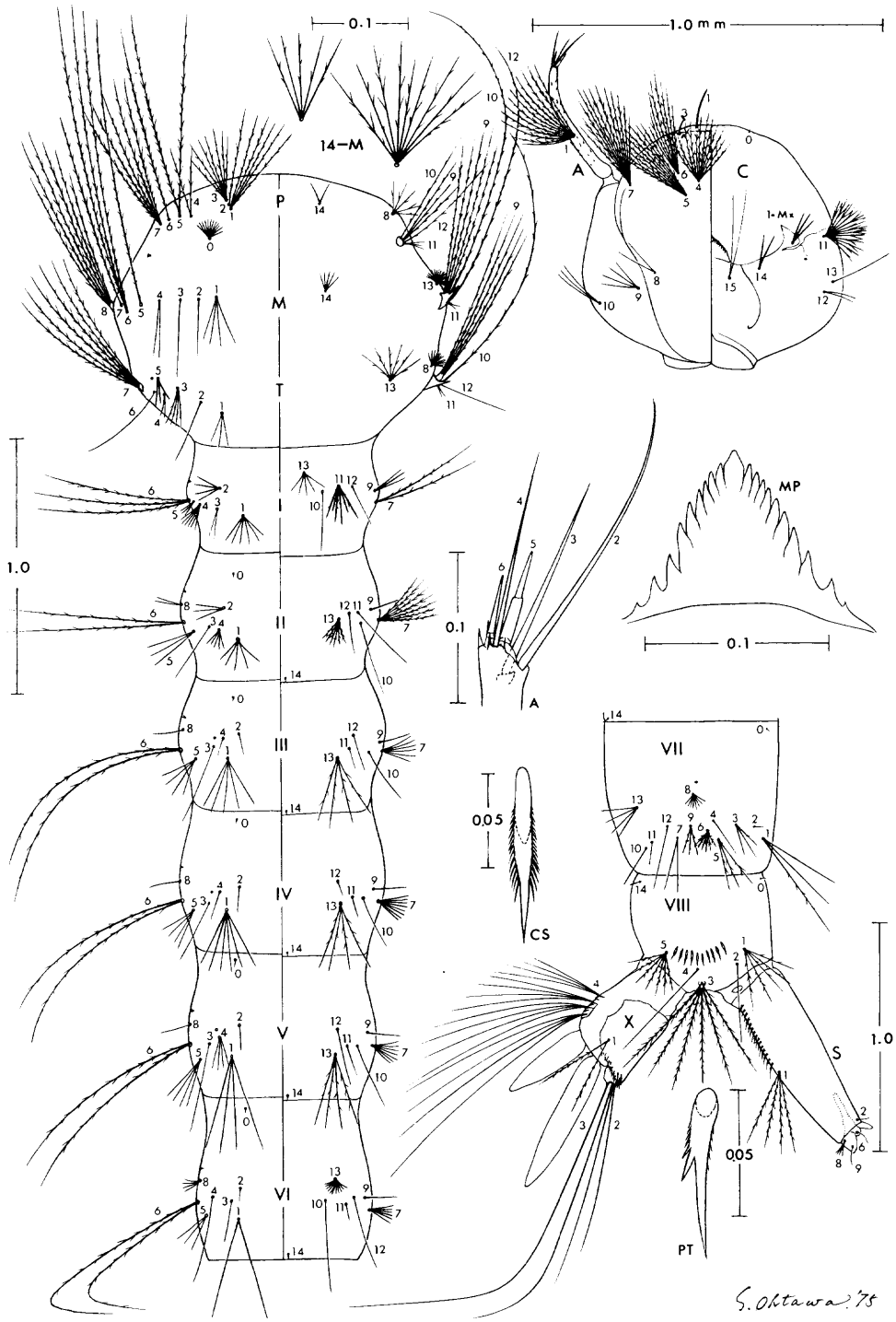
Fig.107



Ae. (Fin.) koreicoides

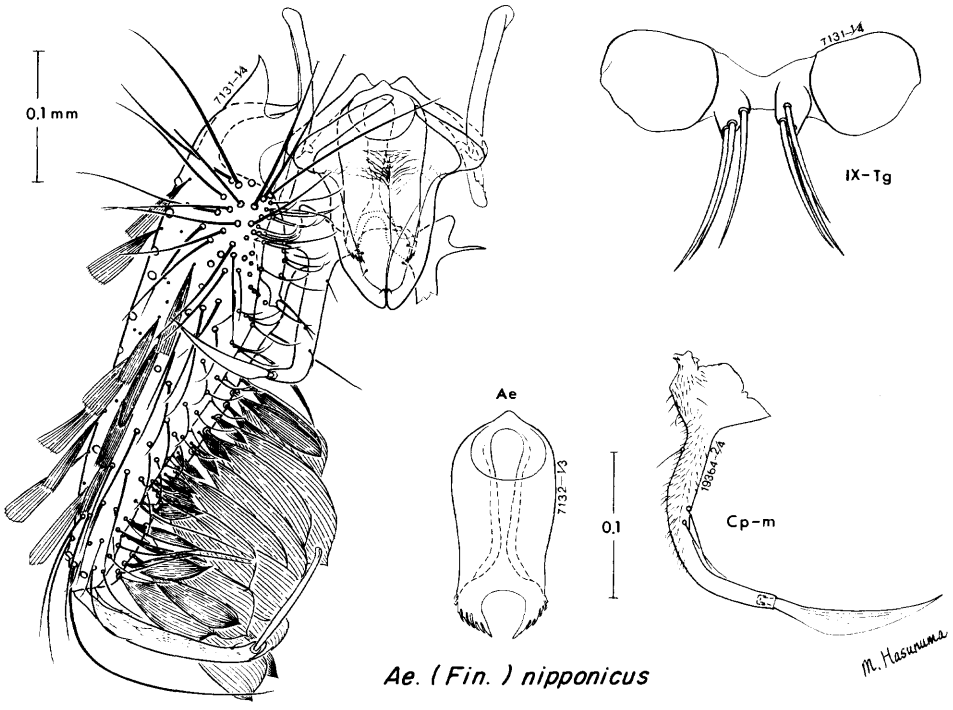
m. misaki

Fig.108

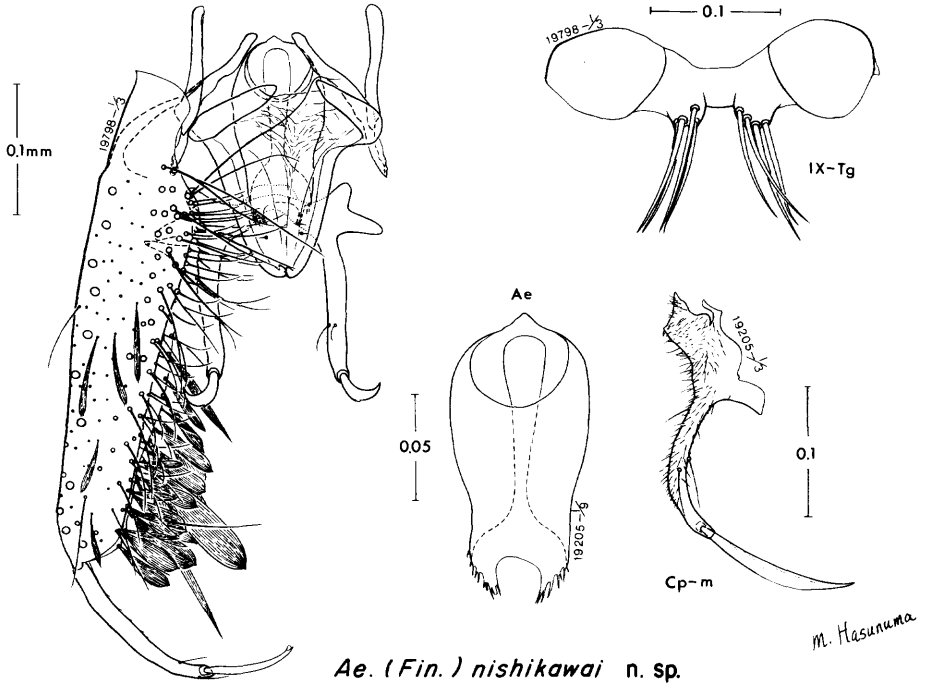


Ae. (Fin.) nipponicus

Fig.109

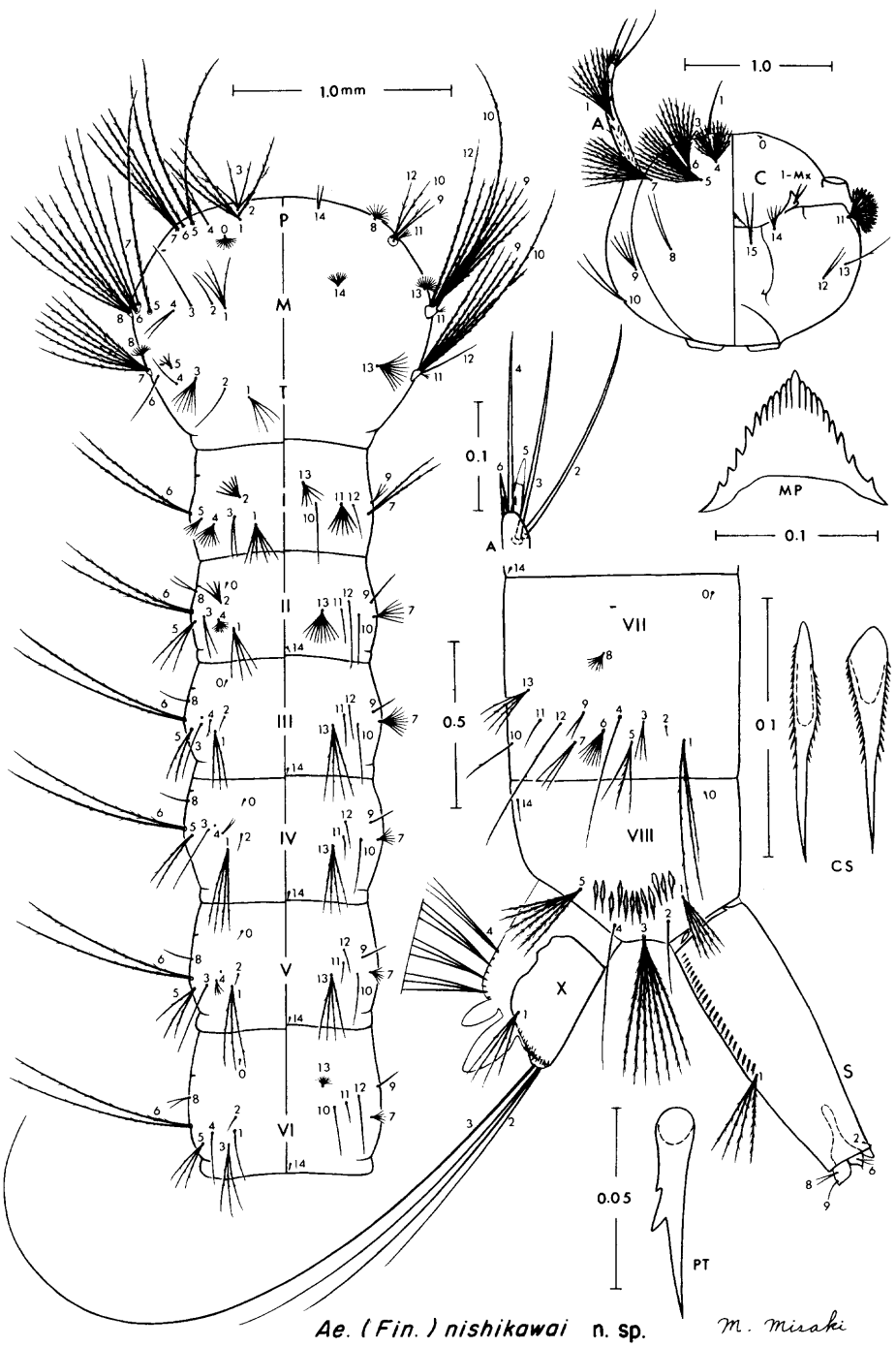


Ae. (Fin.) nipponicus



Ae. (Fin.) nishikawai n. sp.

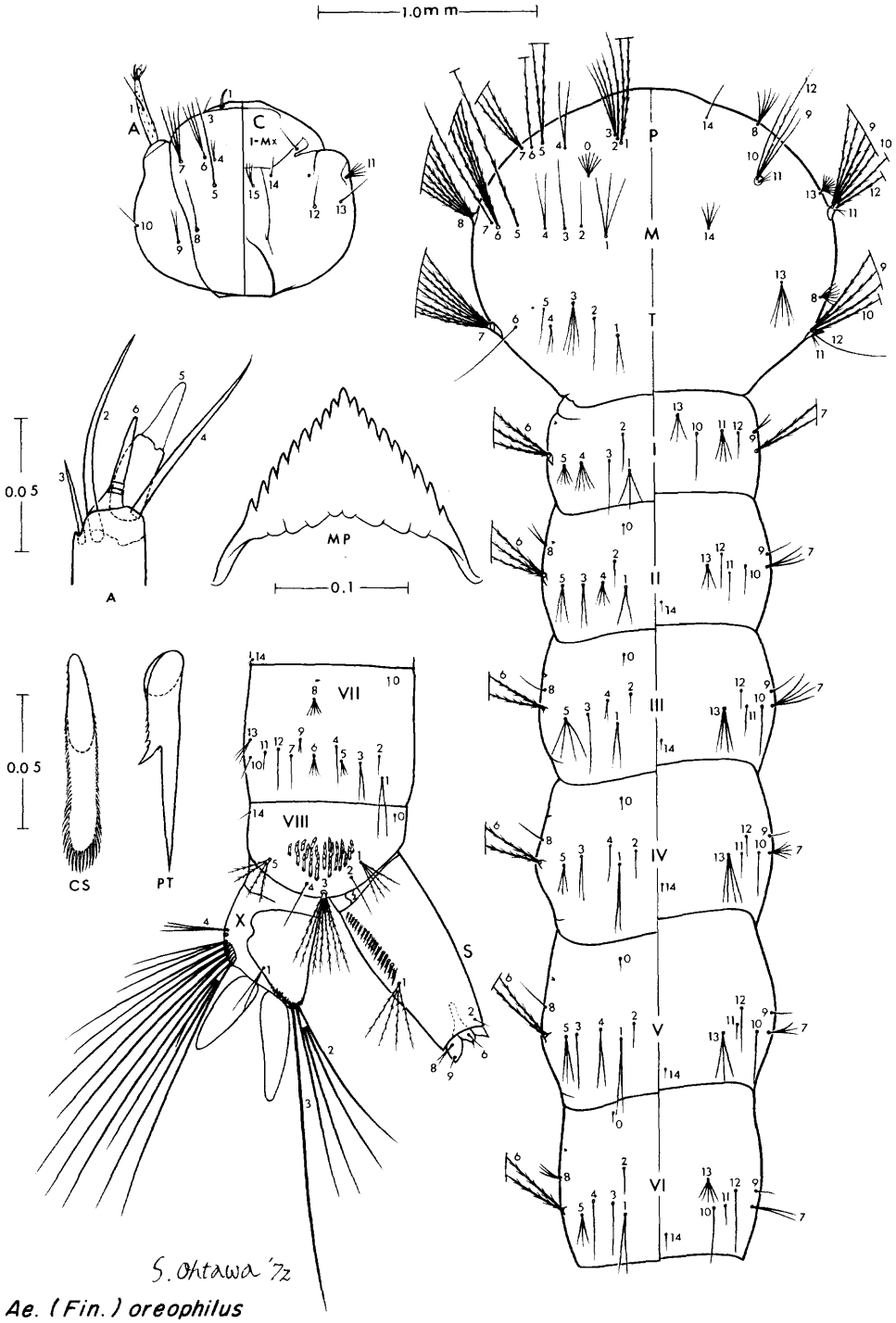
Fig.110



Ae. (Fin.) nishikawai n. sp.

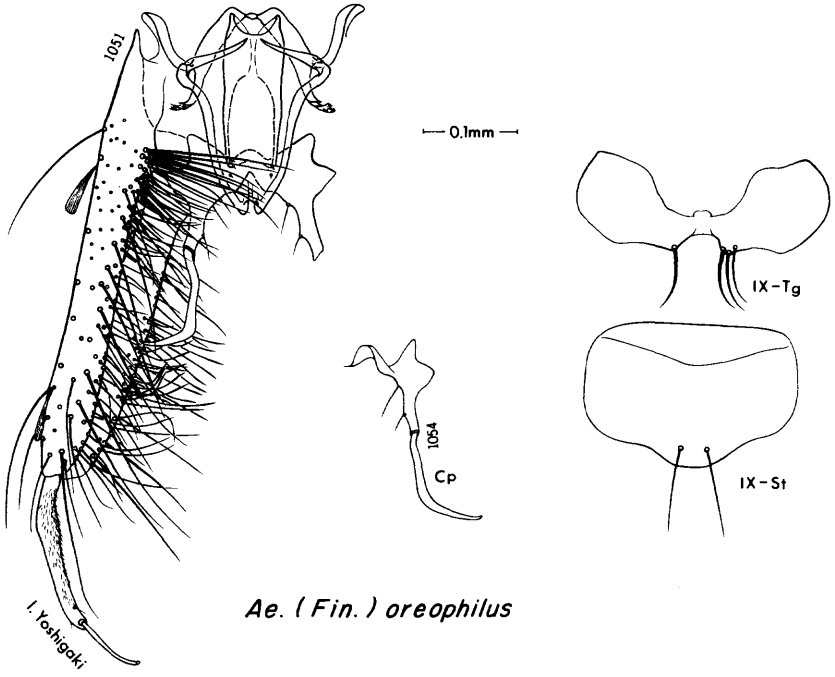
M. Mizaki

Fig. III

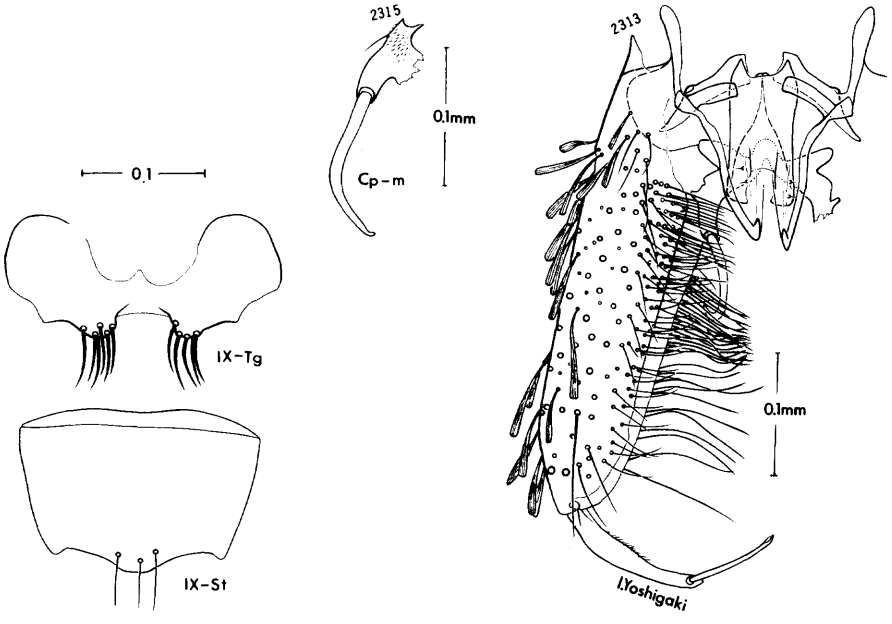


Ae. (Fin.) oreophilus

Fig.112

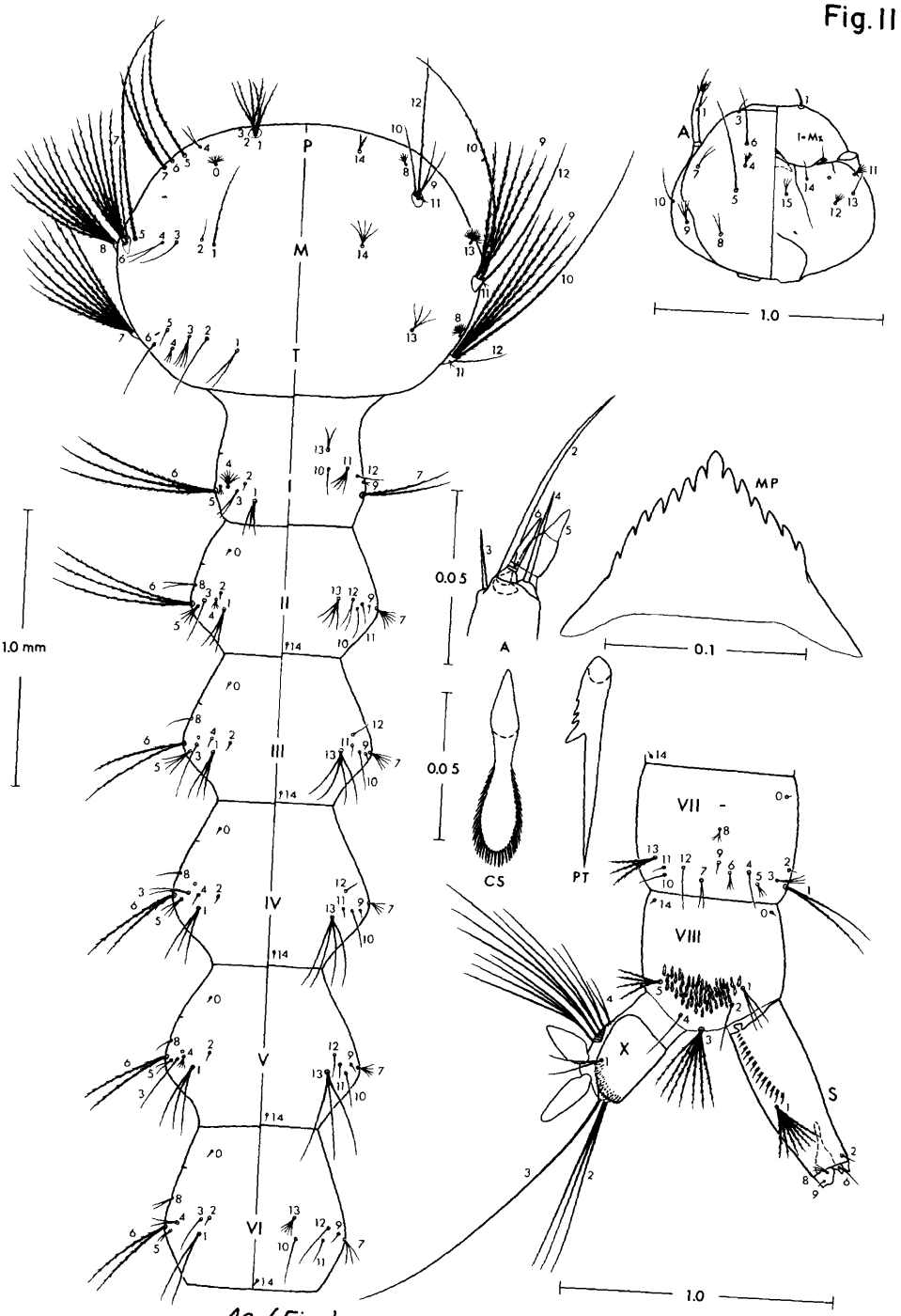


Ae. (Fin.) oreophilus



Ae. (Fin.) watasei

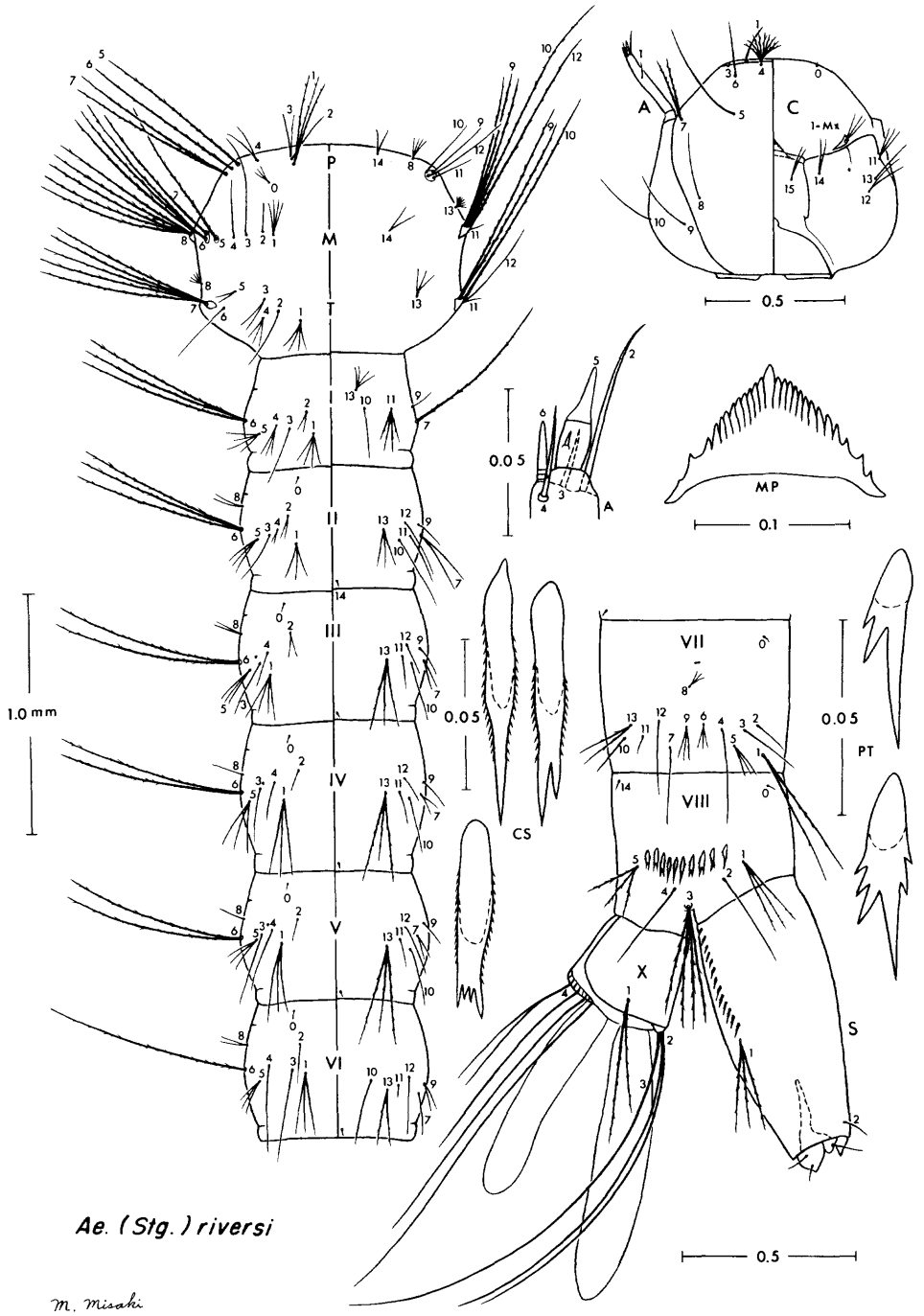
Fig. 113



Ae. (Fin.) watasei

m. misaki

Fig. 114



Ae. (Stg.) riversi

M. Misahi

Fig. 115

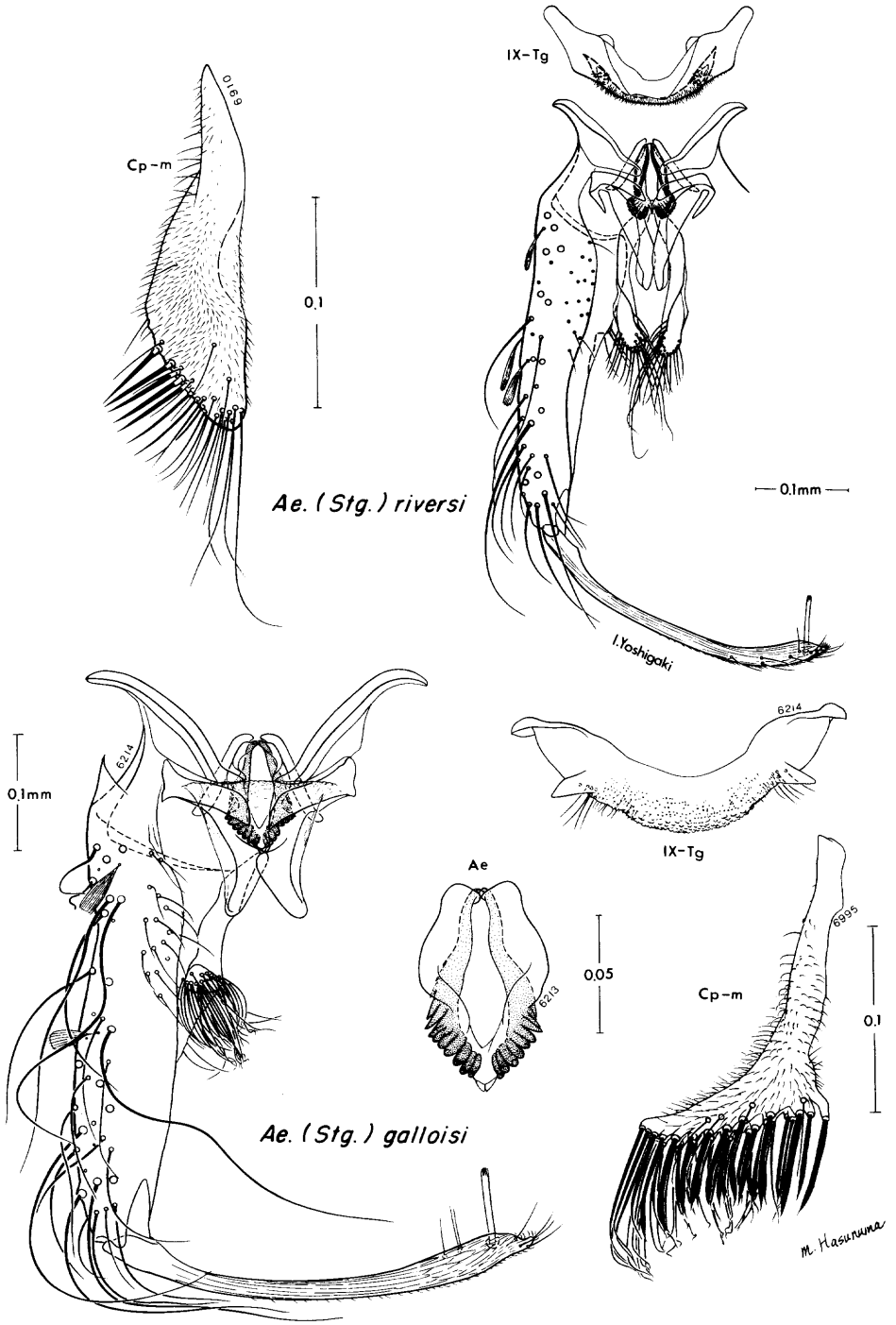
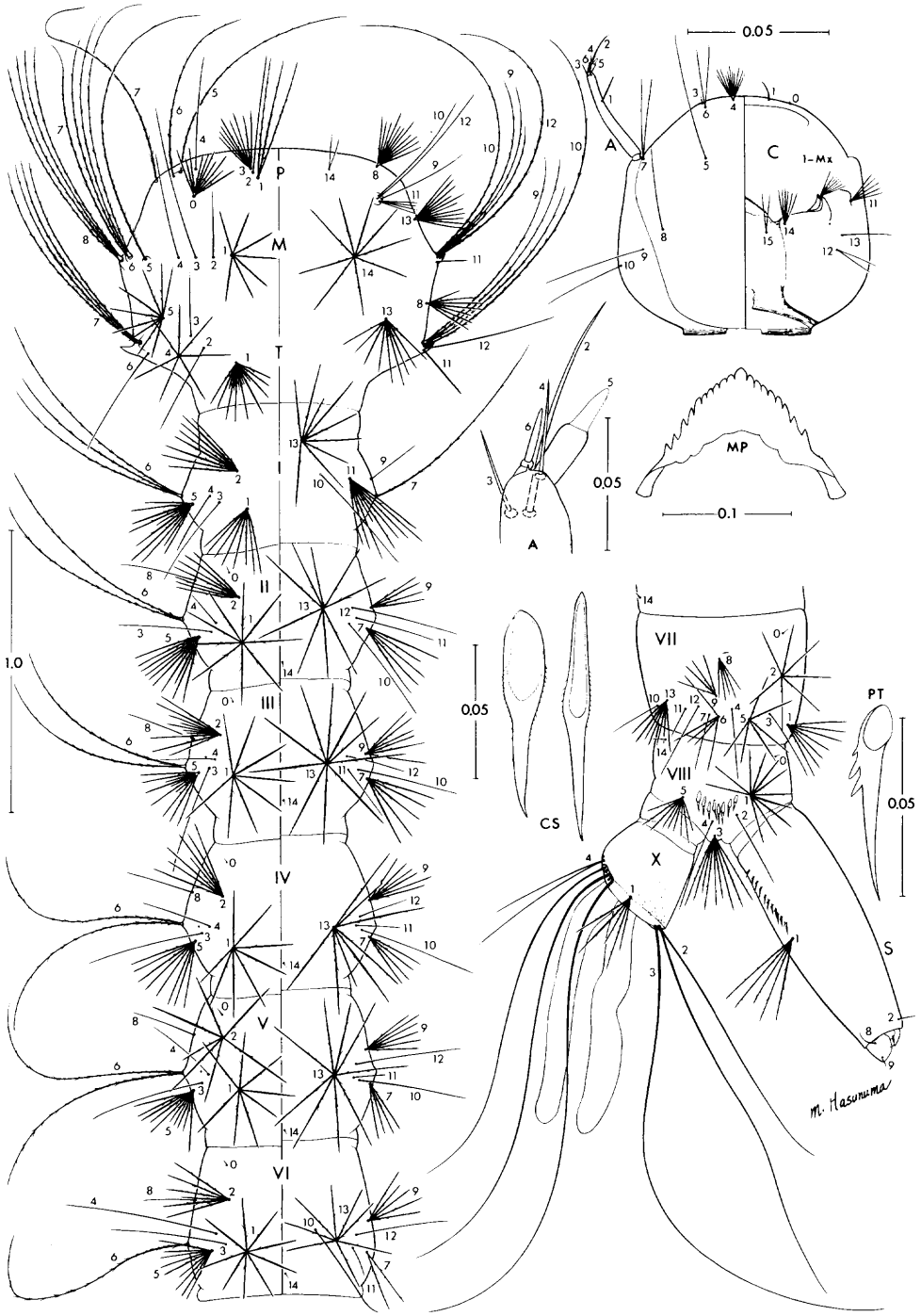
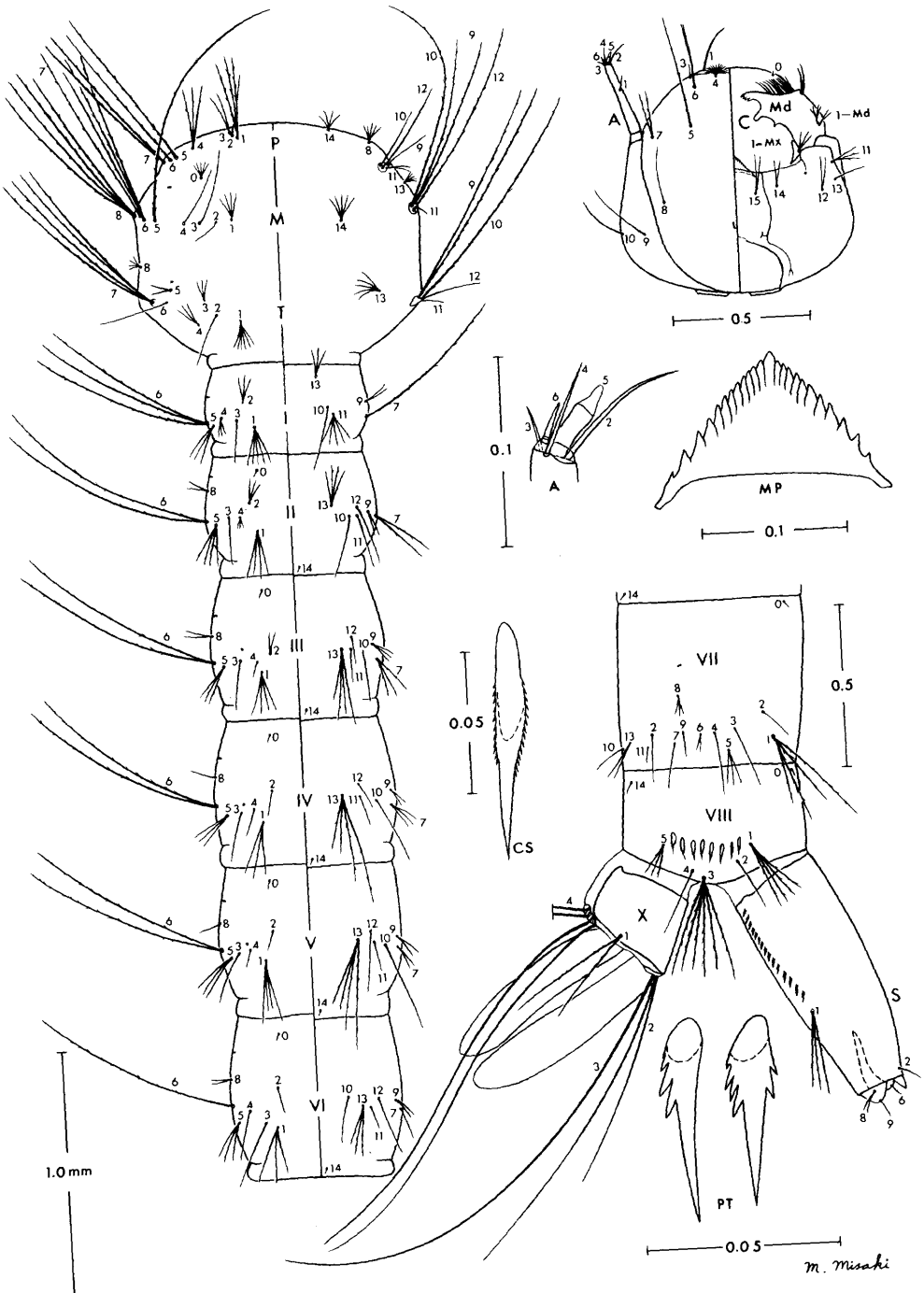

Cp-m
6910
0.1
IX-Tg
0.1mm
Ae. (Stg.) riversi
I. Yoshigaki
0.1mm
6214
6214
IX-Tg
Ae
6213
0.05
Cp-m
6995
0.1
Ae. (Stg.) galloisi
M. Hasunuma

Fig.116



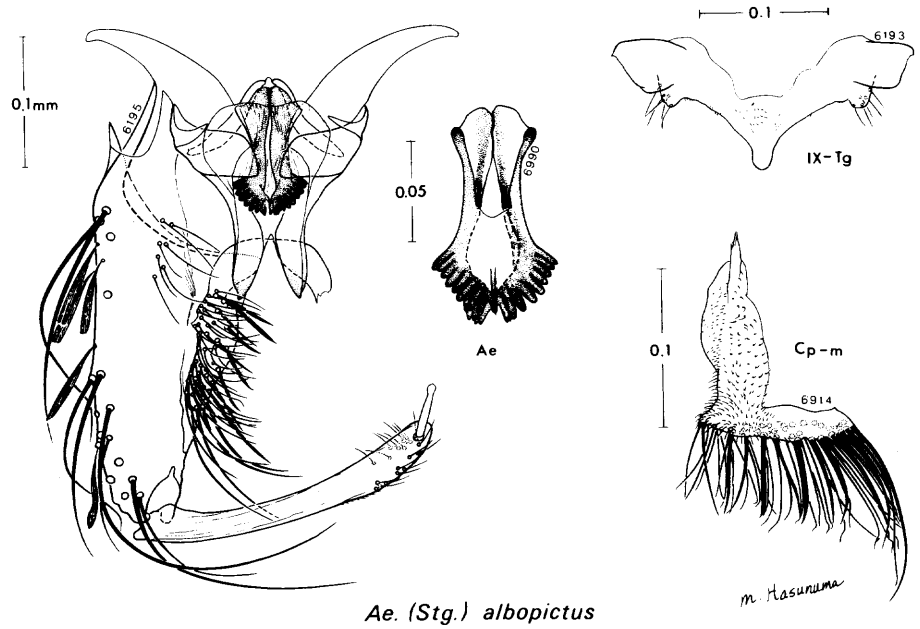
Ae. (Stg.) galloisi

Fig. 117

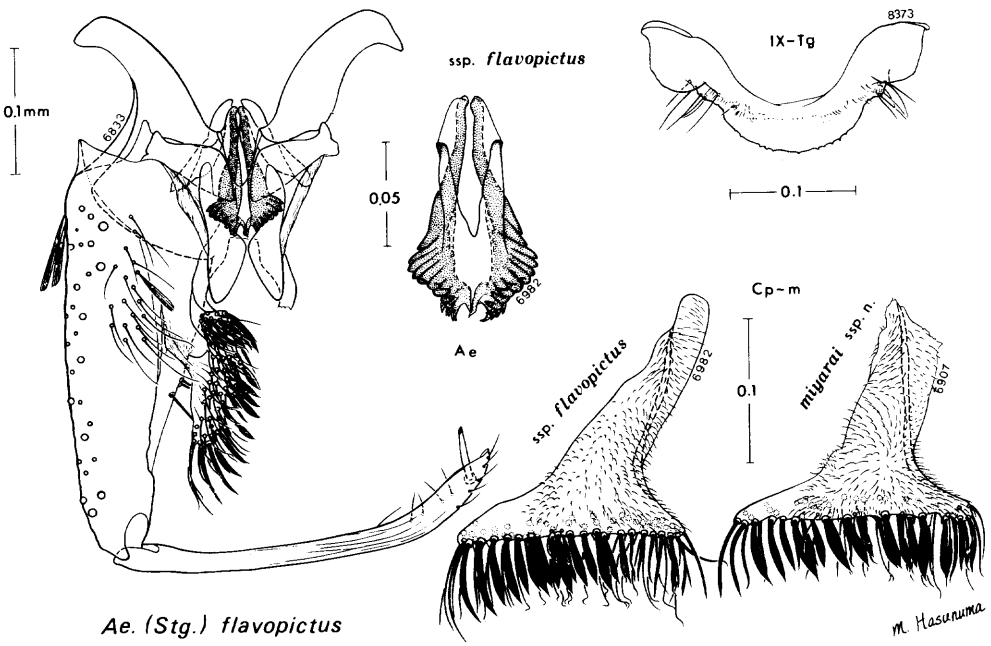


Ae. (Stg.) albopictus

Fig. 118

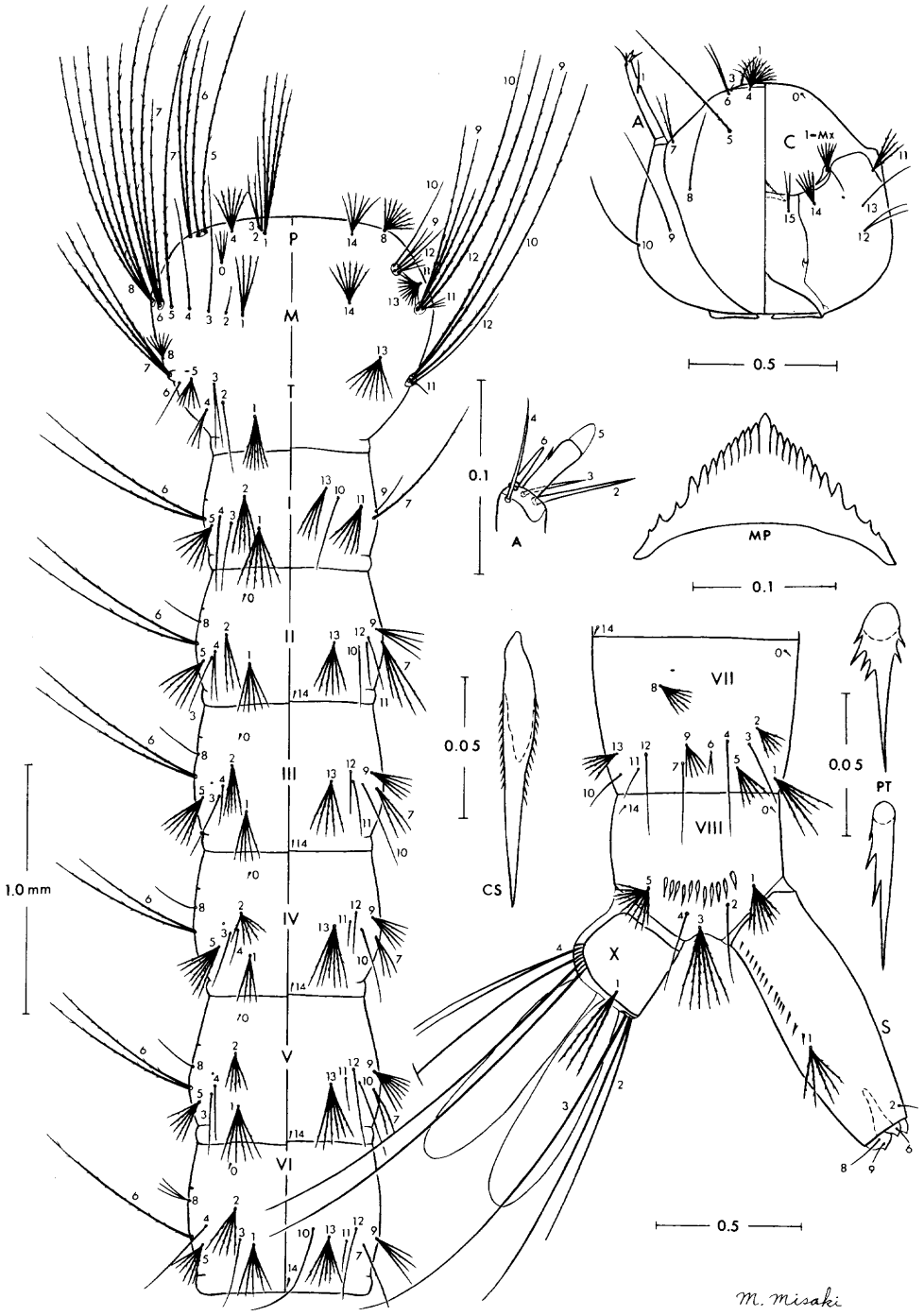


Ae. (Stg.) albopictus



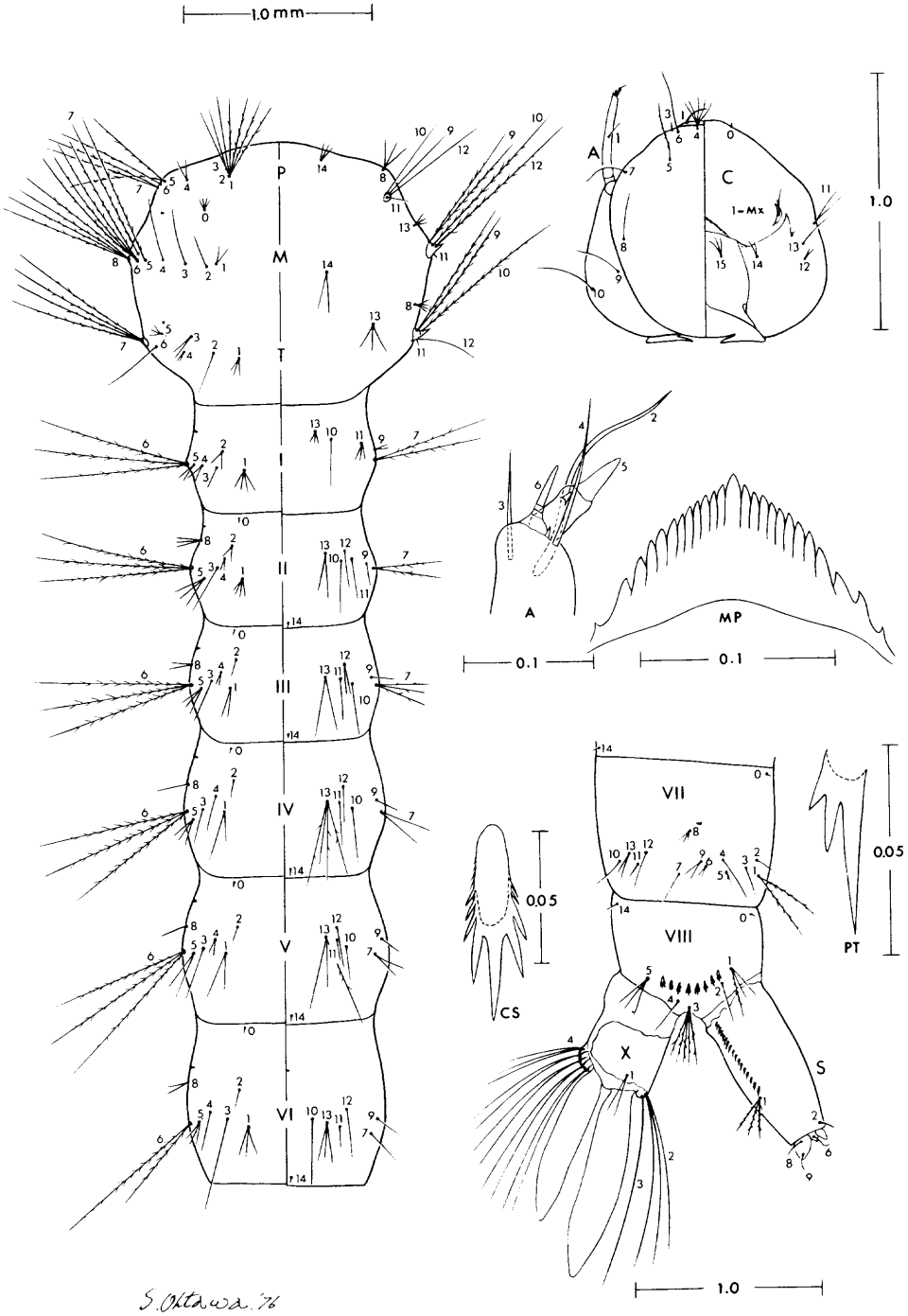
Ae. (Stg.) flavopictus

Fig. 119



Ae. (Stg.) flavopictus flavopictus

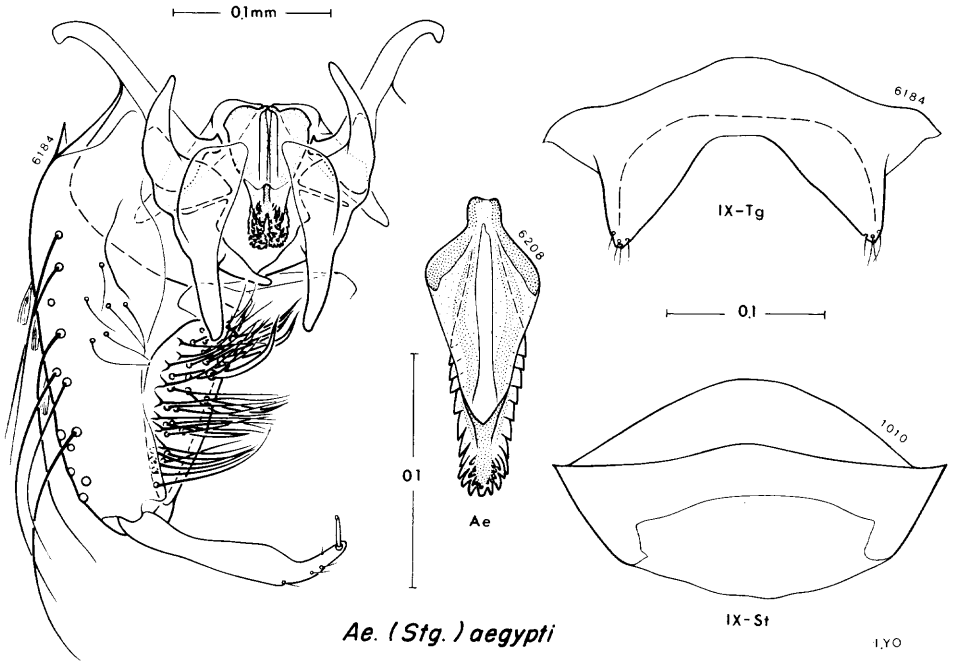
Fig.120



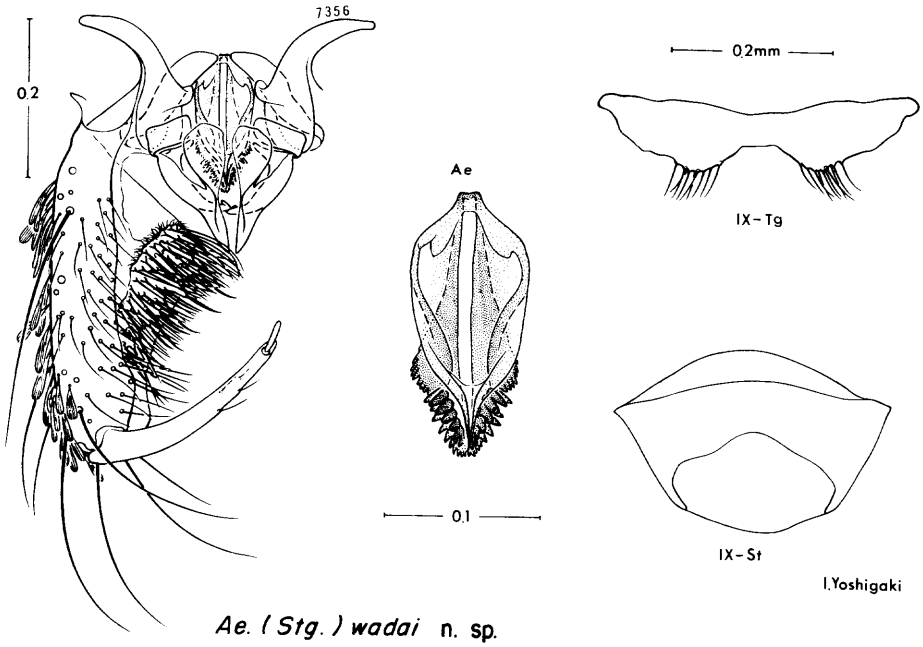
S. Ottawa. '76

Ae. (Stg.) aegypti (Laboratory Colony)

Fig.121

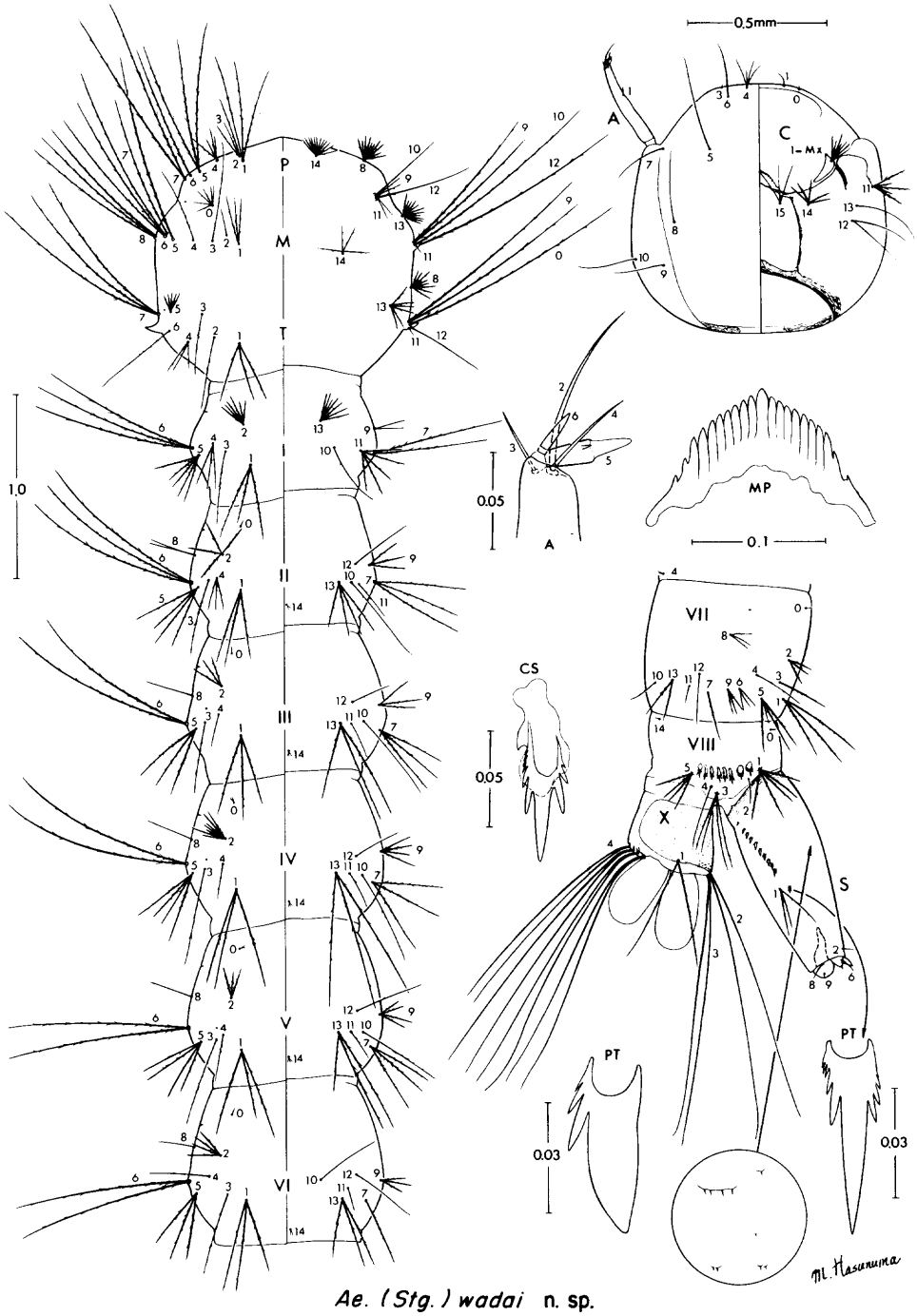


Ae. (Stg.) aegypti



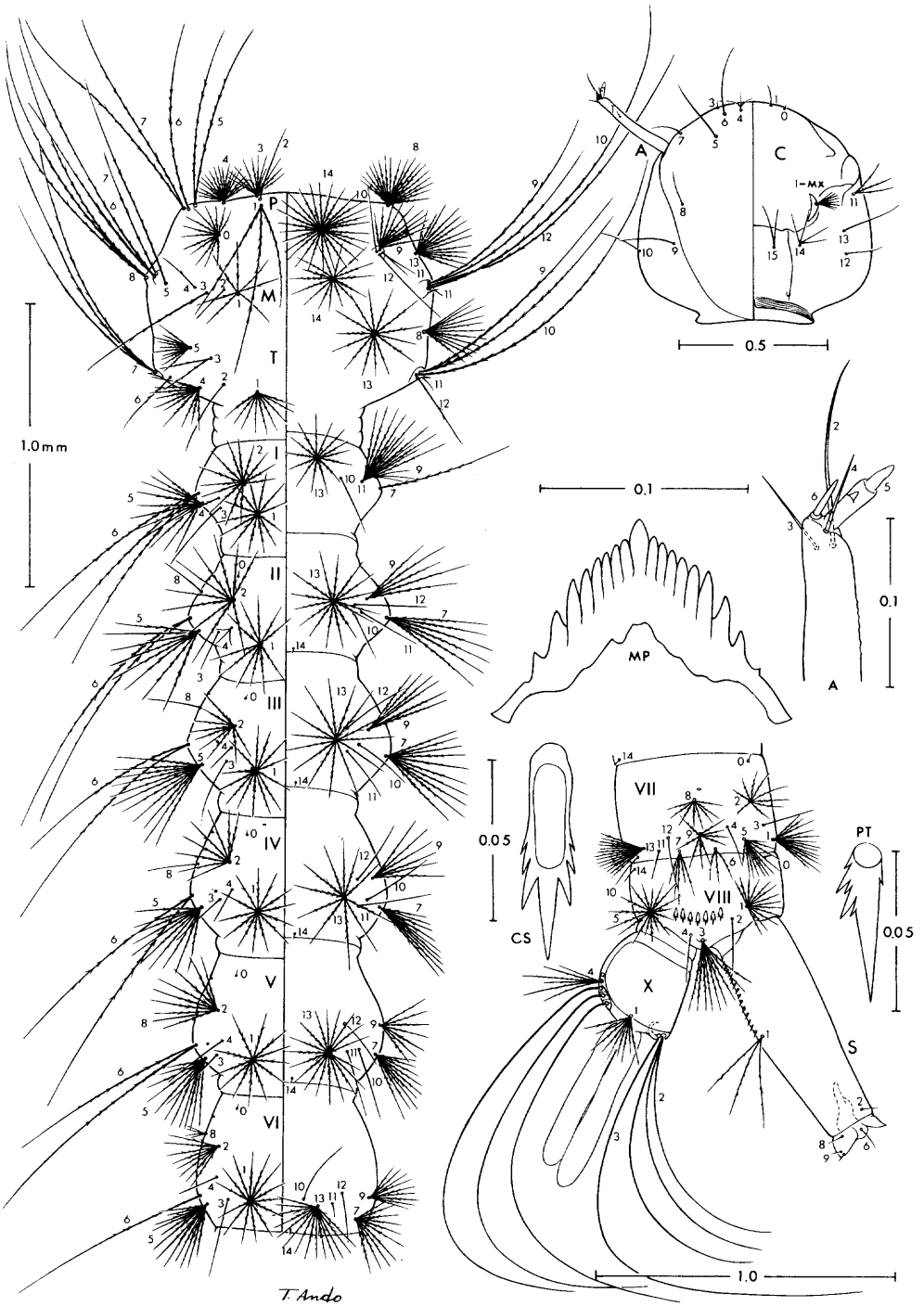
Ae. (Stg.) wadai n. sp.

Fig. 122



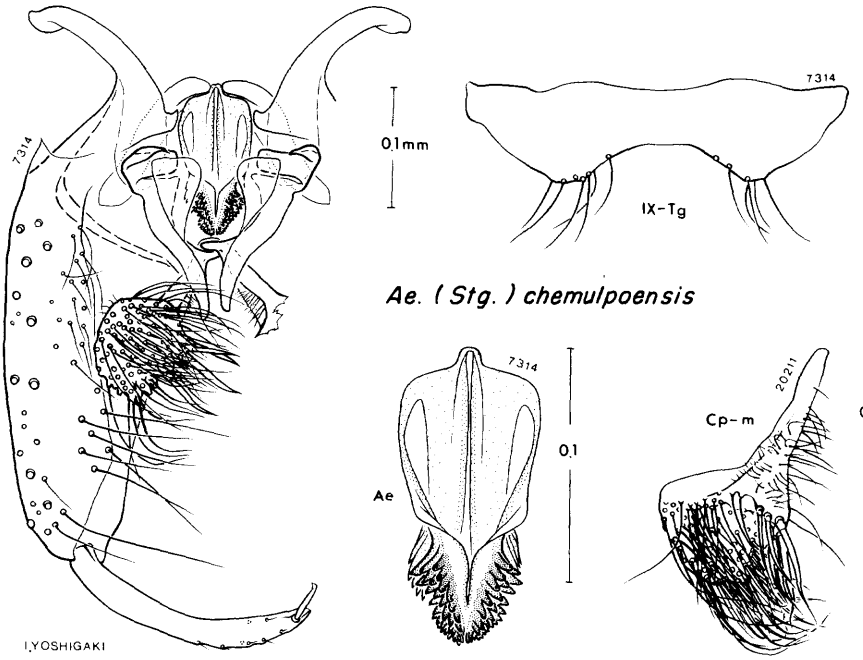
Ae. (Stg.) wadai n. sp.

Fig.123

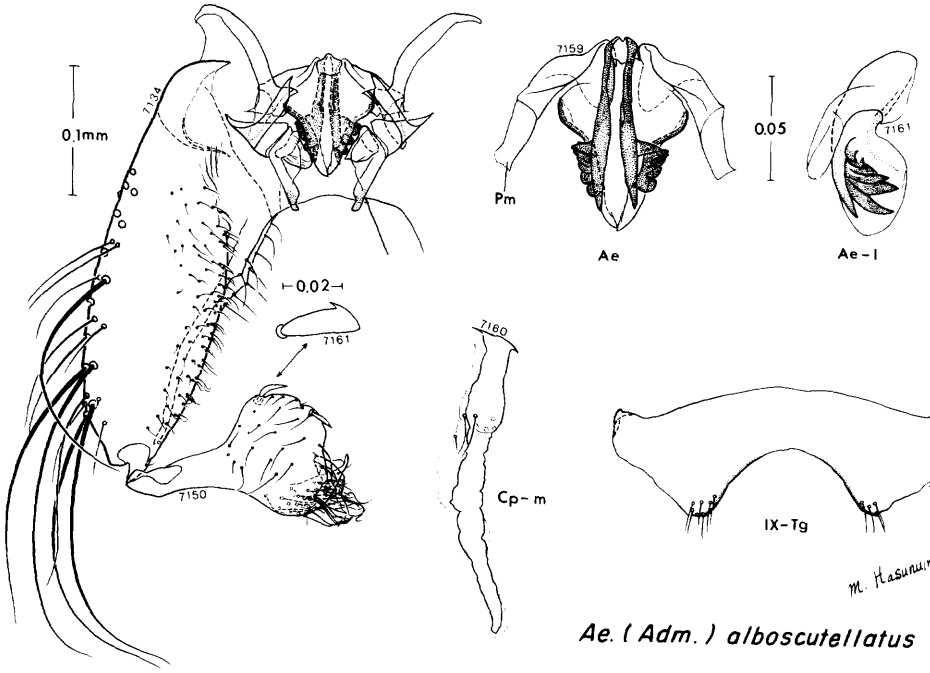


Ae. (Stg.) chemulpoensis

Fig.124

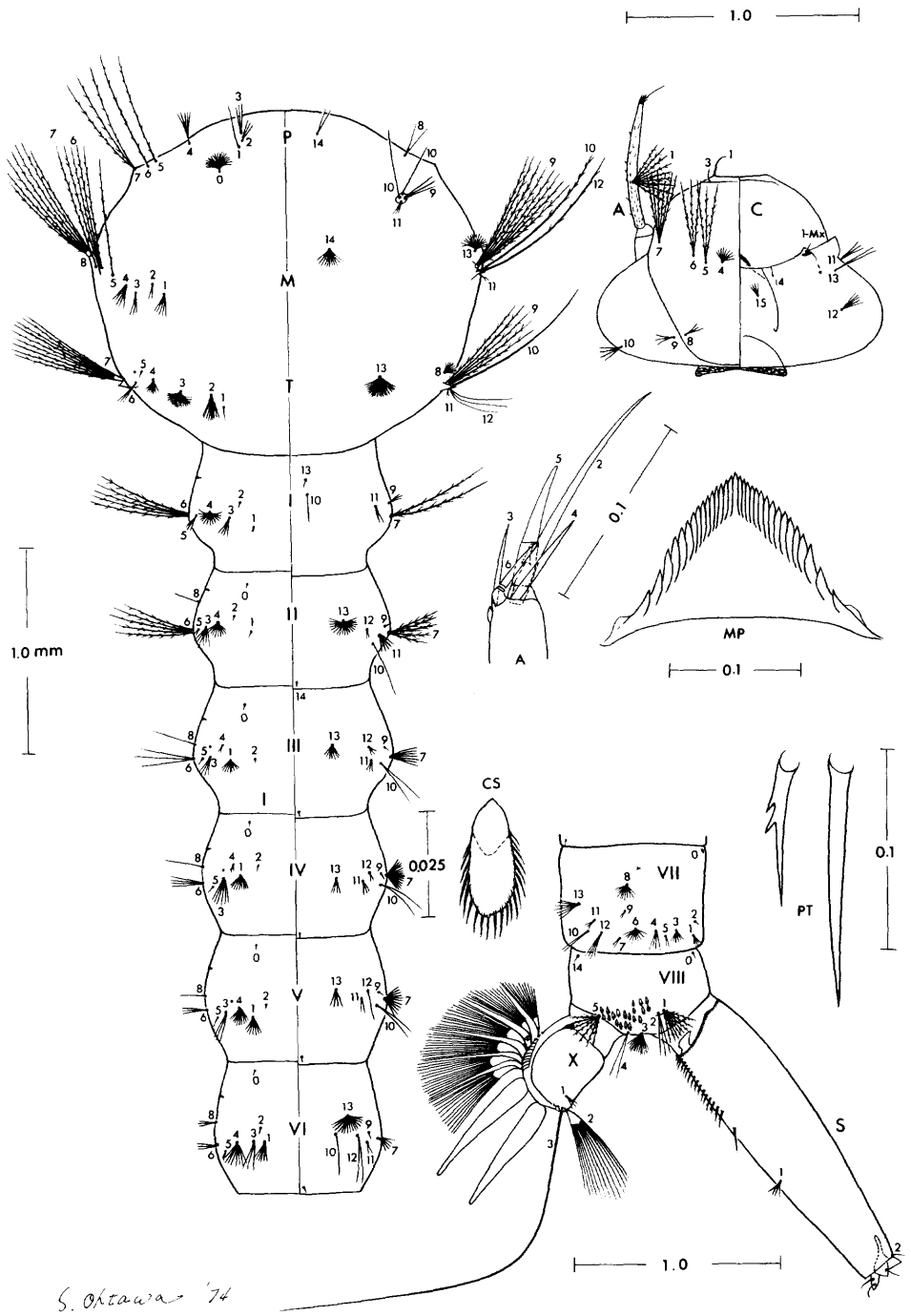


Ae. (Stg.) chemulpoensis



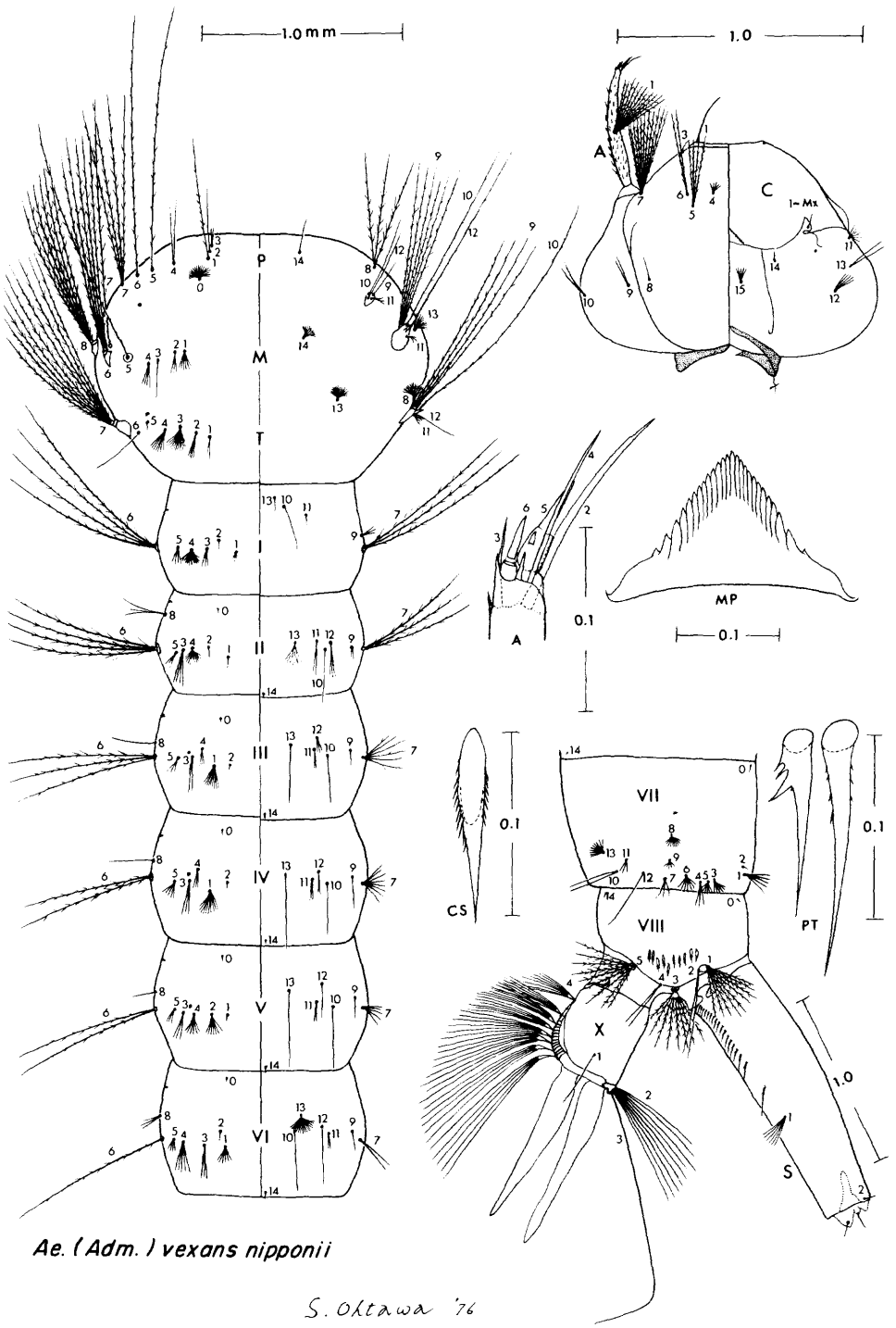
Ae. (Adm.) alboscutellatus

Fig.125



Ae. (Adm.) alboscutellatus from Mindanao

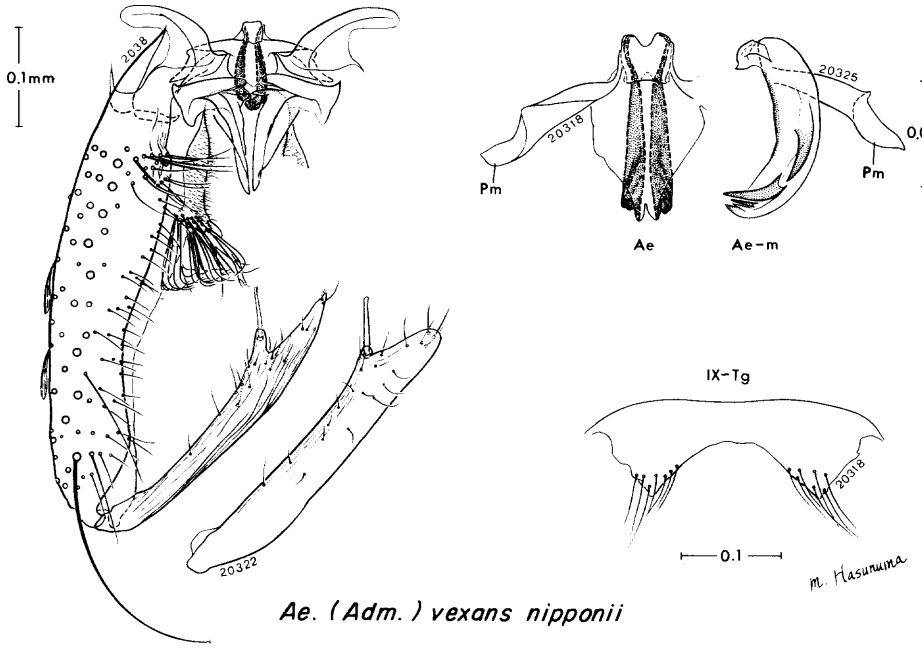
Fig. 126



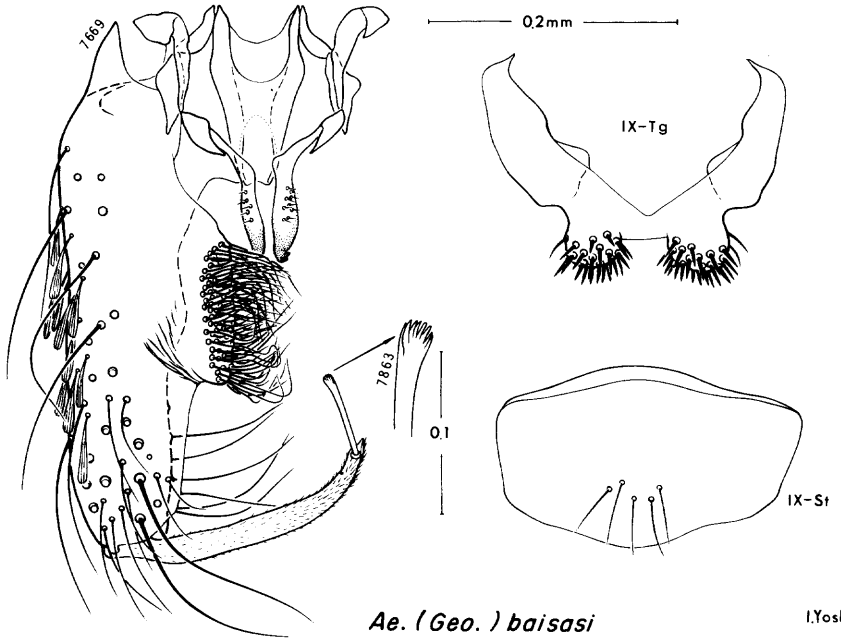
Ae. (Adm.) vexans nipponii

S. Ohtawa '76

Fig.127



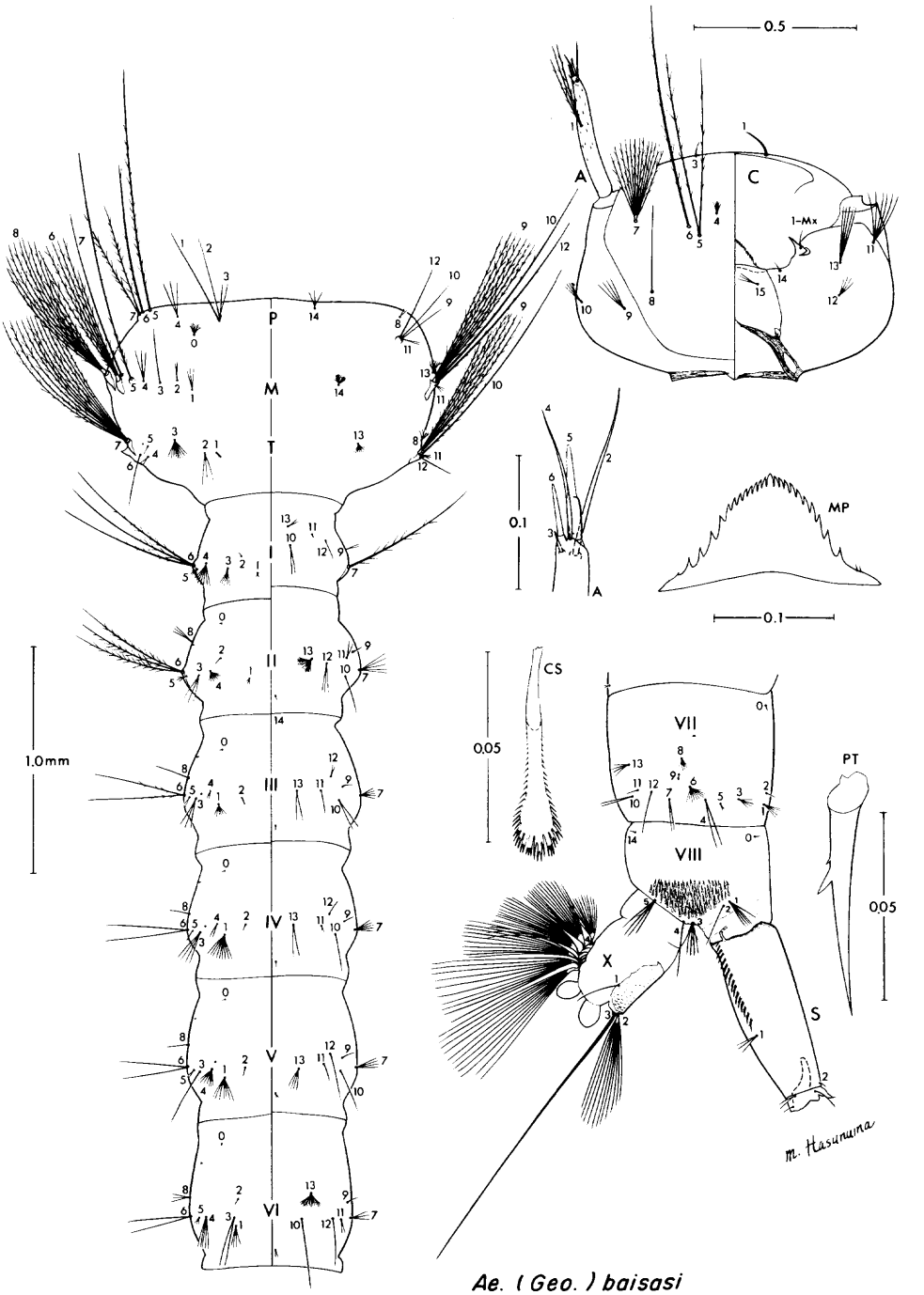
Ae. (Adm.) vexans nipponii



Ae. (Geo.) baisasi

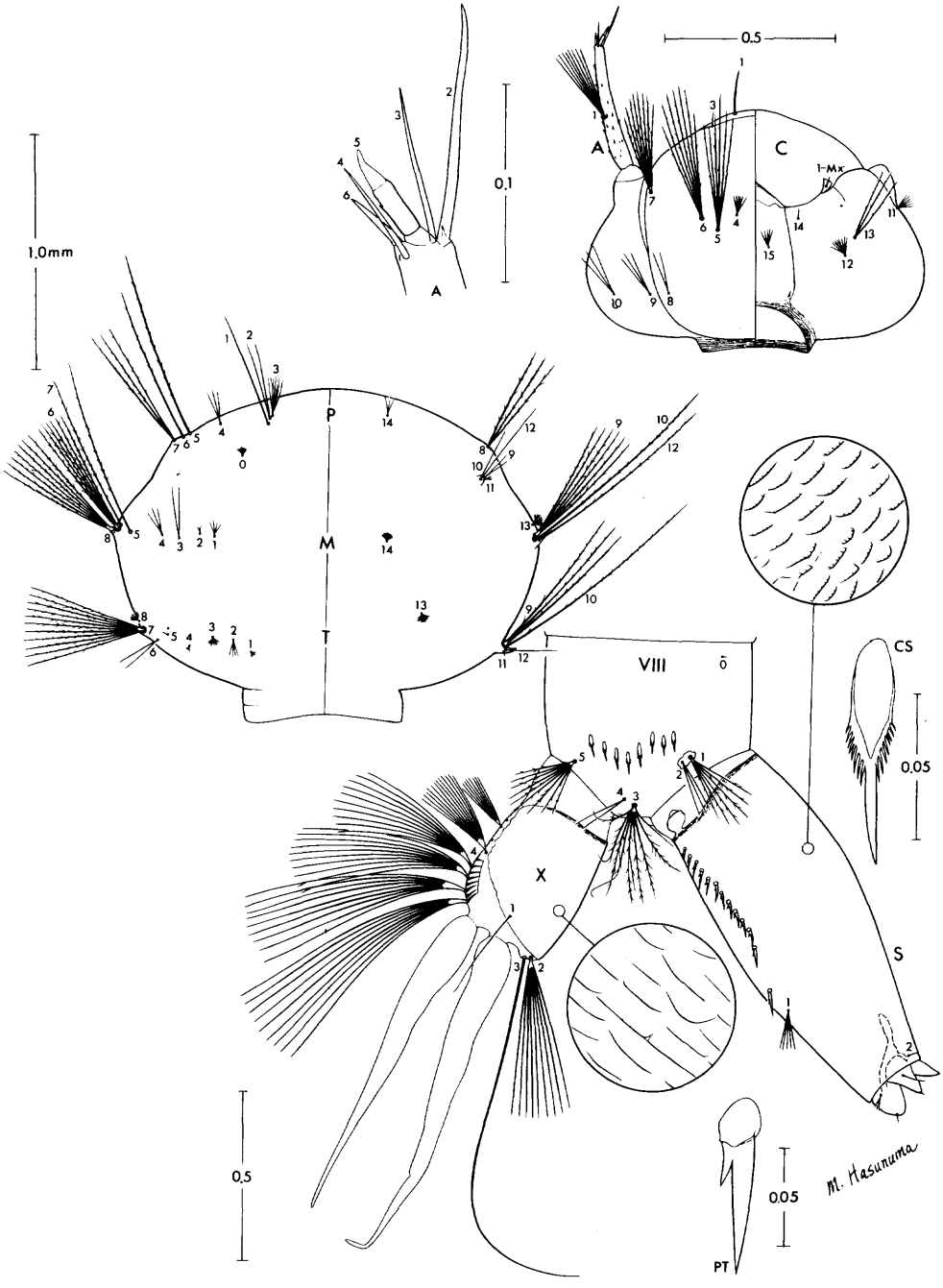
I.Yoshigaki

Fig. 128



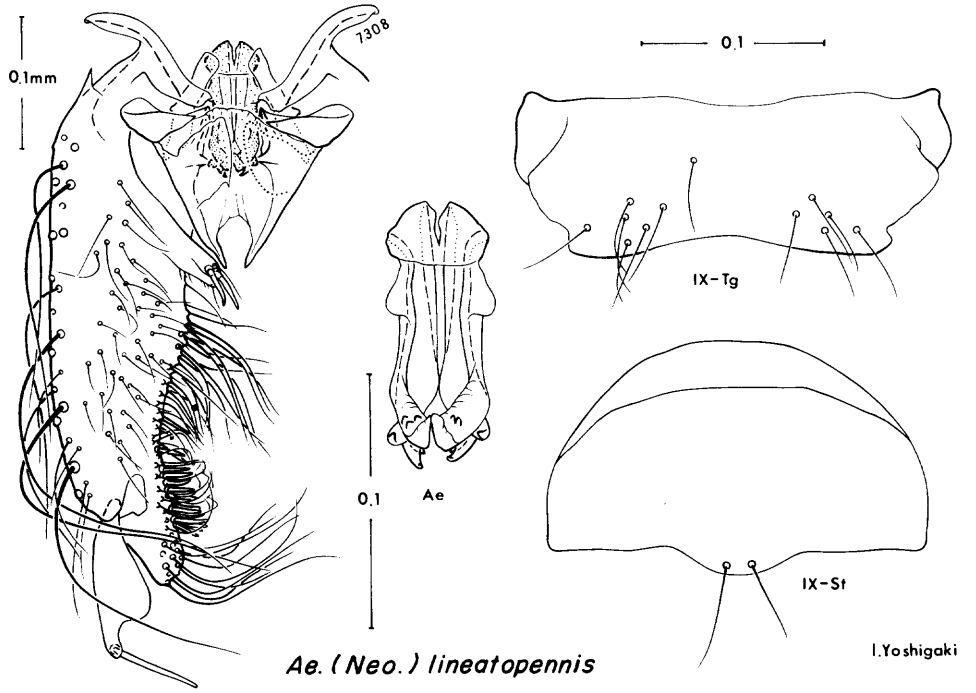
Ae. (Geo.) baisasi

Fig.129

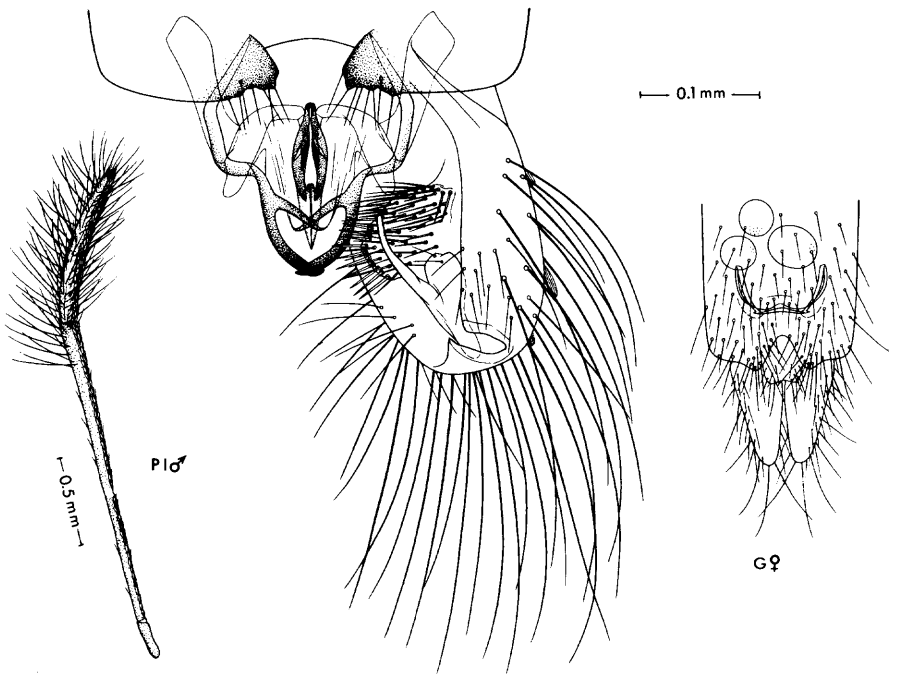


Ae. (Neo.) lineatopennis from Thailand

Fig. 130

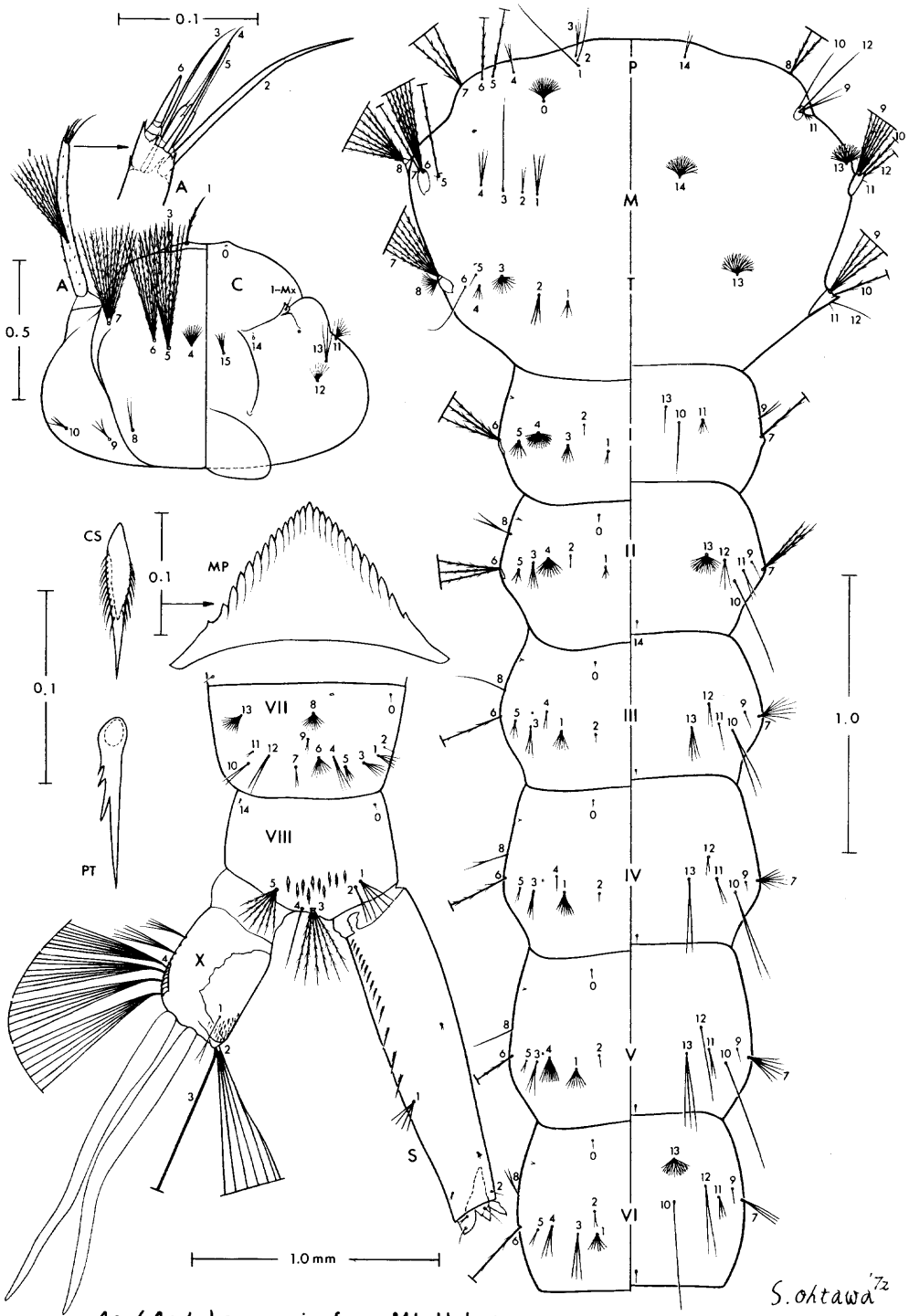


Ae. (Neo.) lineatopennis



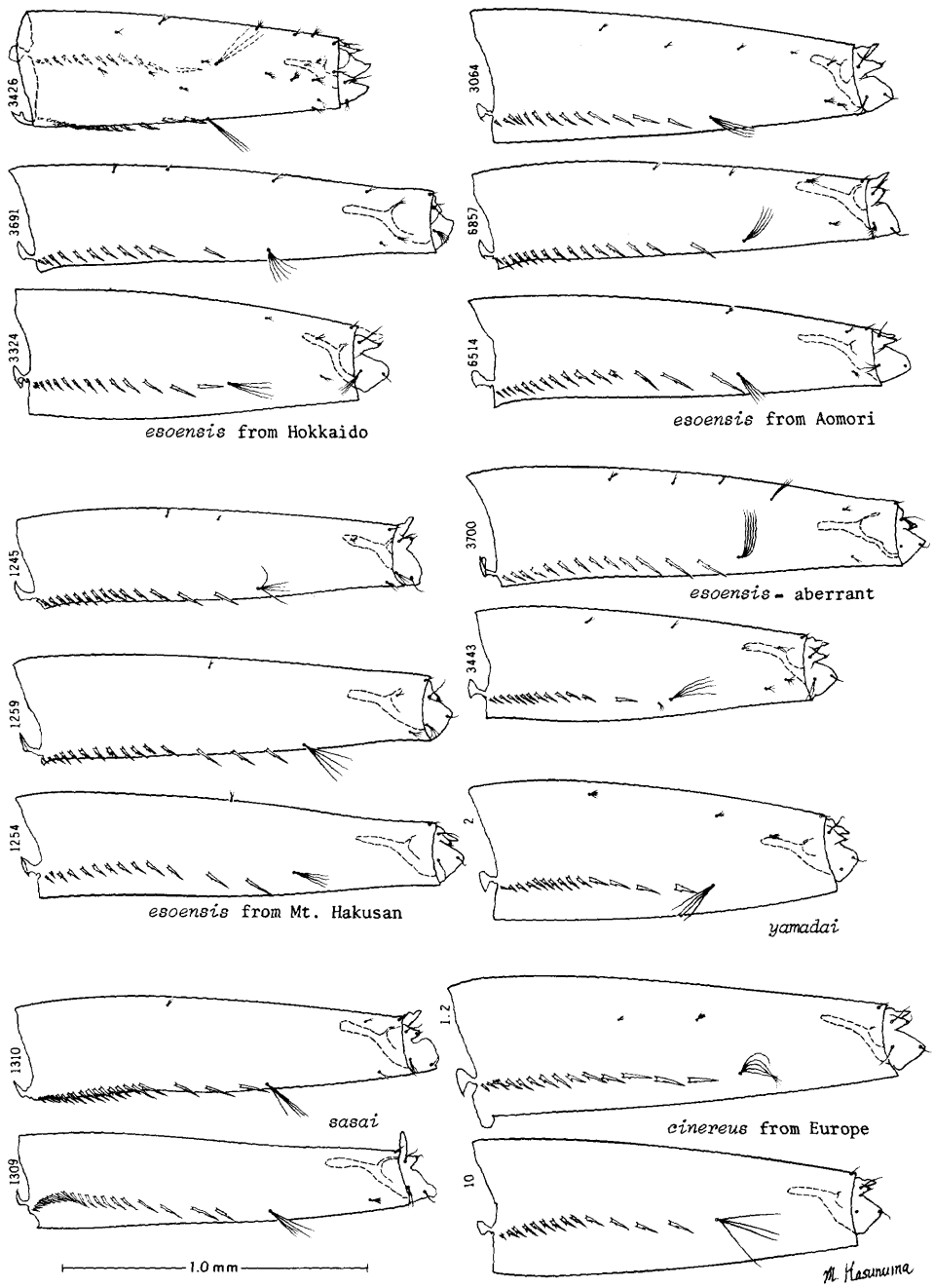
Ae. (Edw.) imprimens (after Yamaguti and LaCasse, unpublished)

Fig.131



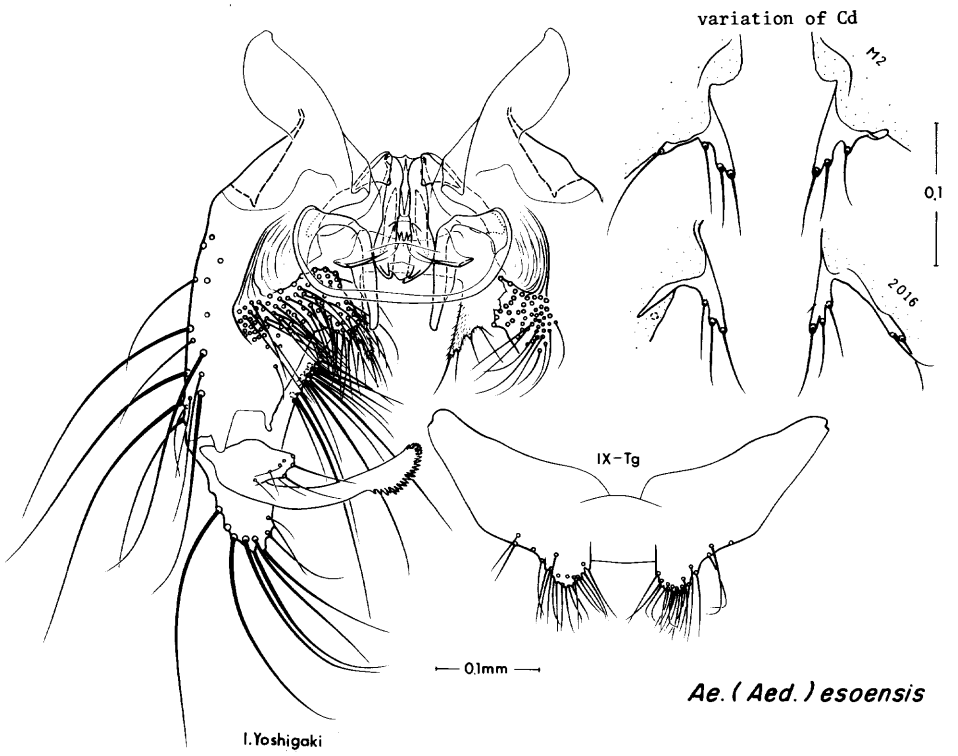
Ae. (Aed.) esoensis from Mt. Hakusan

Fig.132

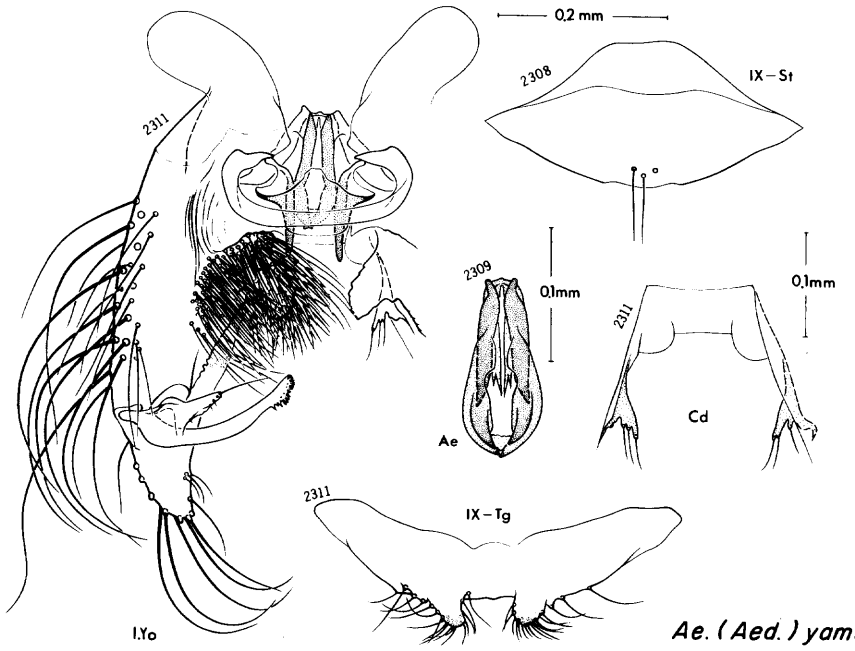


Ae. (Aed.) spp. — siphons

Fig. 133

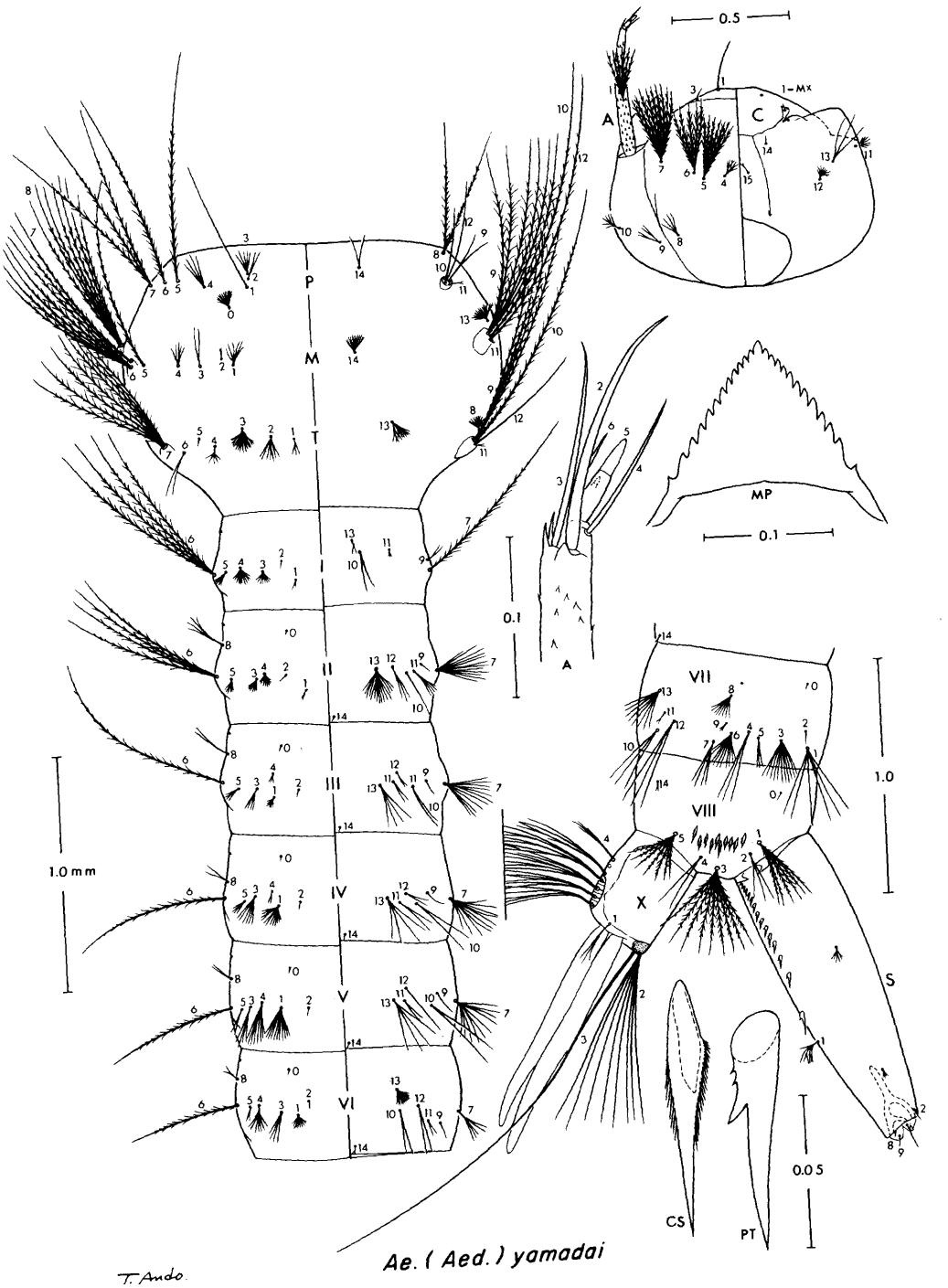


Ae. (Aed.) esoensis



Ae. (Aed.) yamadai

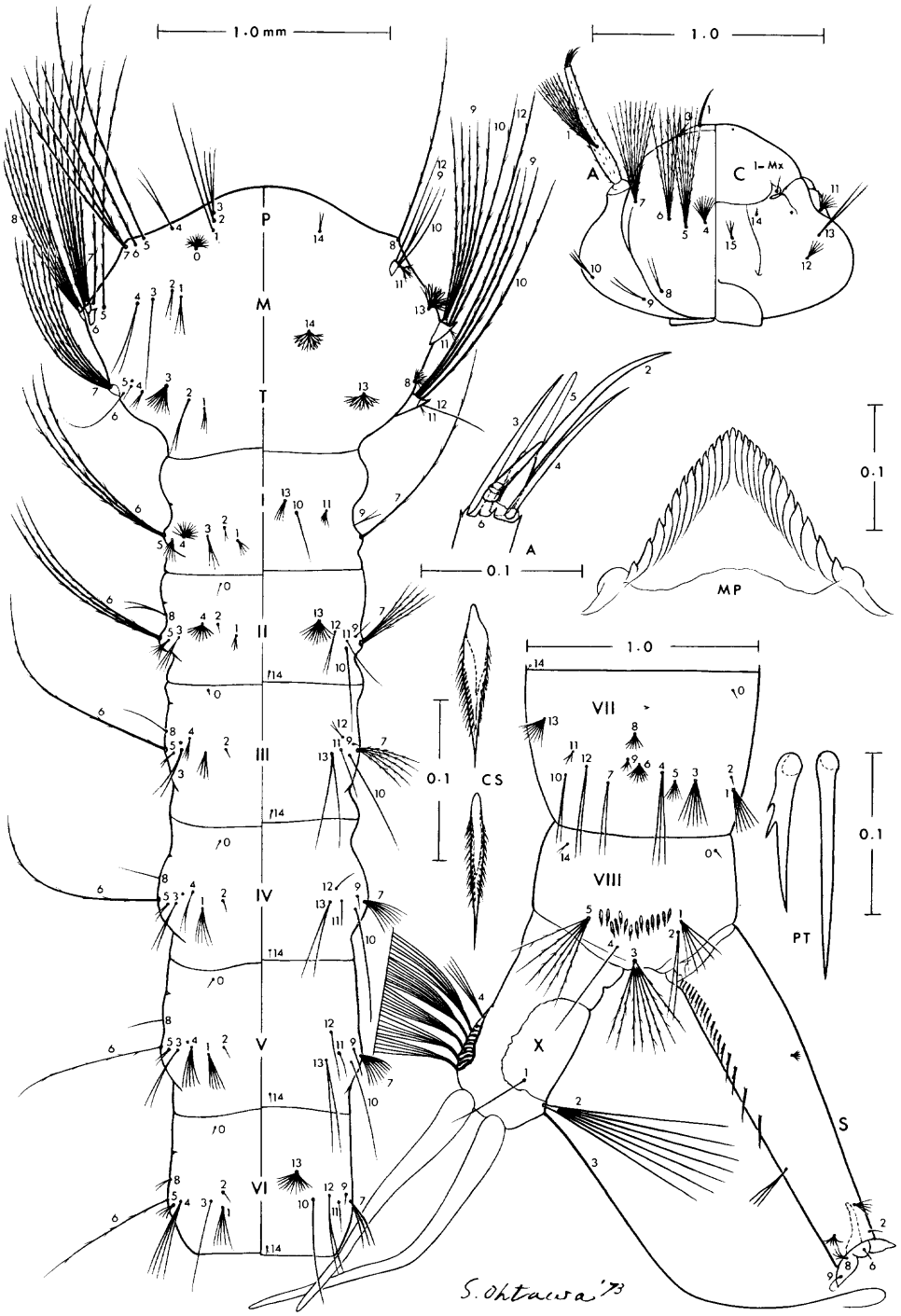
Fig.134



Ae. (Aed.) yamadai

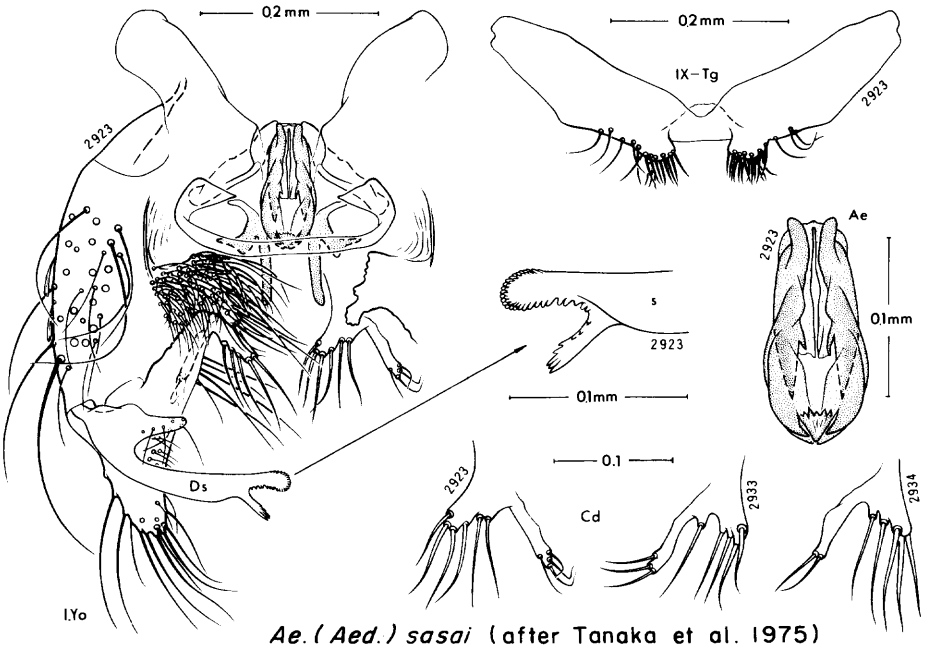
T. Ando

Fig.135

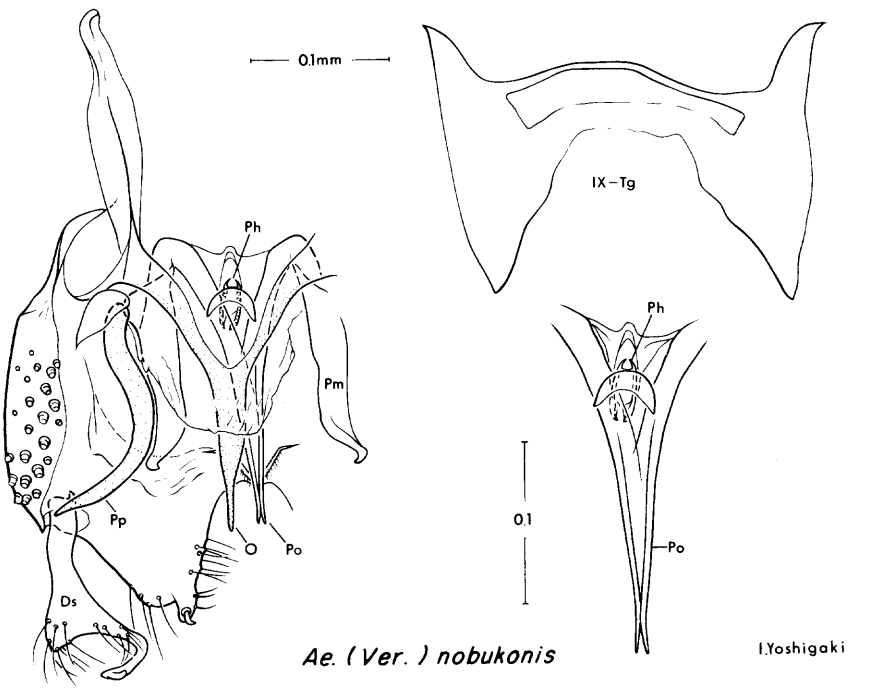


Ae. (Aed.) sasai (after Tanaka et al. 1975)

Fig. 136



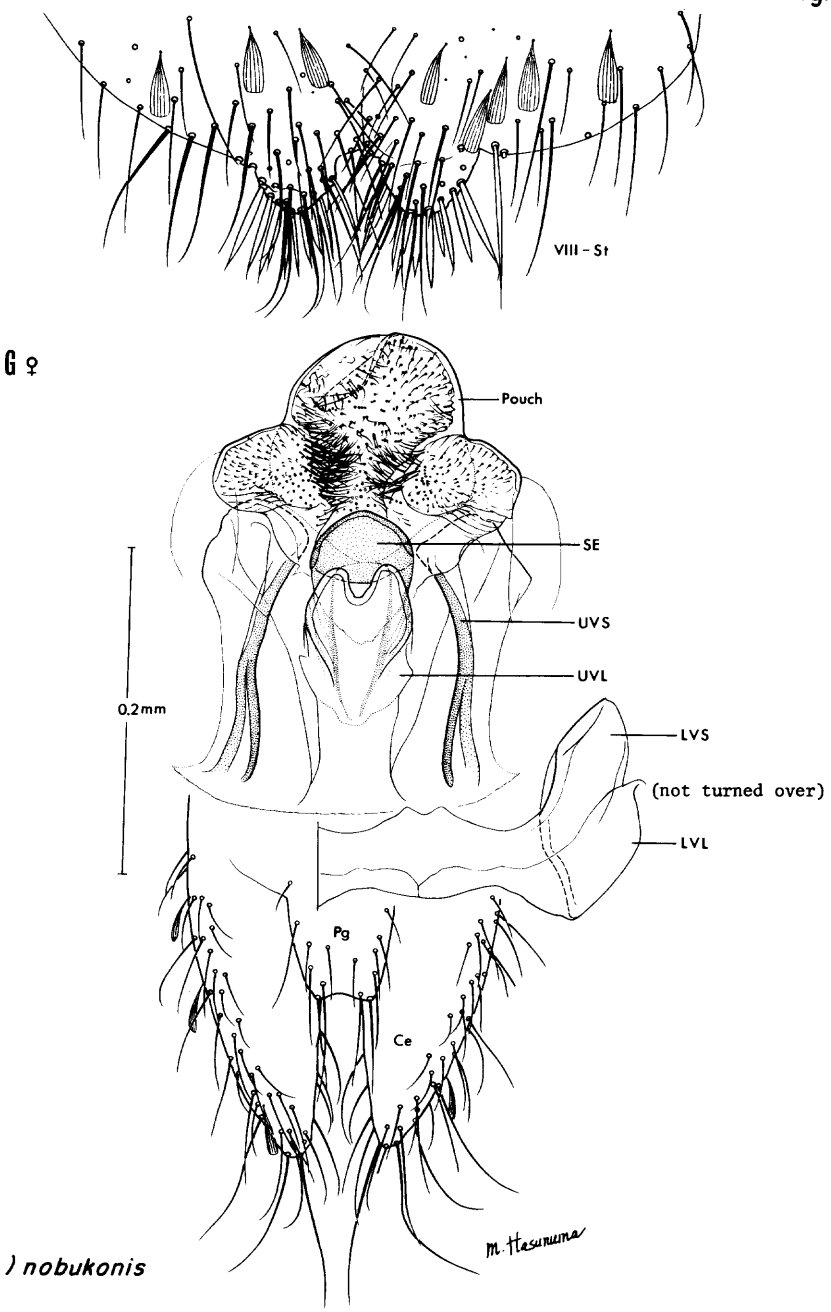
Ae. (Aed.) sasai (after Tanaka et al. 1975)



Ae. (Ver.) nobukonis

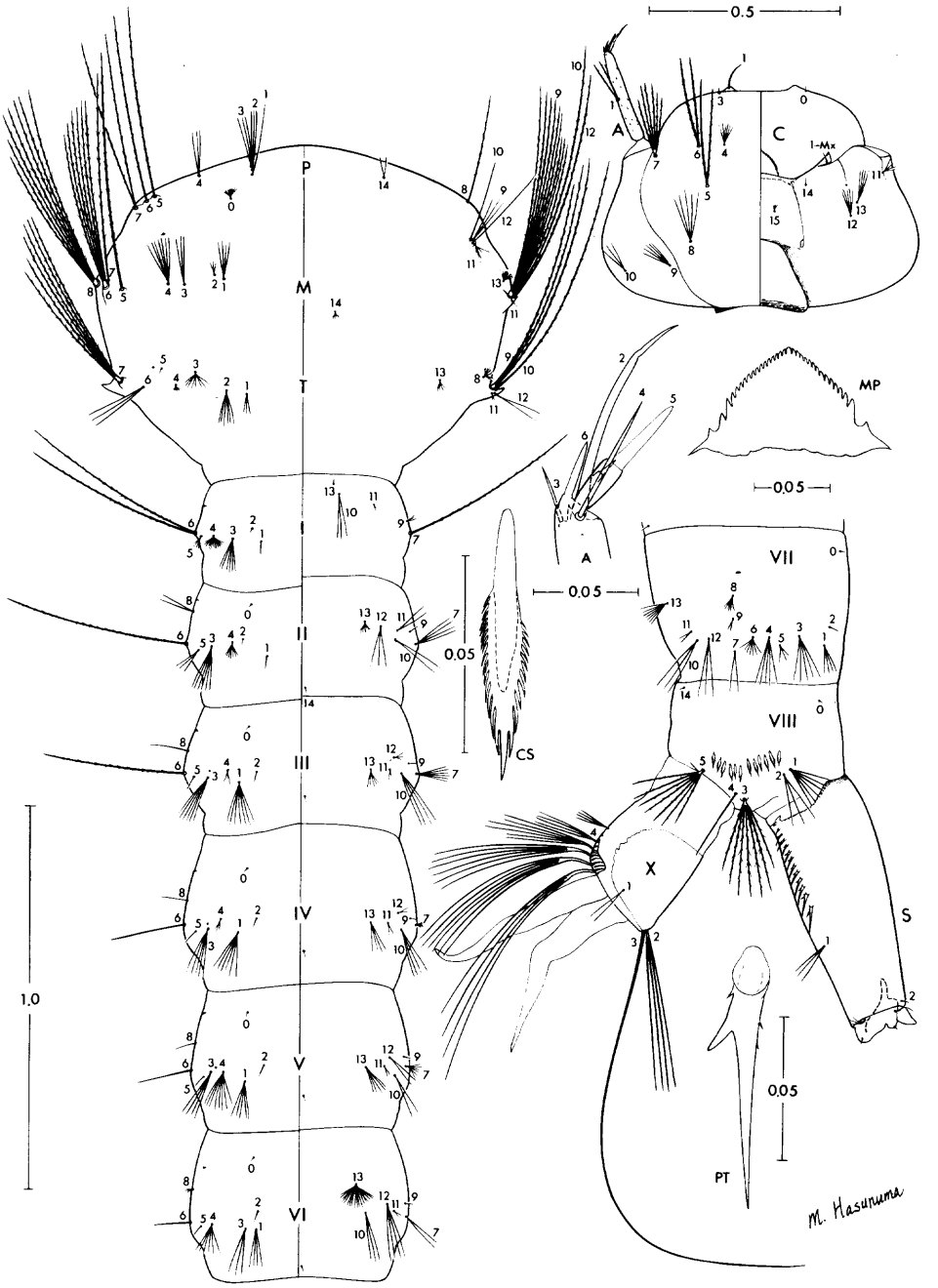
I.Yoshigaki

Fig. 137

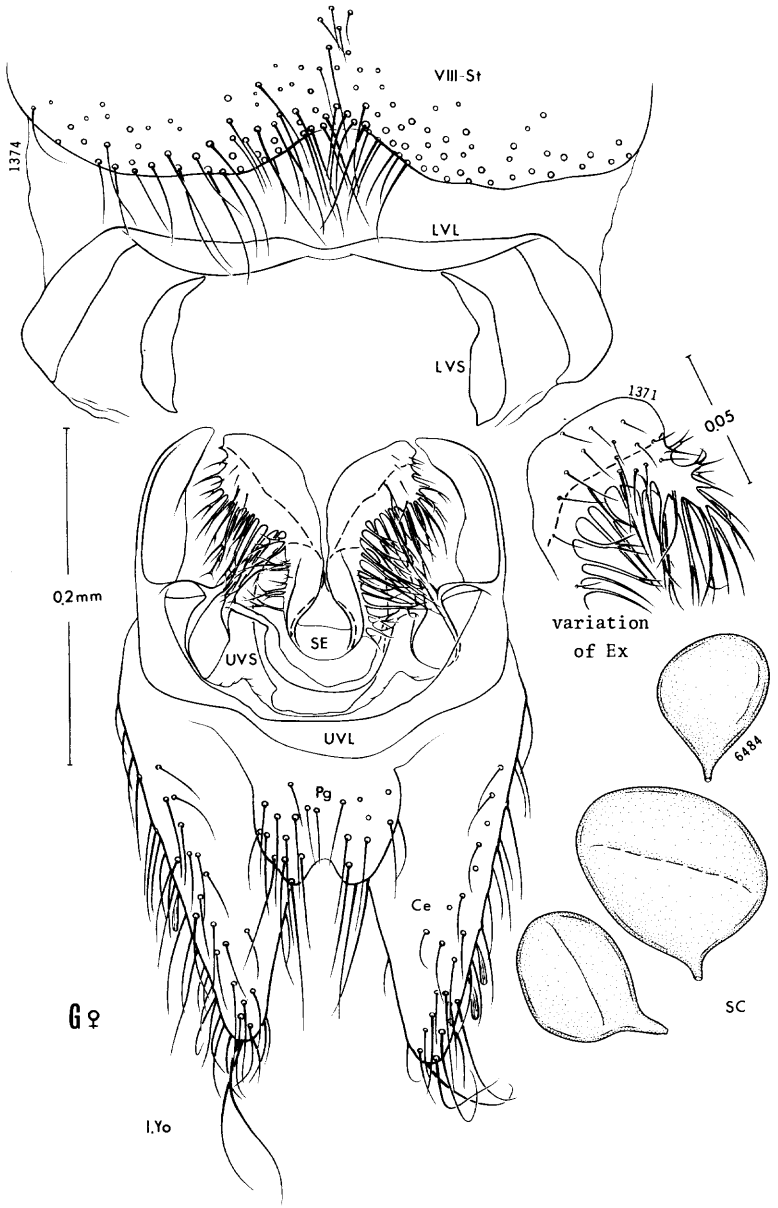


Ae. (Ver.) nobukonis

Fig.138

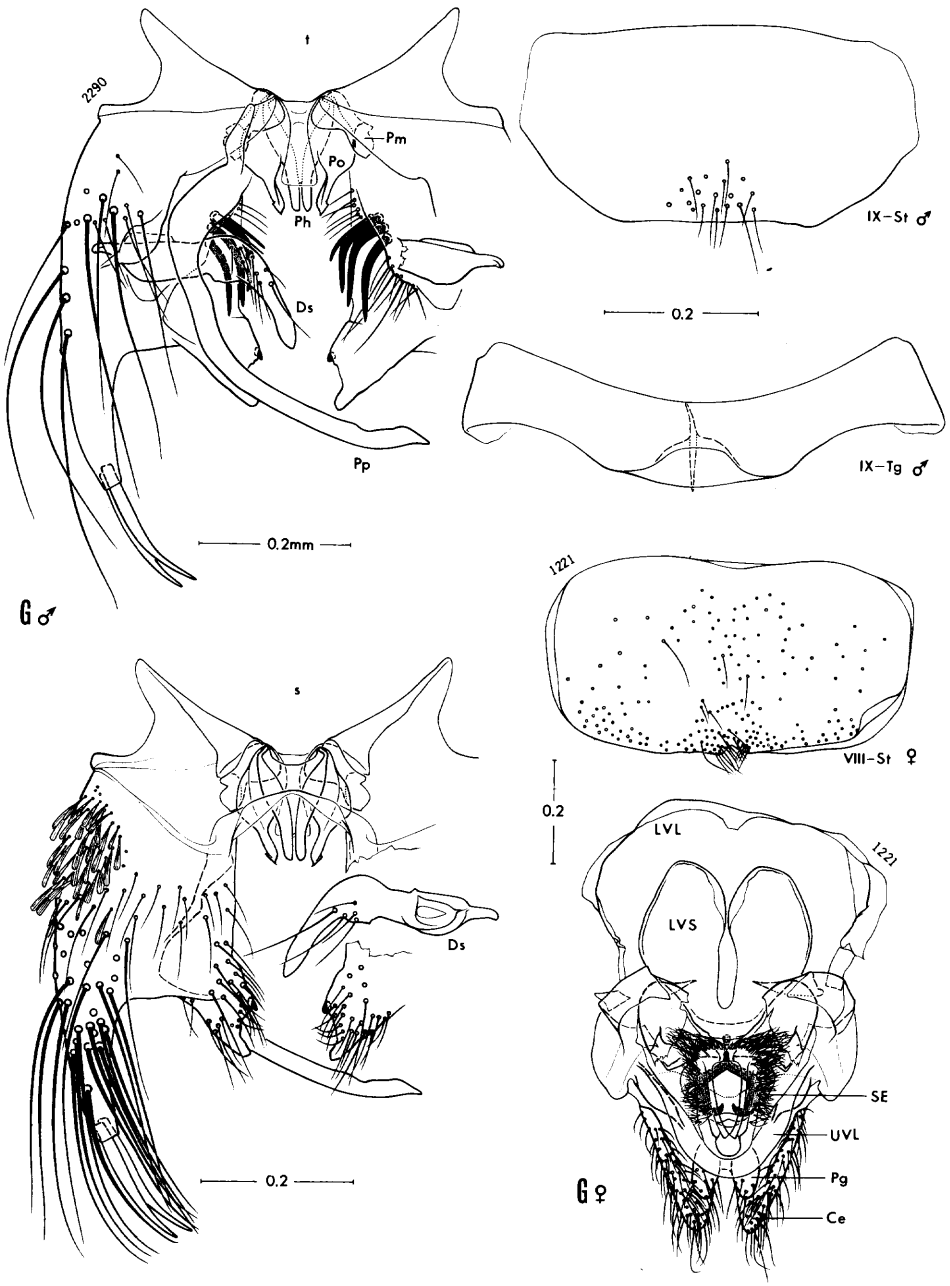


Ae. (Ver.) nobukonis



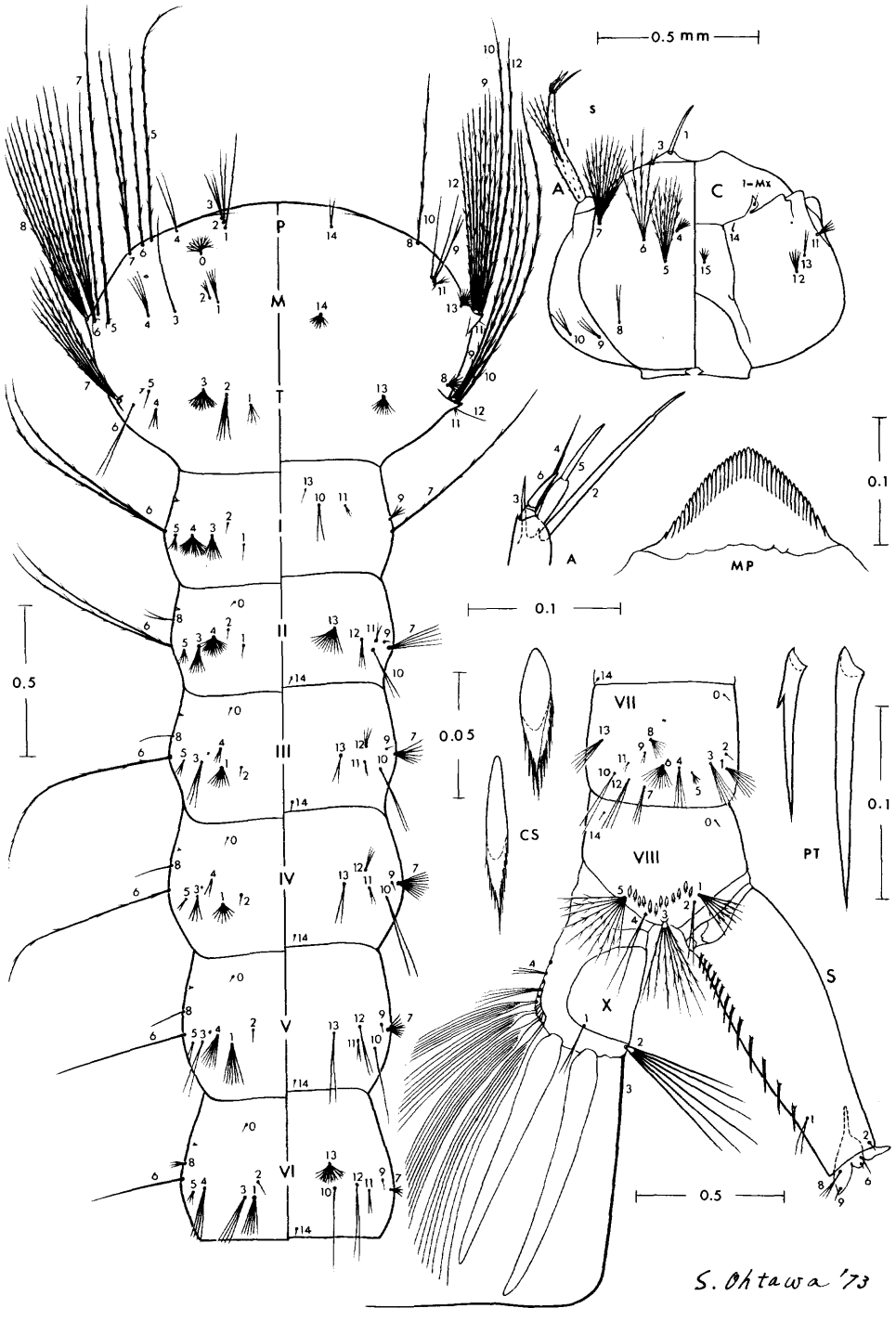
Ae. (Ver.) iriomotensis (after Tanaka and Mizusawa 1973)

Fig.140



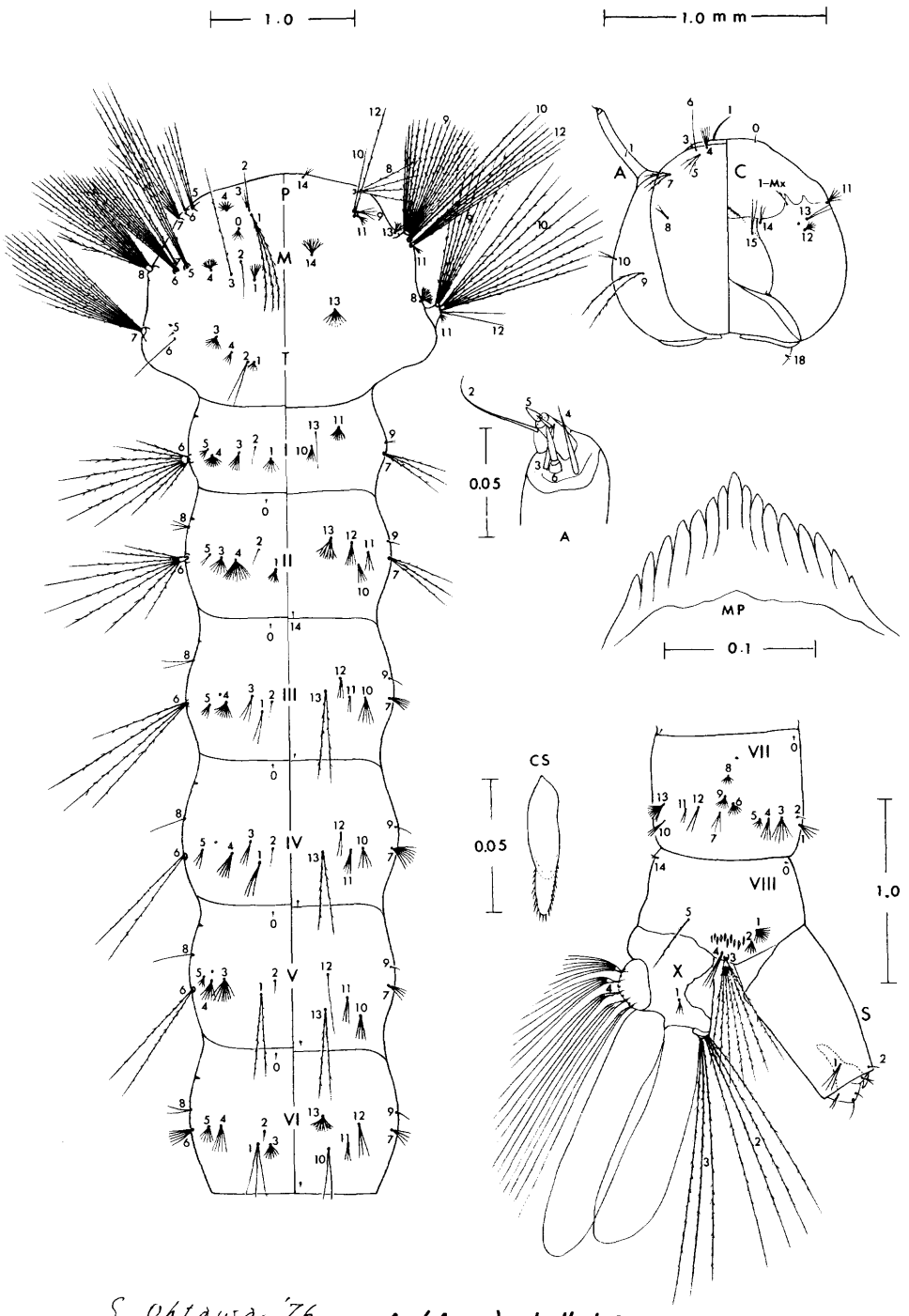
Ae. (Ver.) atriisimilis (after Tanaka and Mizusawa 1973)

Fig.141



Ae. (Ver.) atriisimilis (after Tanaka and Mizusawa 1973)

Fig.142



S. Ohtawa '76

Ar. (Arm.) subalbatus

Fig.143

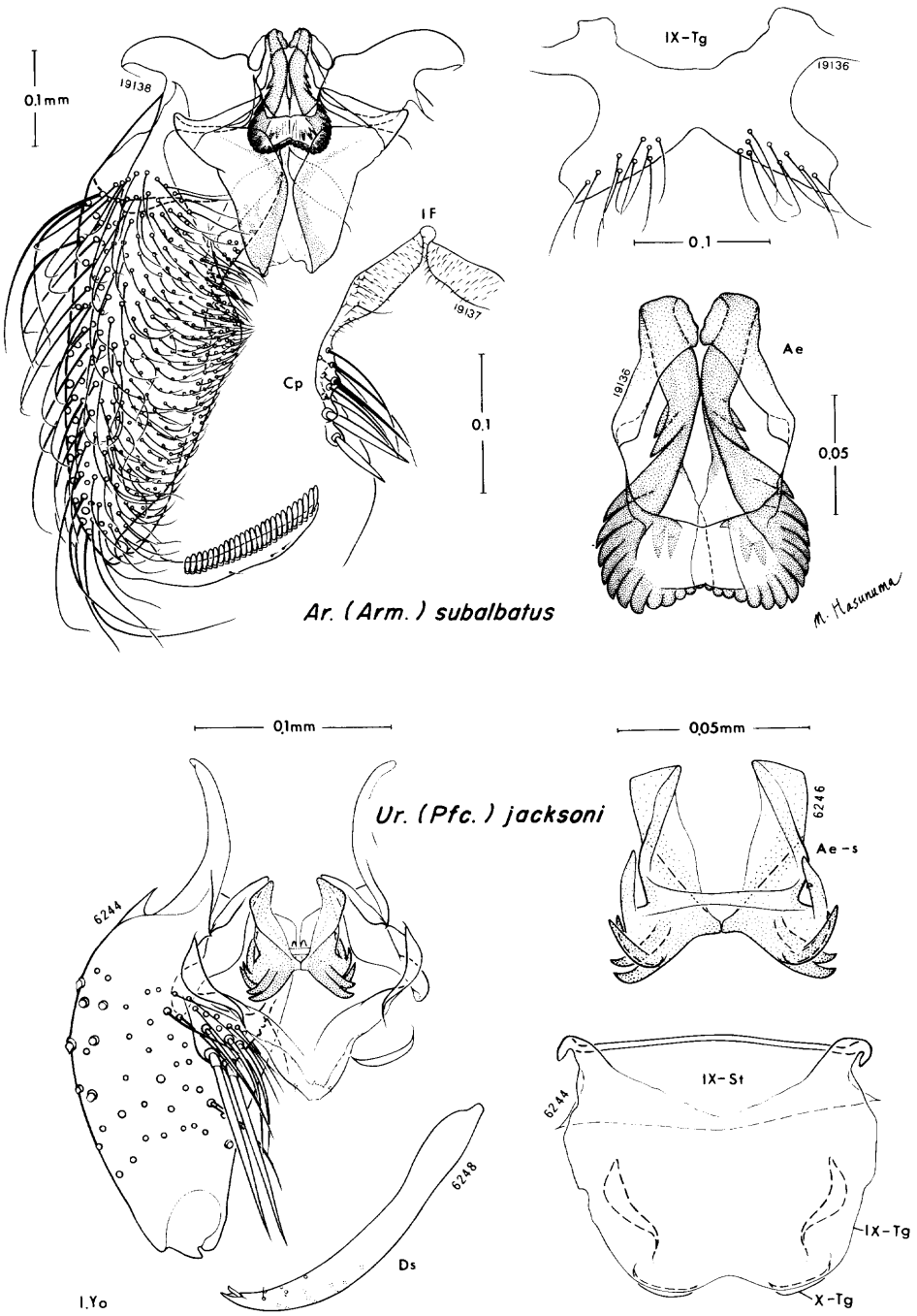
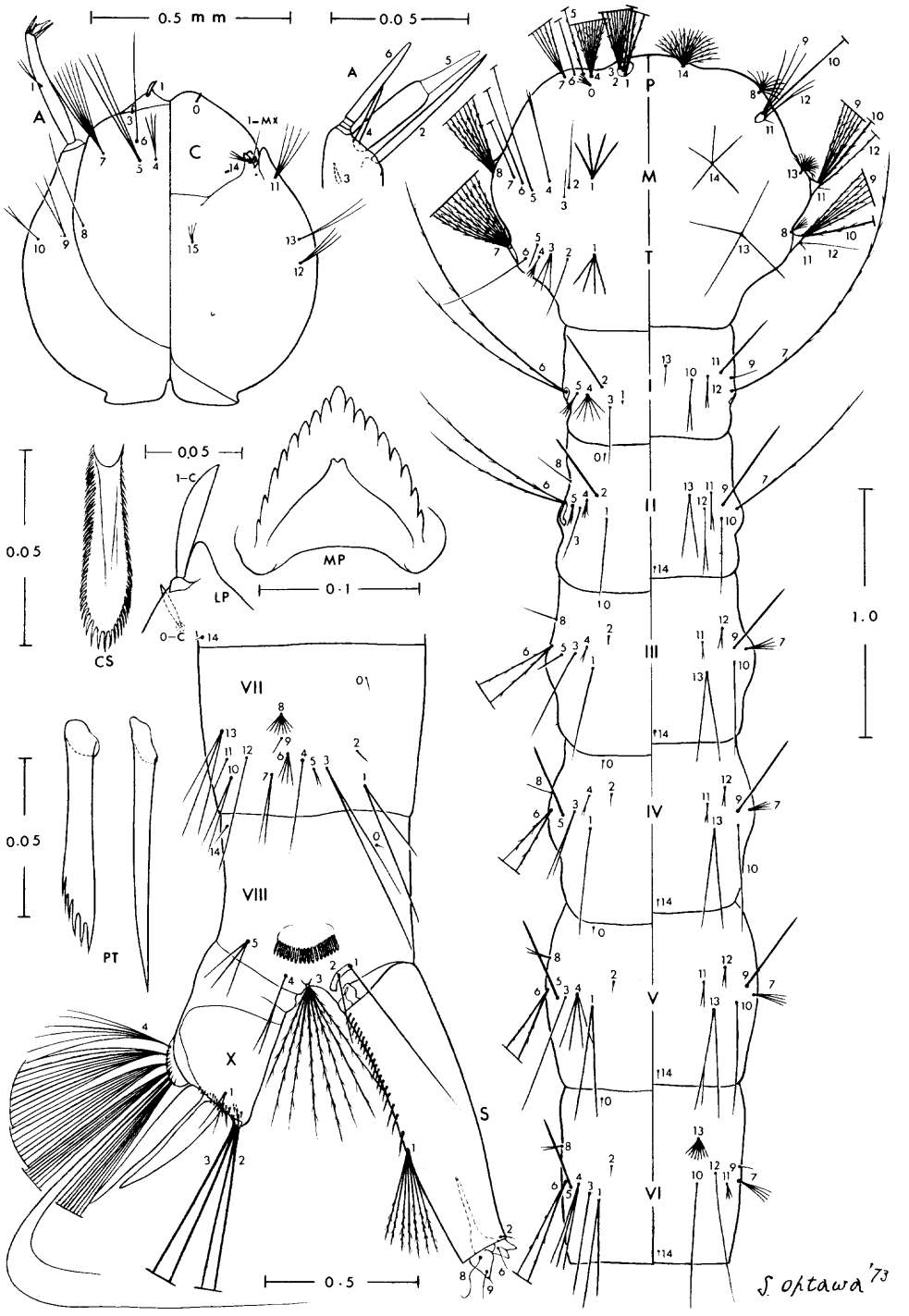
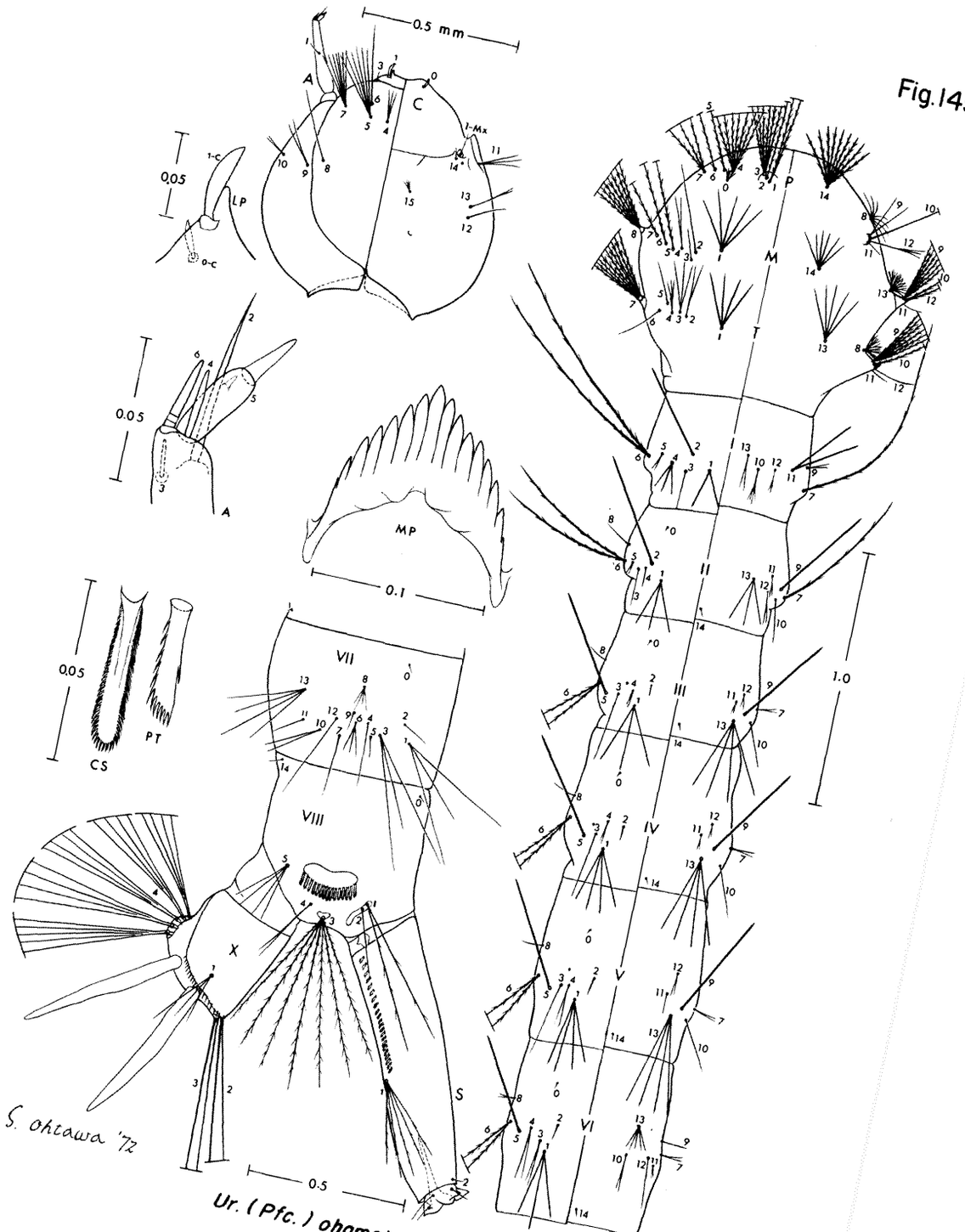

0.1mm
19138
IF
19137
Cp
0.1
IX-Tg
19136
0.1
Ae
19136
0.05
M. Hasunuma
Ar. (Arm.) subalbatus
0.1mm
0.05mm
Ur. (Pfc.) jacksoni
6244
6248
Ds
I.Yo
6246
Ae-s
IX-St
6244
IX-Tg
X-Tg

Fig.144

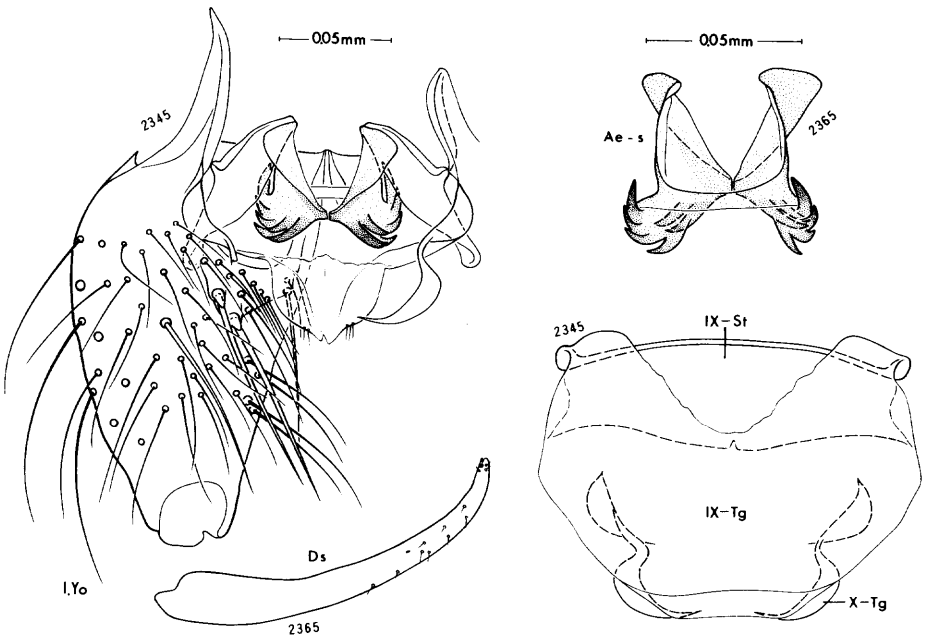


Ur. (Pfc.) jacksoni

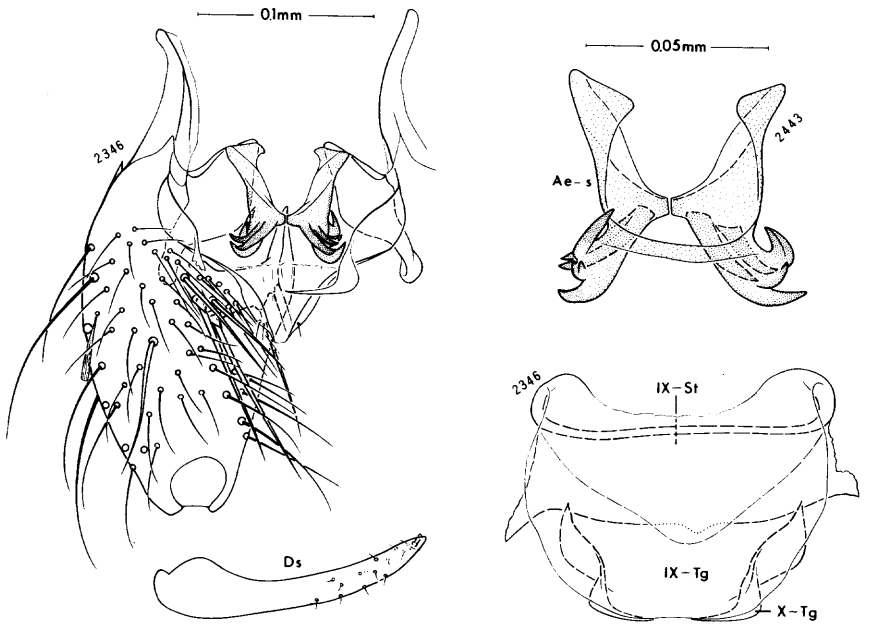
Fig.145



Ur. (Pfc.) ohamai (after Tanaka et al. 1975)

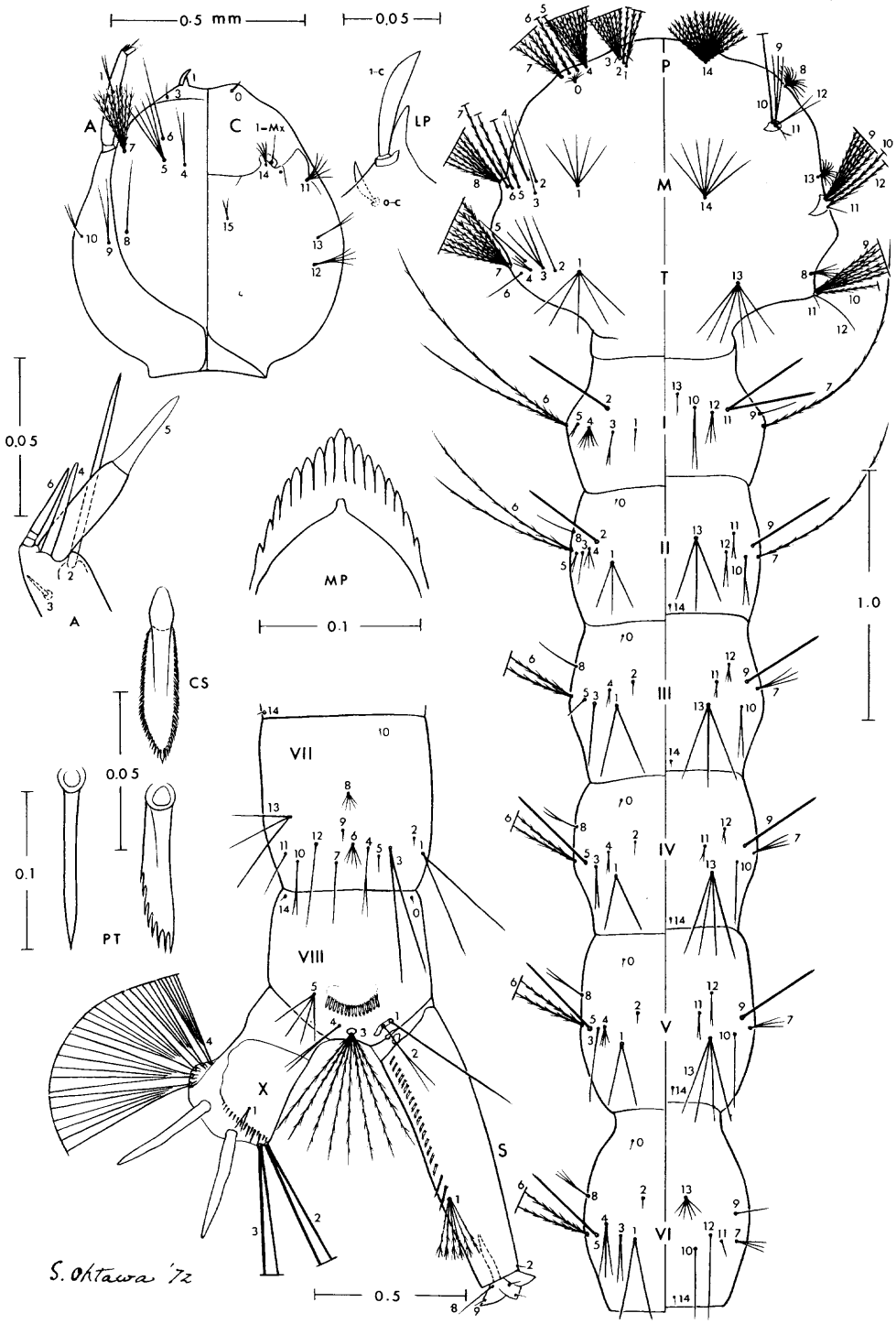


Ur. (Pfc.) ohamai (after Tanaka et al. 1975)



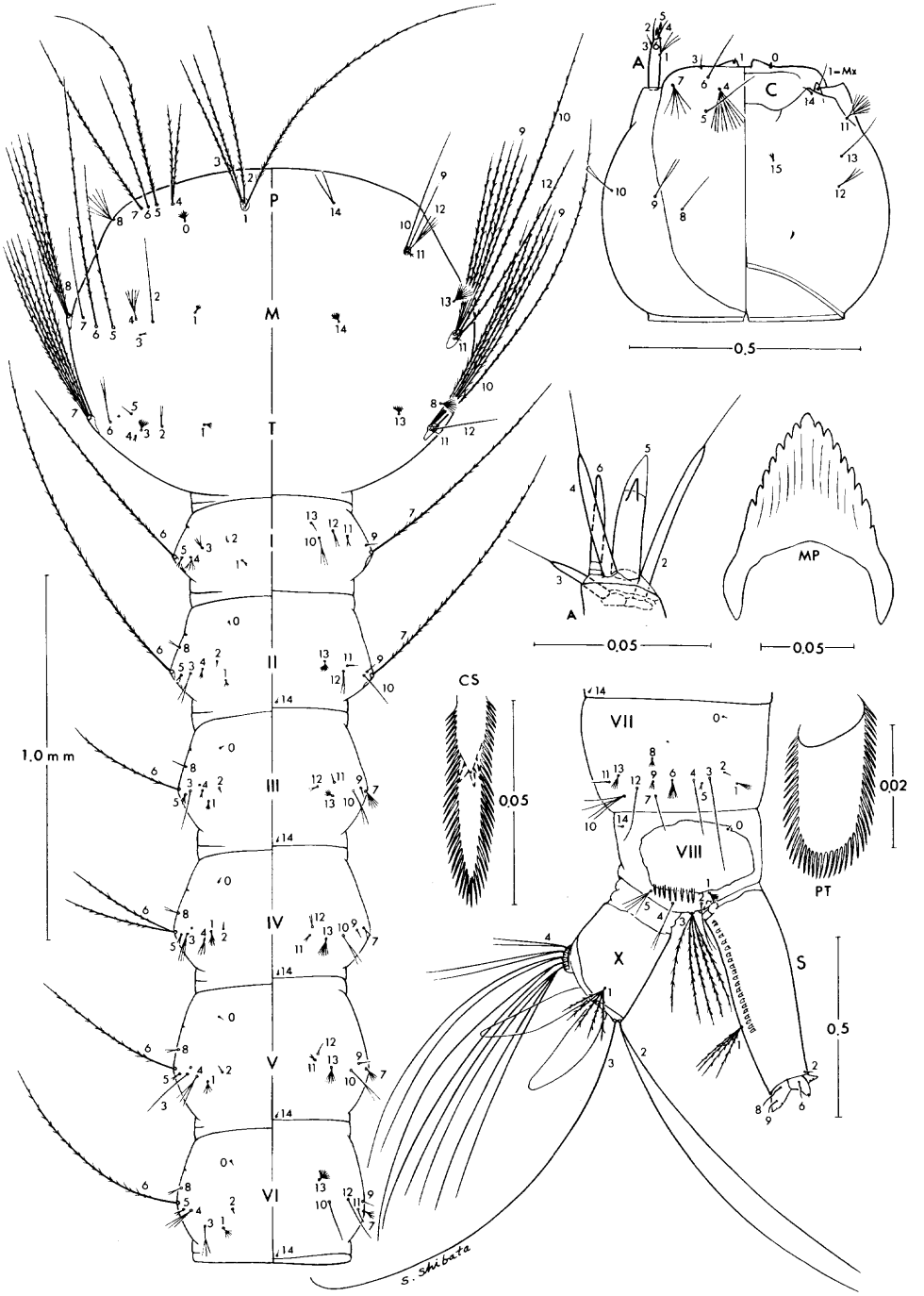
Ur. (Pfc.) yaeyamana (after Tanaka et al. 1975)

Fig.147



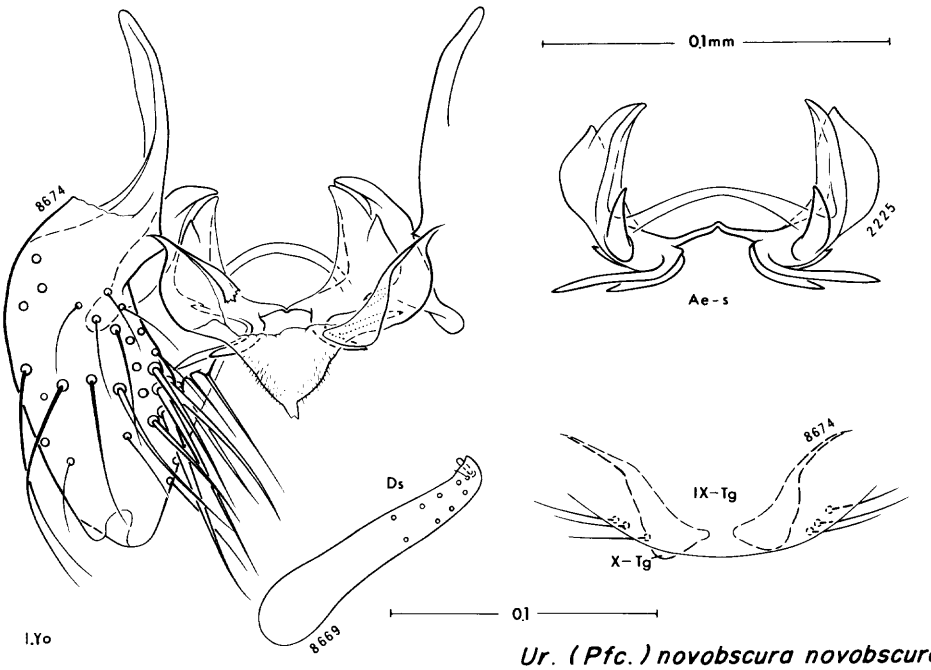
Ur. (Pfc.) yaeyamana (after Tanaka et al. 1975)

Fig.148

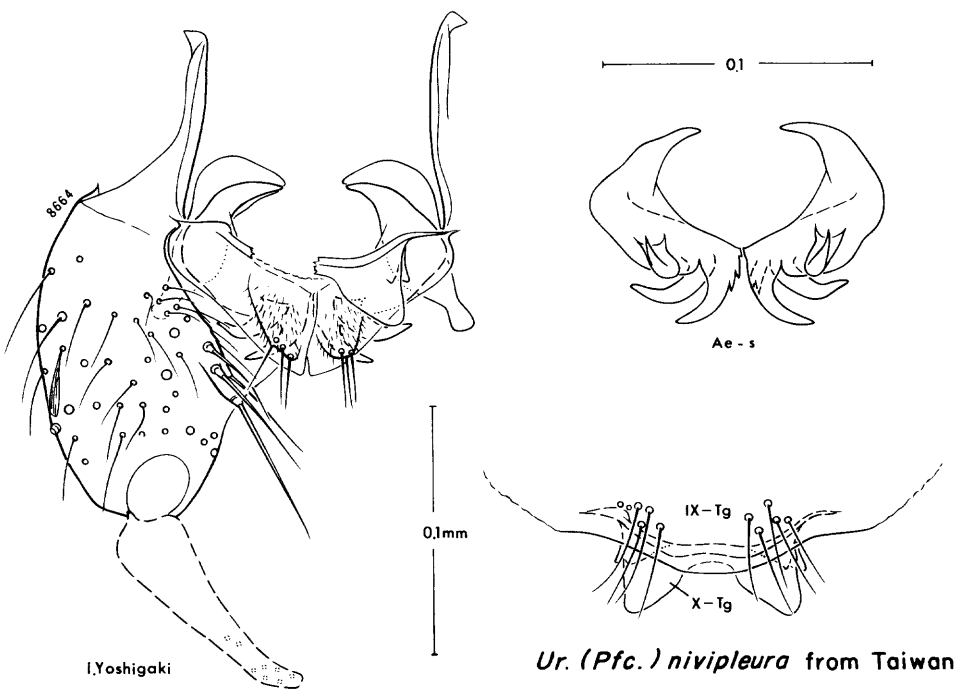


Ur. (Pfc.) novobscura novobscura

Fig.149

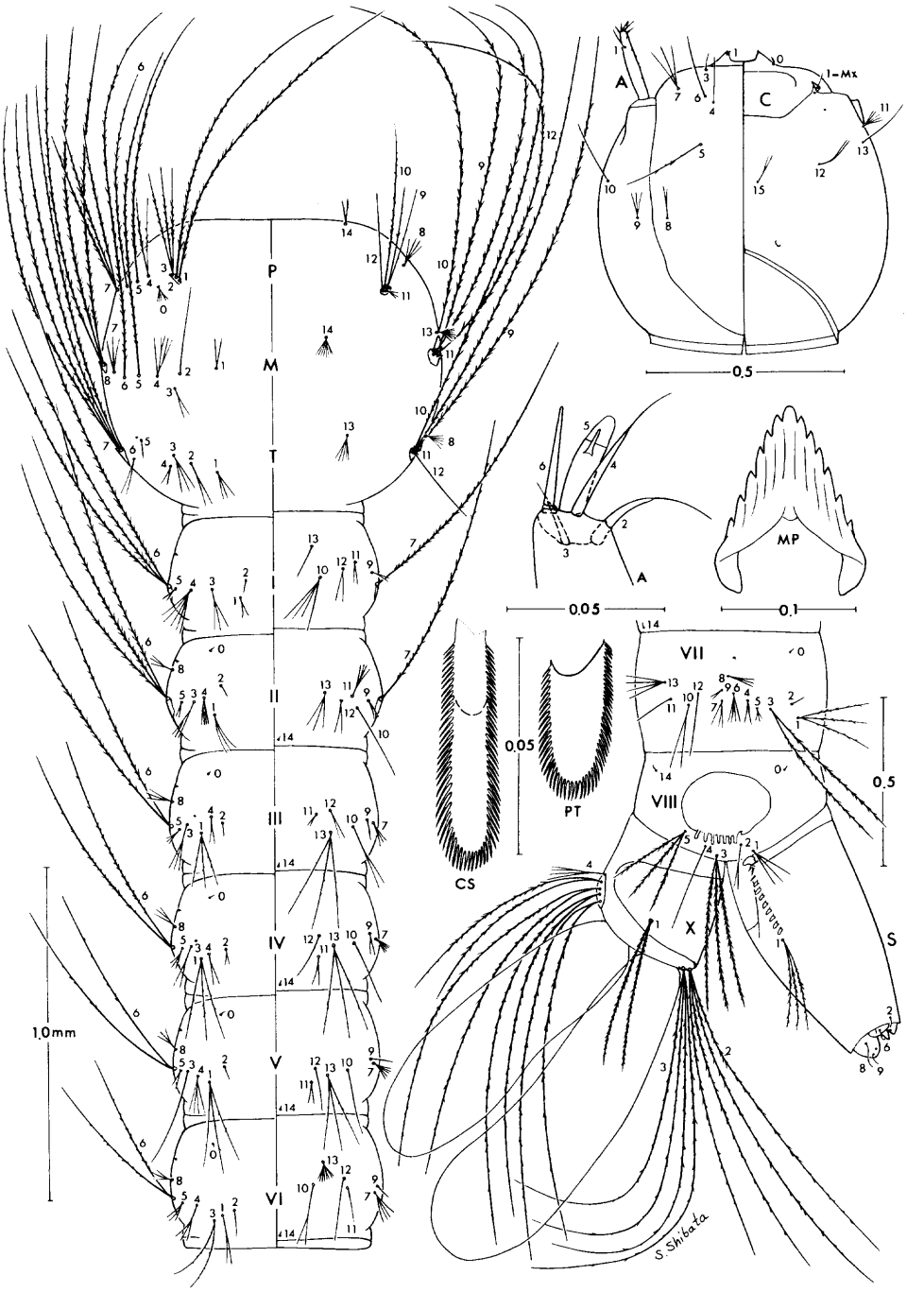


Ur. (Pfc.) novobscura novobscura



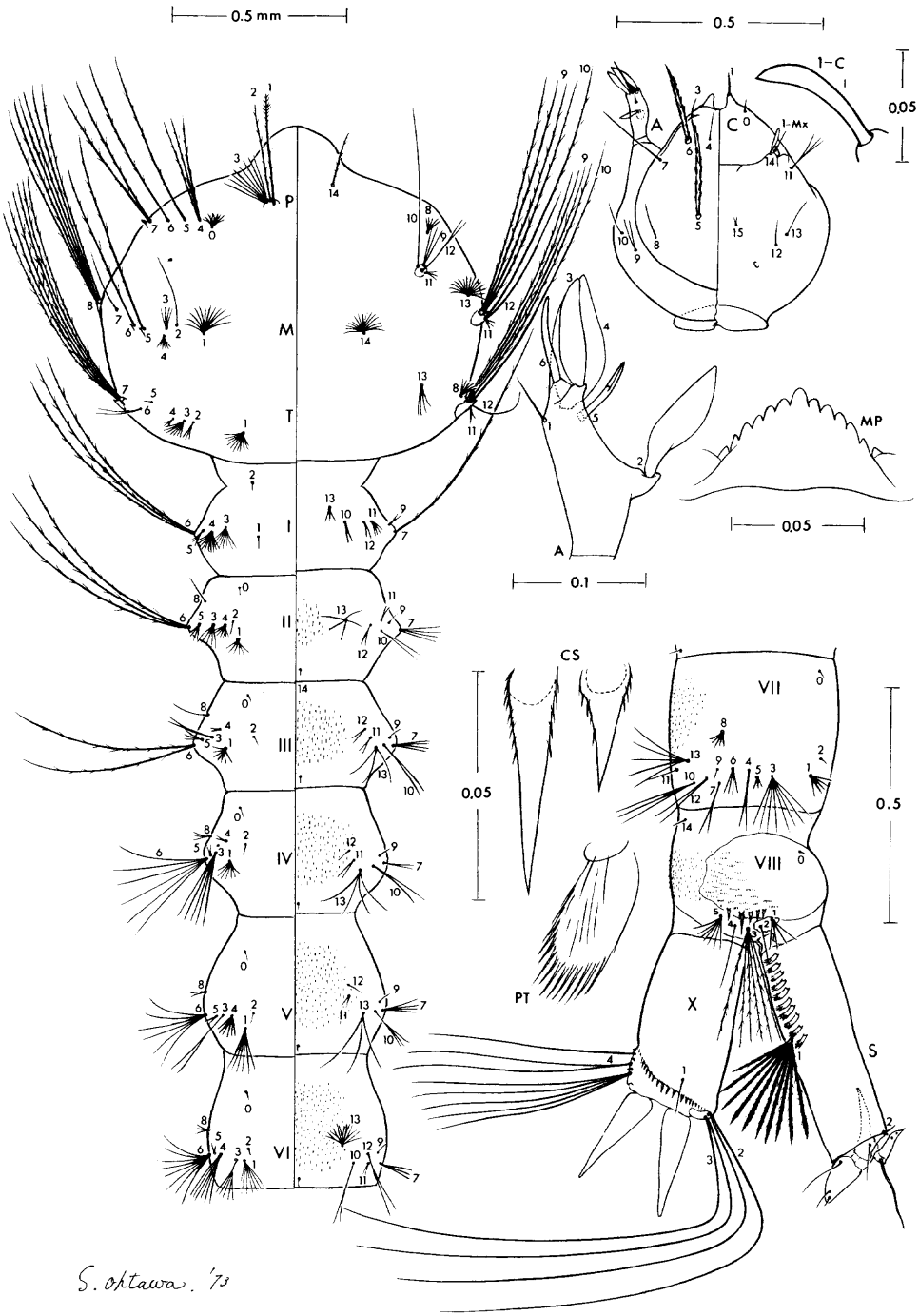
Ur. (Pfc.) nivipleura from Taiwan

Fig.150



Ur. (Pfc.) nivipleura from Taiwan

Fig. 151



S. optawa. '73

Ur. (Ura.) annandalei

Fig.152

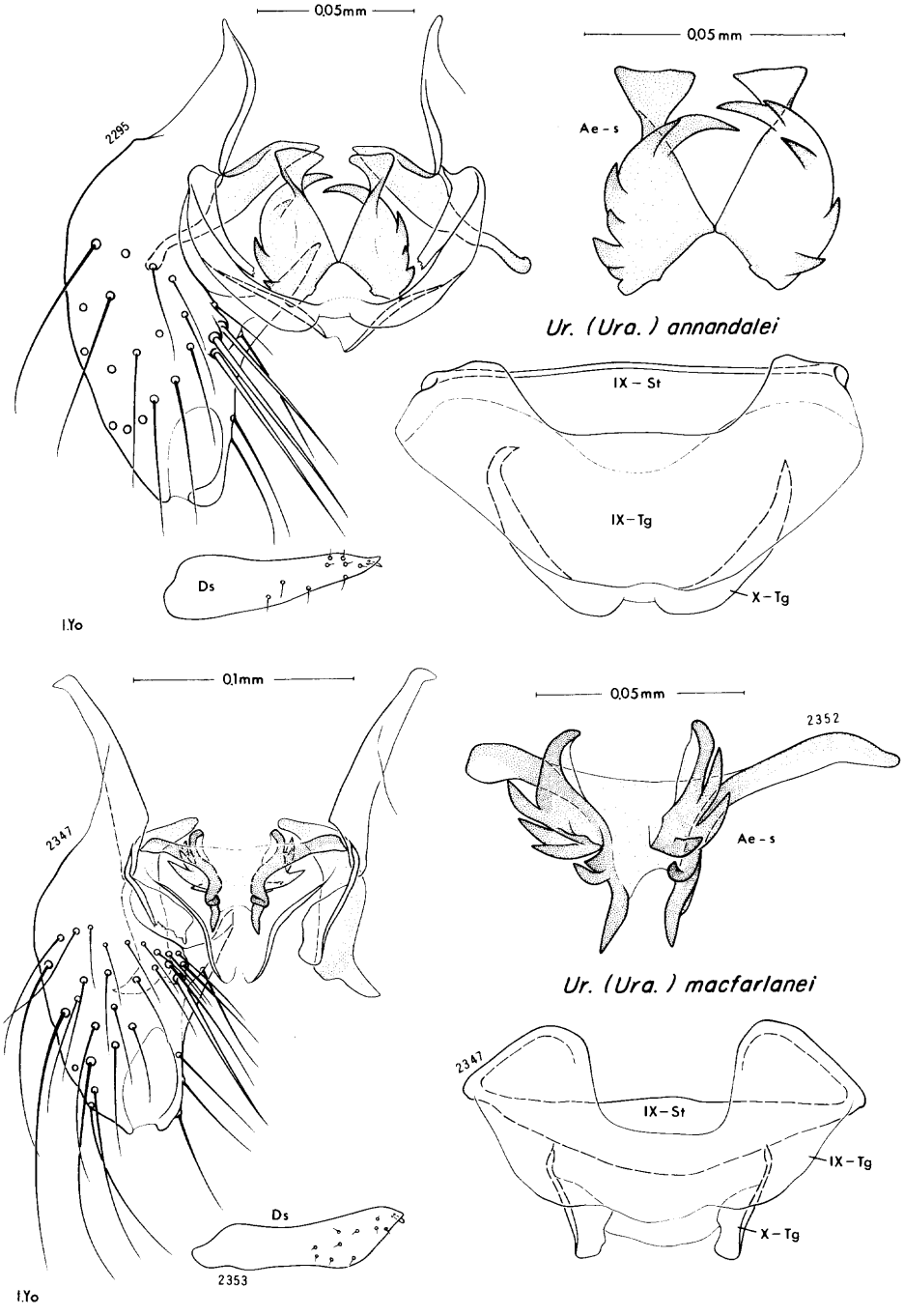
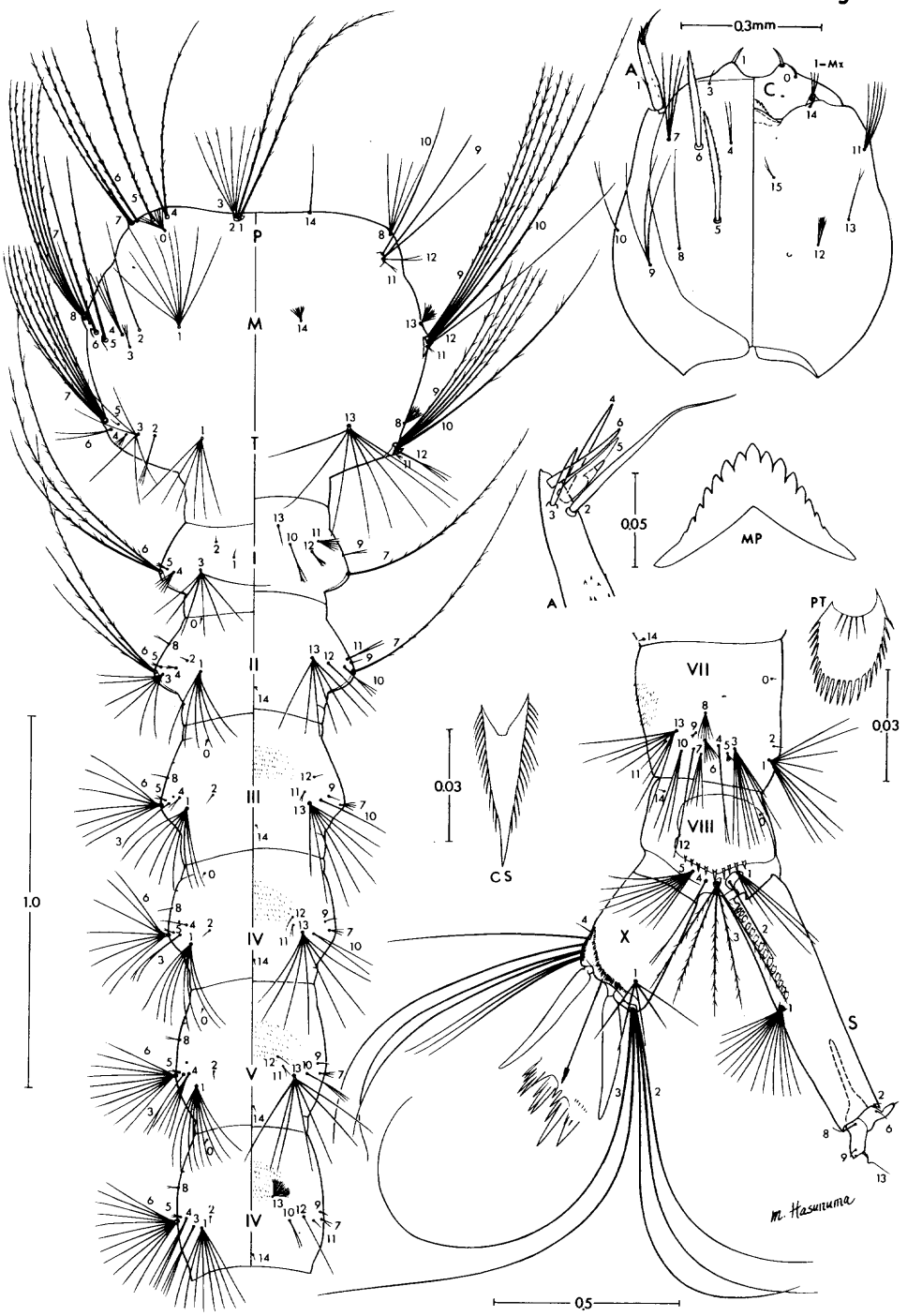
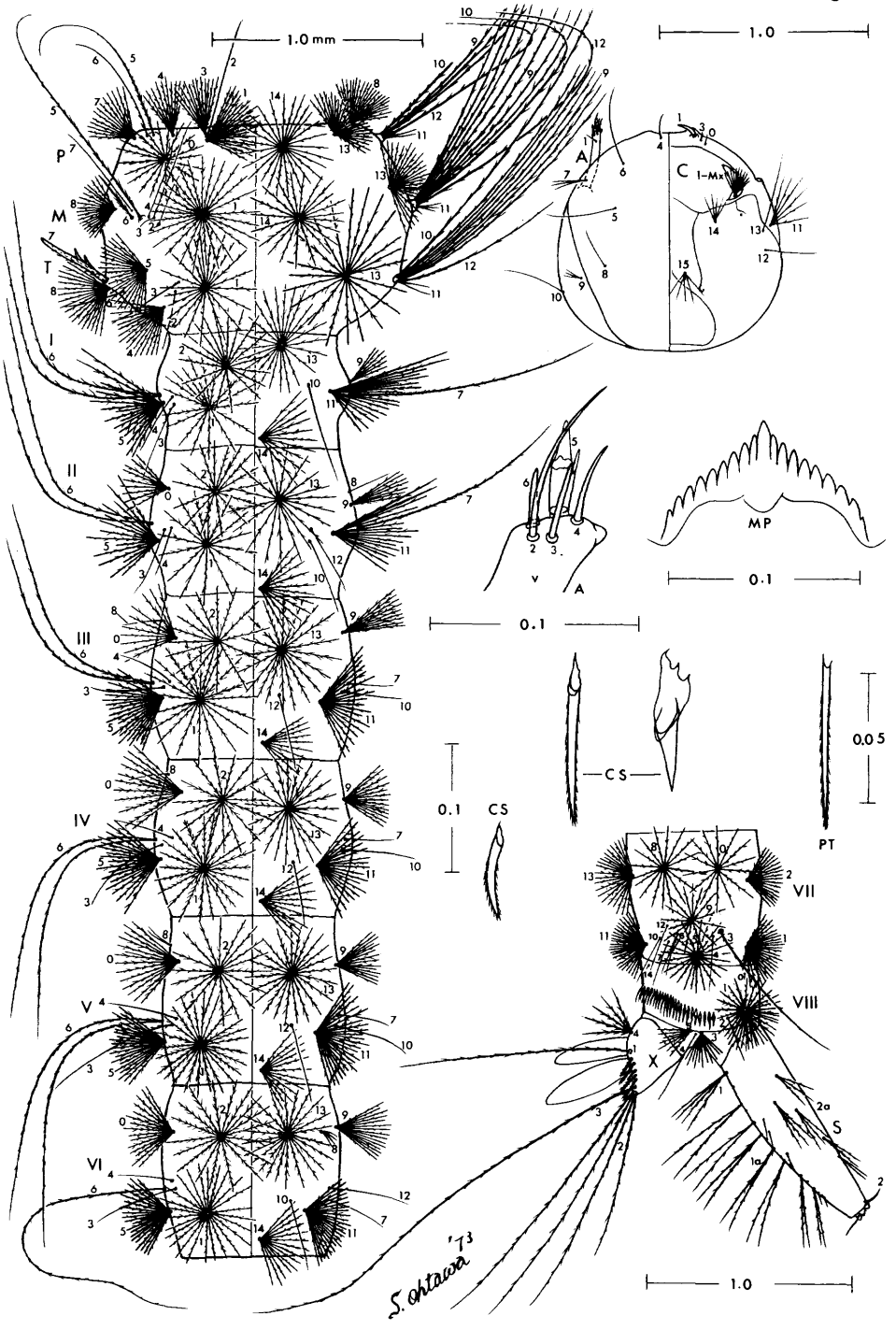

0.05mm
2295
Ds
I.Yo
0.05 mm
Ae - s
Ur. (Ura.) annandalei
IX - St
IX - Tg
X - Tg
0.1mm
2347
Ds
2353
I.Yo
0.05mm
2352
Ae - s
Ur. (Ura.) macfarlanei
2347
IX - St
IX - Tg
X - Tg

Fig.153



Ur. (Ura.) macfarlanei

Fig.154



Tp. (Trp.) bambusa bambusa

Fig. 155

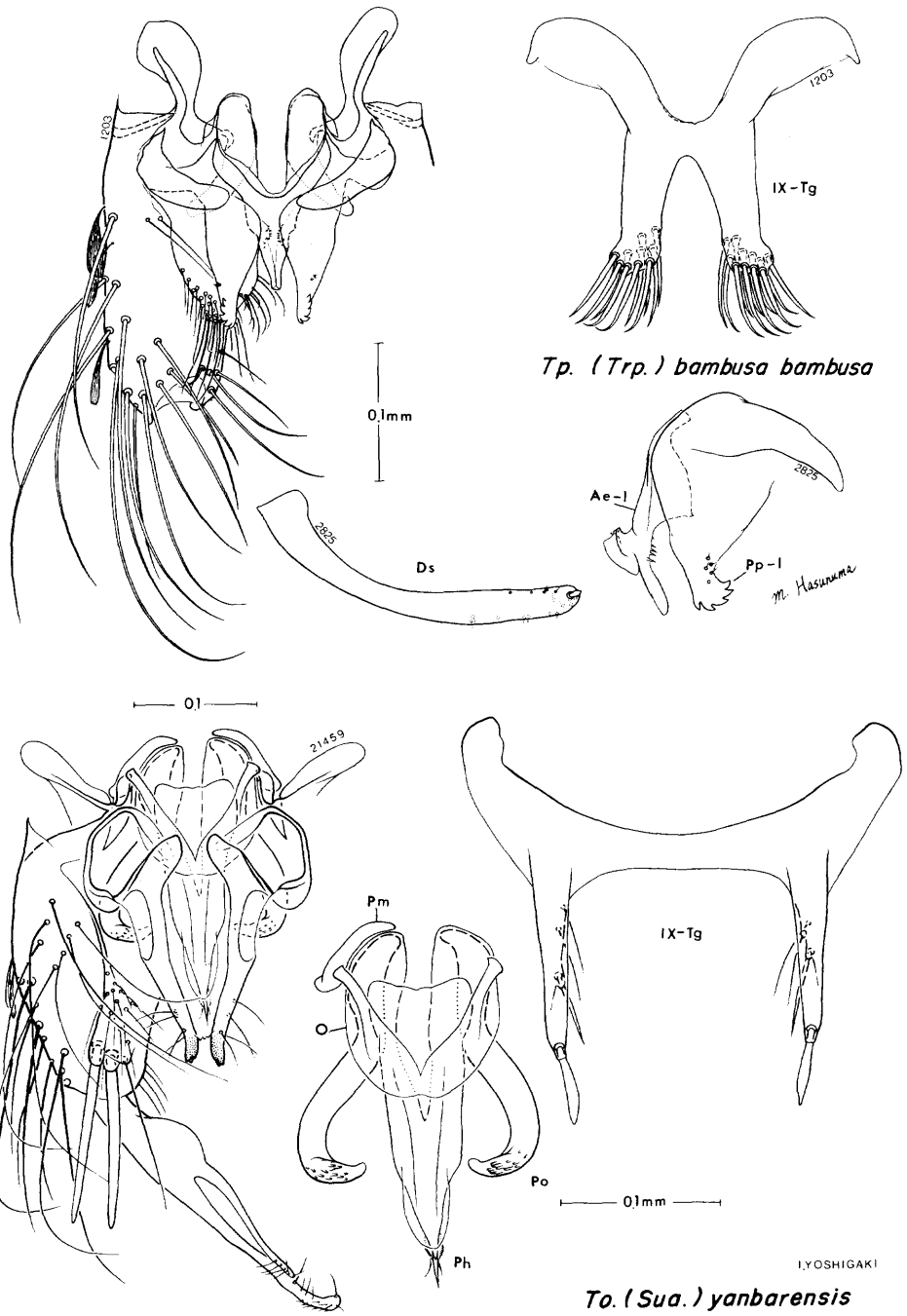
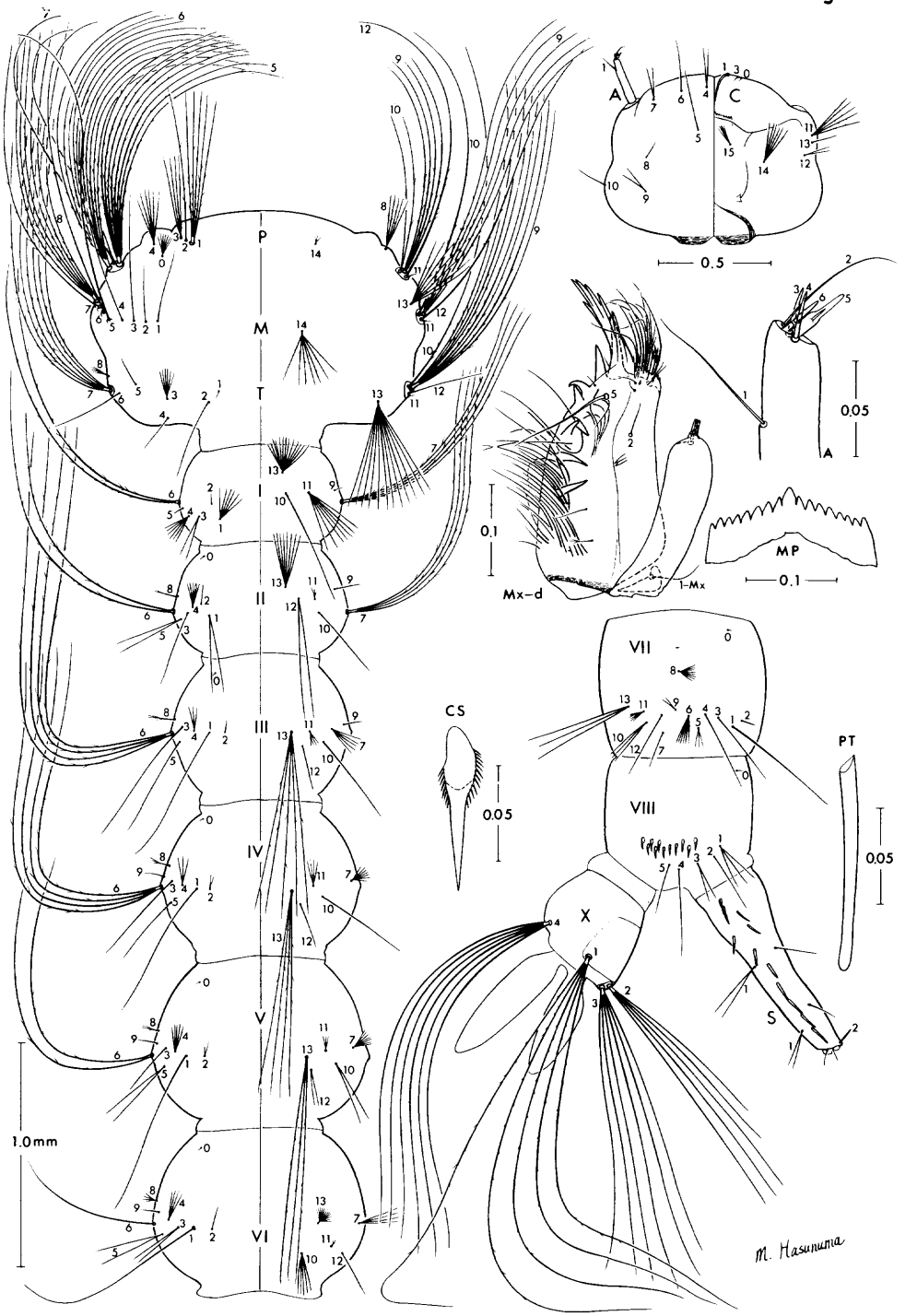
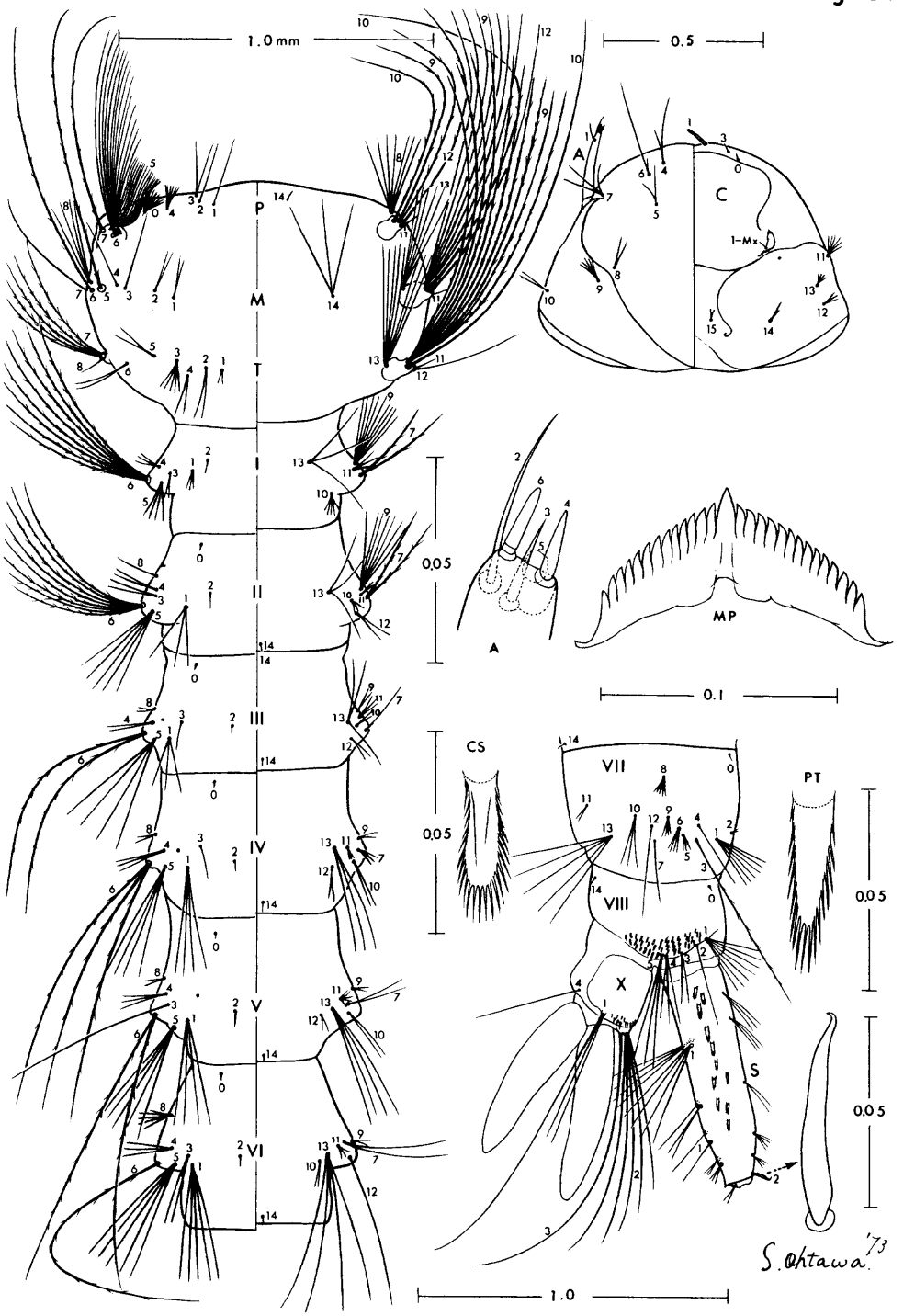

1203
0.1mm
2825
Ds
1203
IX-Tg
Tp. (Trp.) bambusa bambusa
Ae-I
2825
Pp-I
M. Hasunuma
0.1
21459
Pm
O
Po
Ph
IX-Tg
0.1mm
IYOSHIGAKI
To. (Sua.) yanbarensis

Fig. 156



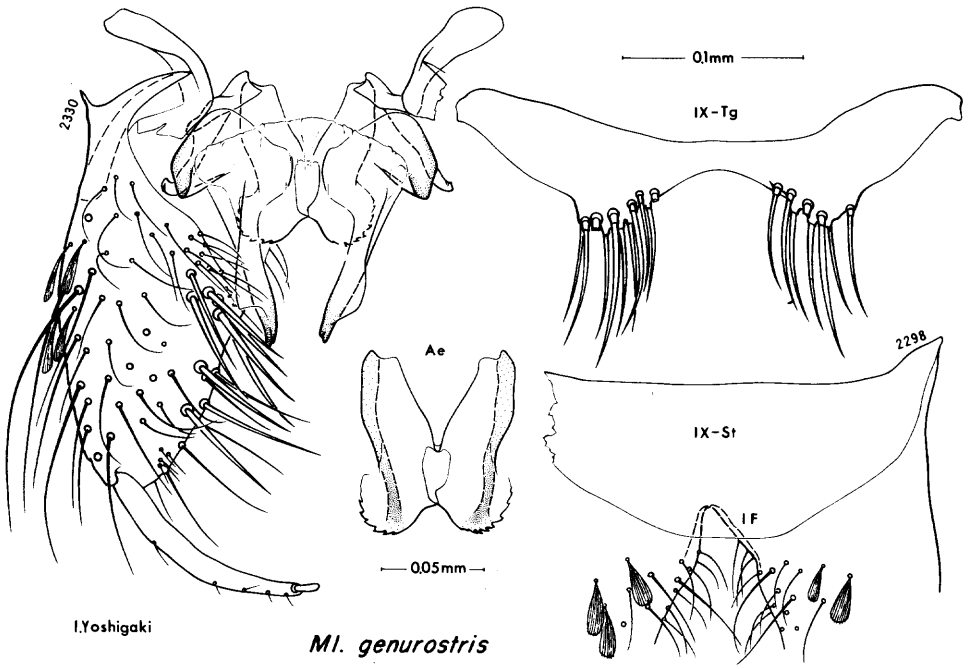
To. (Sua.) yanbarensis

Fig.157

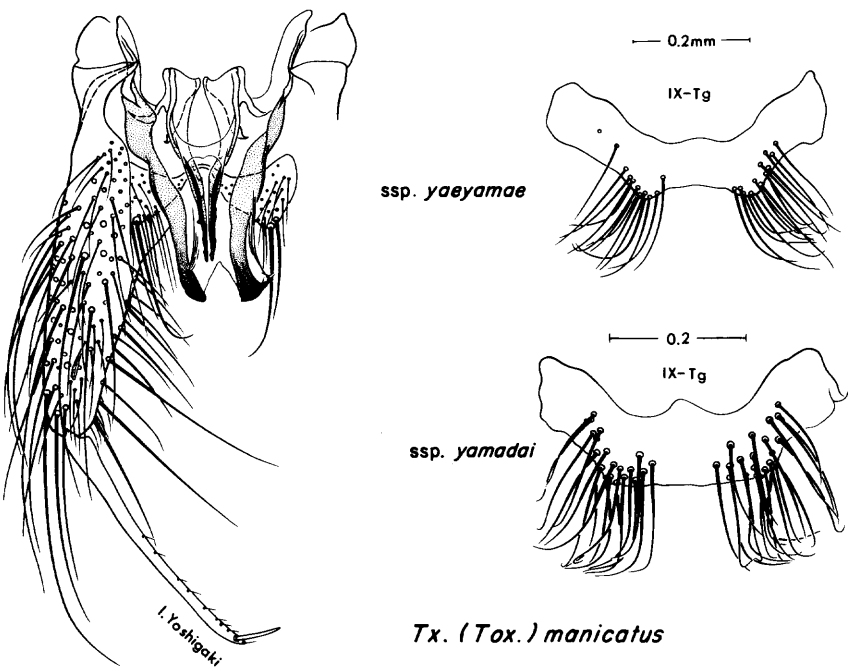


MI. genurostris

Fig.158

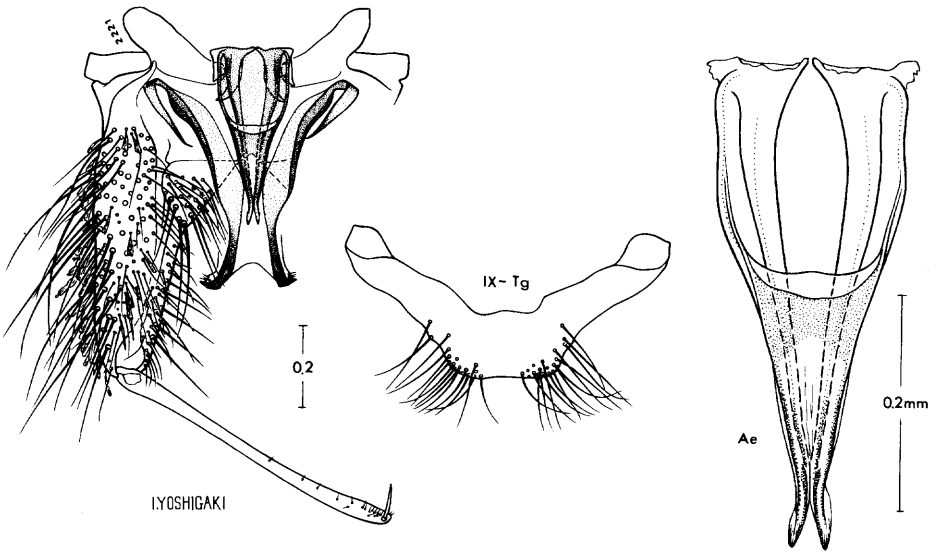


Ml. genurostris

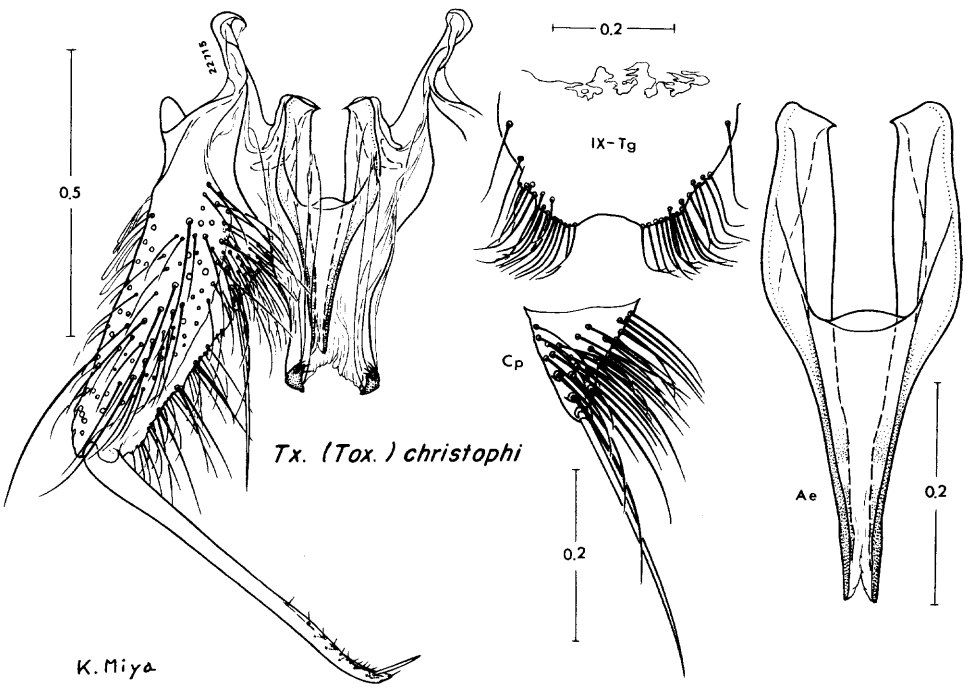


Tx. (Tox.) manicatus

Fig.159



Tx. (Tox.) towadensis



Tx. (Tox.) christophi

Fig.160

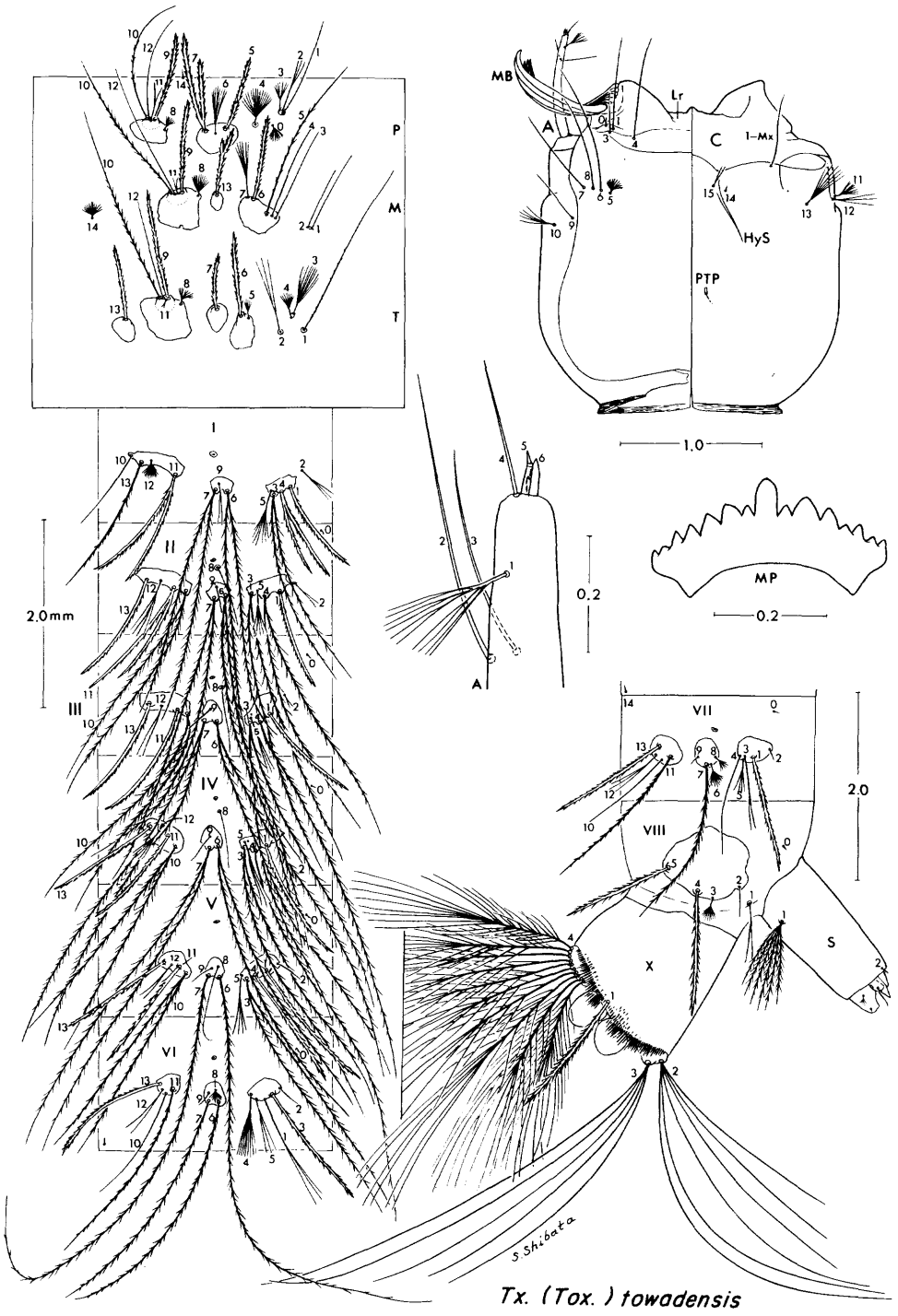

P
M
T
MB
Lr
A
C
1-Mx
HyS
PTP
1.0
0.2
MP
0.2
2.0mm
I
II
III
IV
V
VI
VII
VIII
X
S
2.0
S. Shibata
Tx. (Tox.) towadensis

Fig. 161

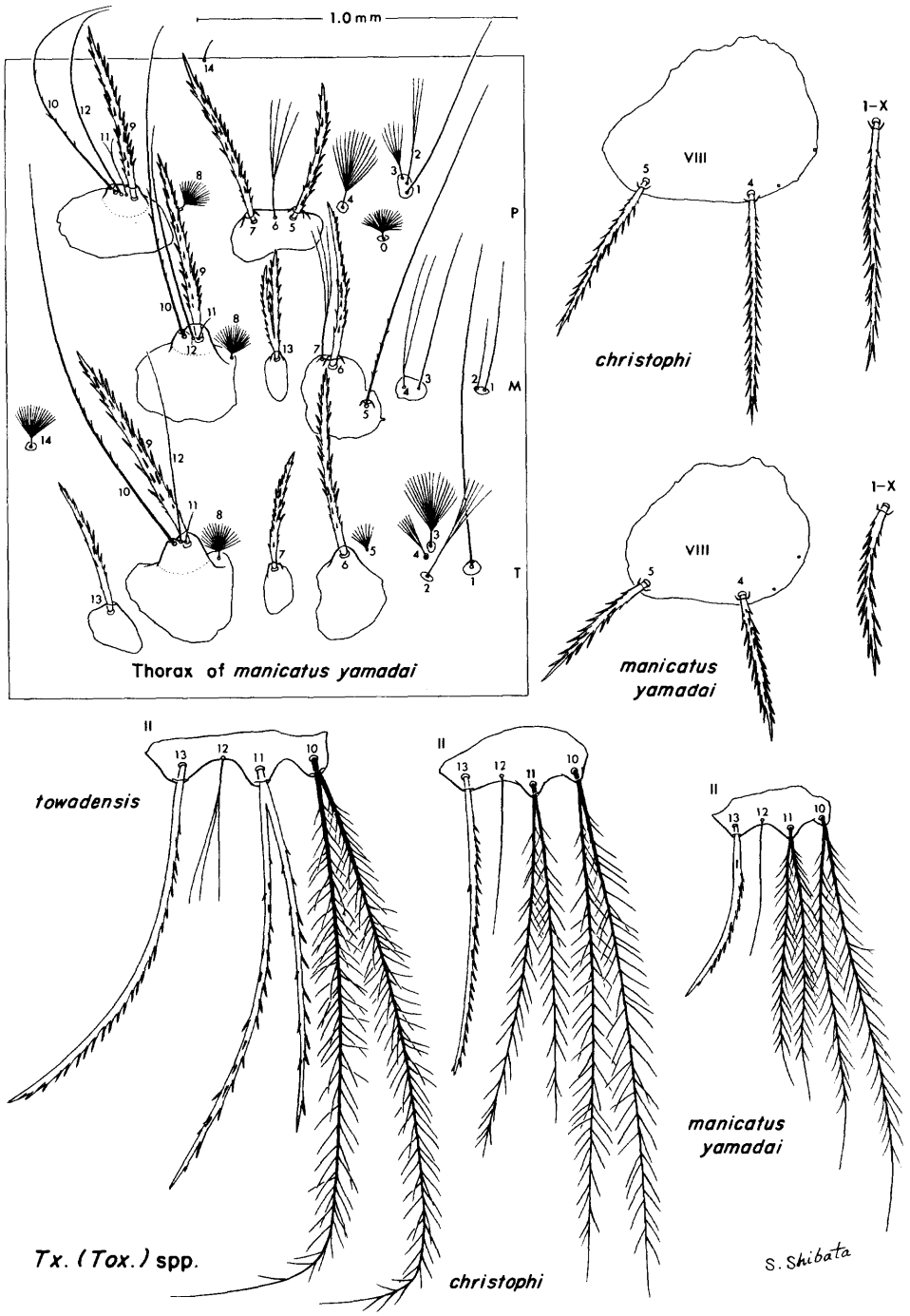
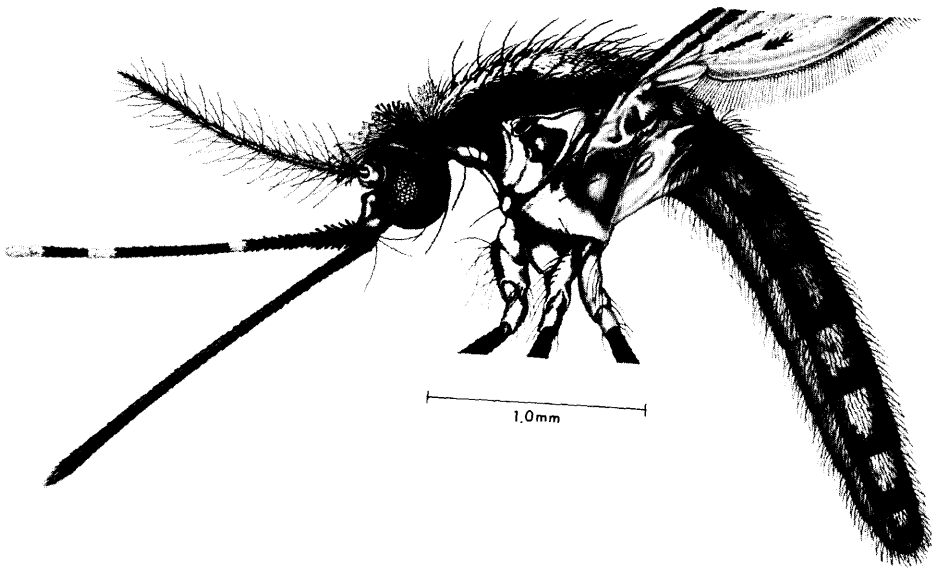
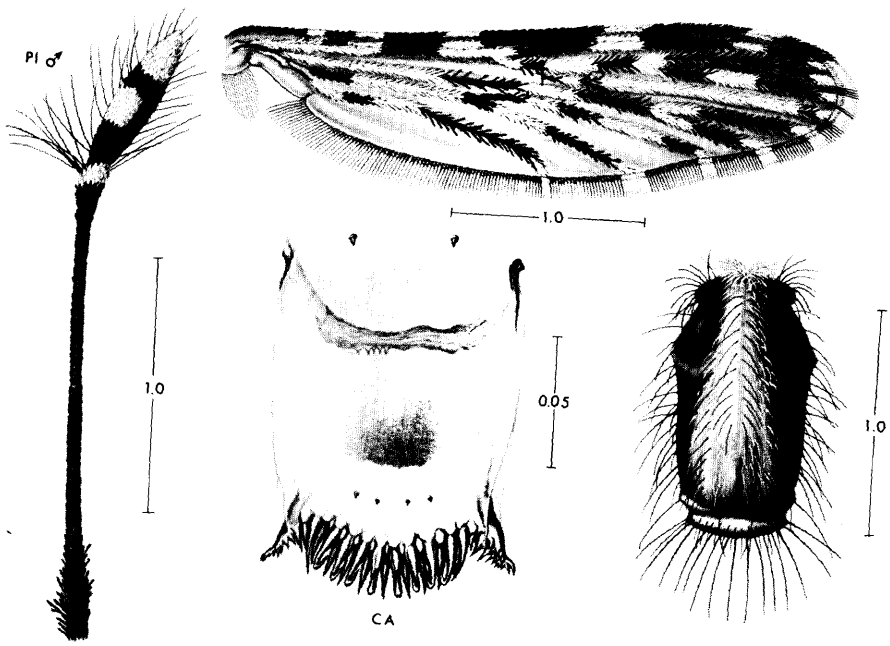

1.0 mm
P
M
T
Thorax of manicatus yamadai
VIII
1-X
christophi
manicatus yamadai
II
towadensis
Tx. (Tox.) spp.
christophi
manicatus yamadai
S. Shibata

Fig. 162

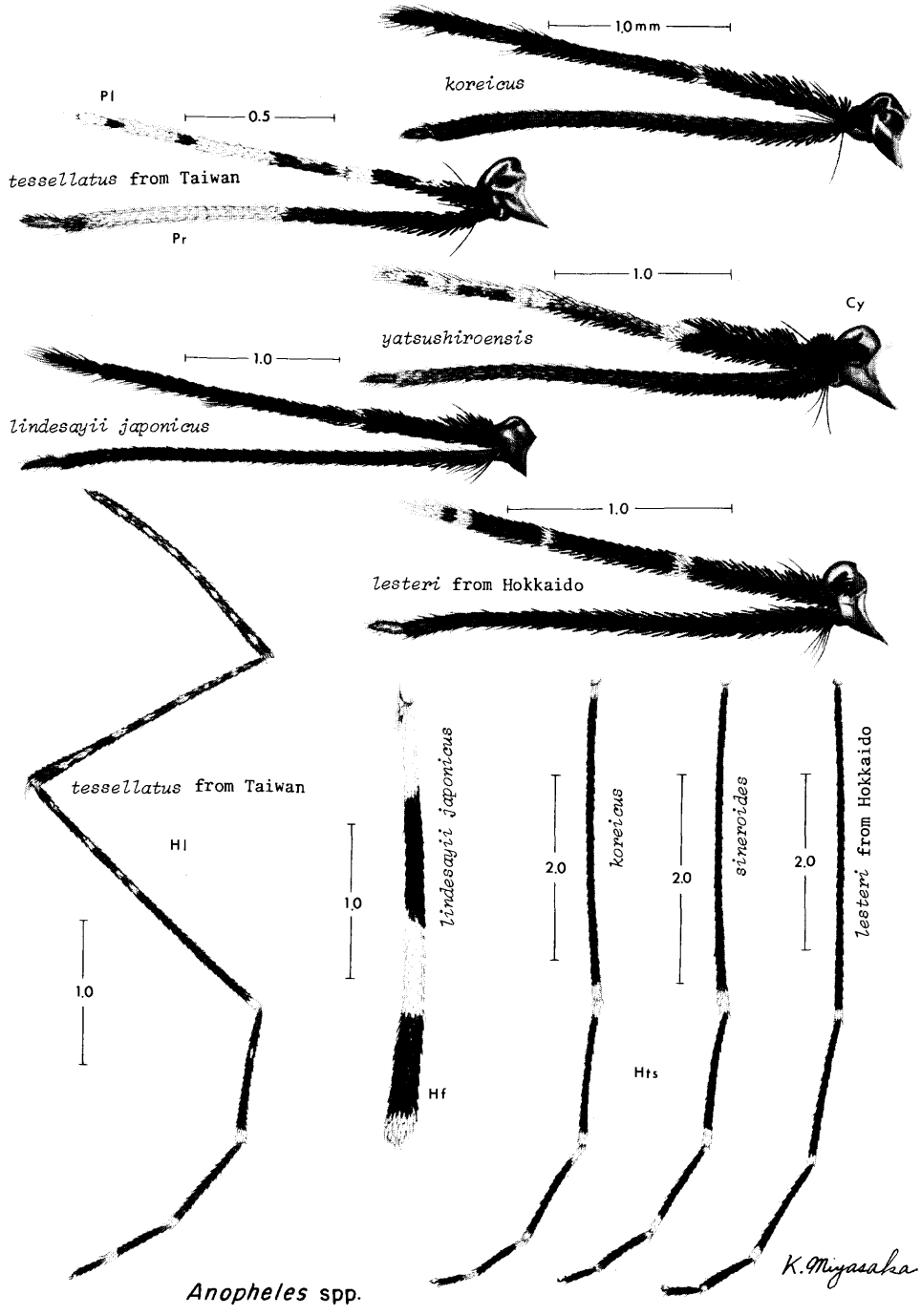




An. (Cel.) minimus

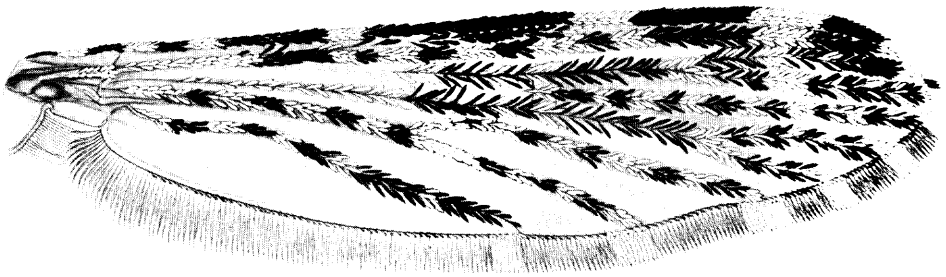
Kei. Daishoji

Fig. 163

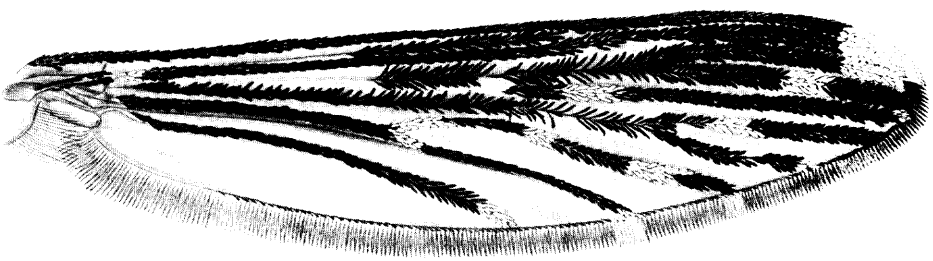


Anopheles spp.

Fig. 164

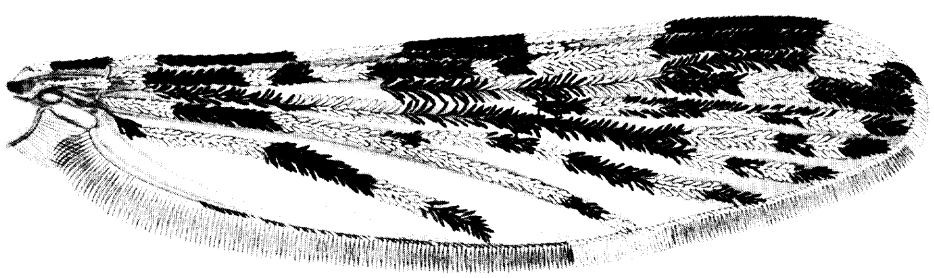


tessellatus from Taiwan



lindesayii japonicus

koreicus

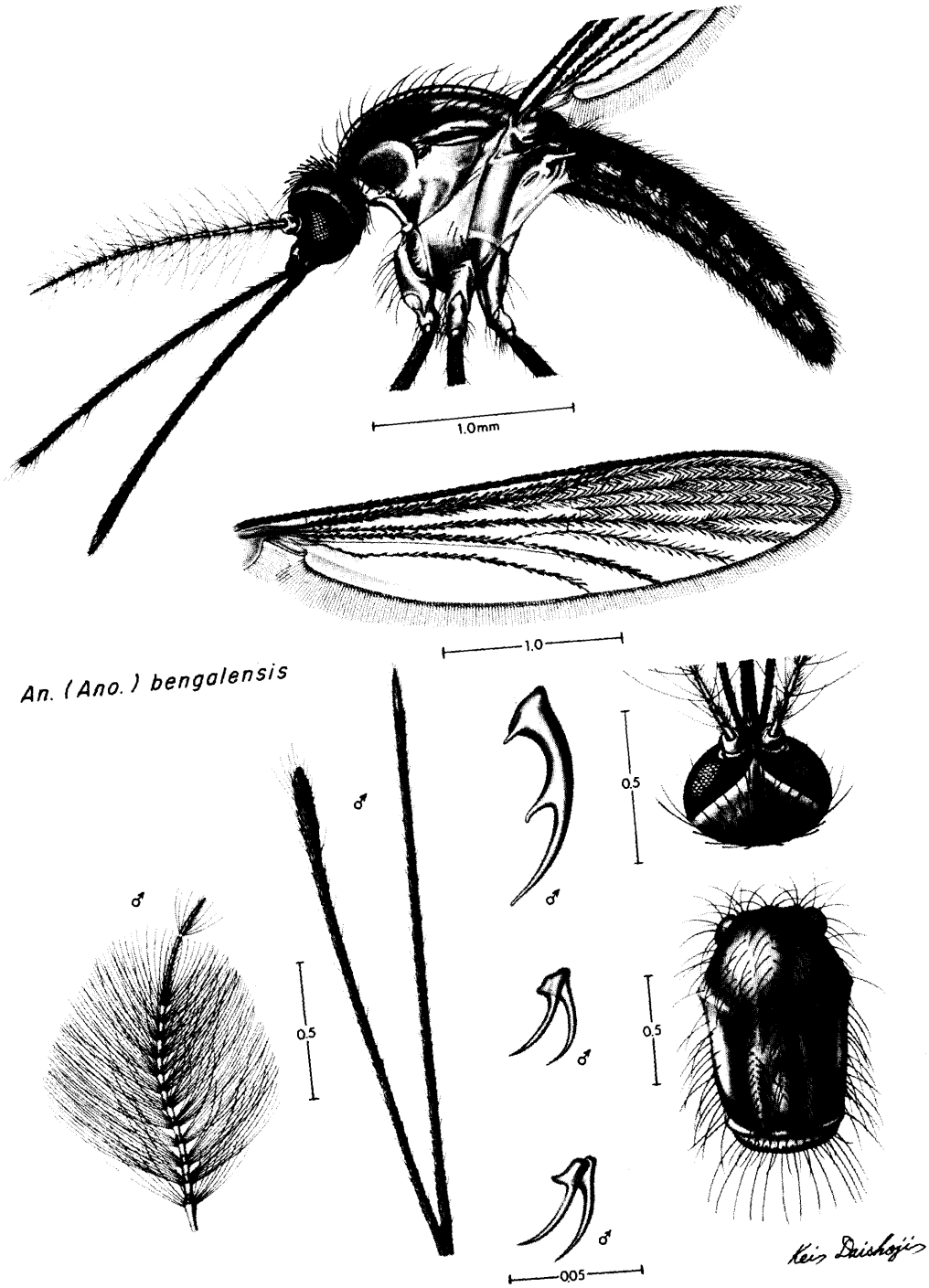


koreicus (*edwardsi* – type)

K. Miyasaka

Anopheles spp.

Fig. 165



An. (Ano.) bengalensis

Fig. 166

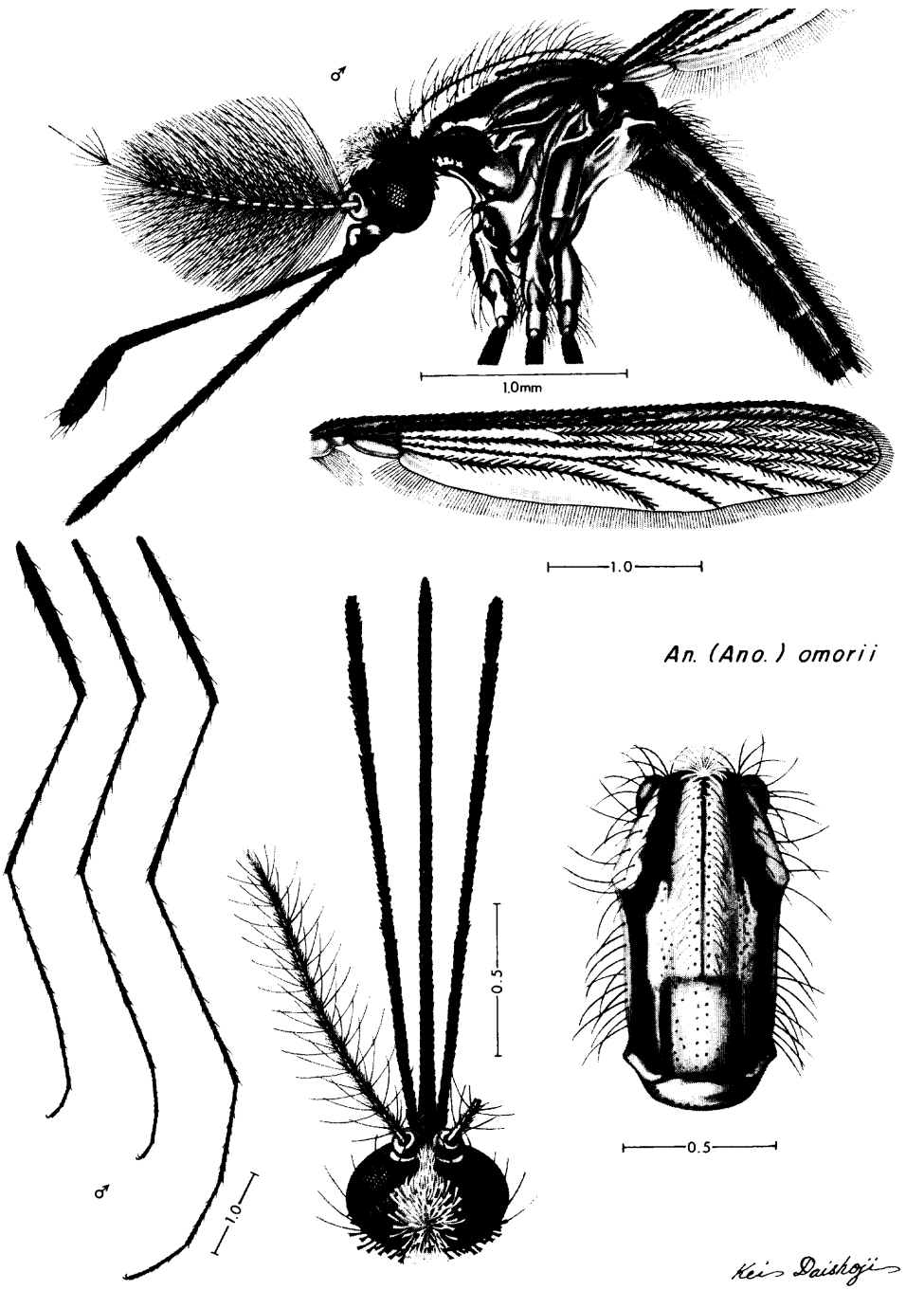
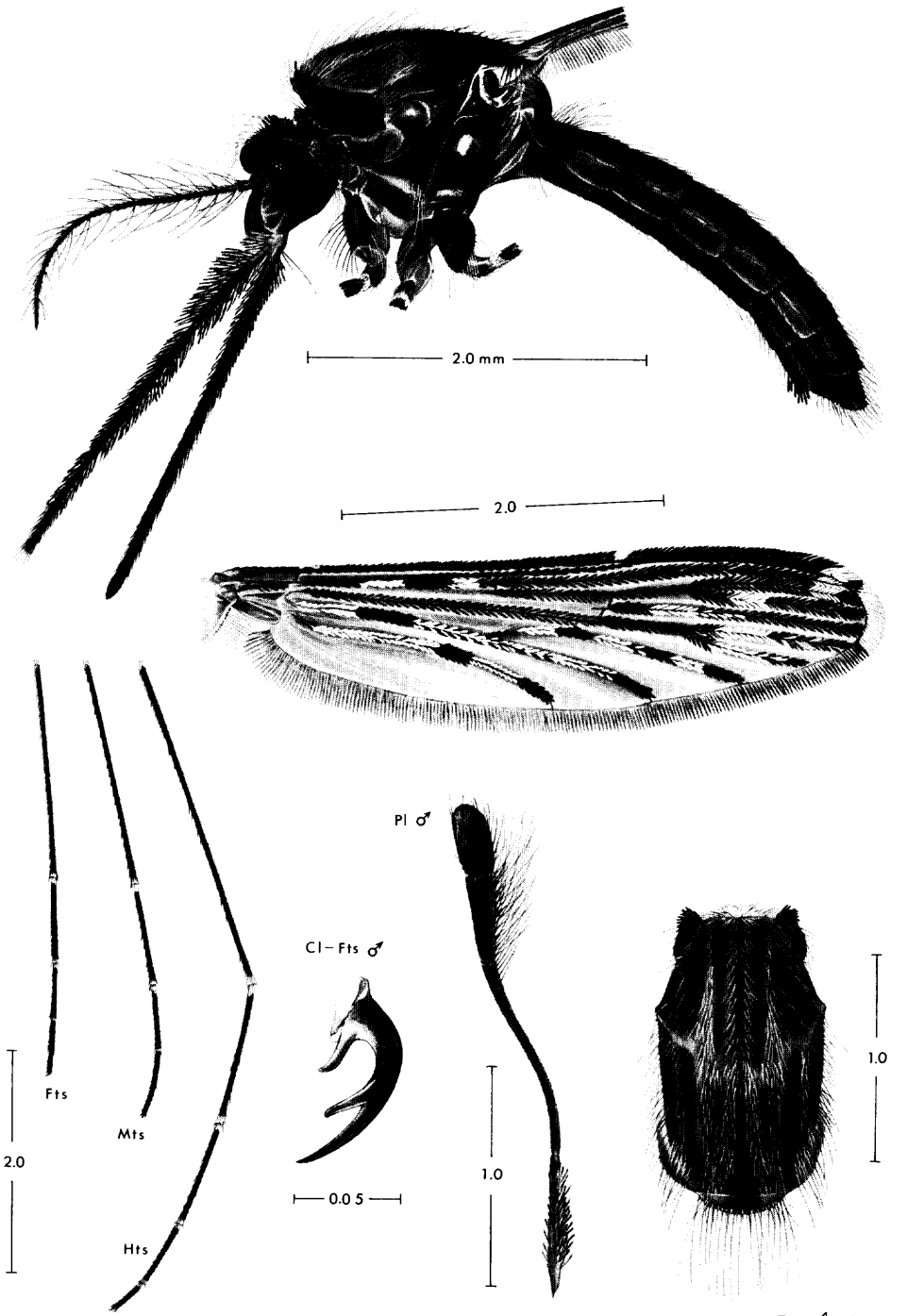


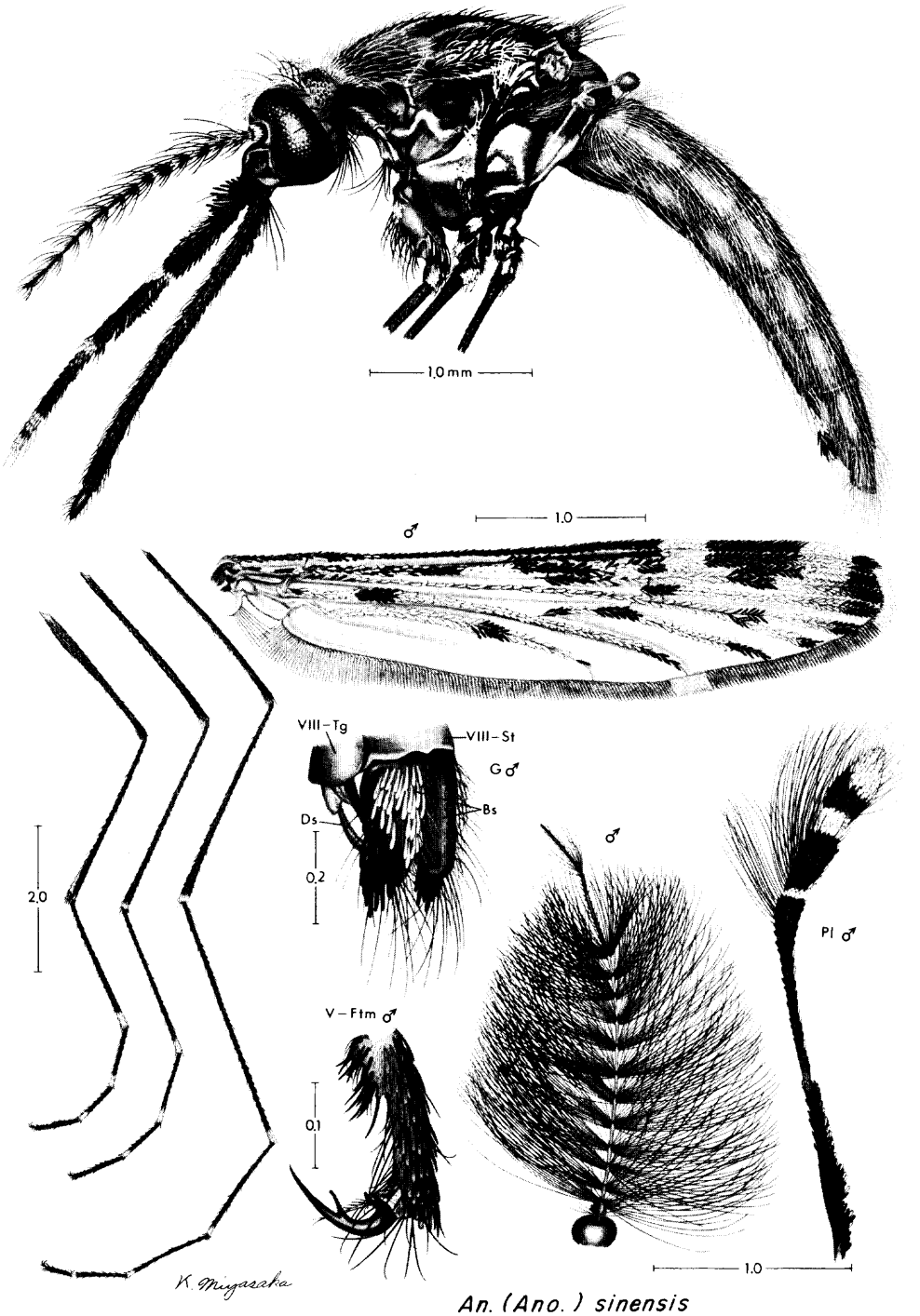
Fig. 167



An. (Ano.) saperoi saperoi

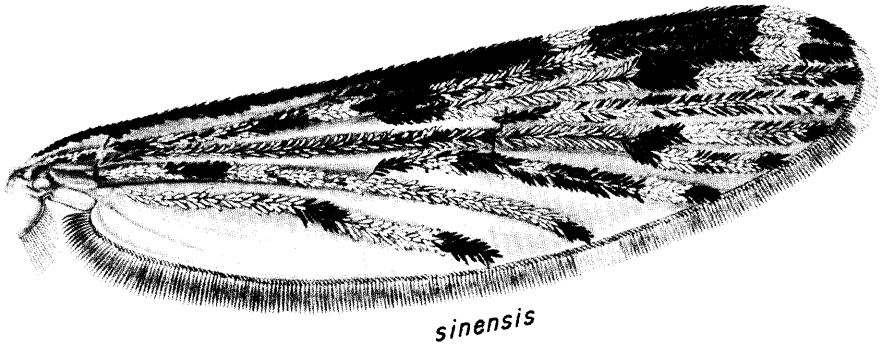
T. Ando

Fig. 168

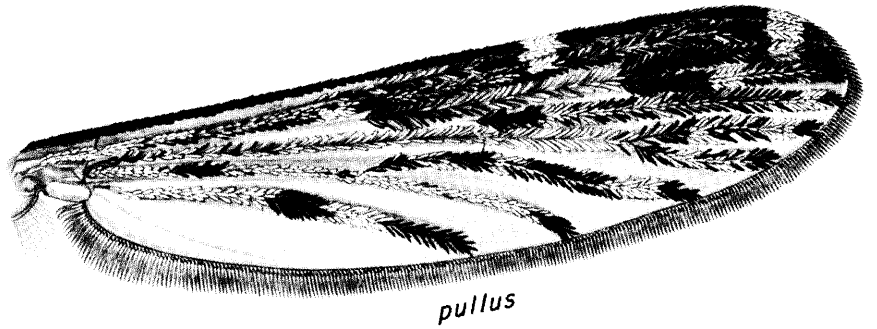


An. (Ano.) sinensis

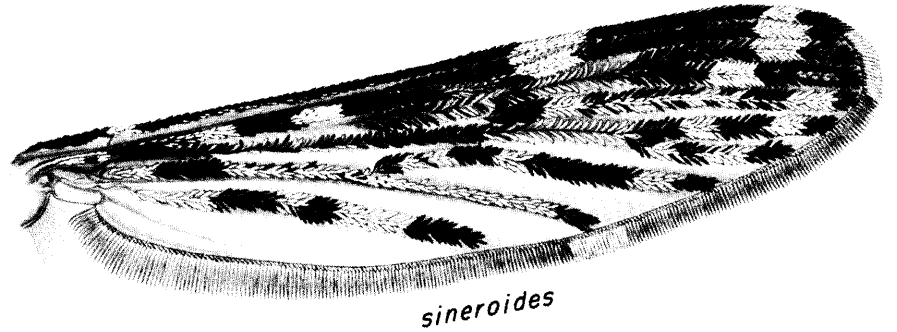
Fig. 169



sinensis



pullus



sineroides

lesteri from Hokkaido

An. (Ano.) spp.

K. Miyasaka

Fig. 170

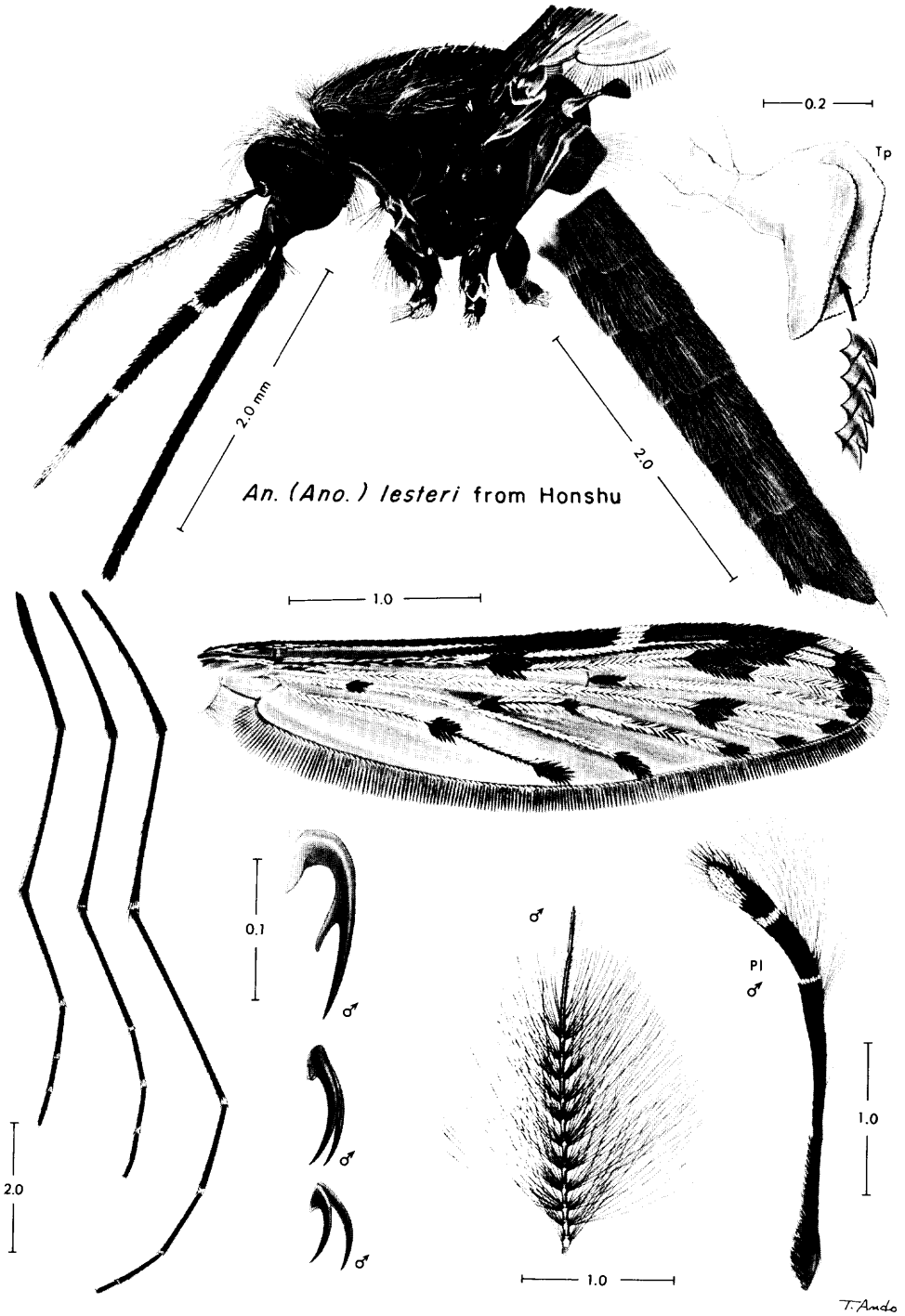
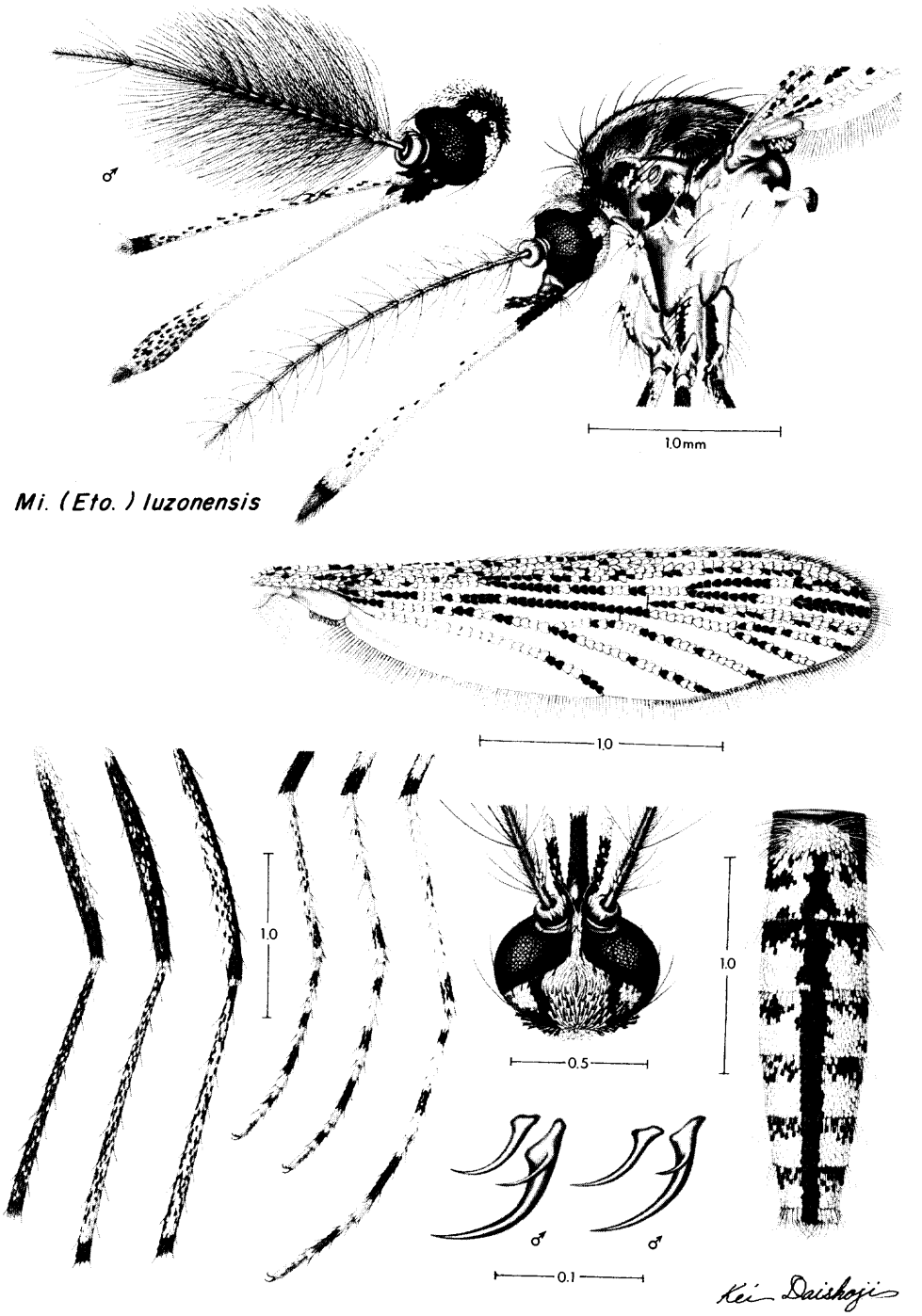
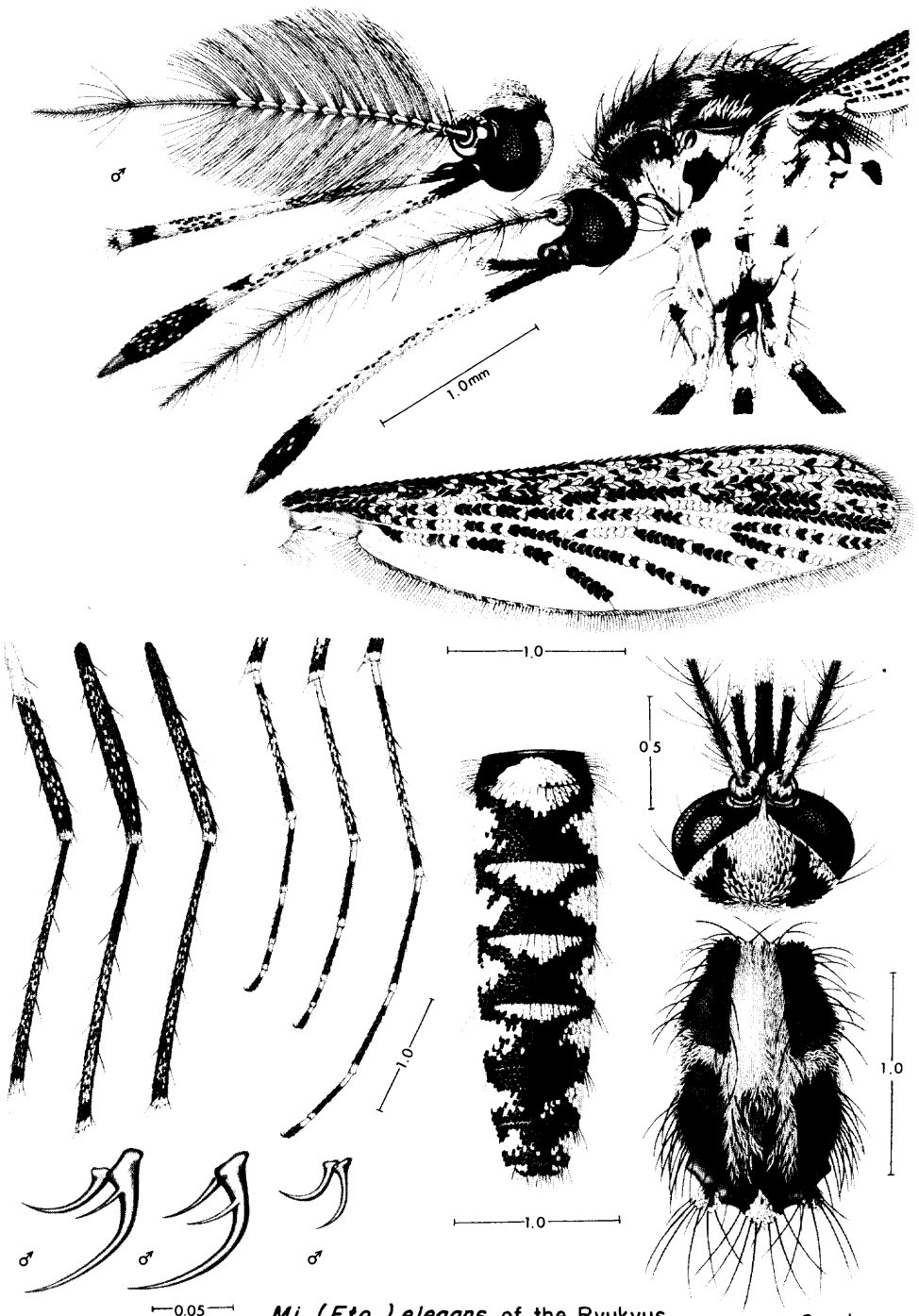


Fig. 171



Mi. (Eto.) luzonensis

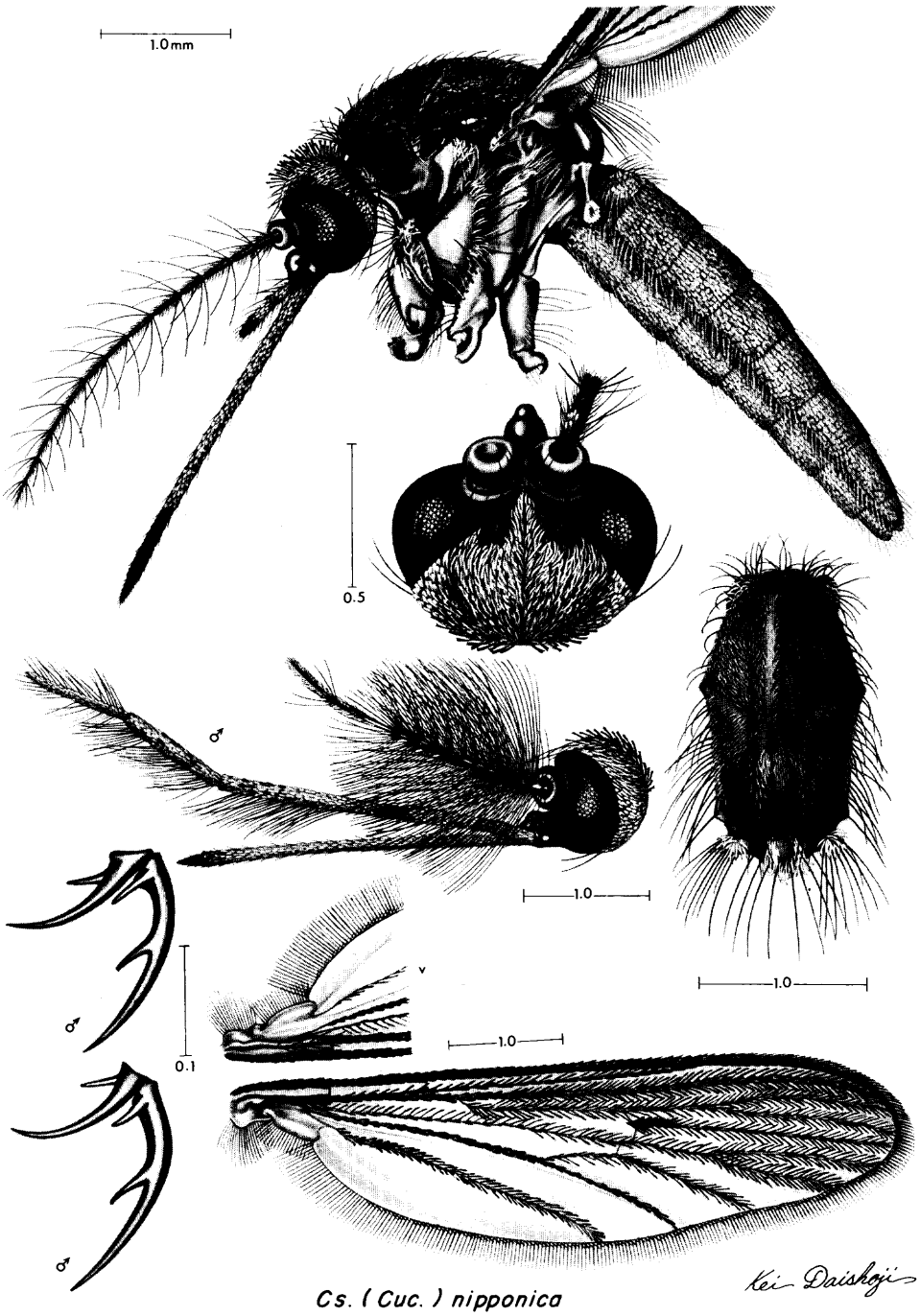
Fig. 172



Mi. (Eto.) elegans of the Ryukyus

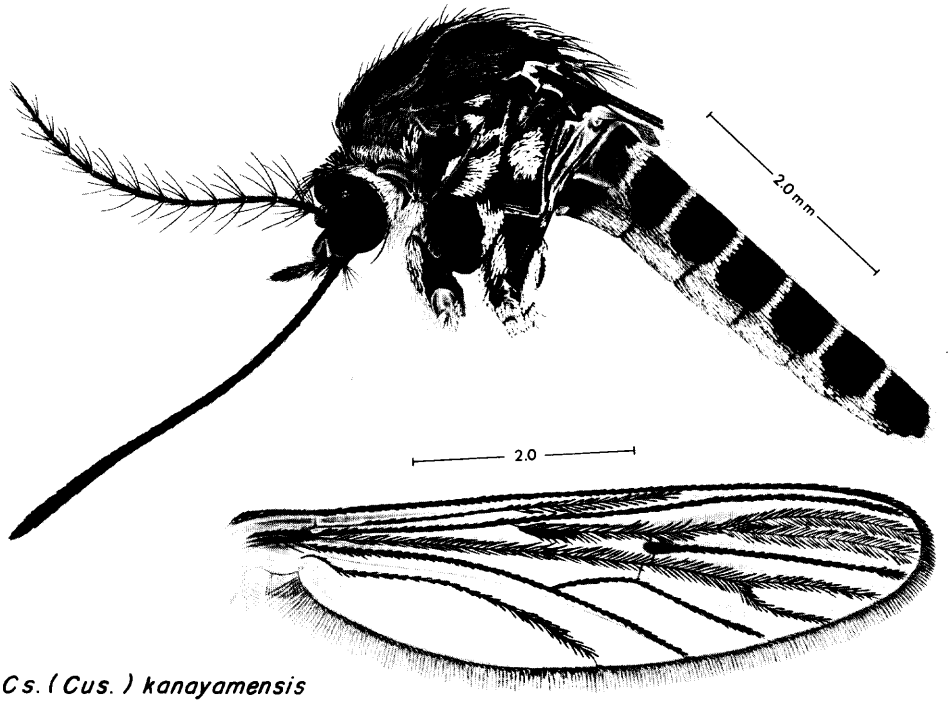
Kei Daishoji

Fig. 173



Cs. (Cuc.) nipponica

Fig. 174



Cs. (Cus.) kanayamensis

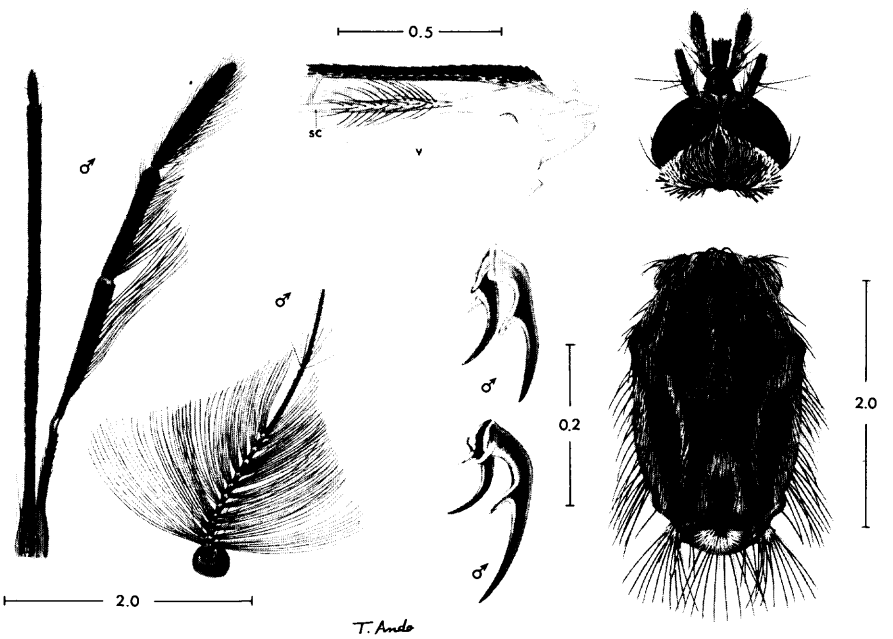
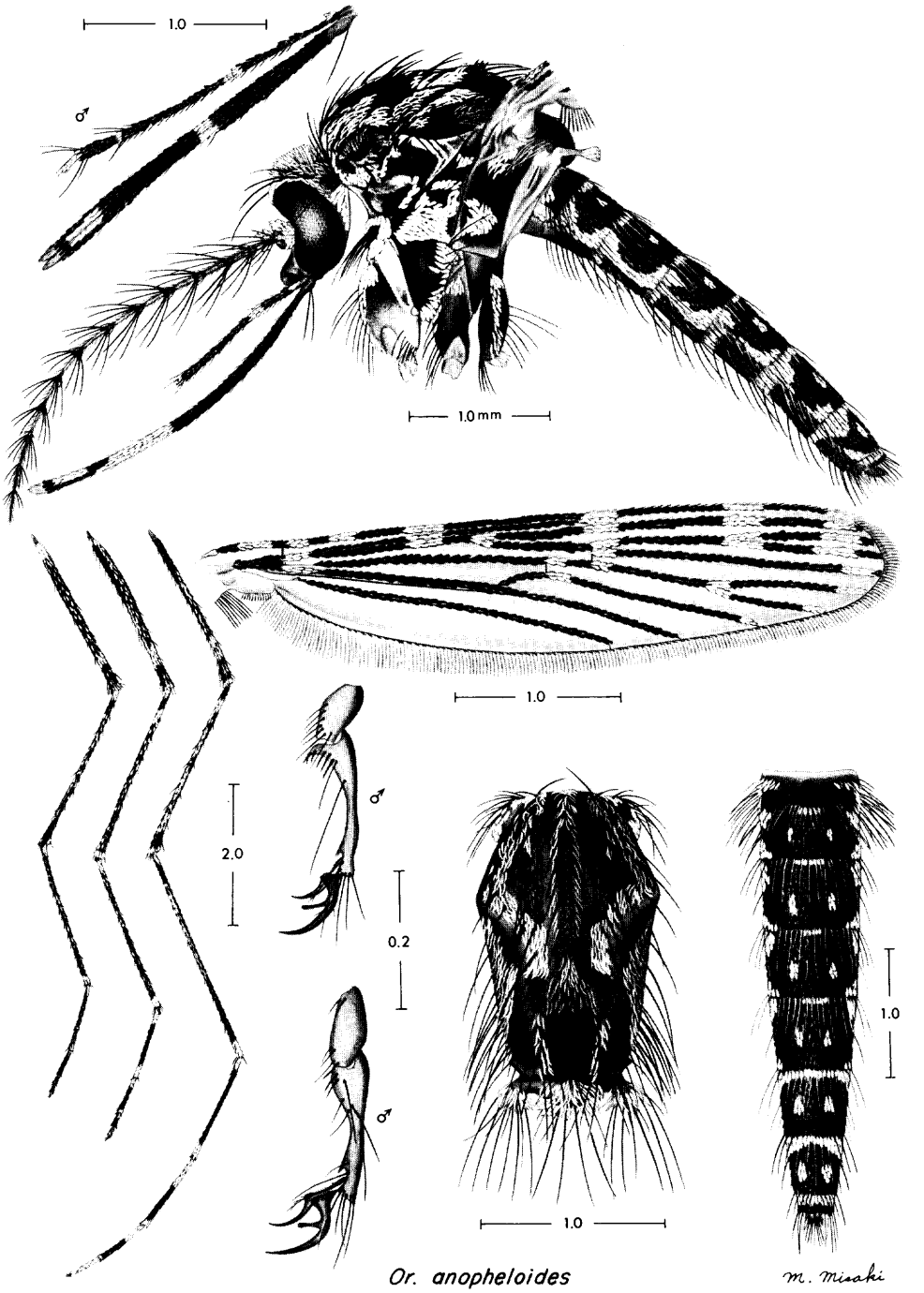


Fig. 175



Or. anopheloides

M. Misaki

Fig. 176

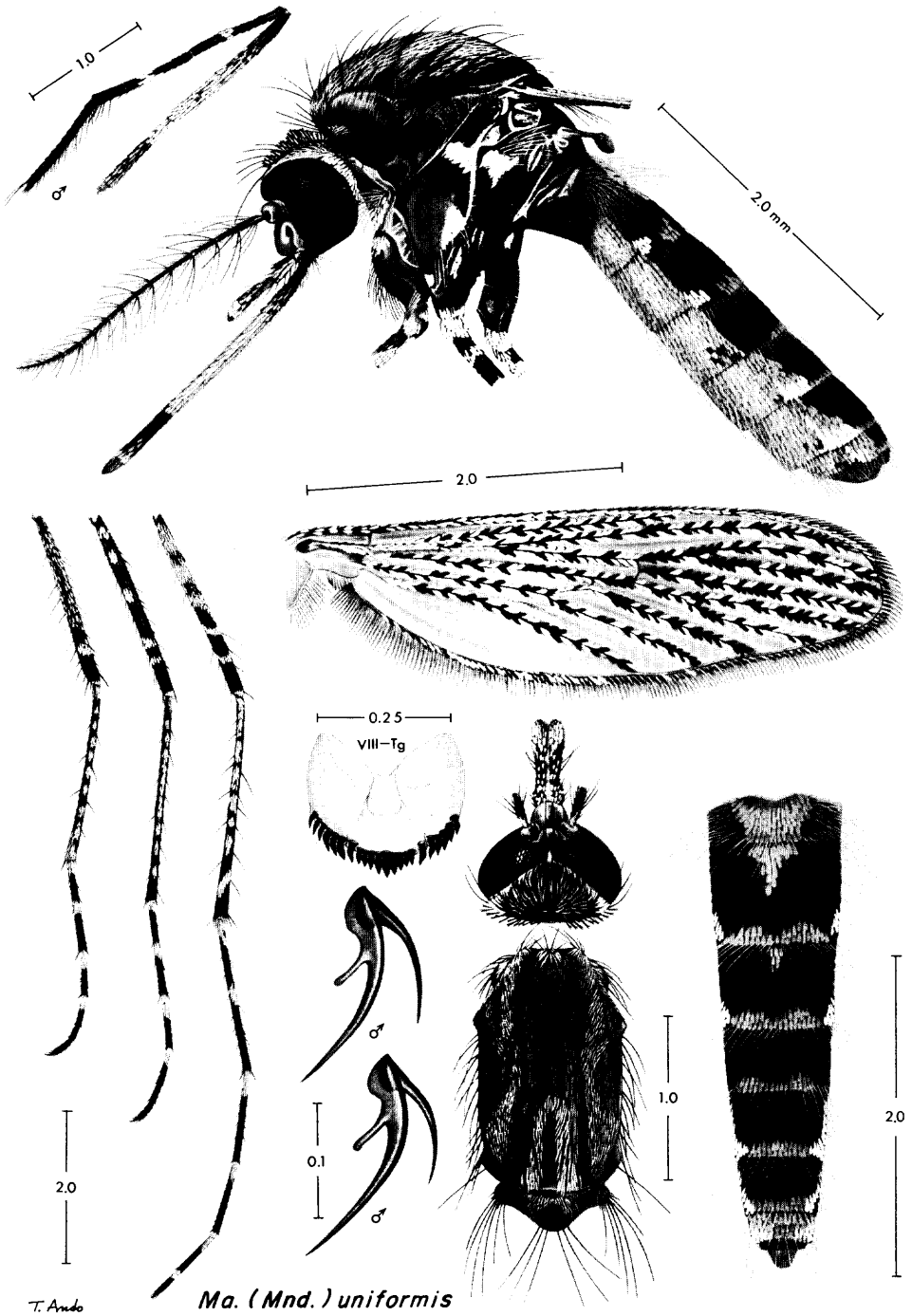
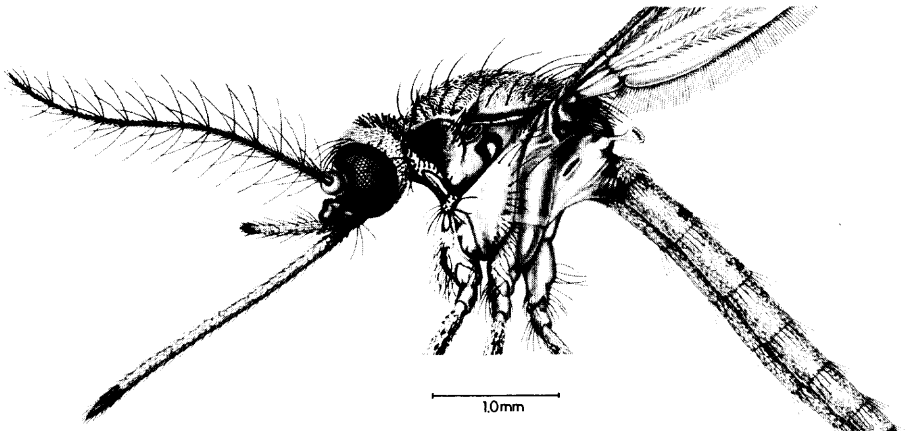


Fig. 177



Ma. (Coq.) ochracea

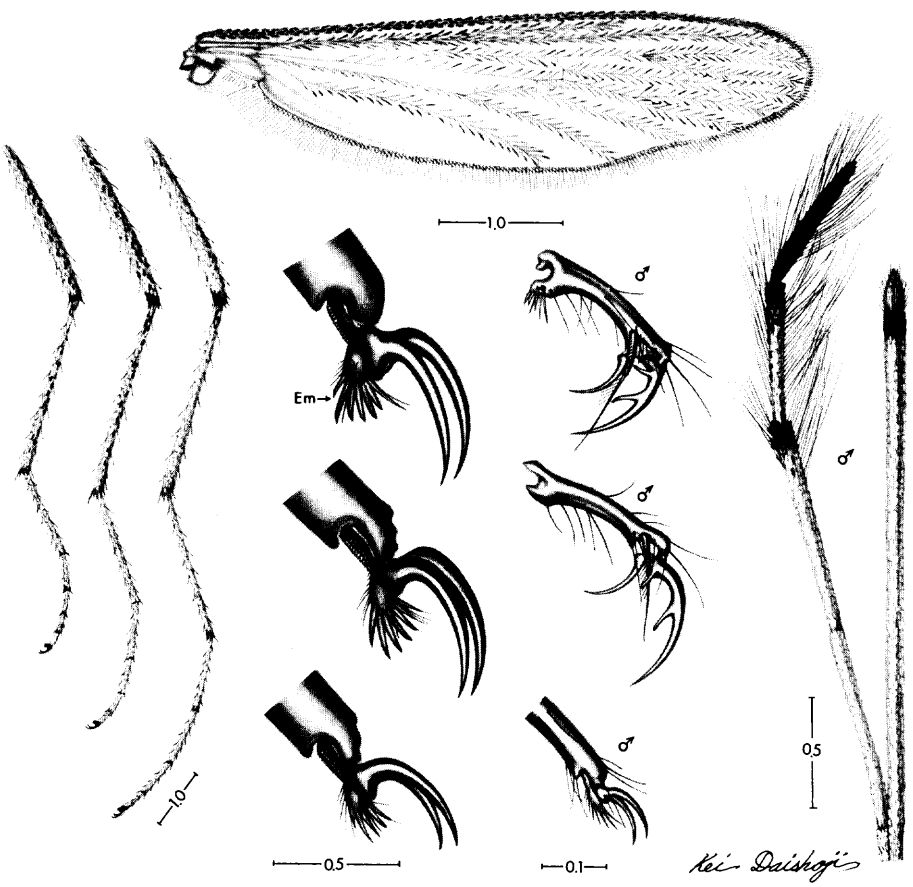
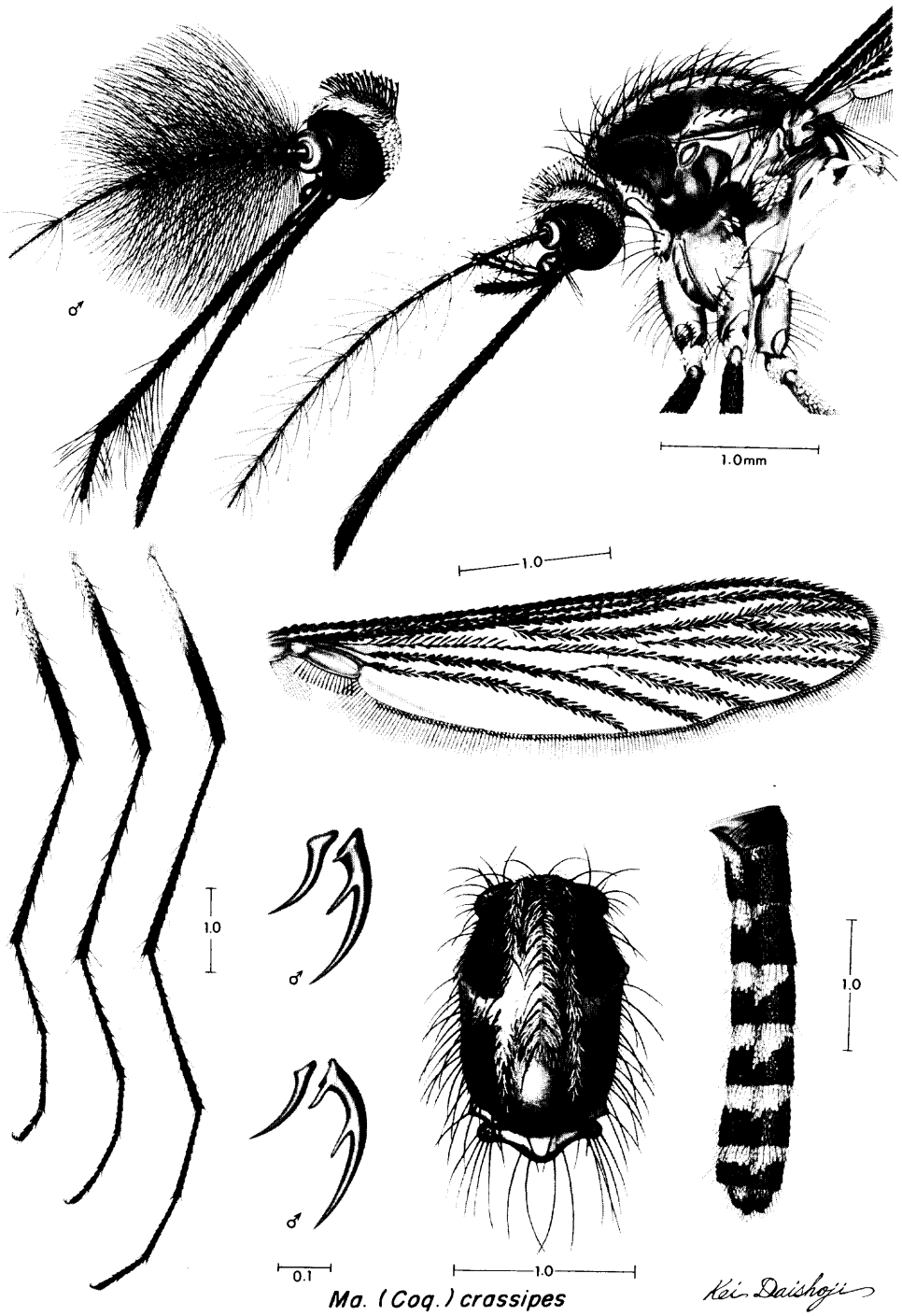


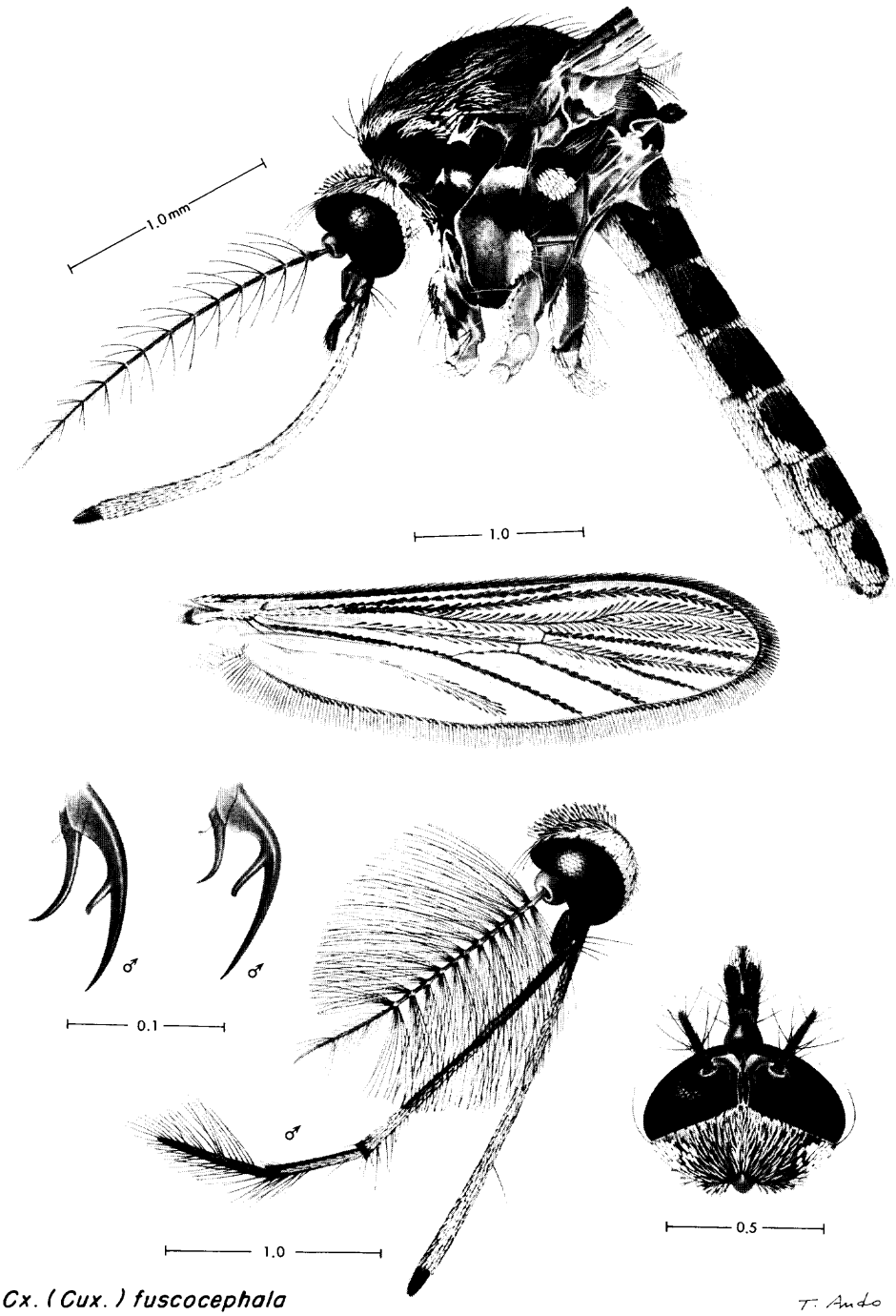
Fig. 178



Ma. (Coq.) crassipes

Kei Daishoji

Fig. 179



Cx. (Cux.) fuscocephala

T. Ando

Fig. 180

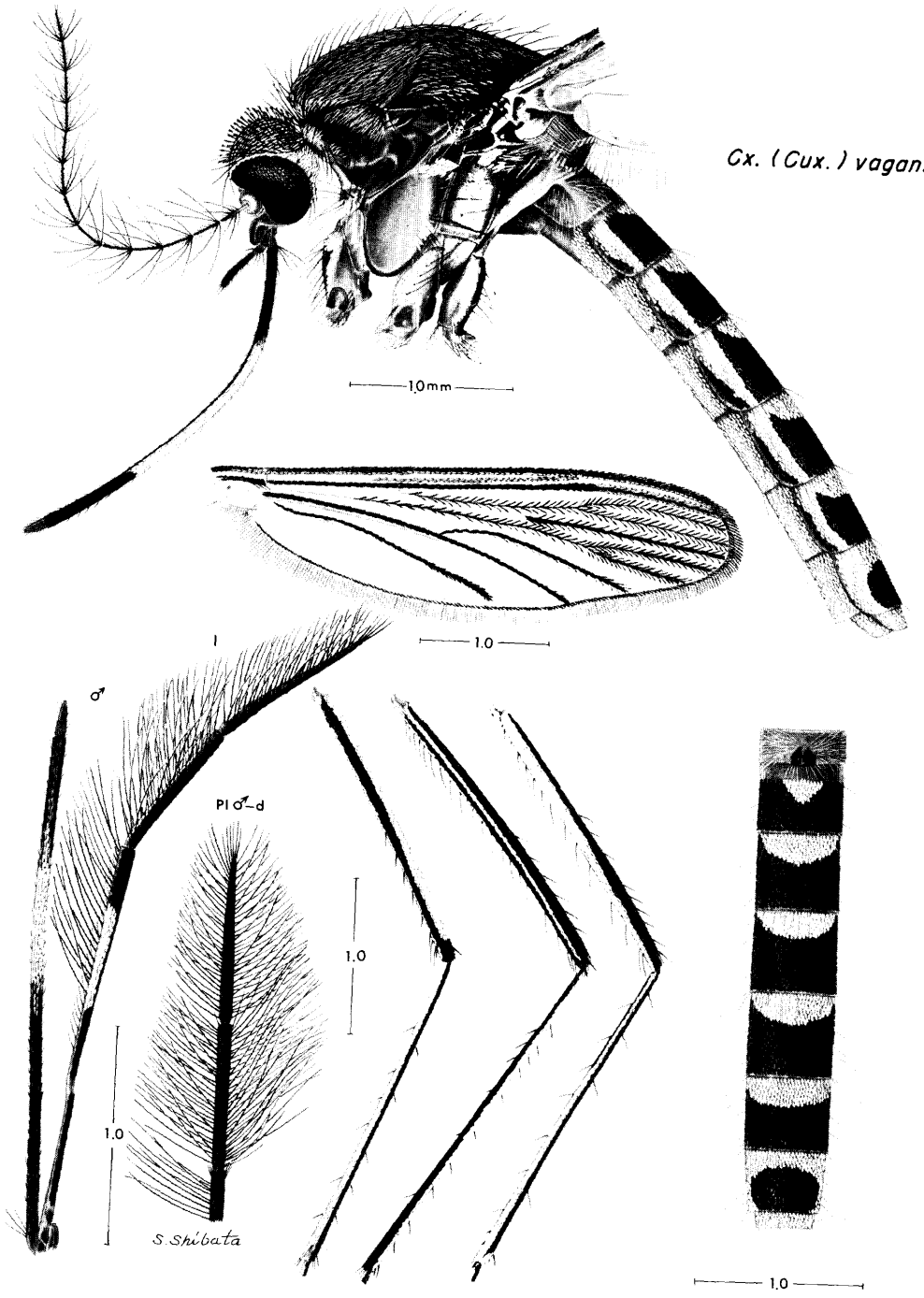
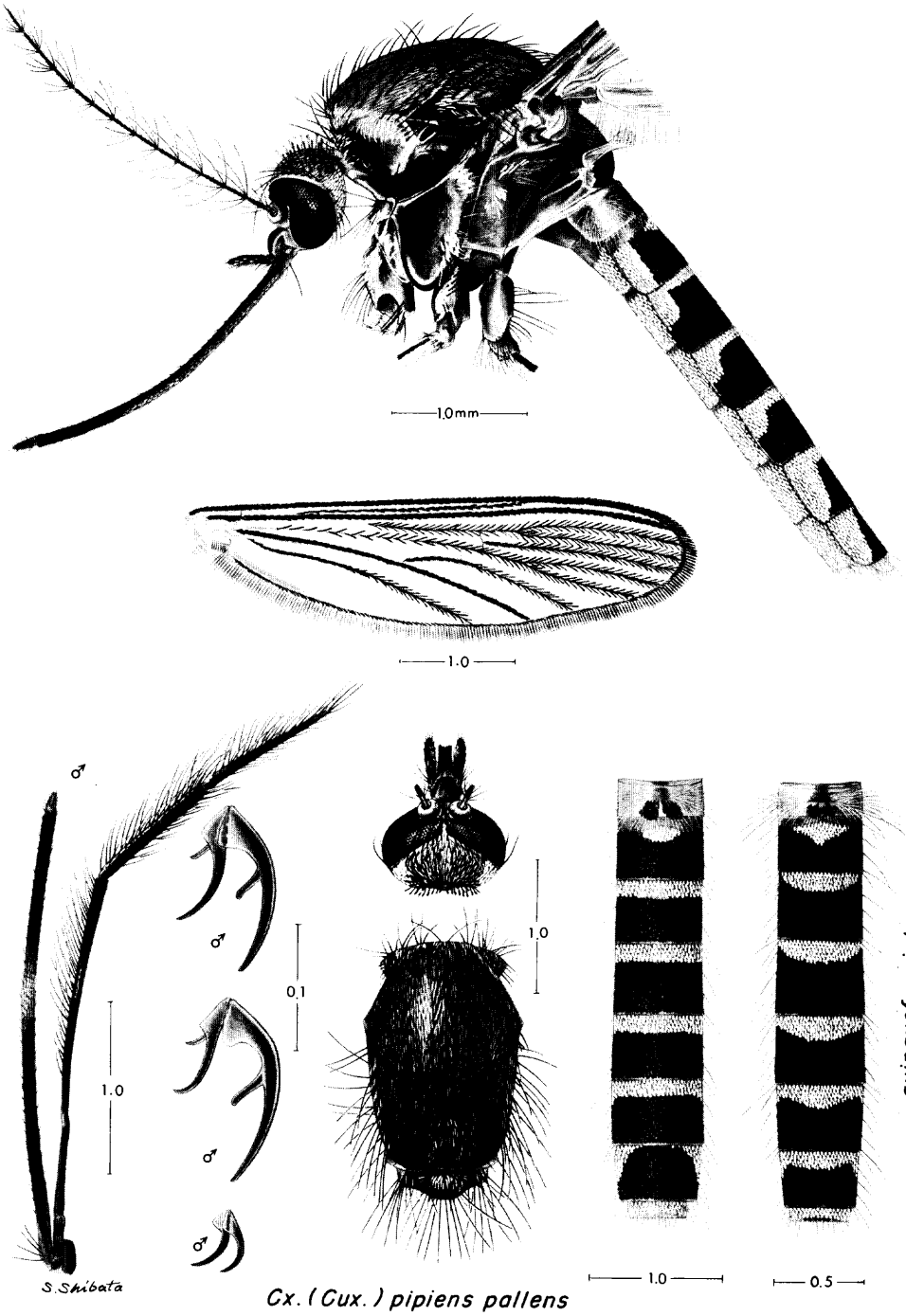
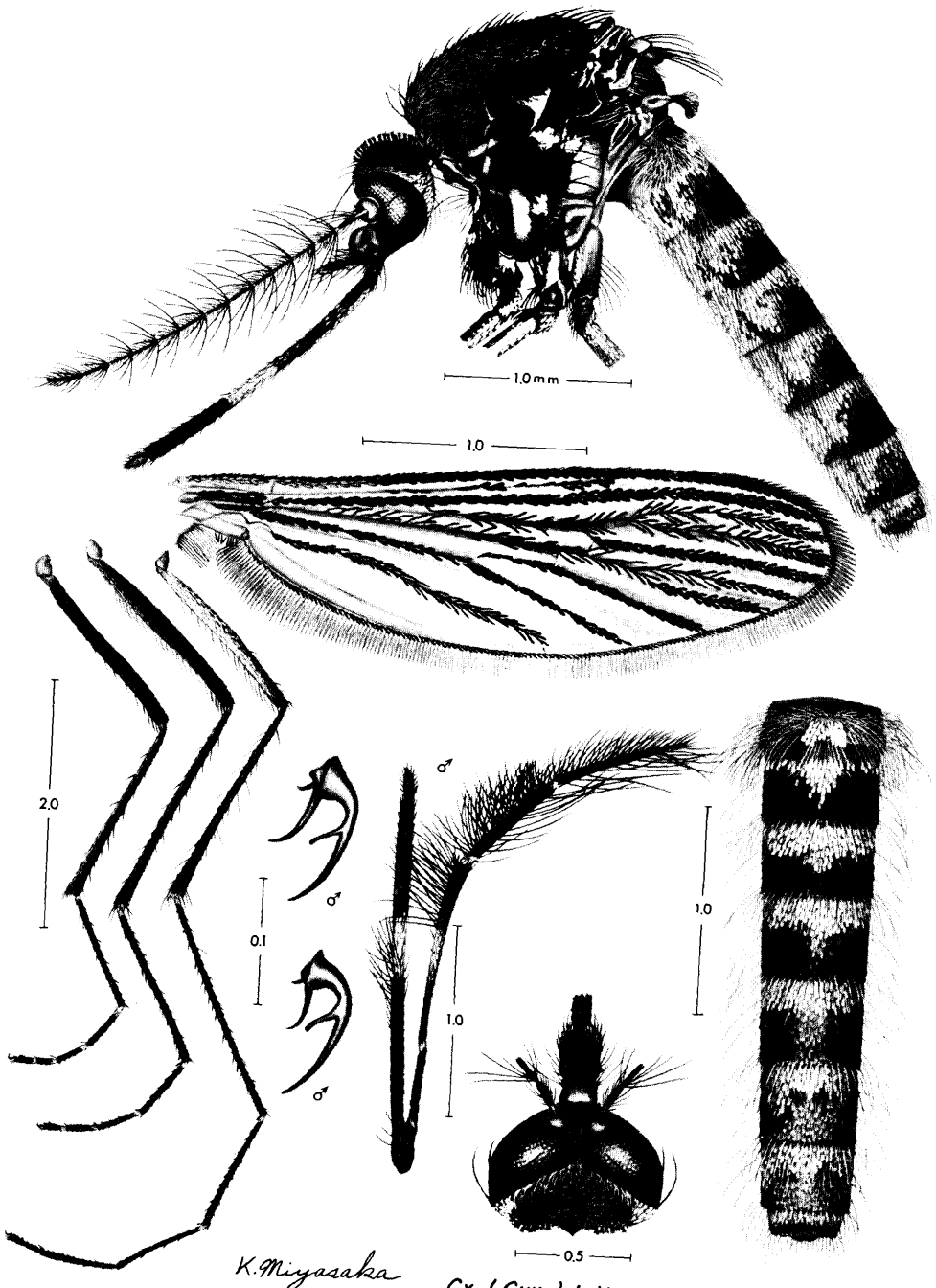


Fig. 181



Cx. (Cux.) pipiens pallens

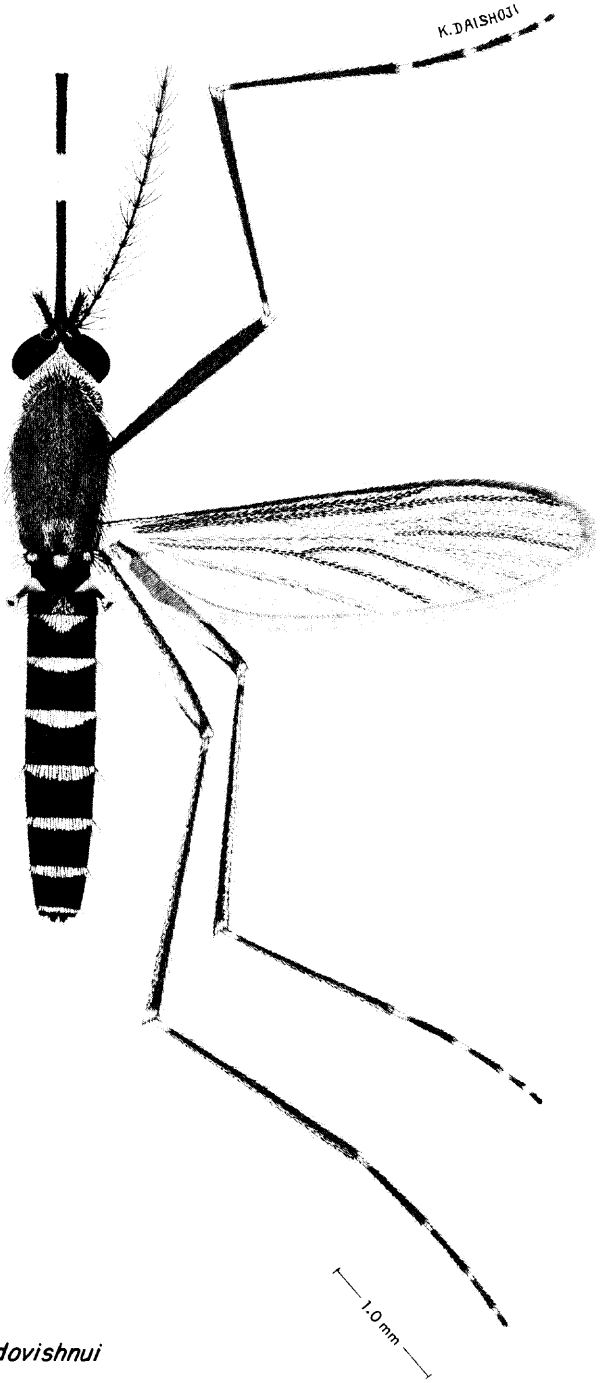
Fig. 182



K. Miyasaka

Cx. (Cux.) tritaeniorhynchus

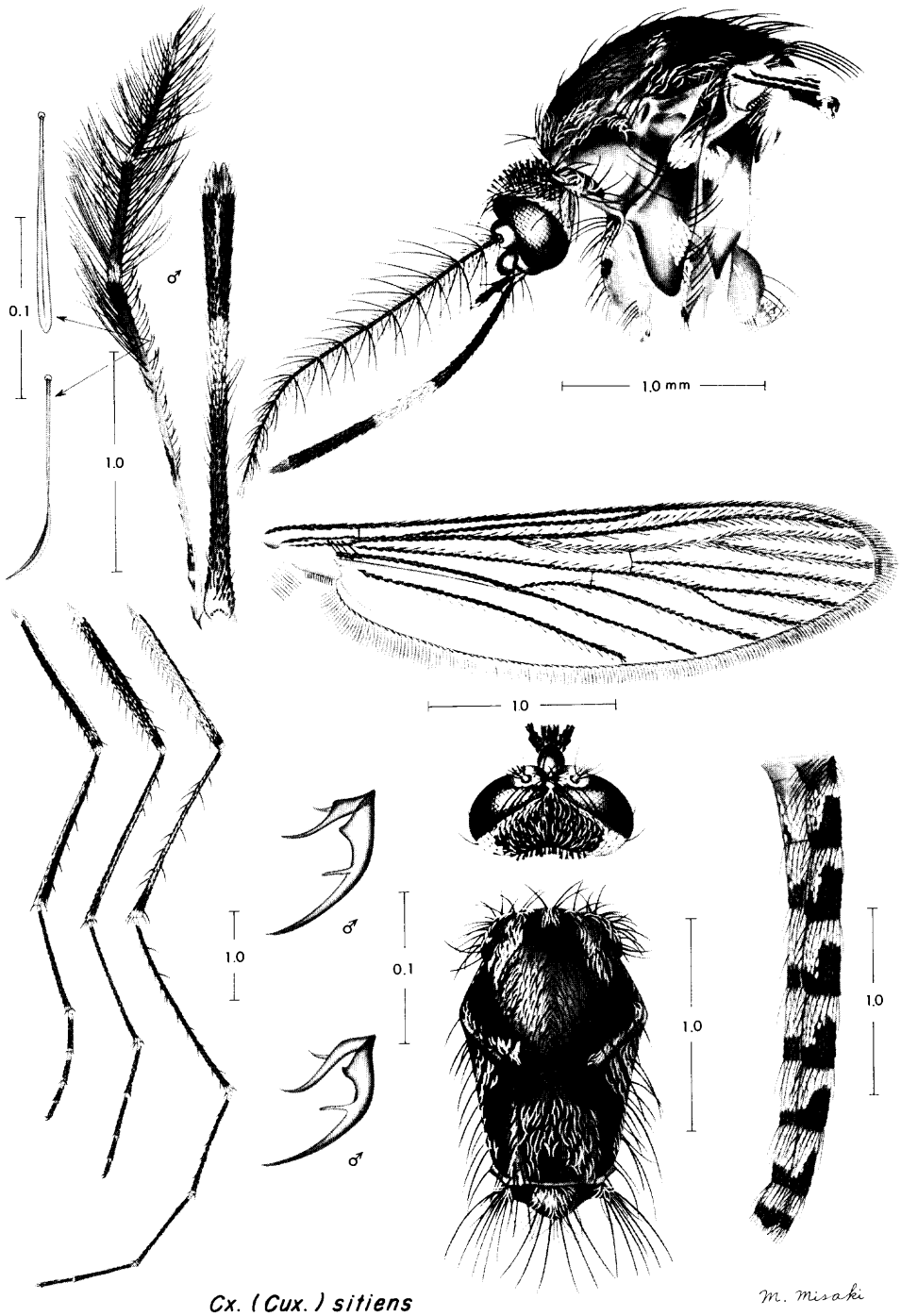
Fig. 183



Cx. (Cux.) pseudovishnui

(after LaCasse and Yamaguti 1950)

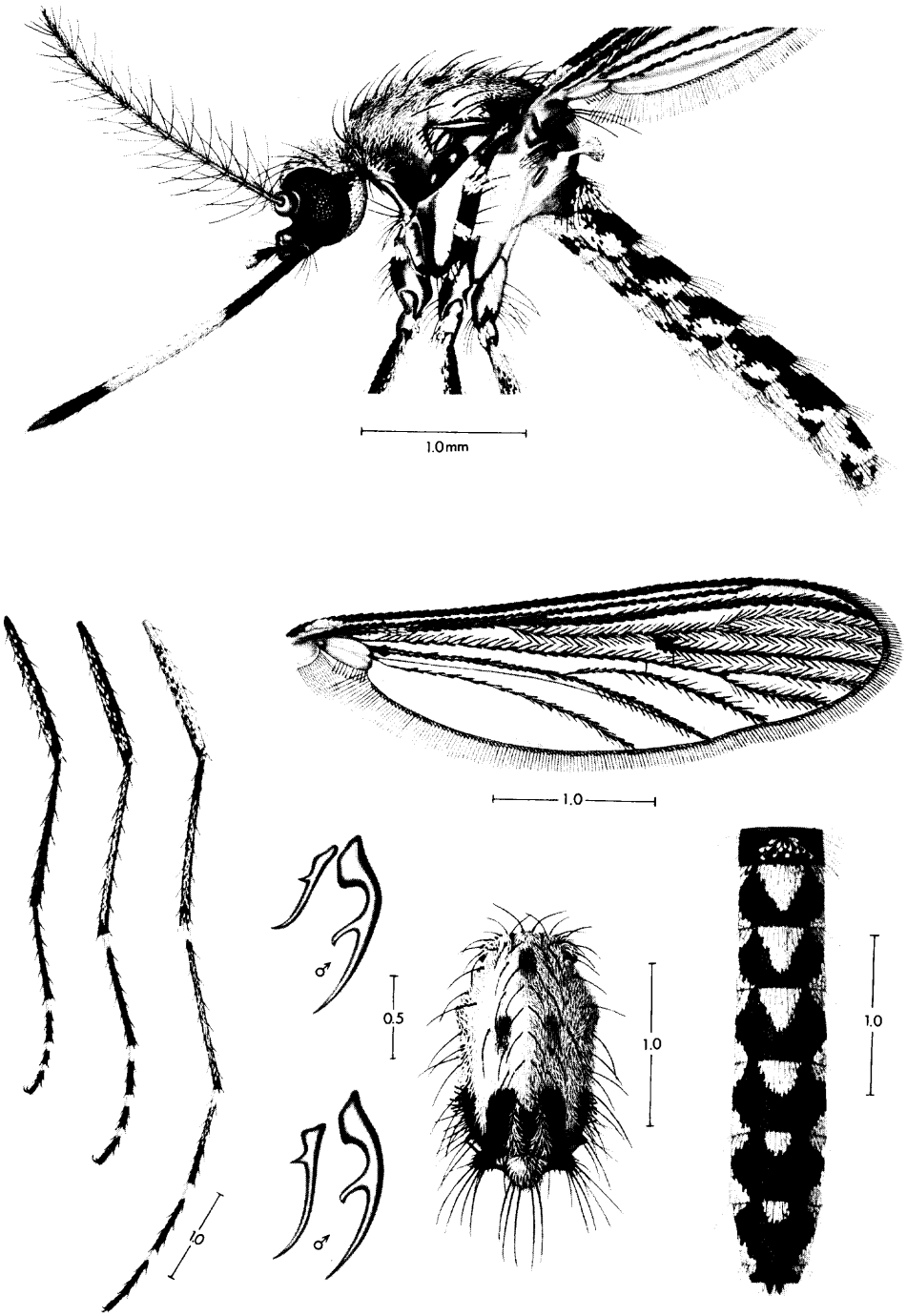
Fig. 184



Cx. (Cux.) sitiens

M. Misaki

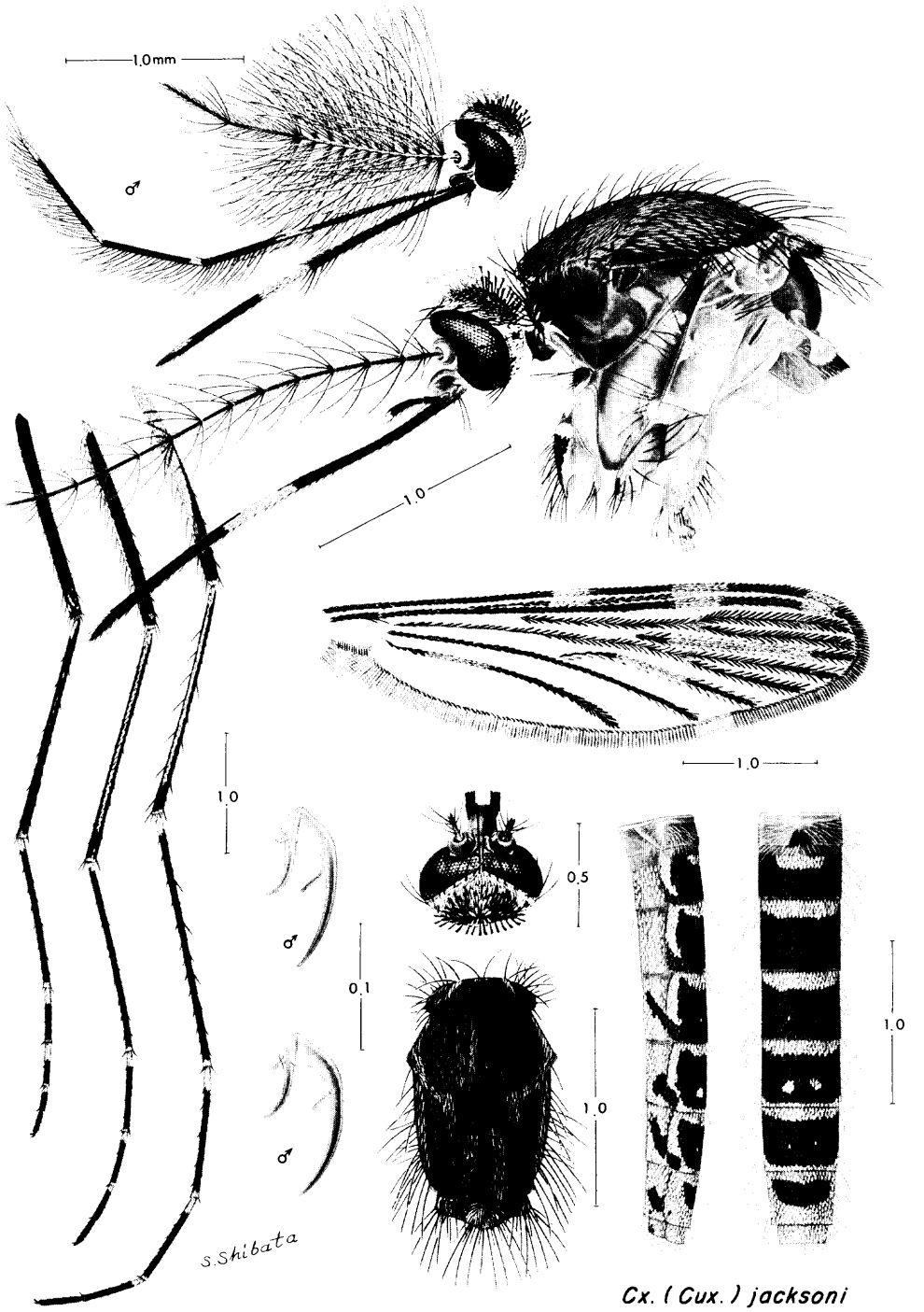
Fig. 185



Cx. (Cux.) whitmorei

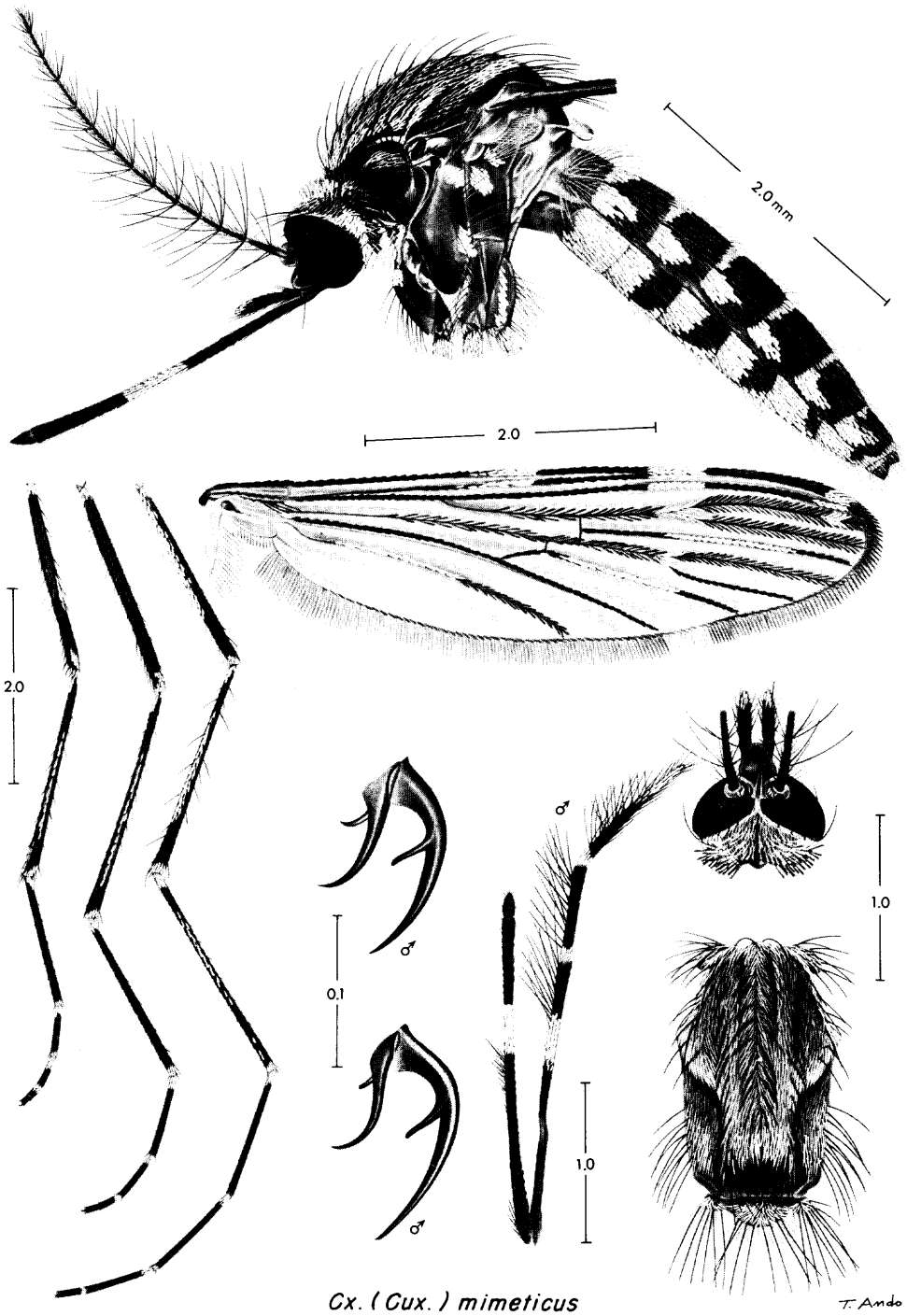
Kei Daishoji

Fig. 186



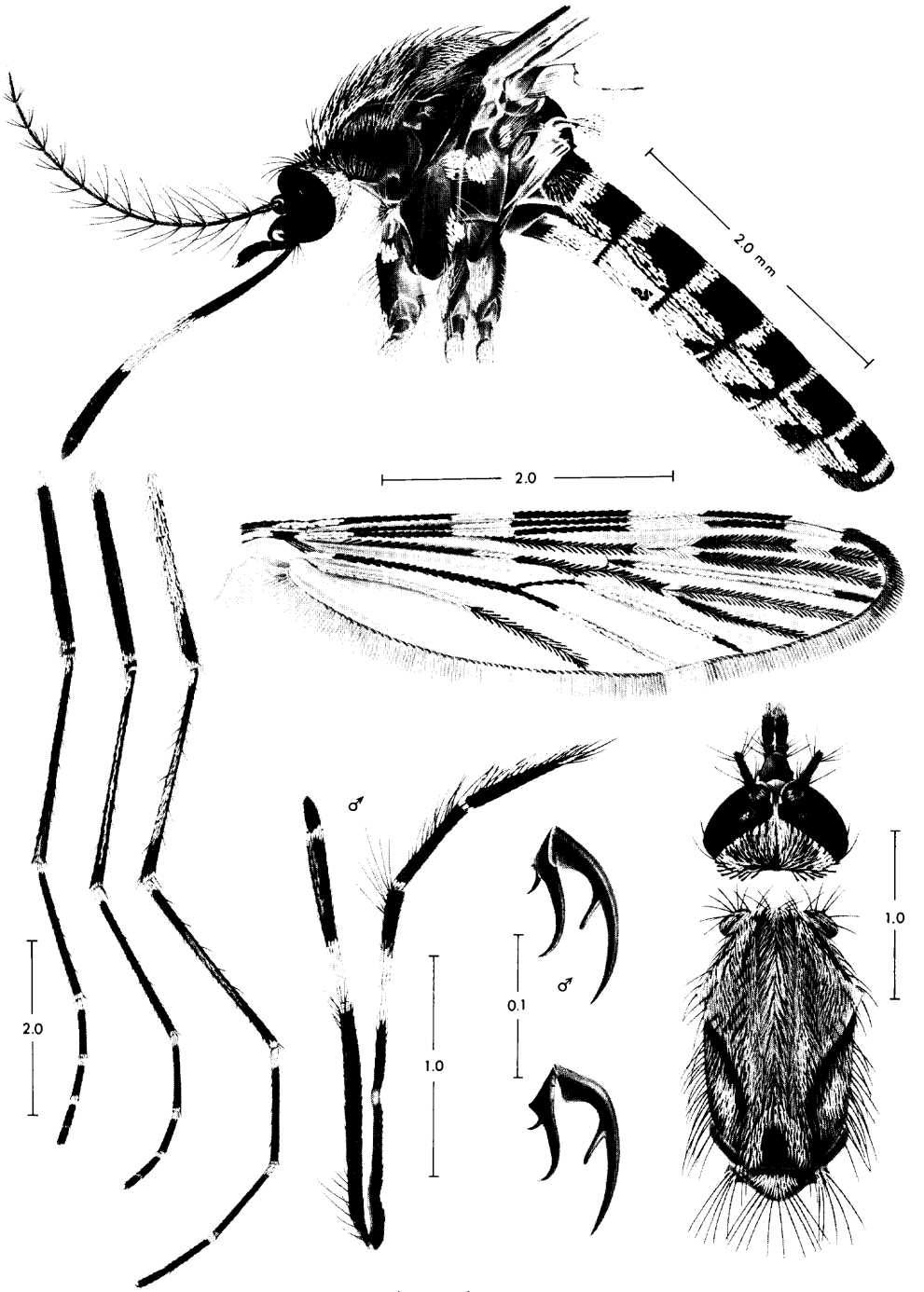
Cx. (Cux.) jacksoni

Fig. 187



Cx. (Cux.) mimeticus

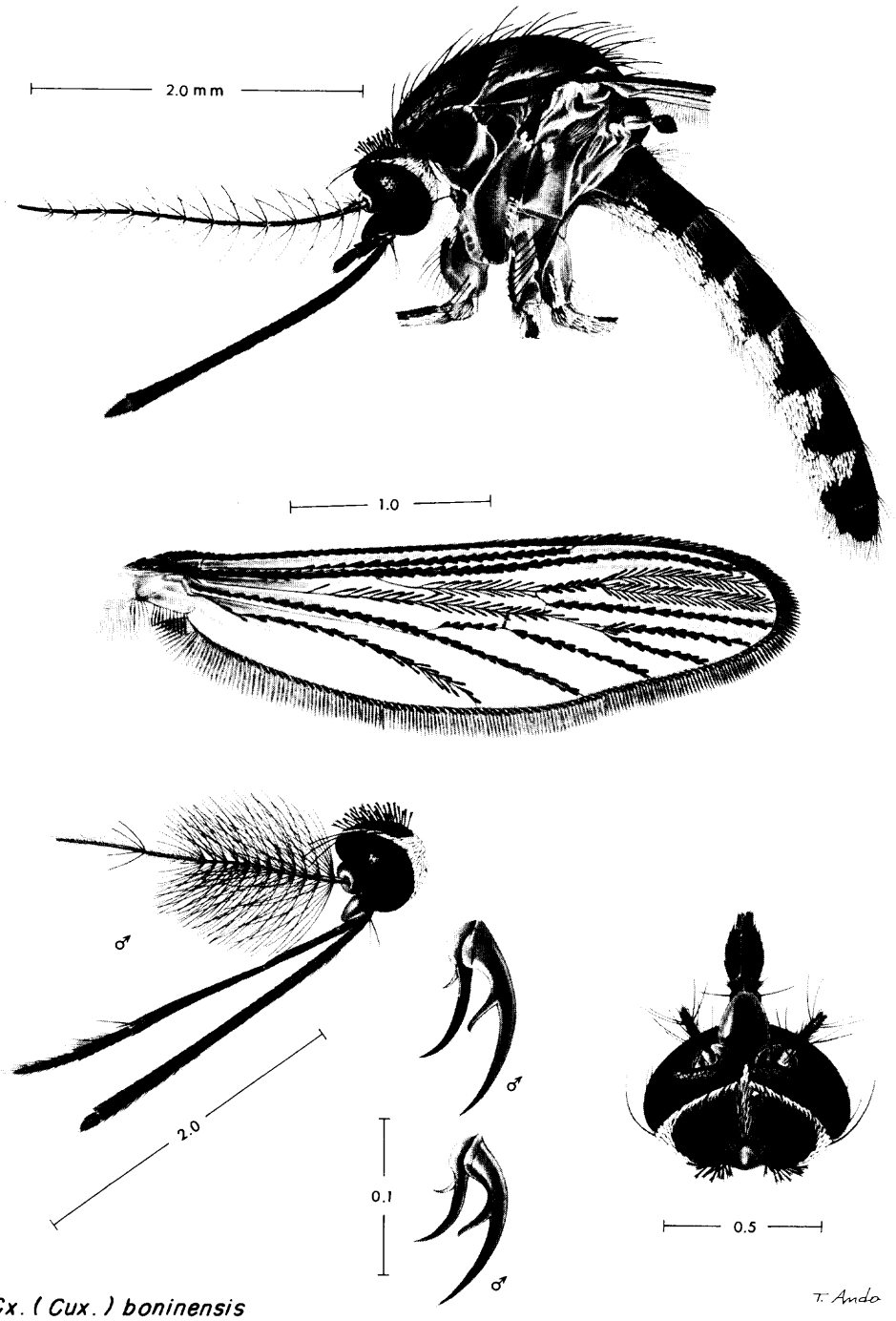
Fig. 188



Cx. (Cux.) orientalis

T. Ando

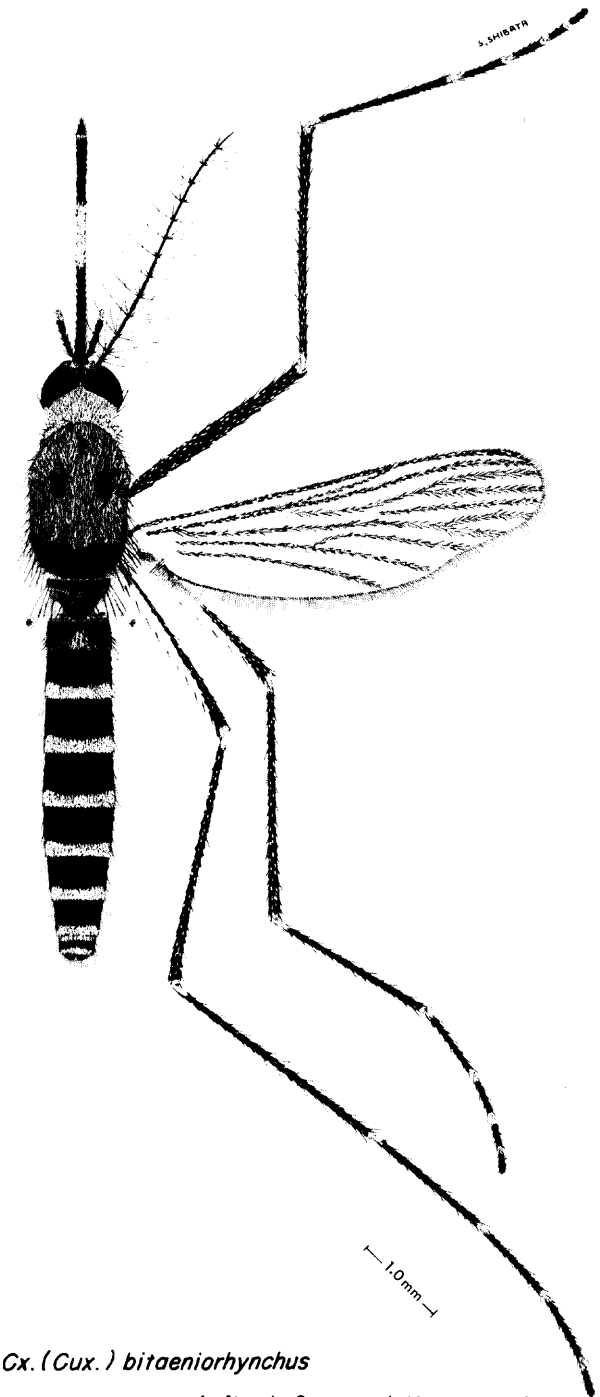
Fig. 189



Cx. (Cux.) boninensis

T. Ando

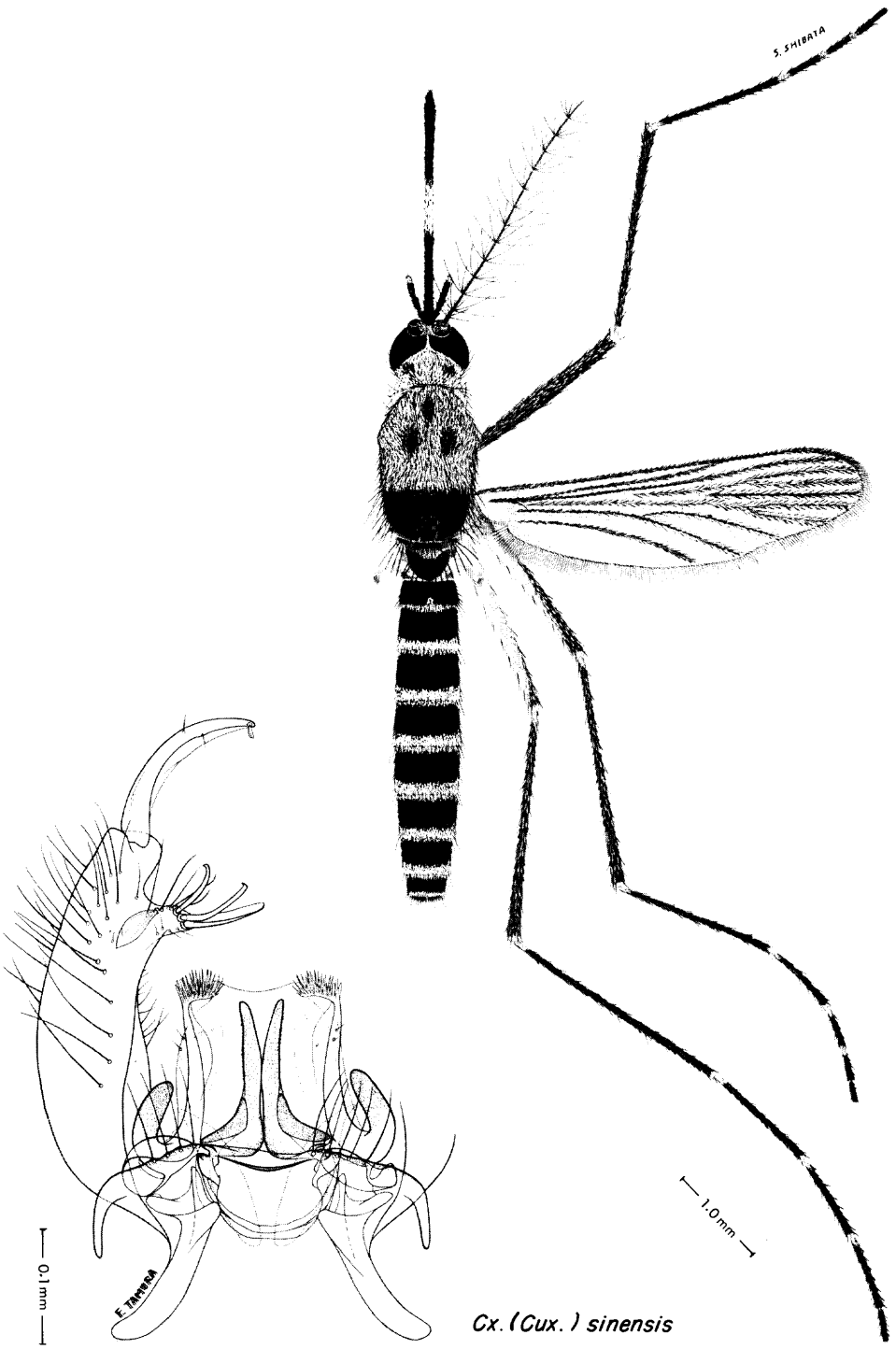
Fig. 190



Cx. (Cux.) bitaeniorhynchus

(after LaCasse and Yamaguti 1950)

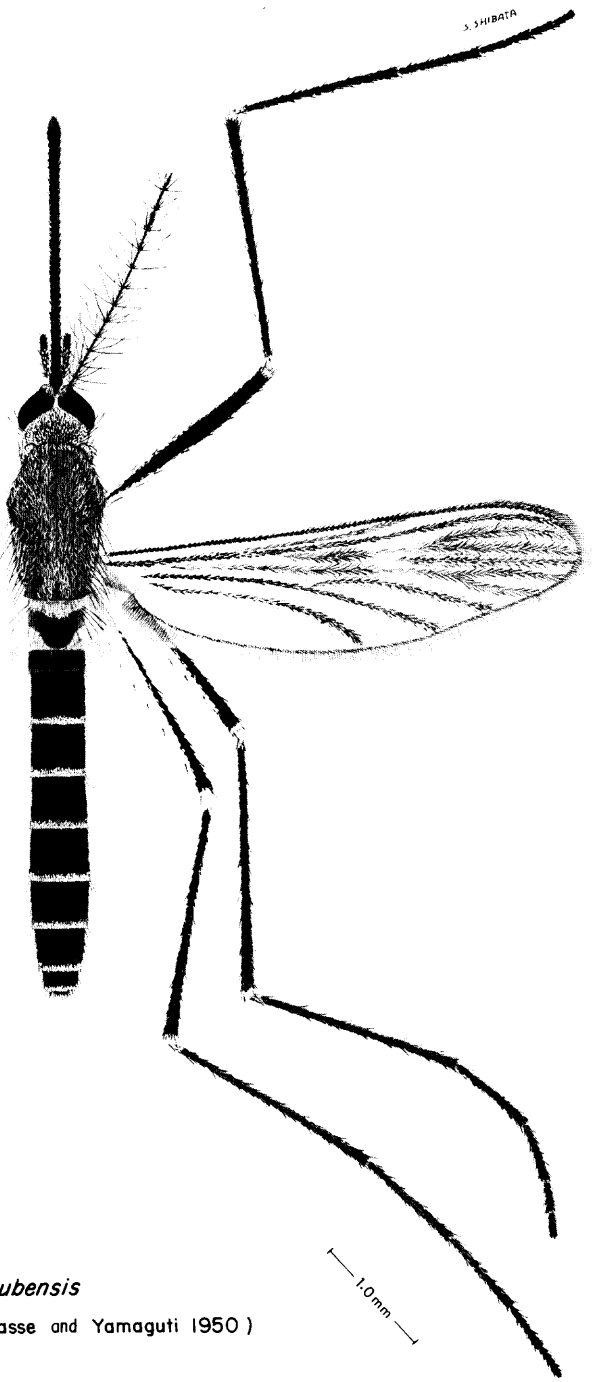
Fig. 191



Cx. (Cux.) sinensis

(after LaCasse and Yamaguti 1950)

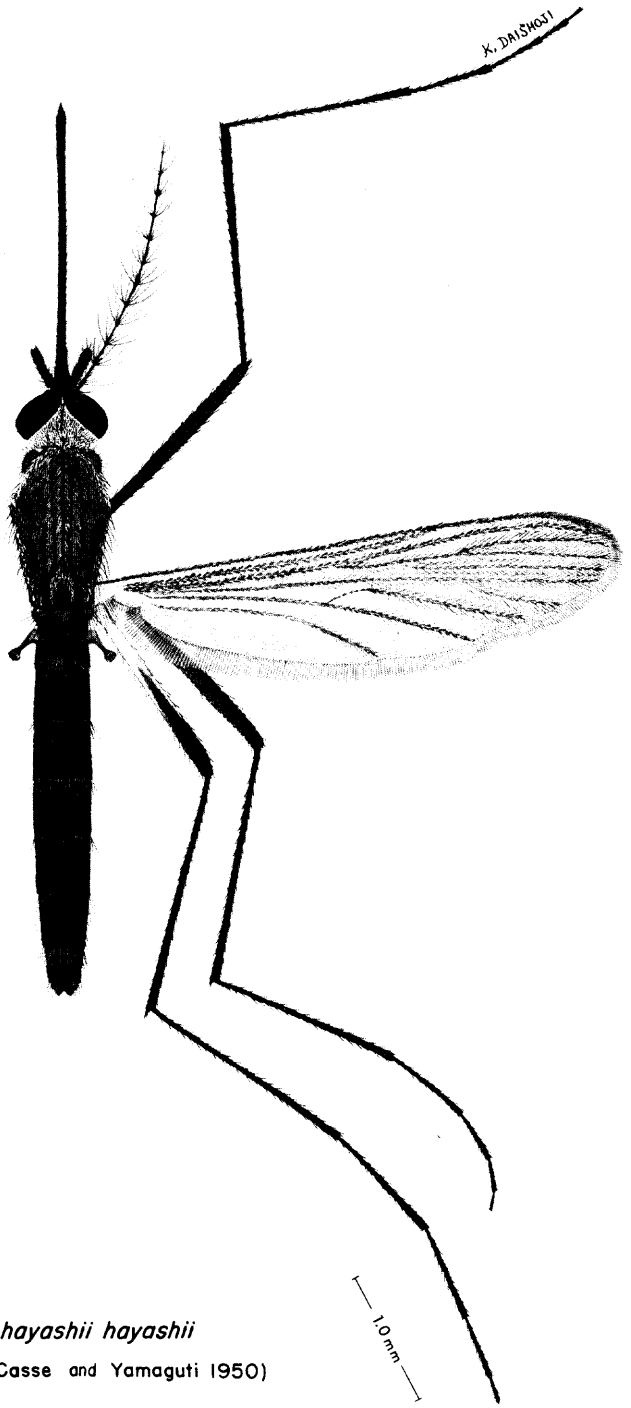
Fig. 192



Cx. (Ncx.) rubensis

(after LaCasse and Yamaguti 1950)

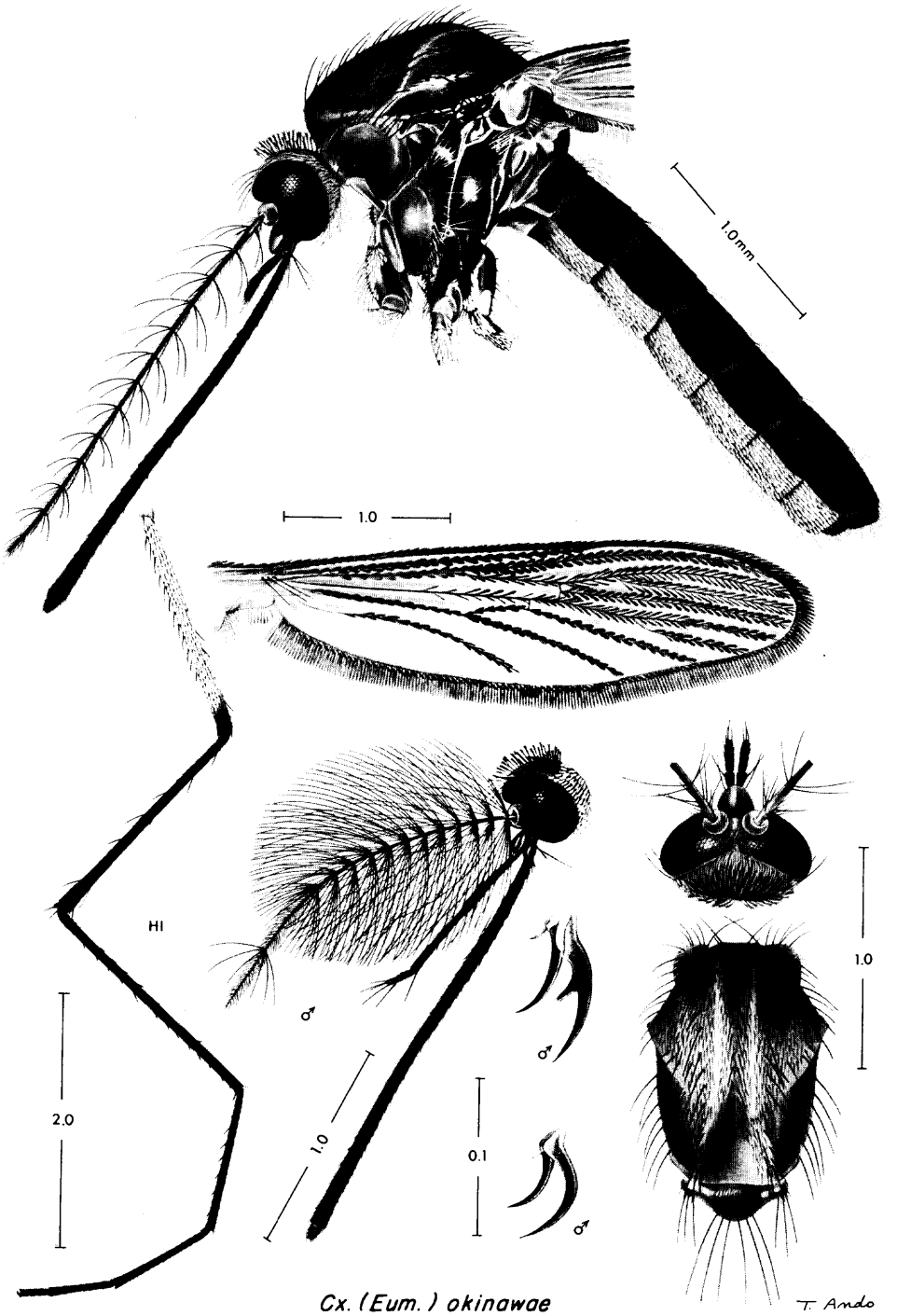
Fig. 193



Cx. (Eum.) hayashii hayashii

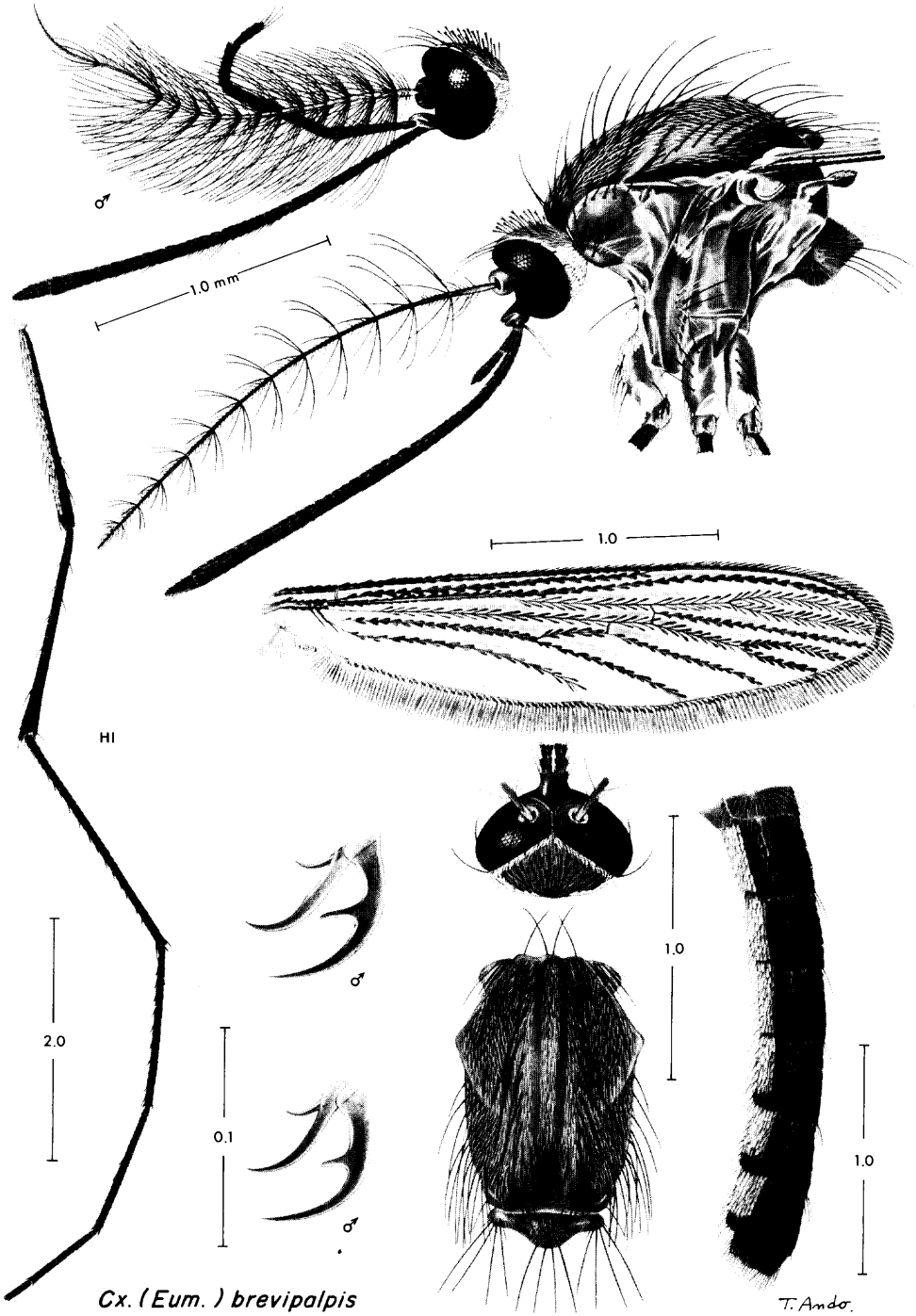
(after LaCasse and Yamaguti 1950)

Fig. 194



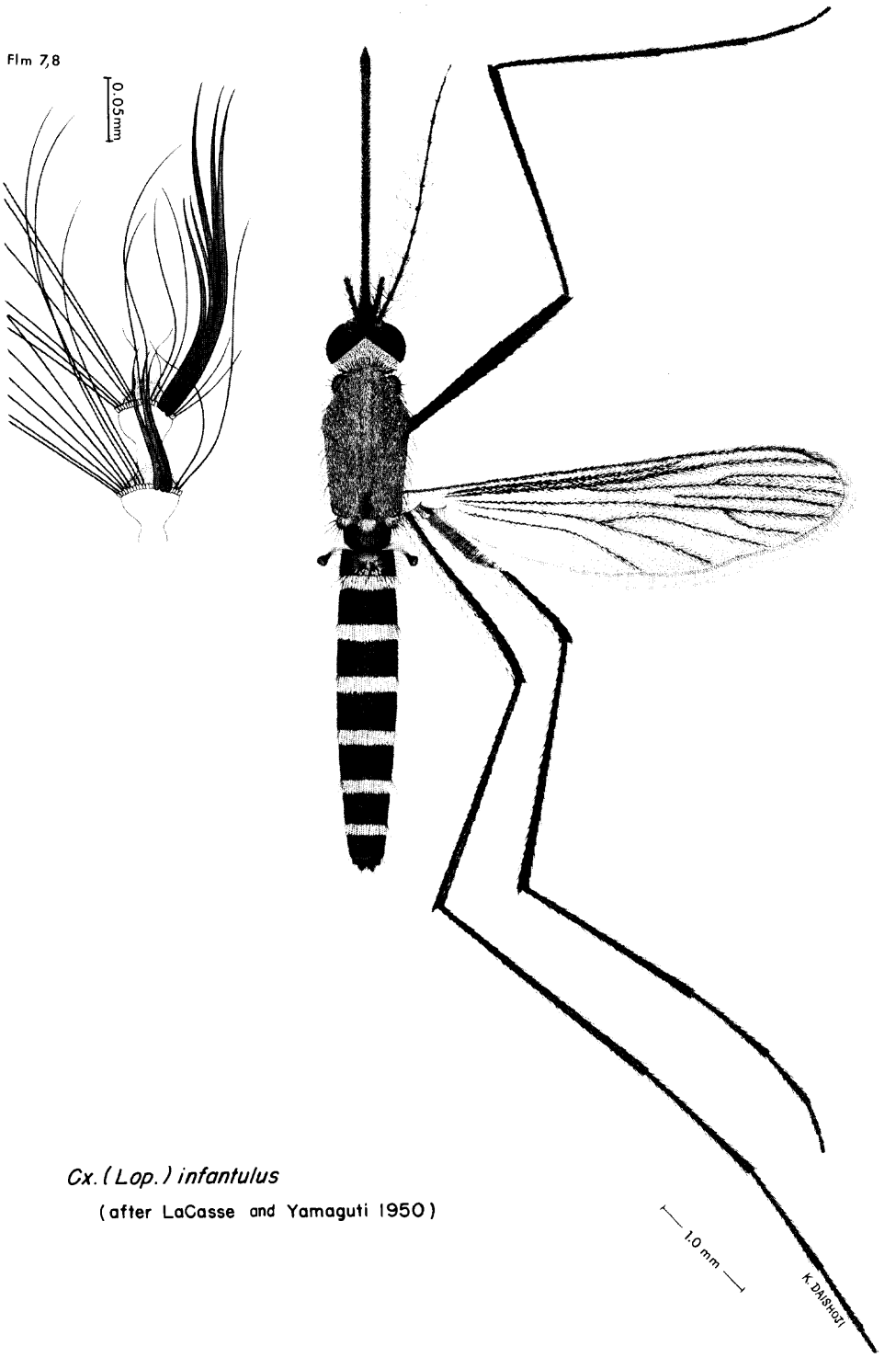
Cx. (Eum.) okinawae

Fig. 195



Cx. (Eum.) brevipalpis

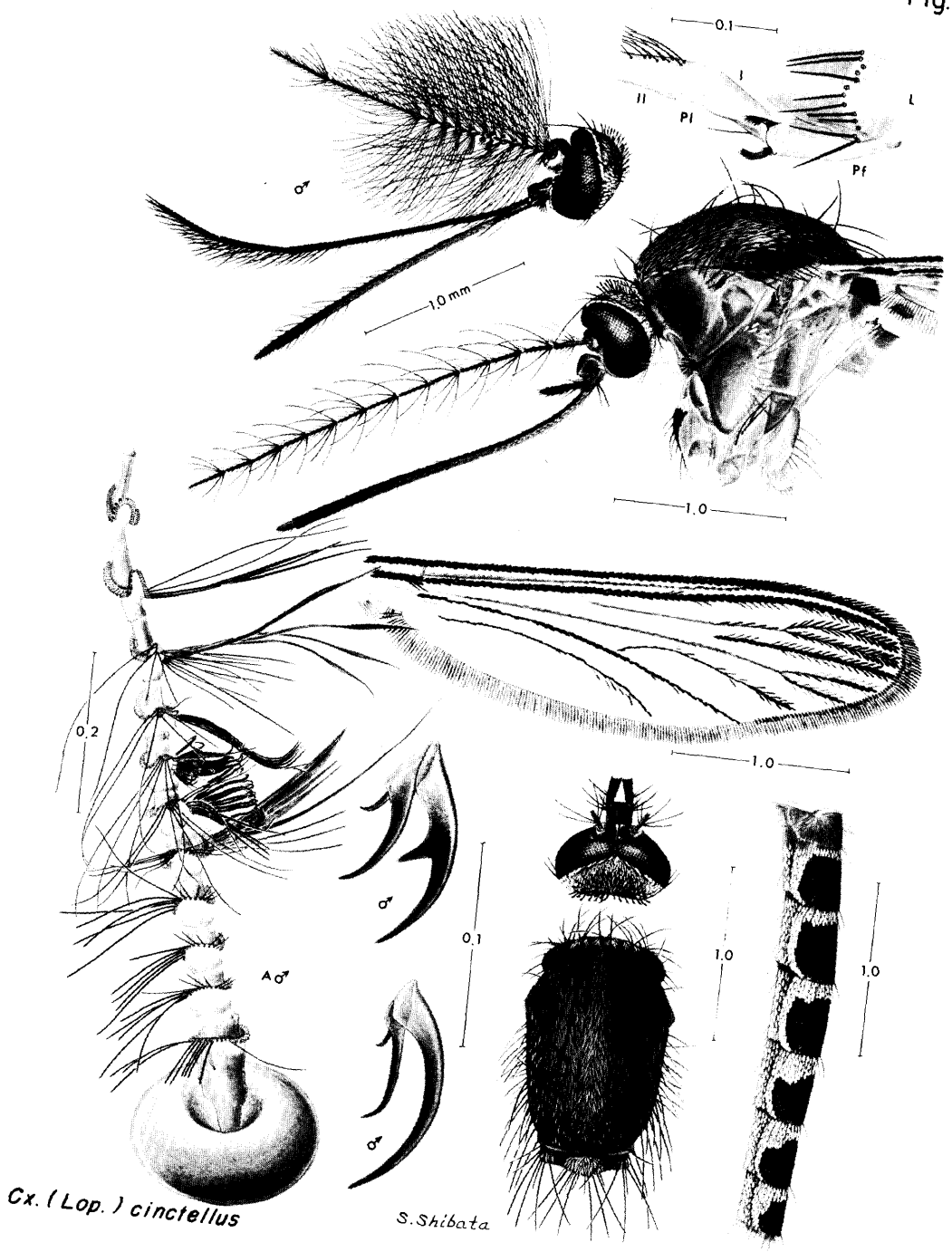
Fig. 196



Cx. (Lop.) infantulus

(after LaCasse and Yamaguti 1950)

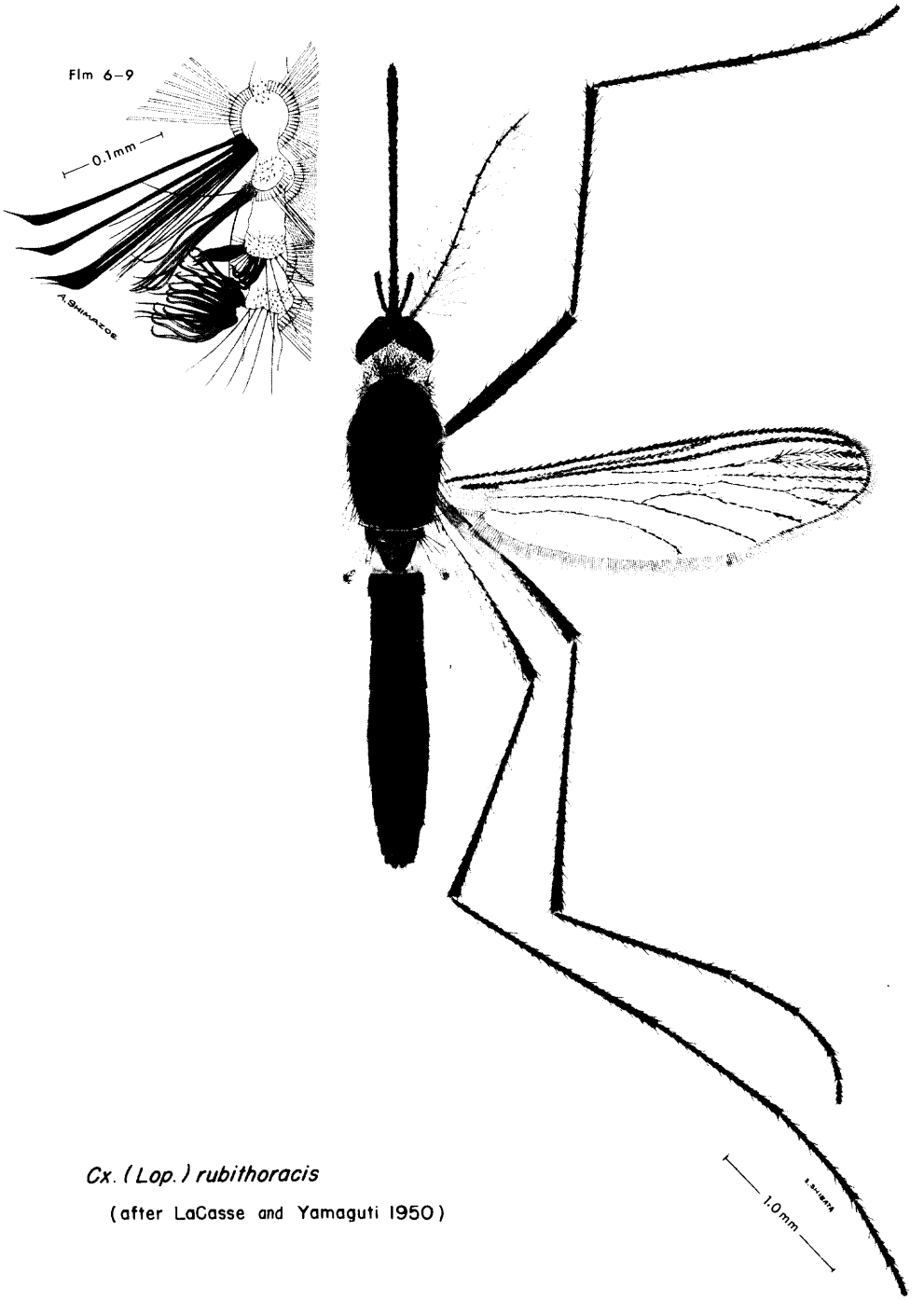
Fig. 197



Cx. (Lop.) cinctellus

S. Shibata

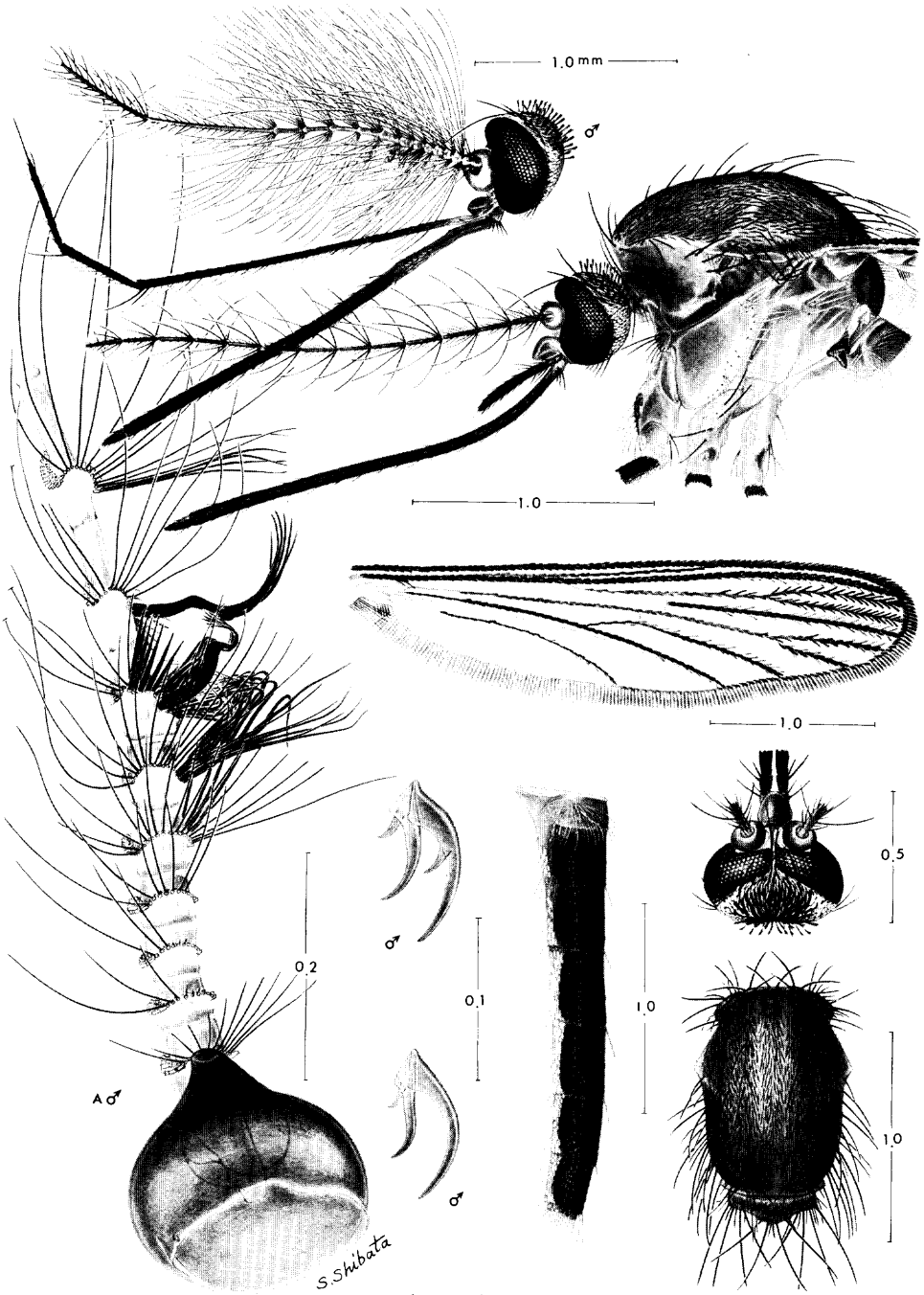
Fig. 198



Cx. (Lop.) rubithoracis

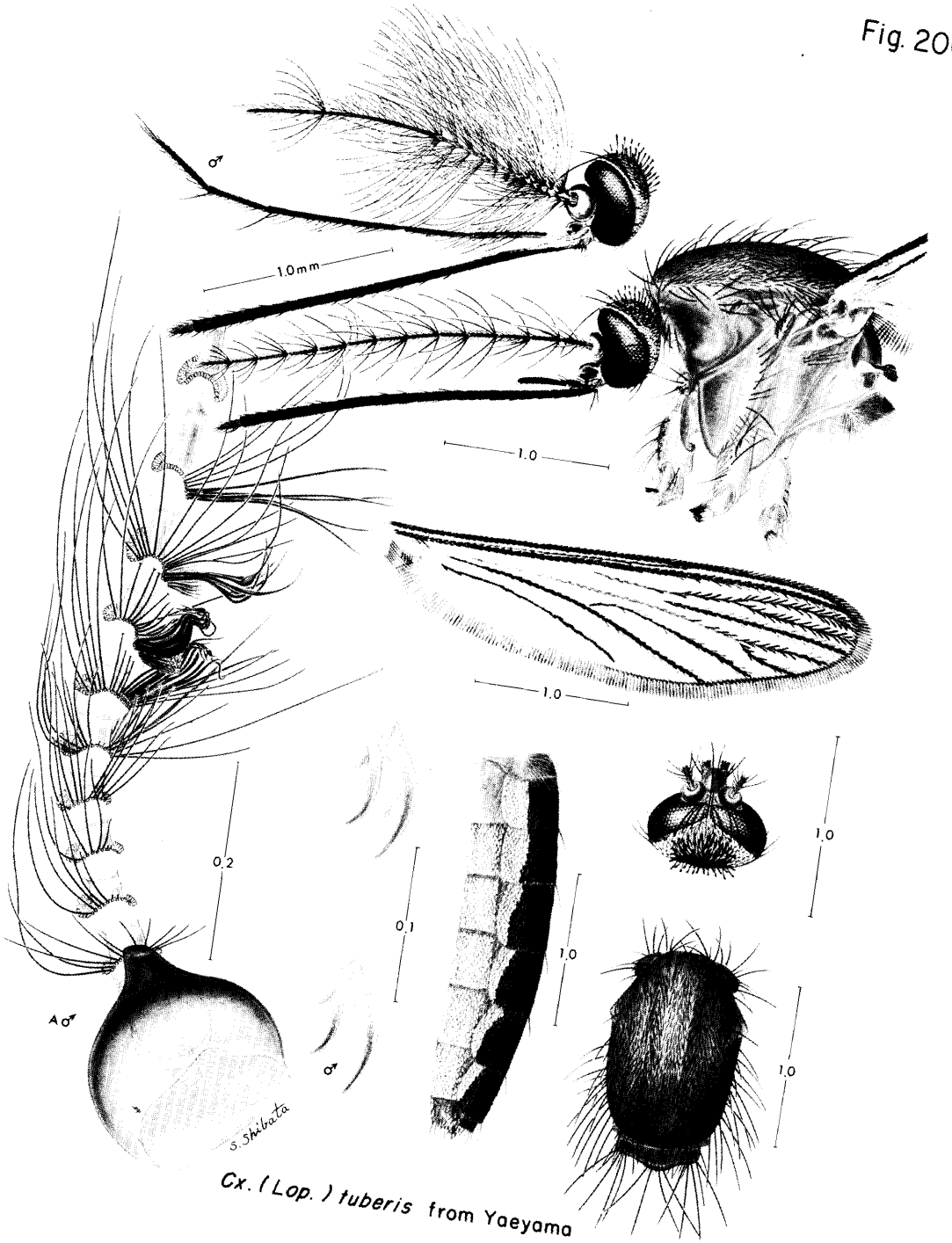
(after LaCasse and Yamaguti 1950)

Fig. 199



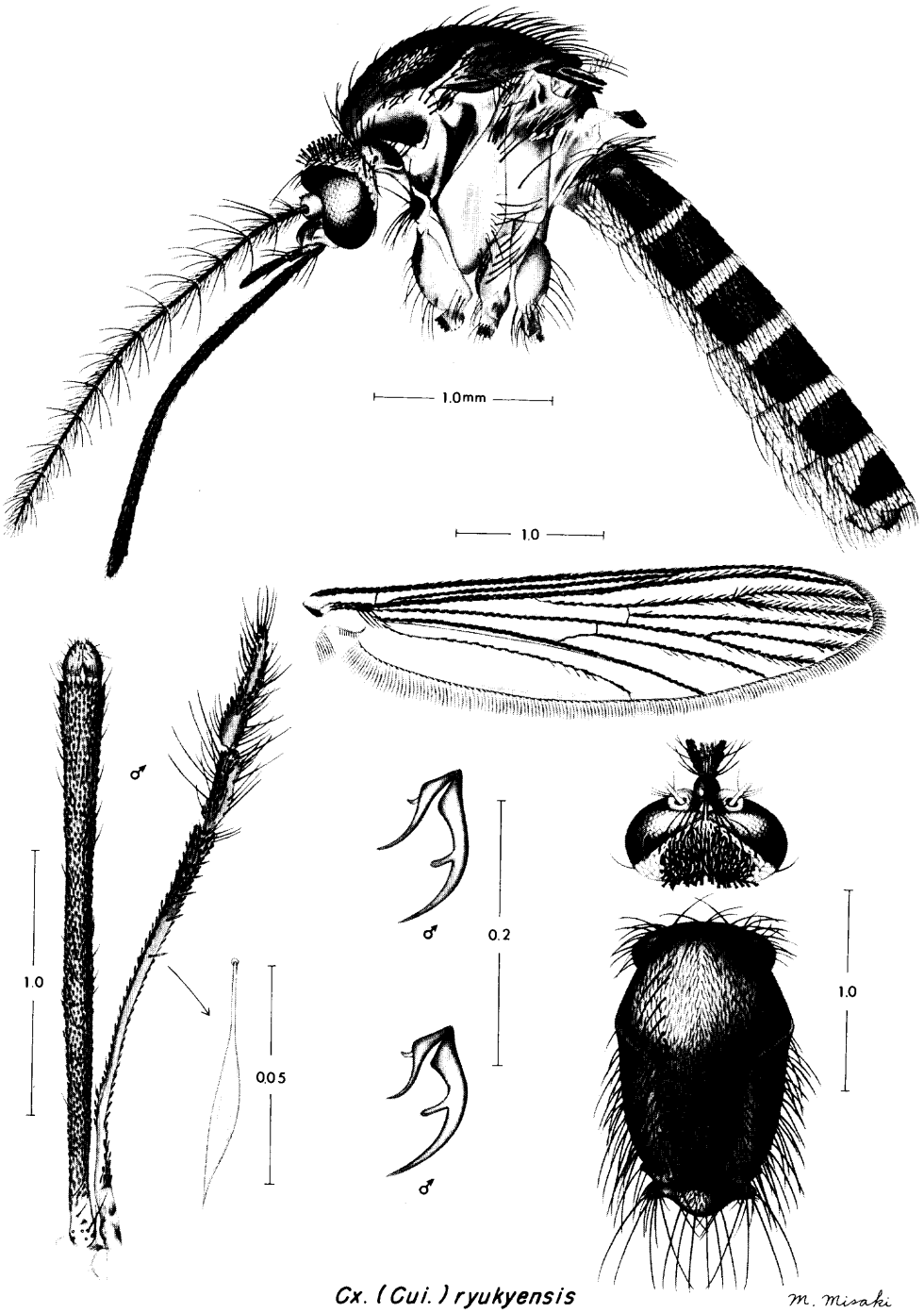
Cx. (Lop.) bicornutus

Fig. 200



Cx. (Lop.) tuberis from Yaeyama

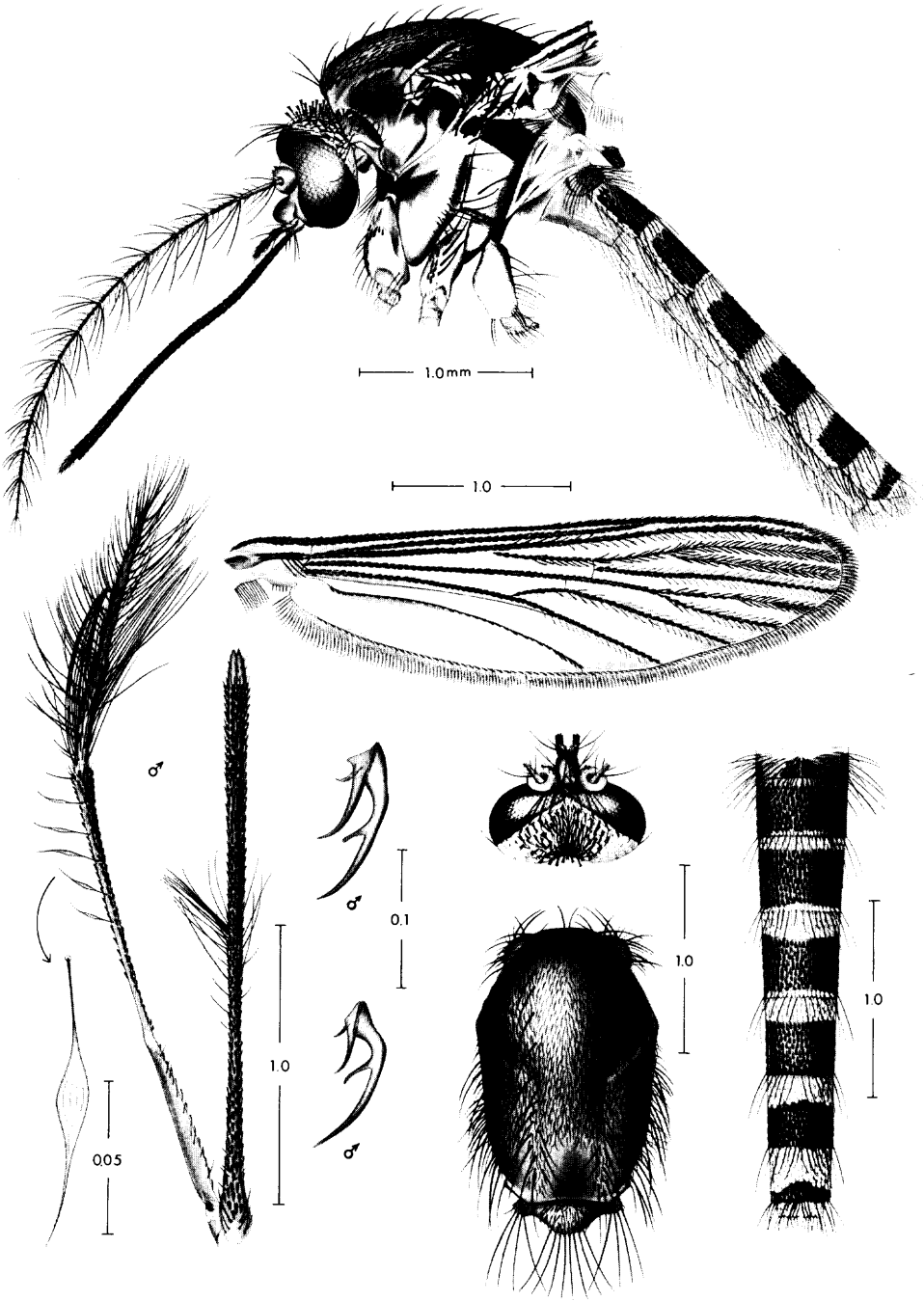
Fig. 201



Cx. (Cui.) ryukyensis

M. Misaki

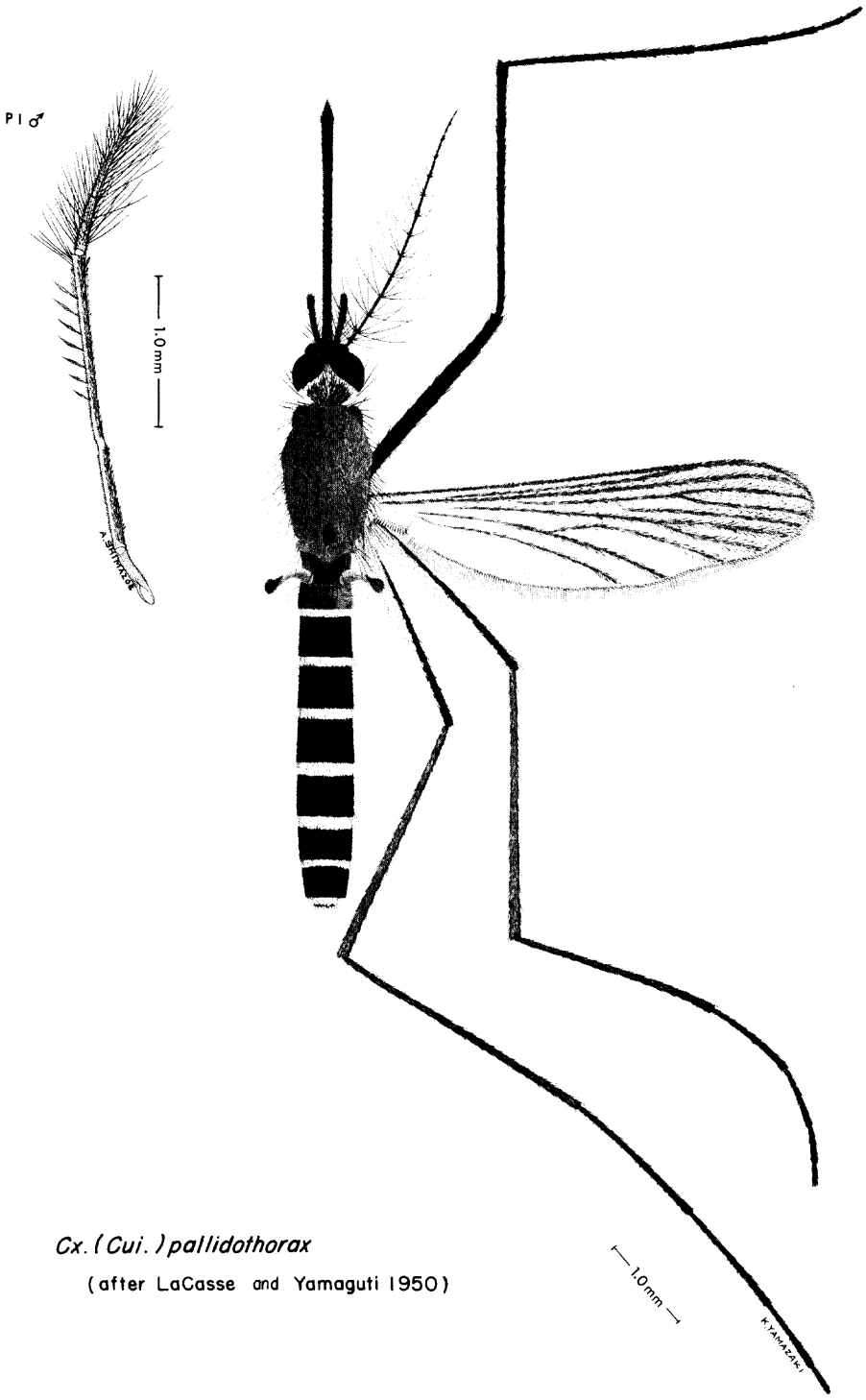
Fig. 202



Cx. (Cui.) nigropunctatus

M. Misaki

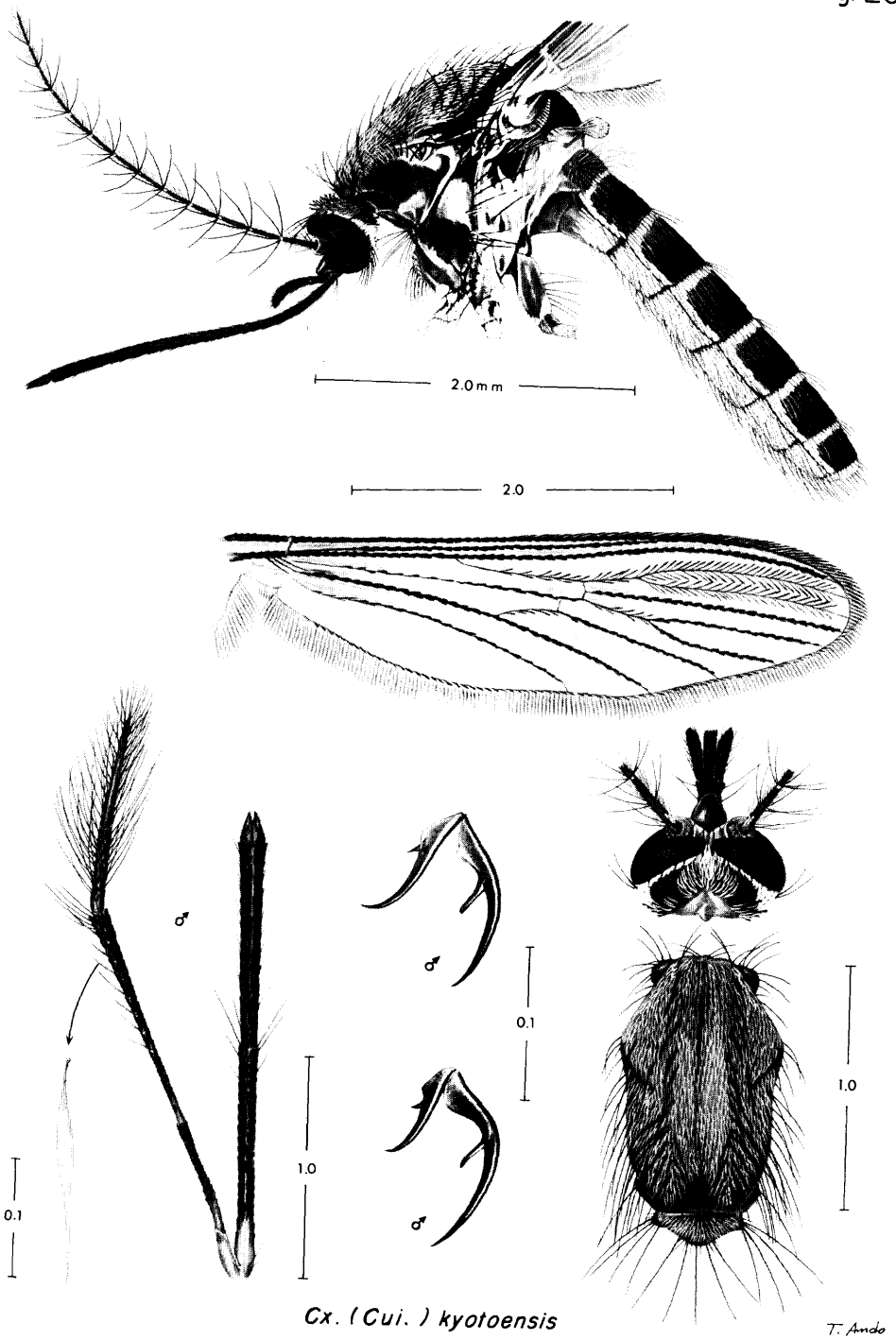
Fig. 203



Cx. (Cui.) pallidothorax

(after LaCasse and Yamaguti 1950)

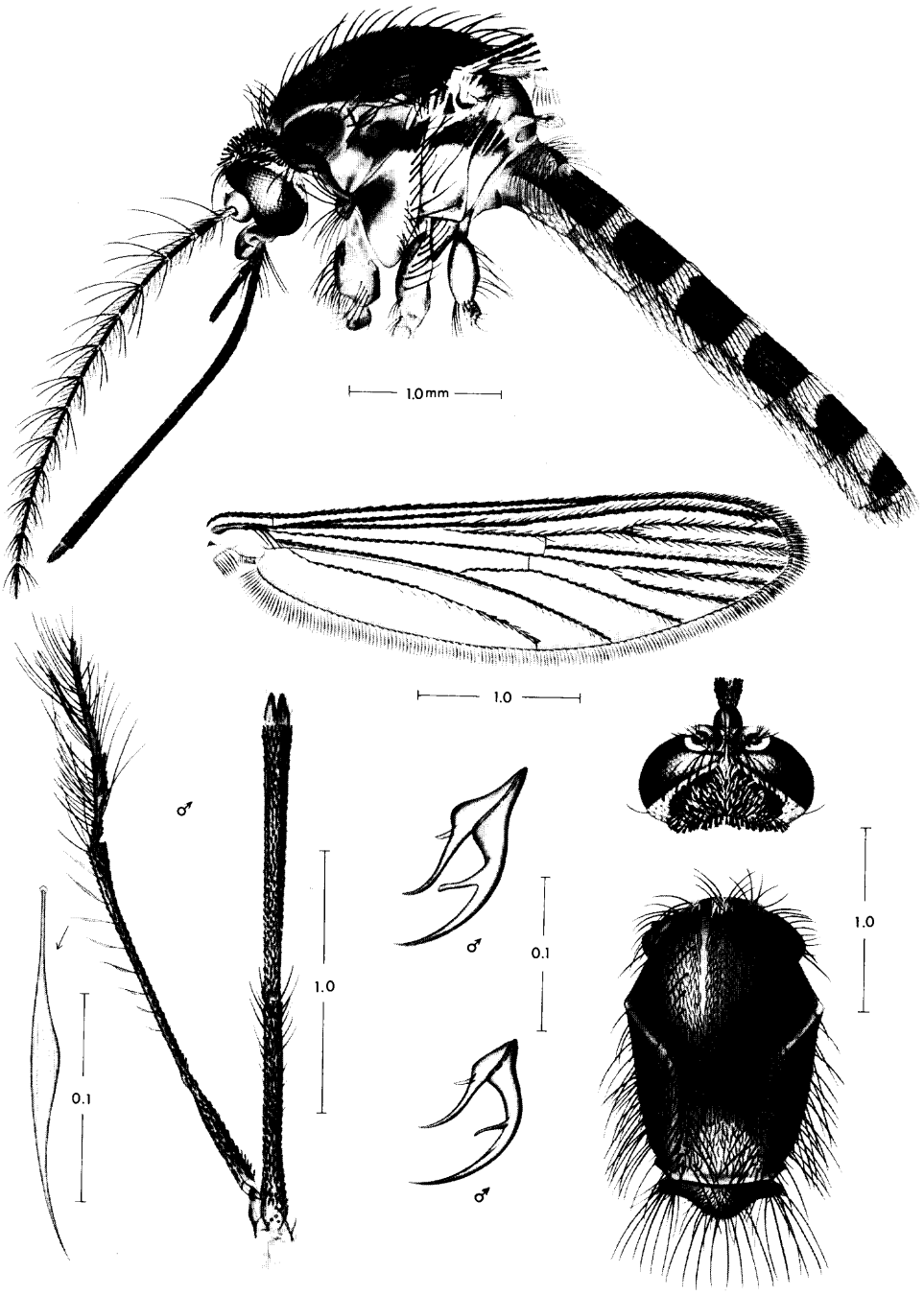
Fig. 204



Cx. (Cui.) kyotoensis

T. Ando

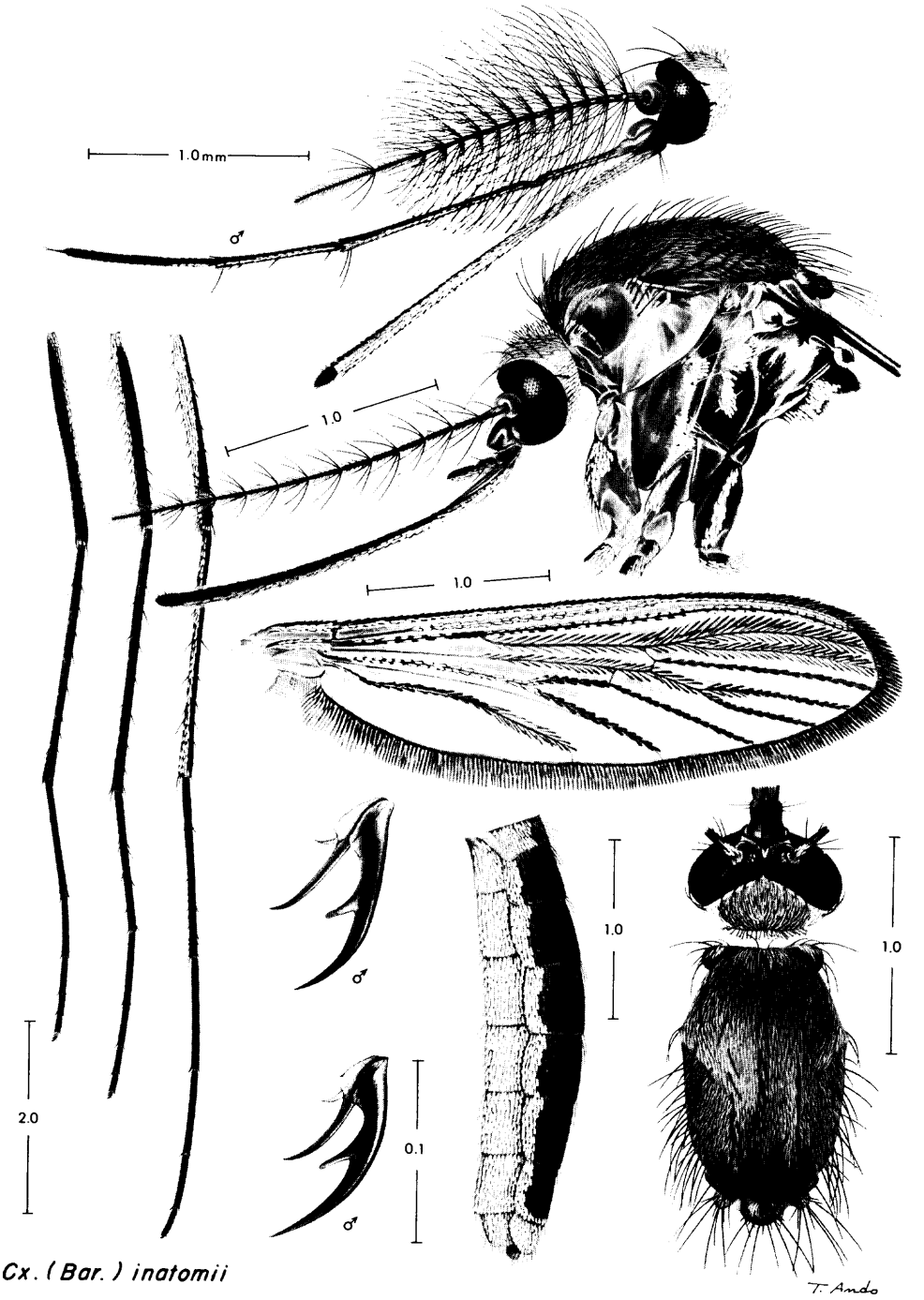
Fig. 205



Cx. (Cui.) sasai

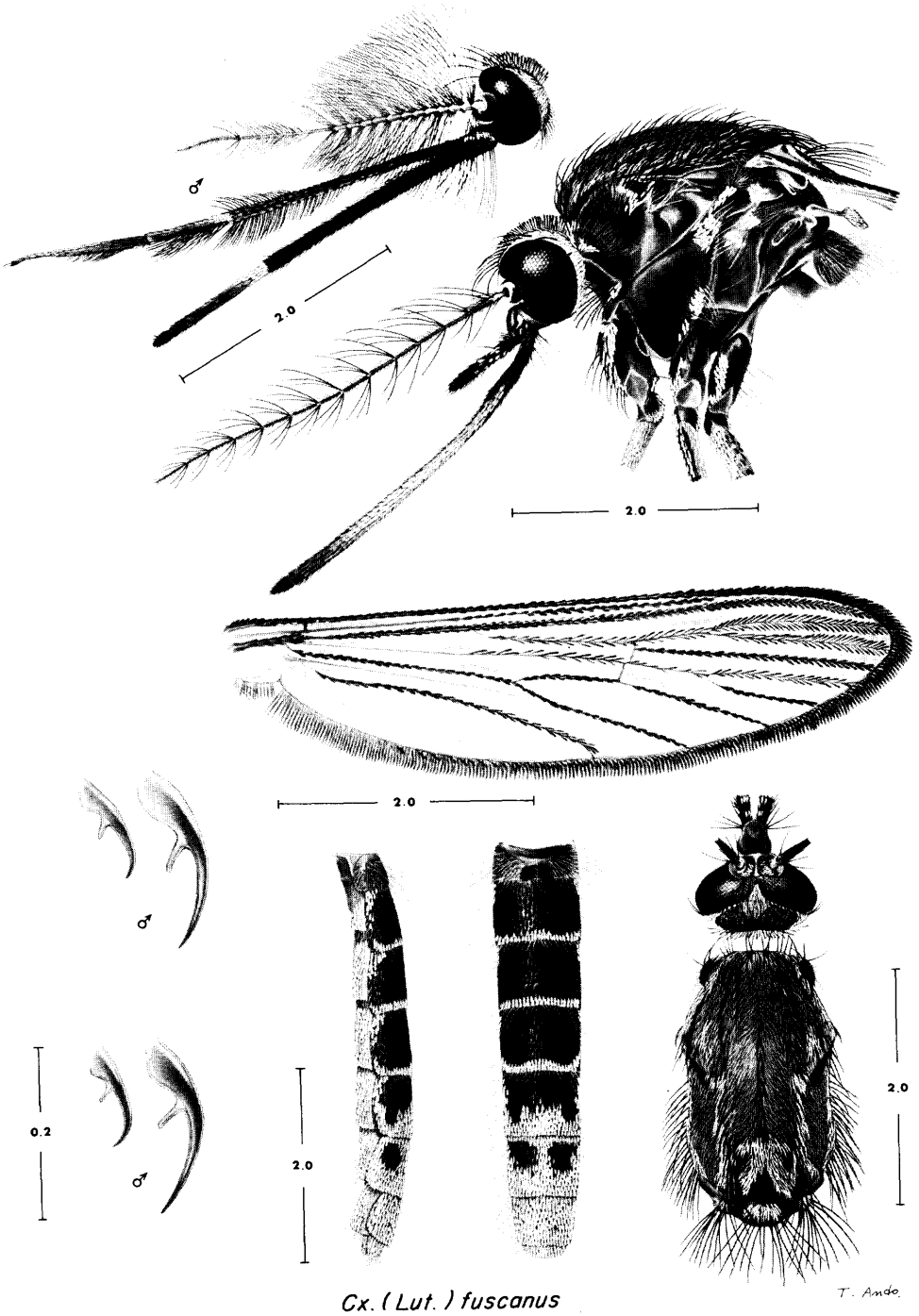
m. misaki

Fig. 206



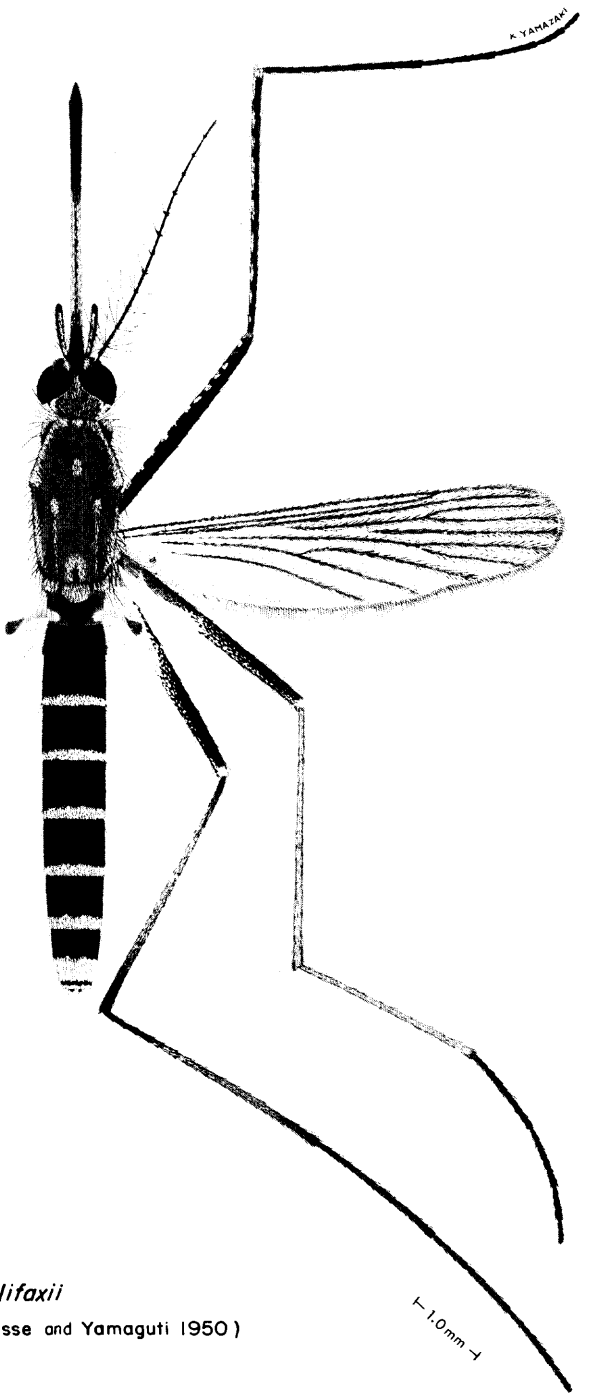
Cx. (Bar.) inatomii

Fig. 207



Cx. (Lut.) fuscanus

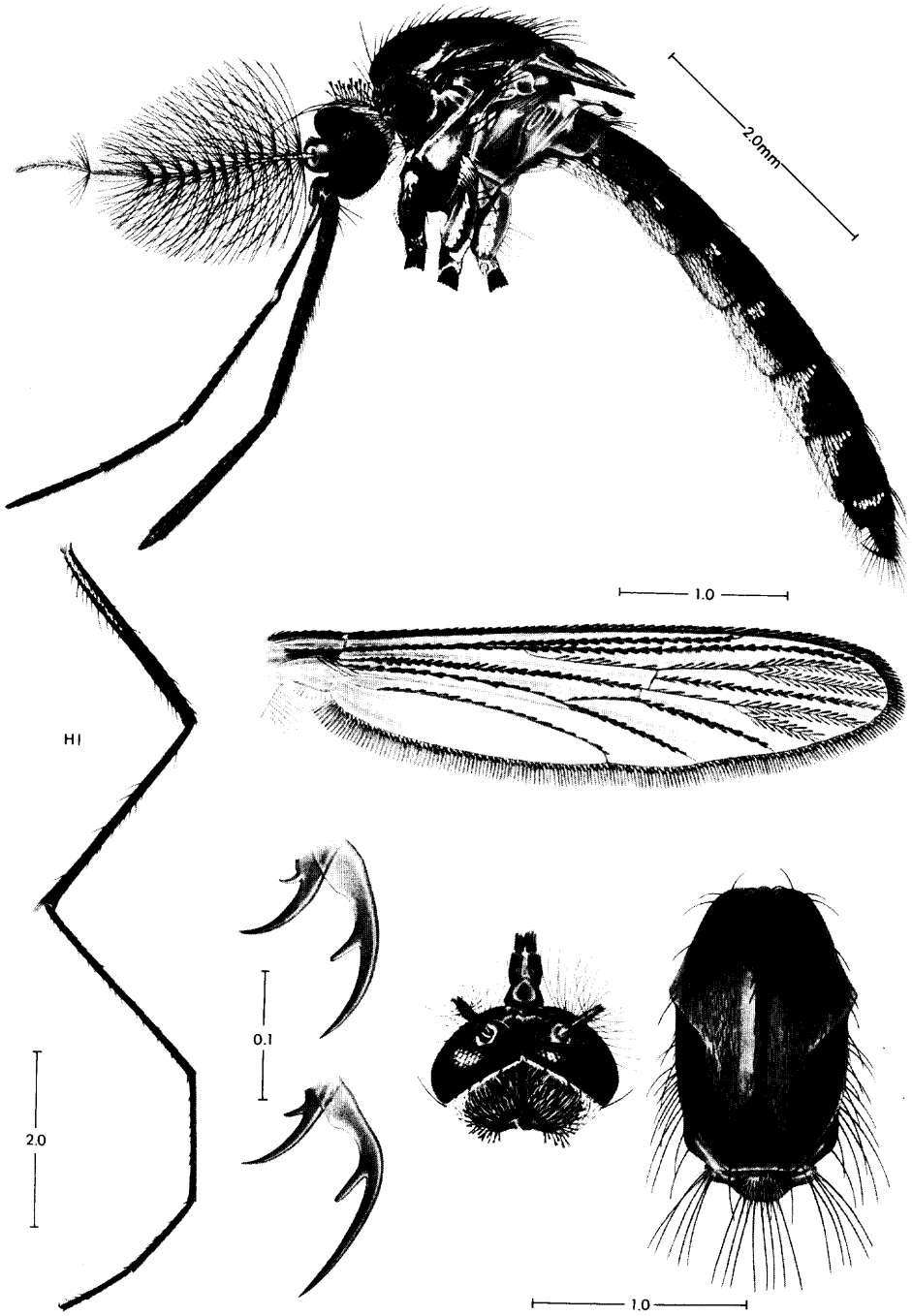
Fig. 208



Cx. (Lut.) halifaxii

(after LaCasse and Yamaguti 1950)

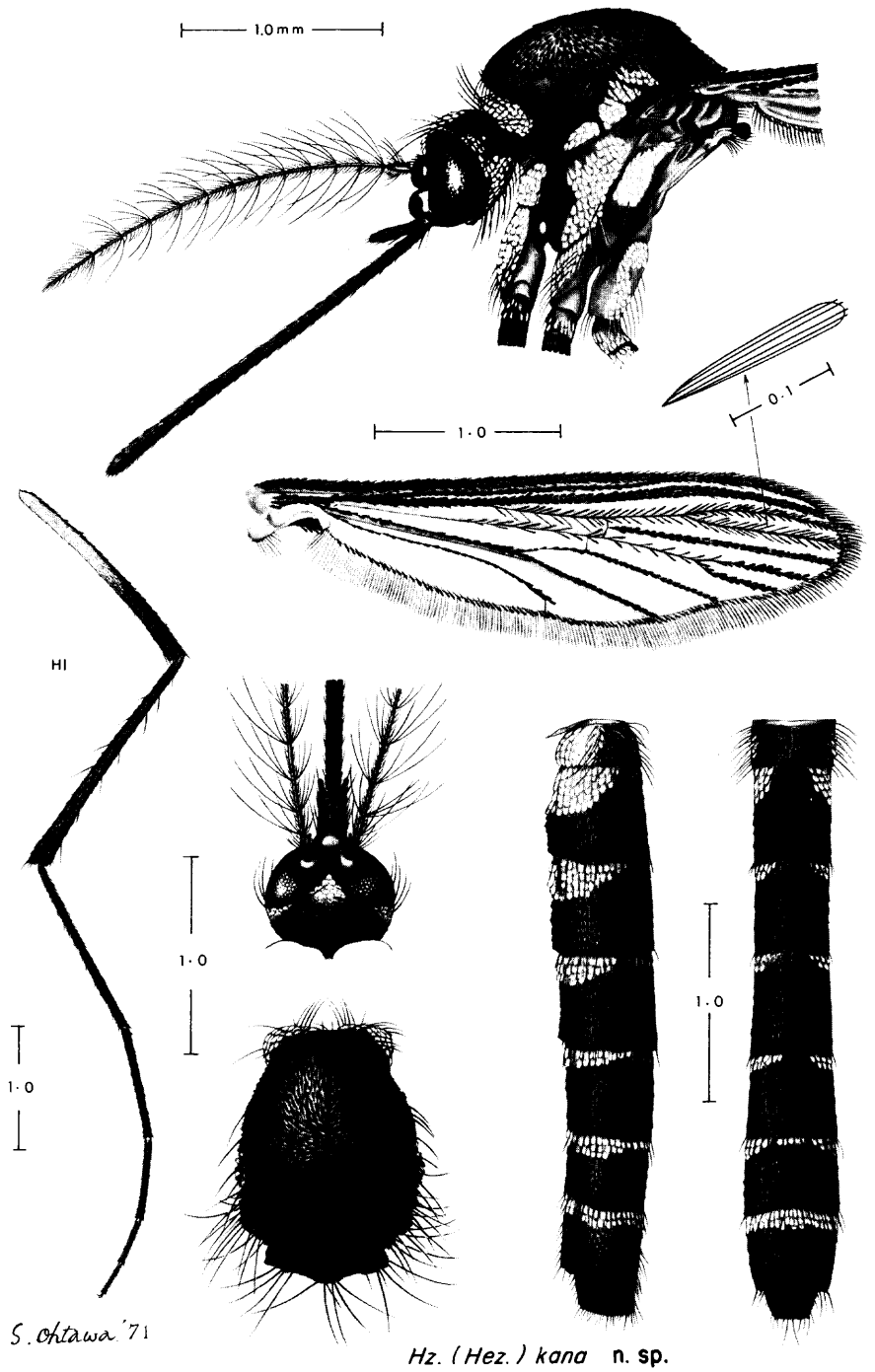
Fig. 209



Cx. (Lut.) shinonagai n. sp. ♂

T. Ando

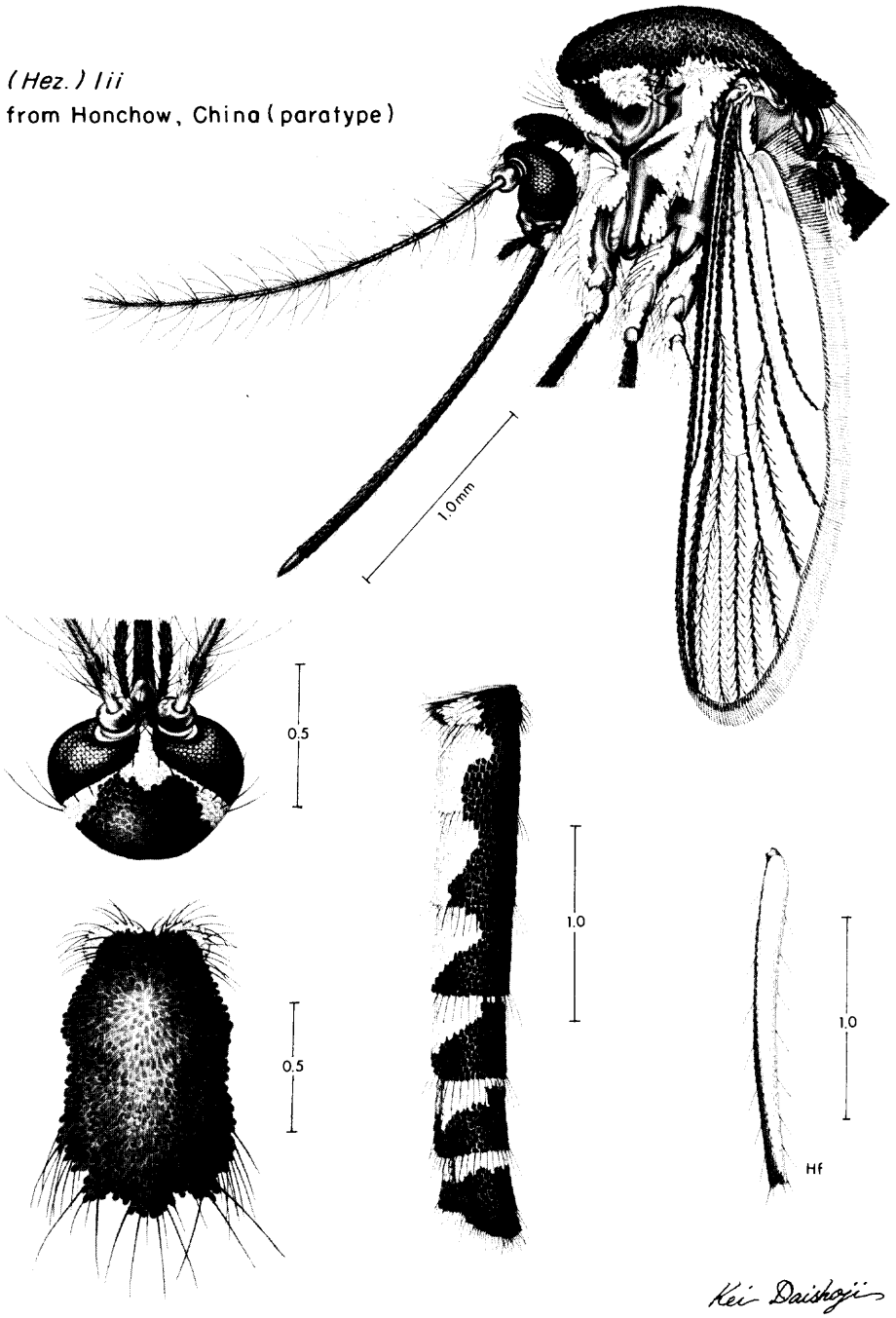
Fig. 210



Hz. (Hez.) kana n. sp.

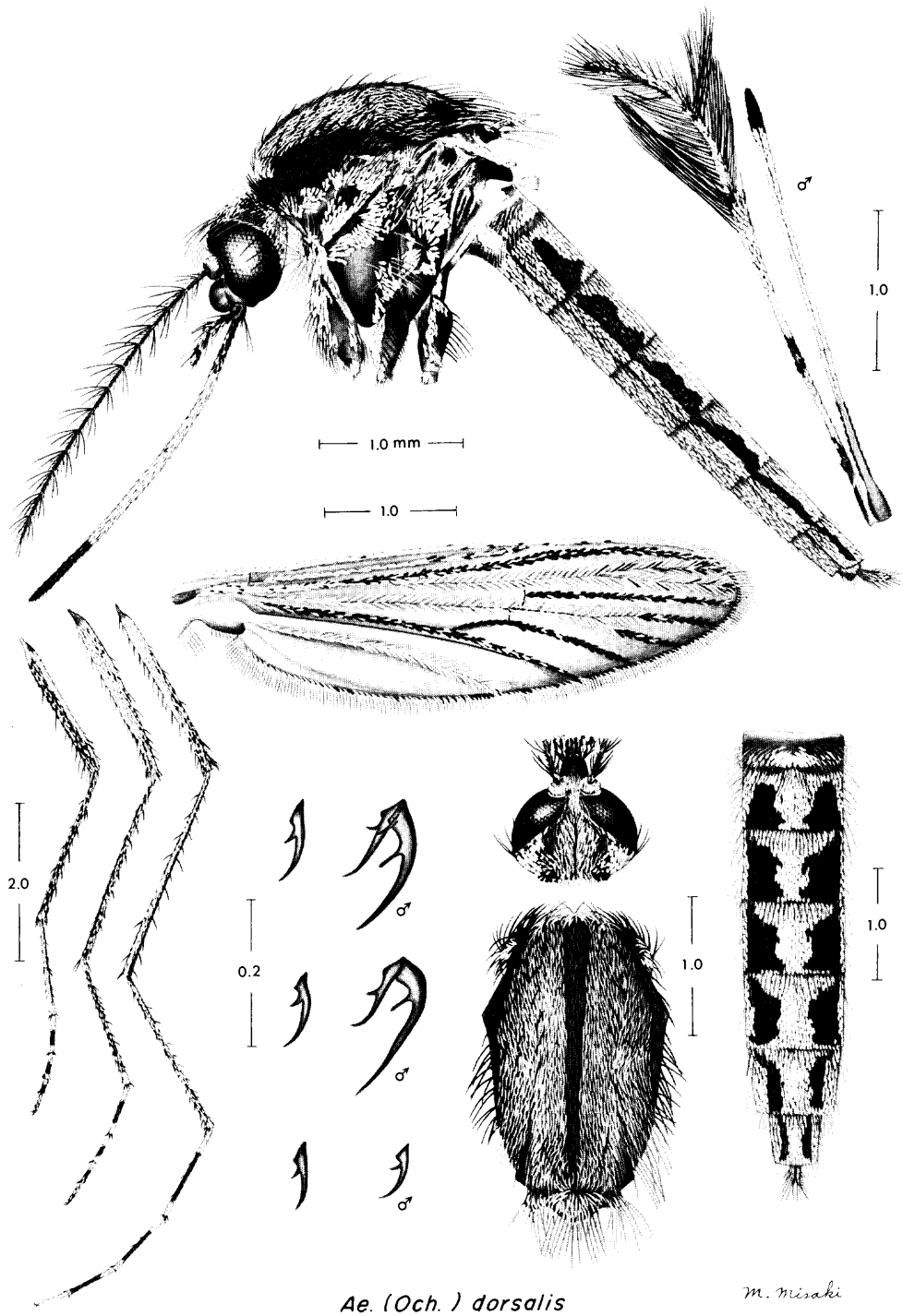
Fig. 211

Hz. (Hez.) lii
from Honchow, China (paratype)



Kei Daishoji

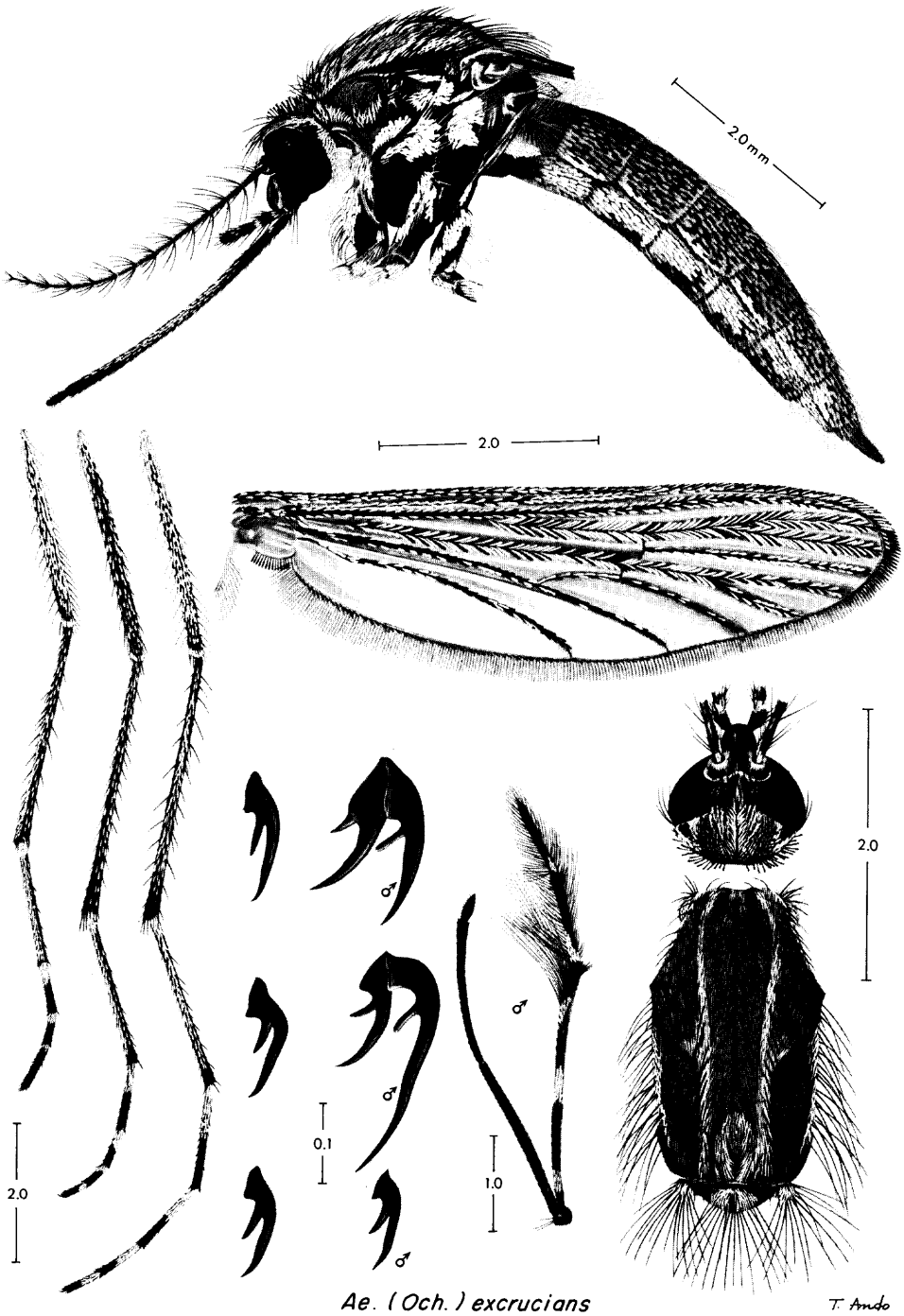
Fig. 212



Ae. (Och.) dorsalis

M. Misaki

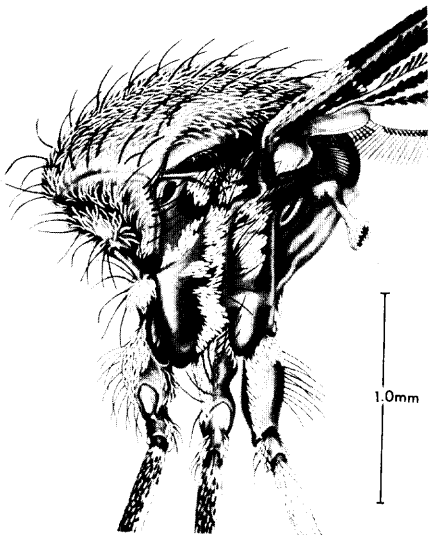
Fig. 213



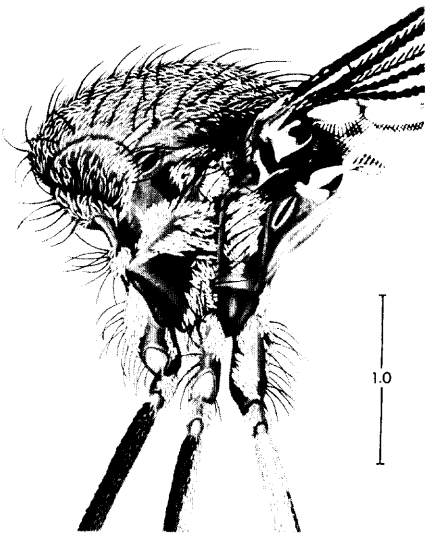
Ae. (Och.) excrucians

T. Ando

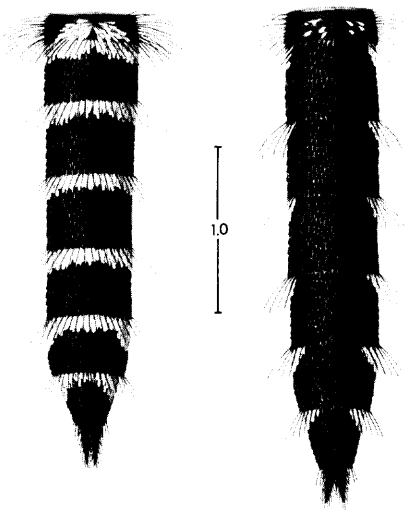
Fig. 214



impiger daisetsuzanus n. ssp.

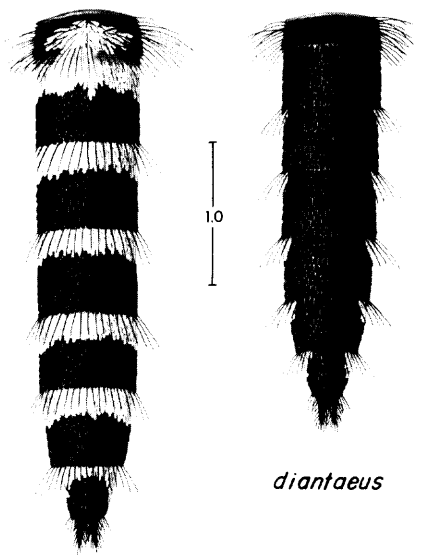


communis



communis

Ae. (Och.) spp.



diantaeus

hexodontus hokkaidensis
n. ssp.

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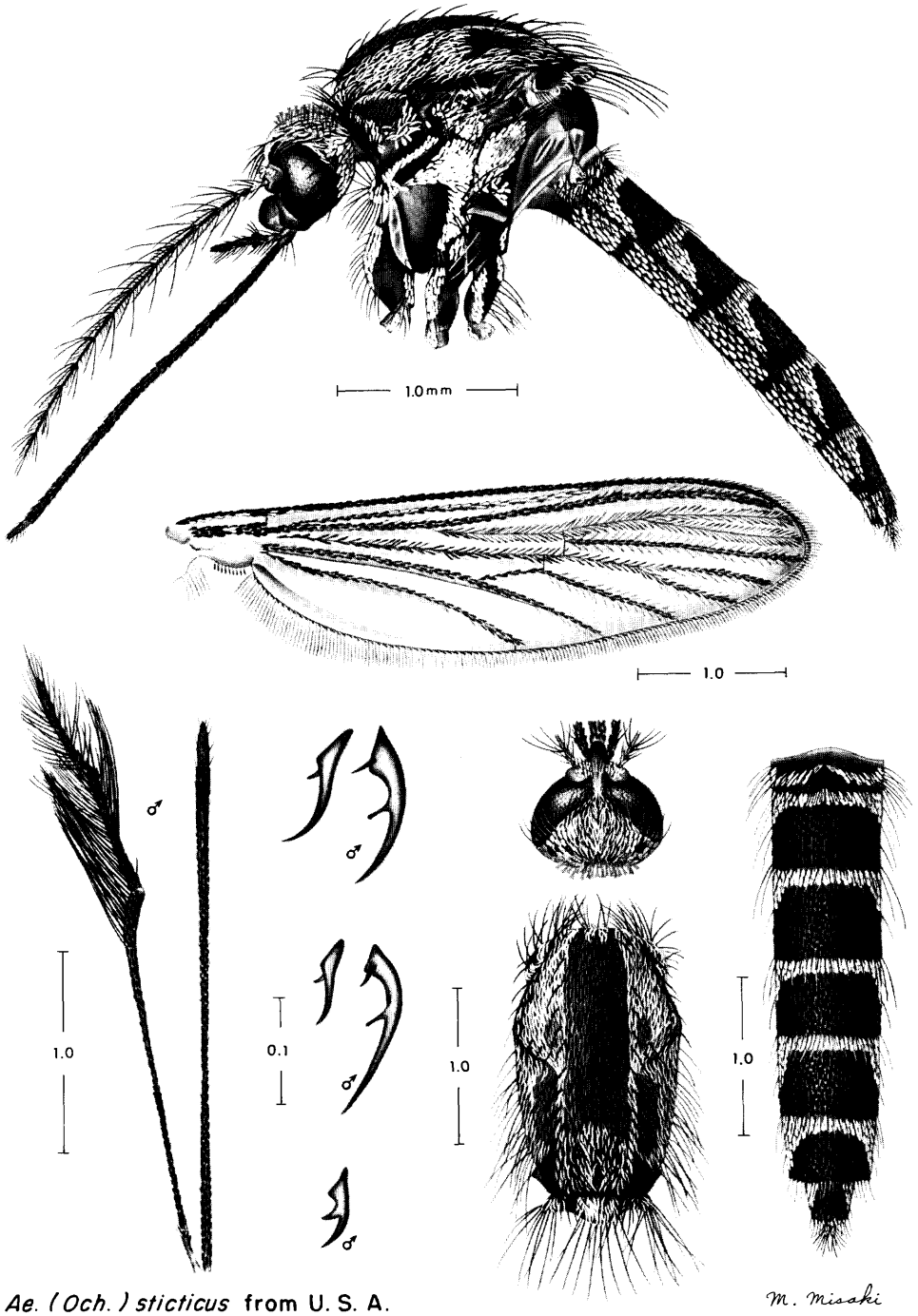
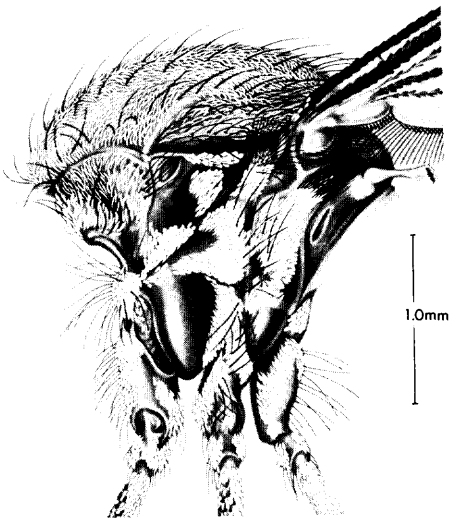
Fig. 215



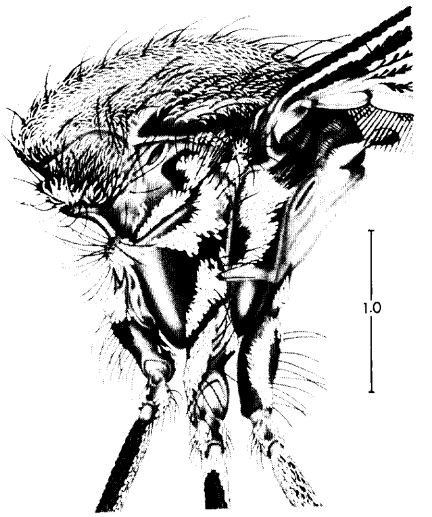
Ae. (Och.) sticticus from U. S. A.

M. Misaki

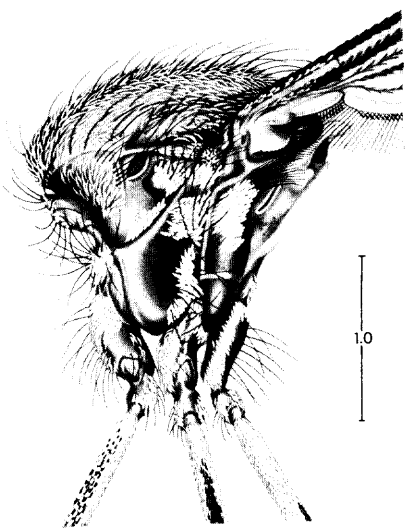
Fig. 216



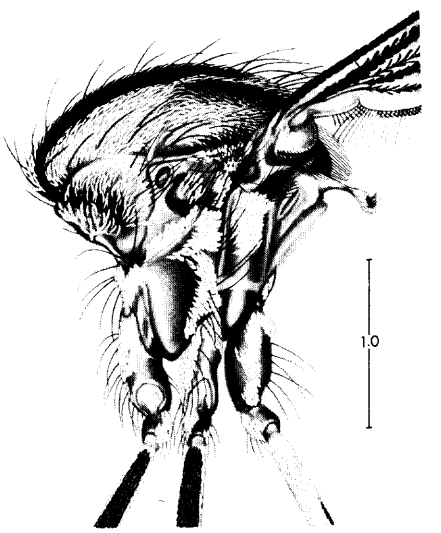
Ae. (Och.) punctor



Ae. (Och.) hakusanensis



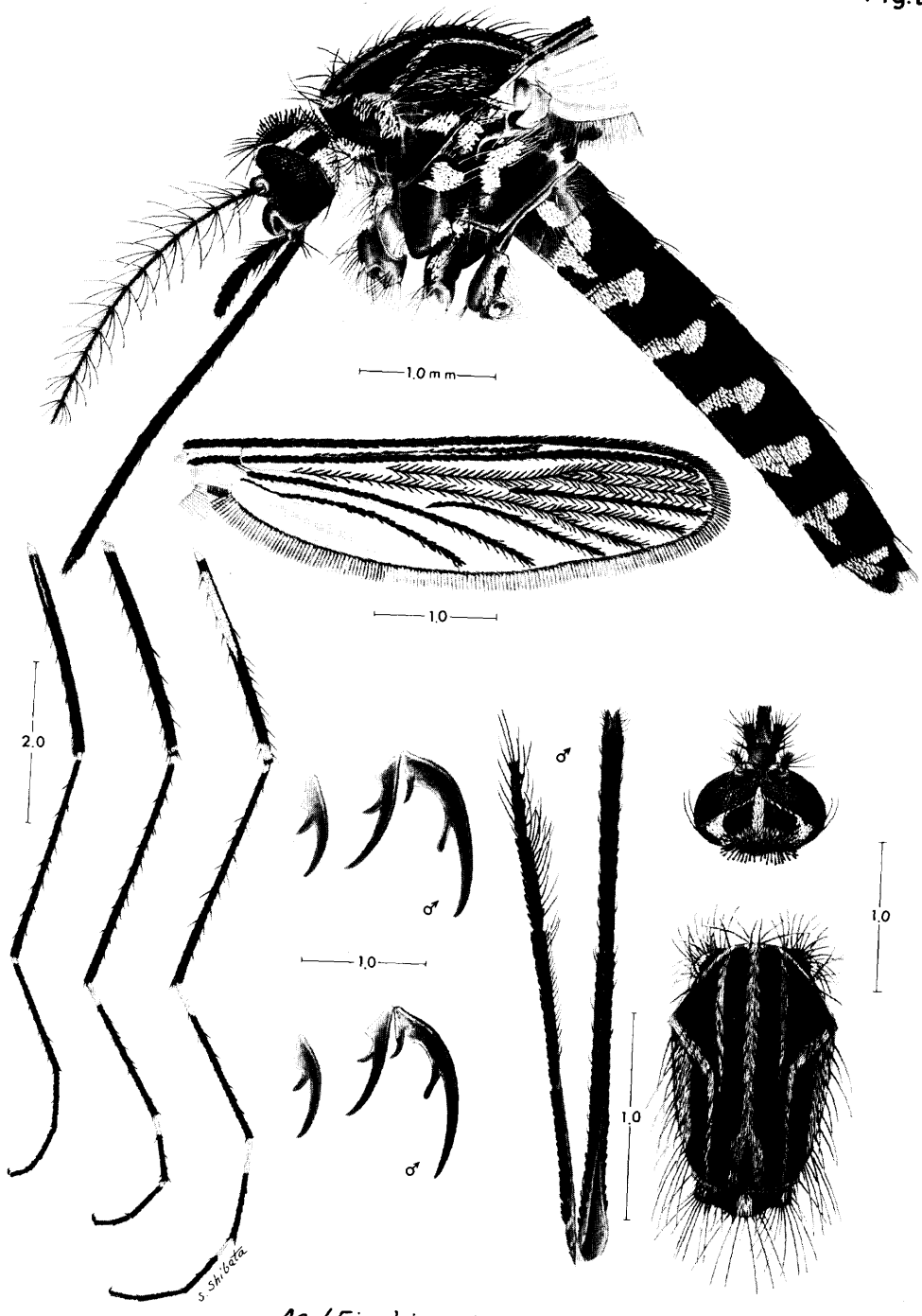
Ae. (Och.) intrudens



Ae. (Och.) diantaeus

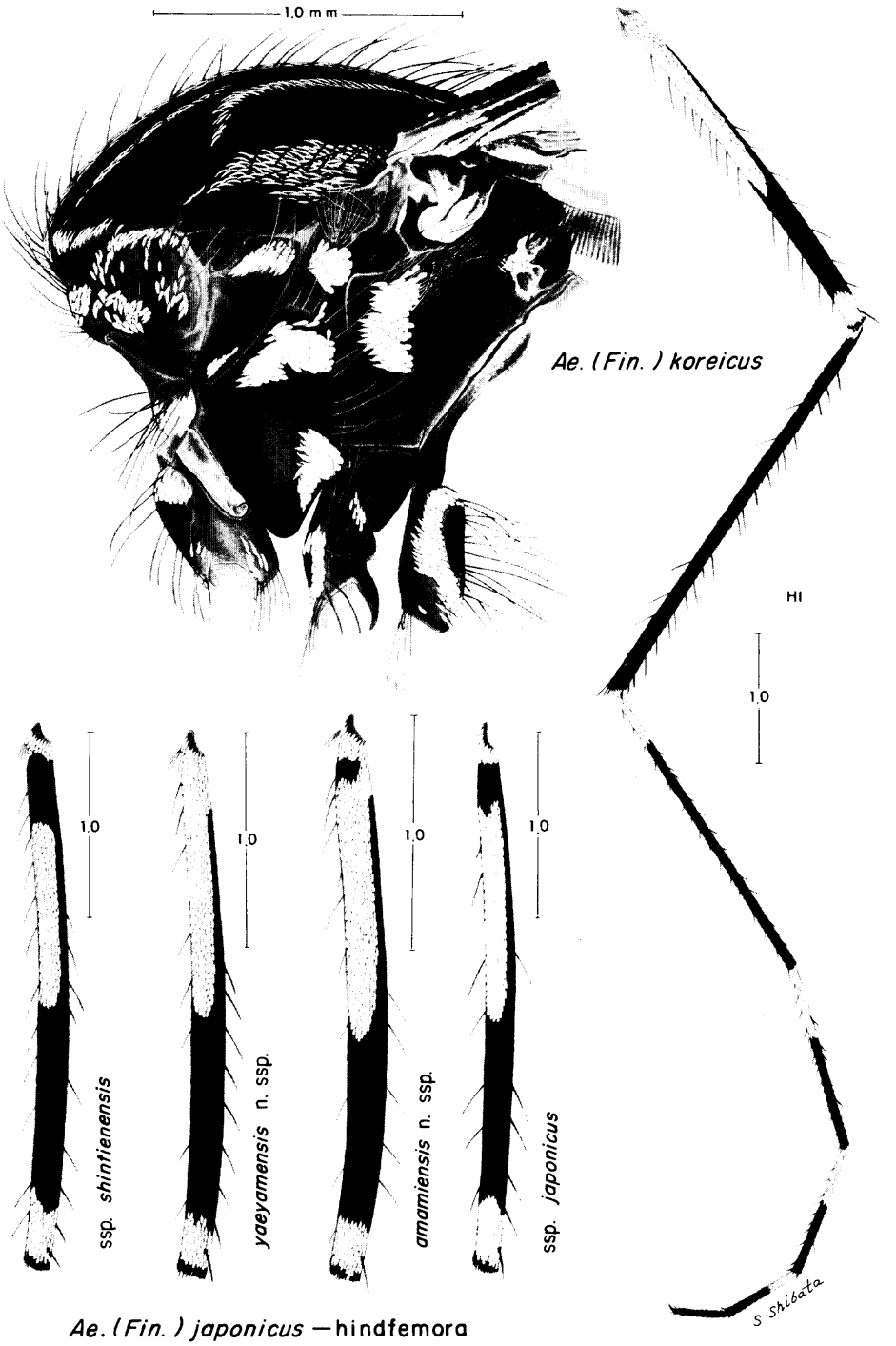
Kei Daishoji

Fig. 217



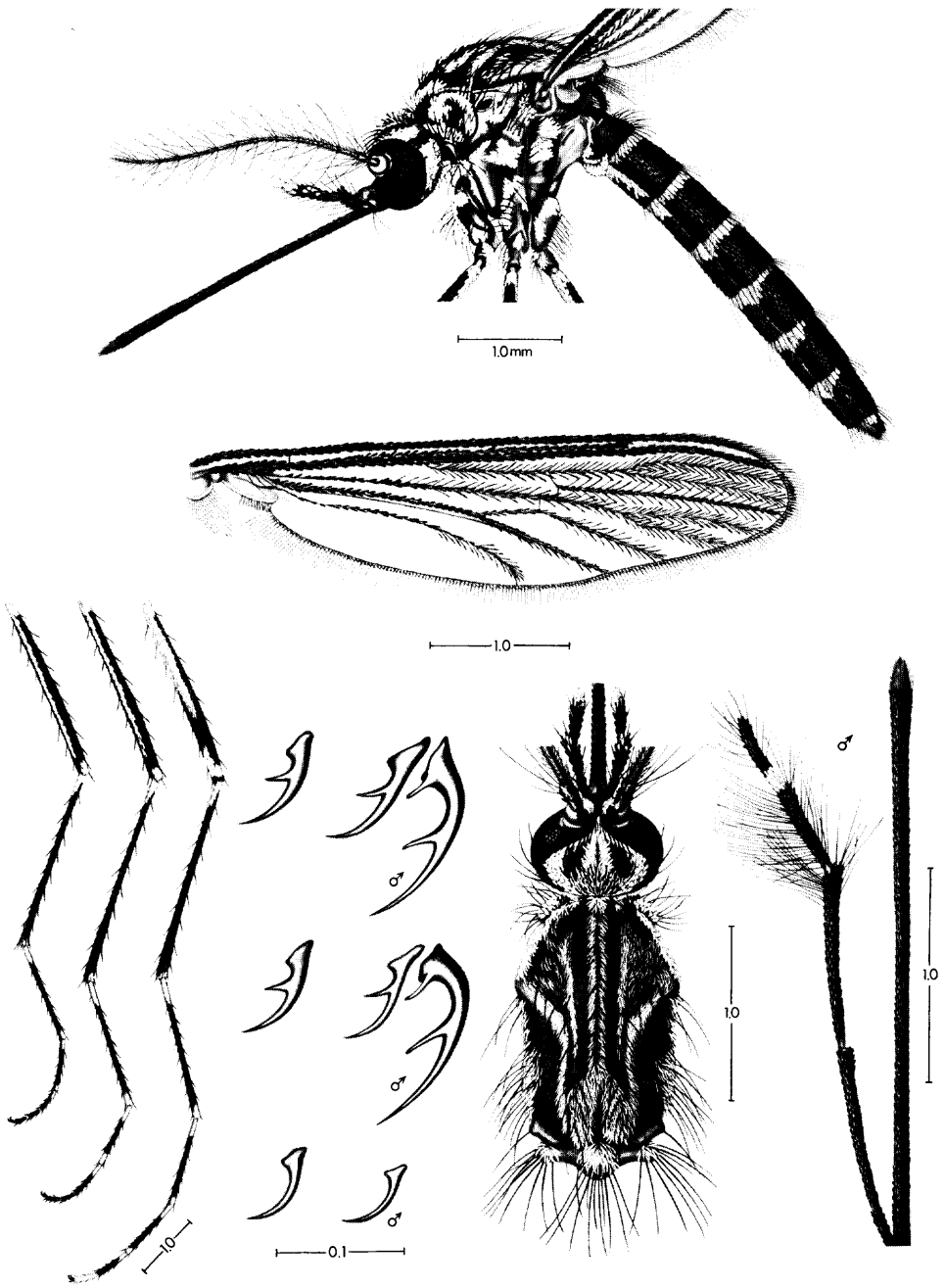
Ae. (Fin.) japonicus japonicus

Fig. 218



Ae. (Fin.) japonicus — hindfemora

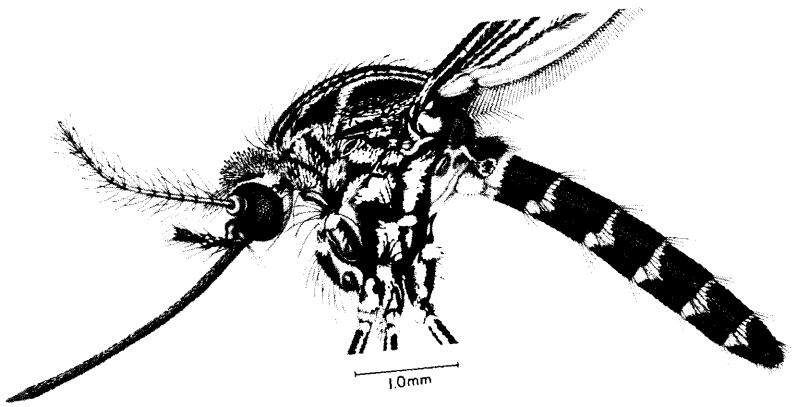
Fig. 219

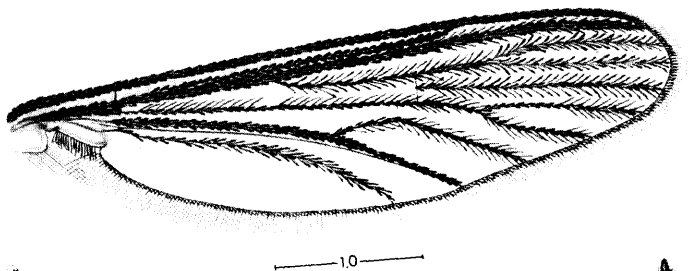


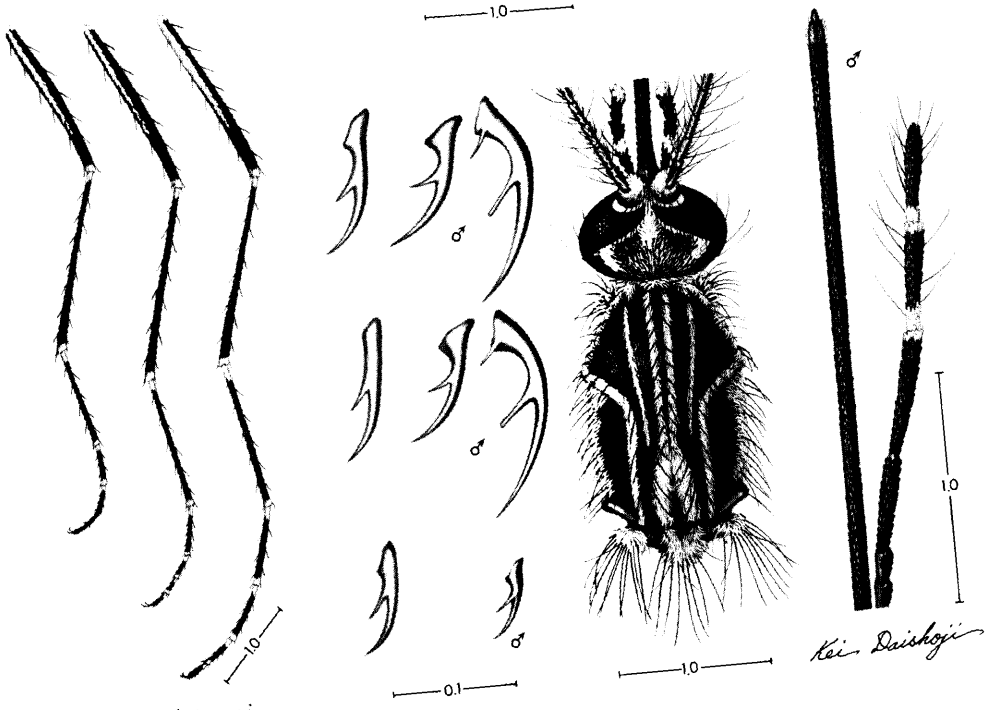
Ae. (Fin.) hatorii

Kei Daishoji

Fig. 220

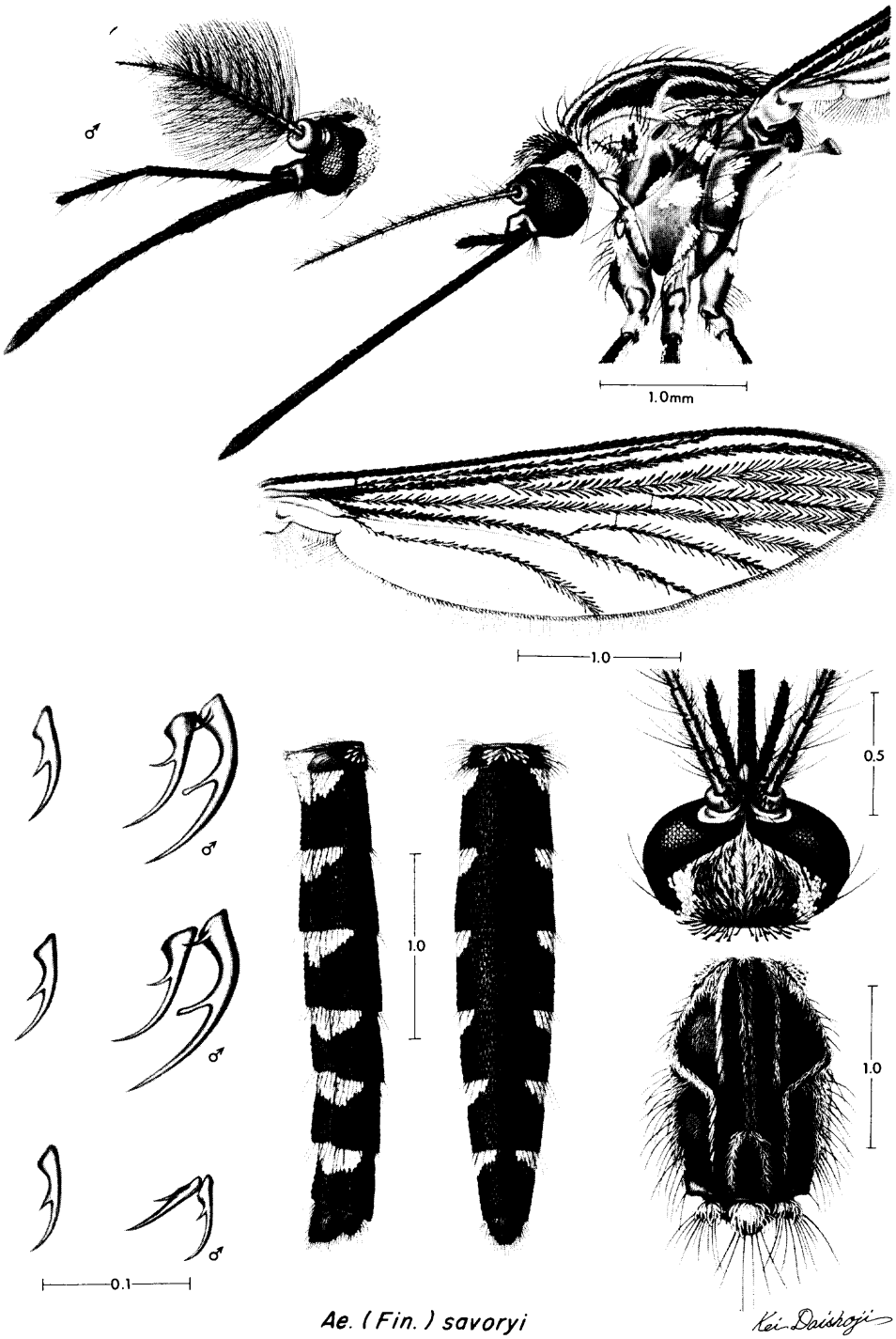






Ae. (Fin.) togoi

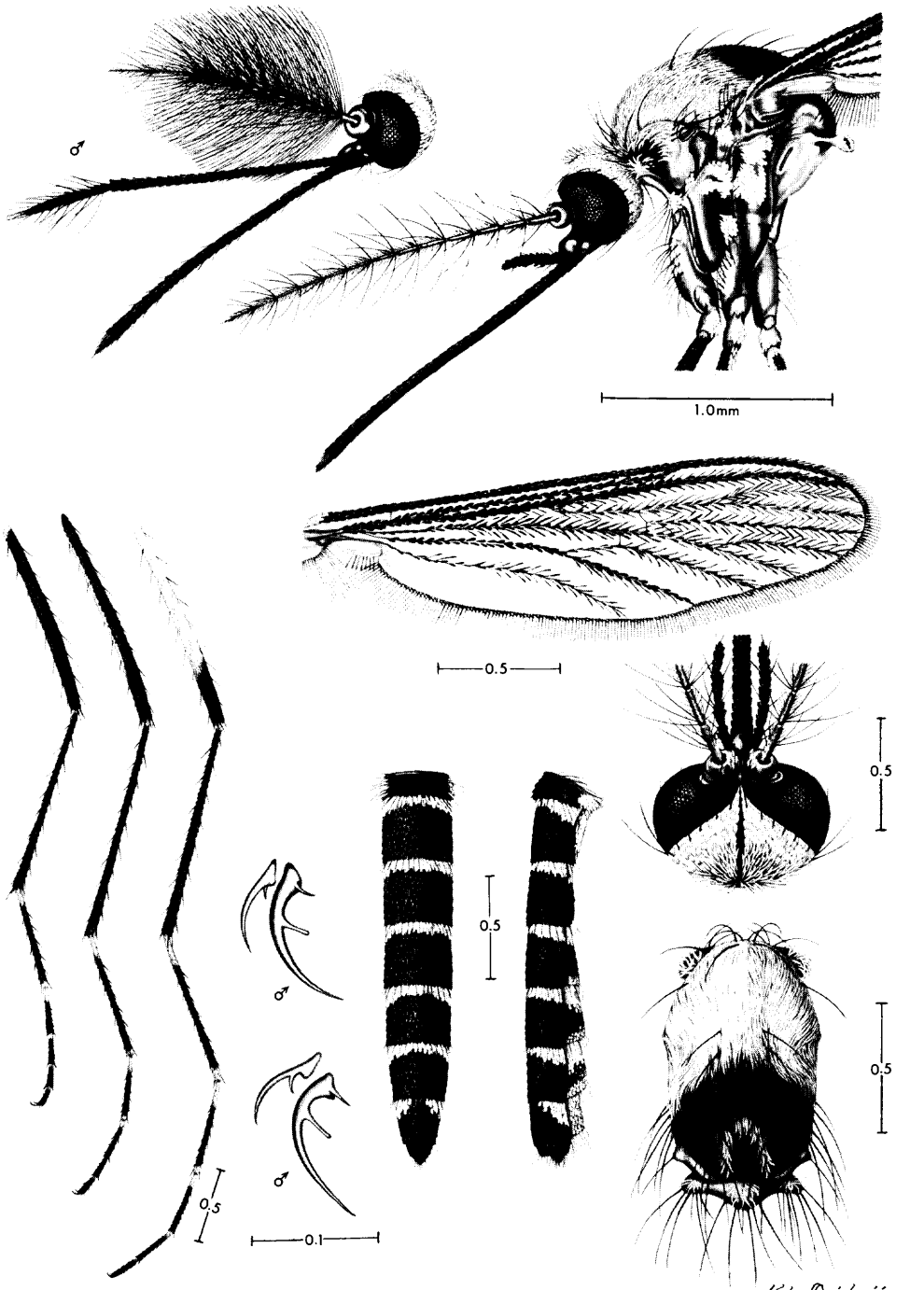
Fig. 221



Ae. (Fin.) savoryi

Kei Daishoji

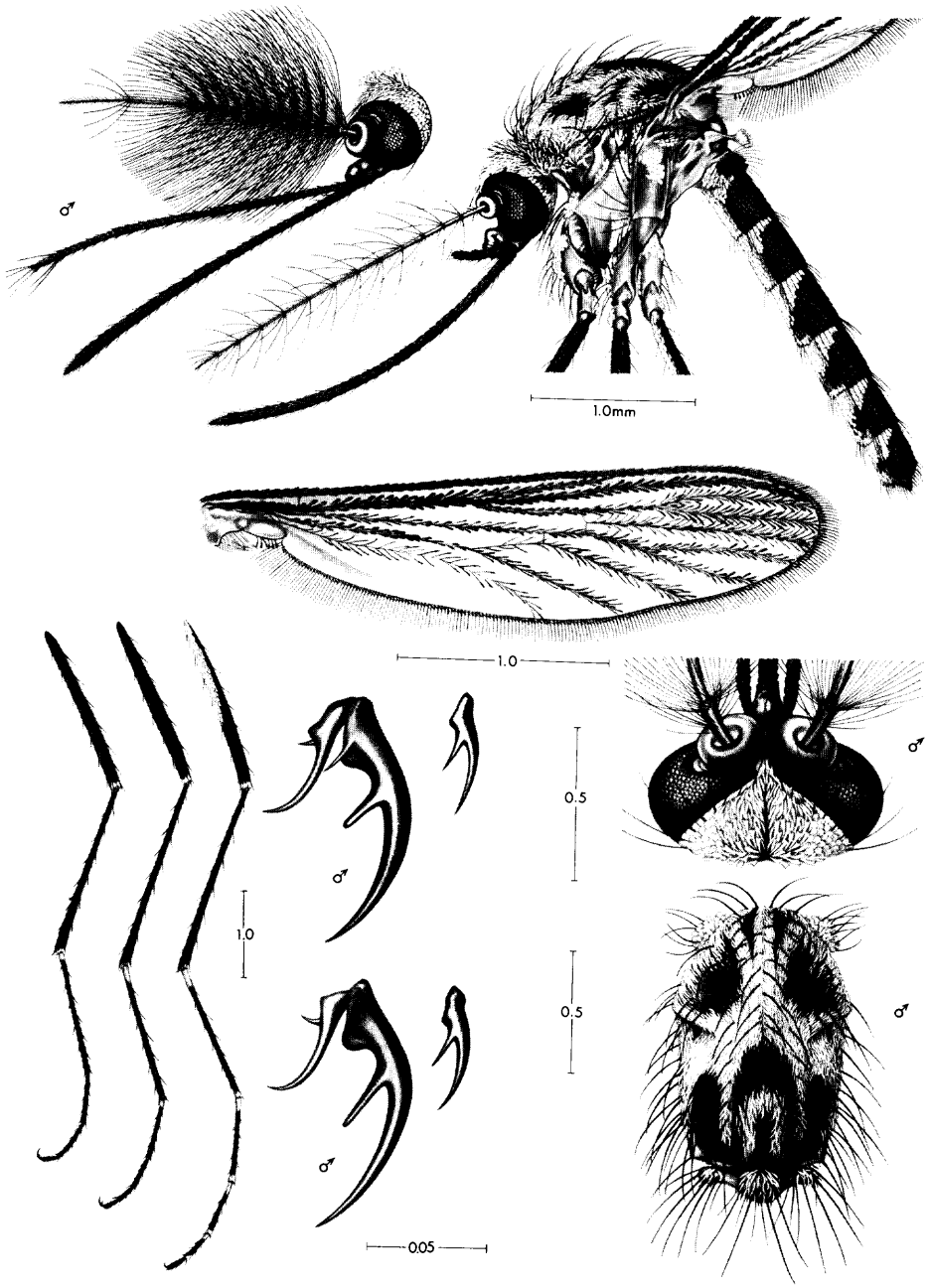
Fig. 222



Ae. (Fin.) seoulensis

Kei Daishoji

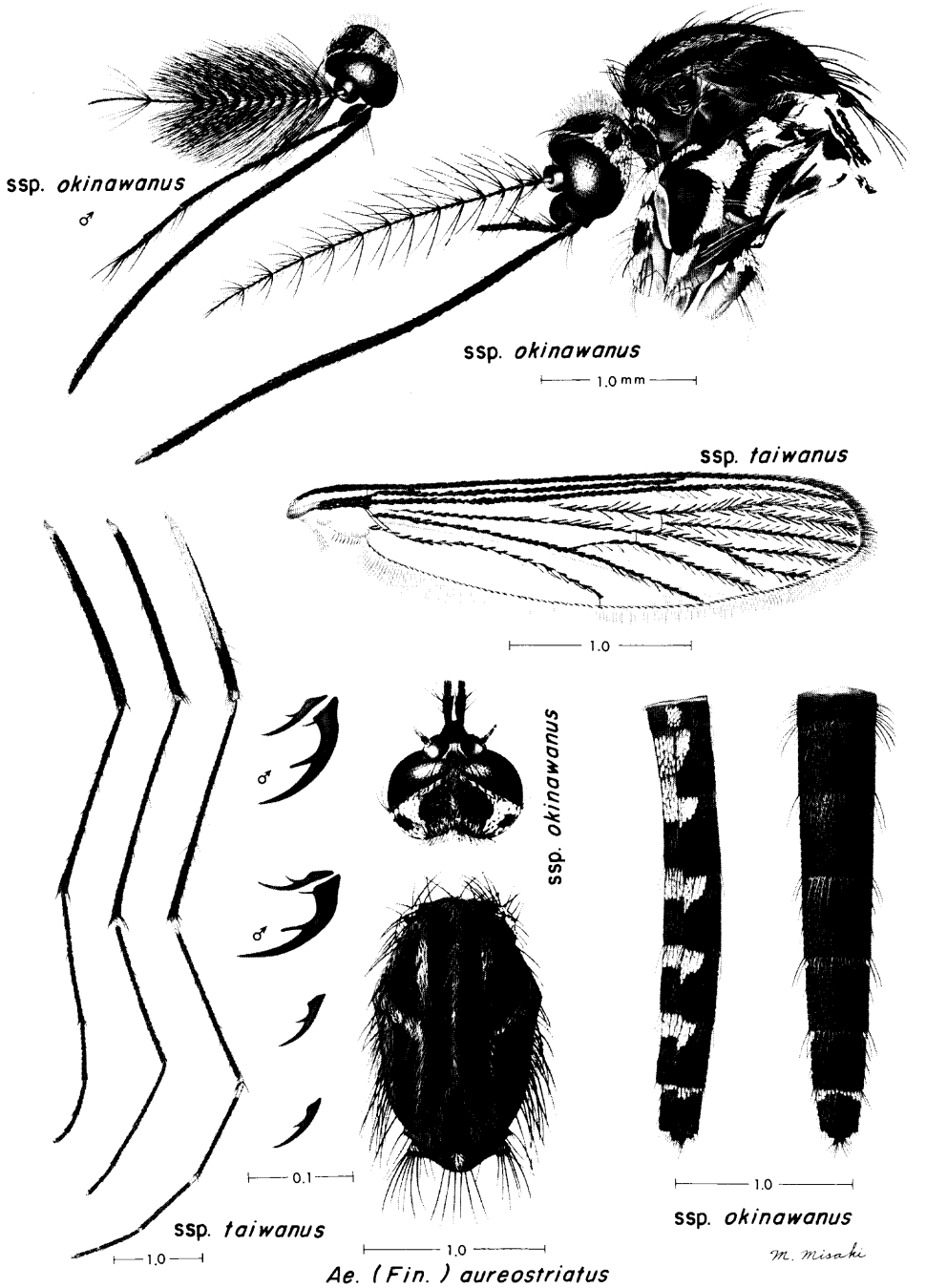
Fig. 223



Ae. (Fin.) kobayashii

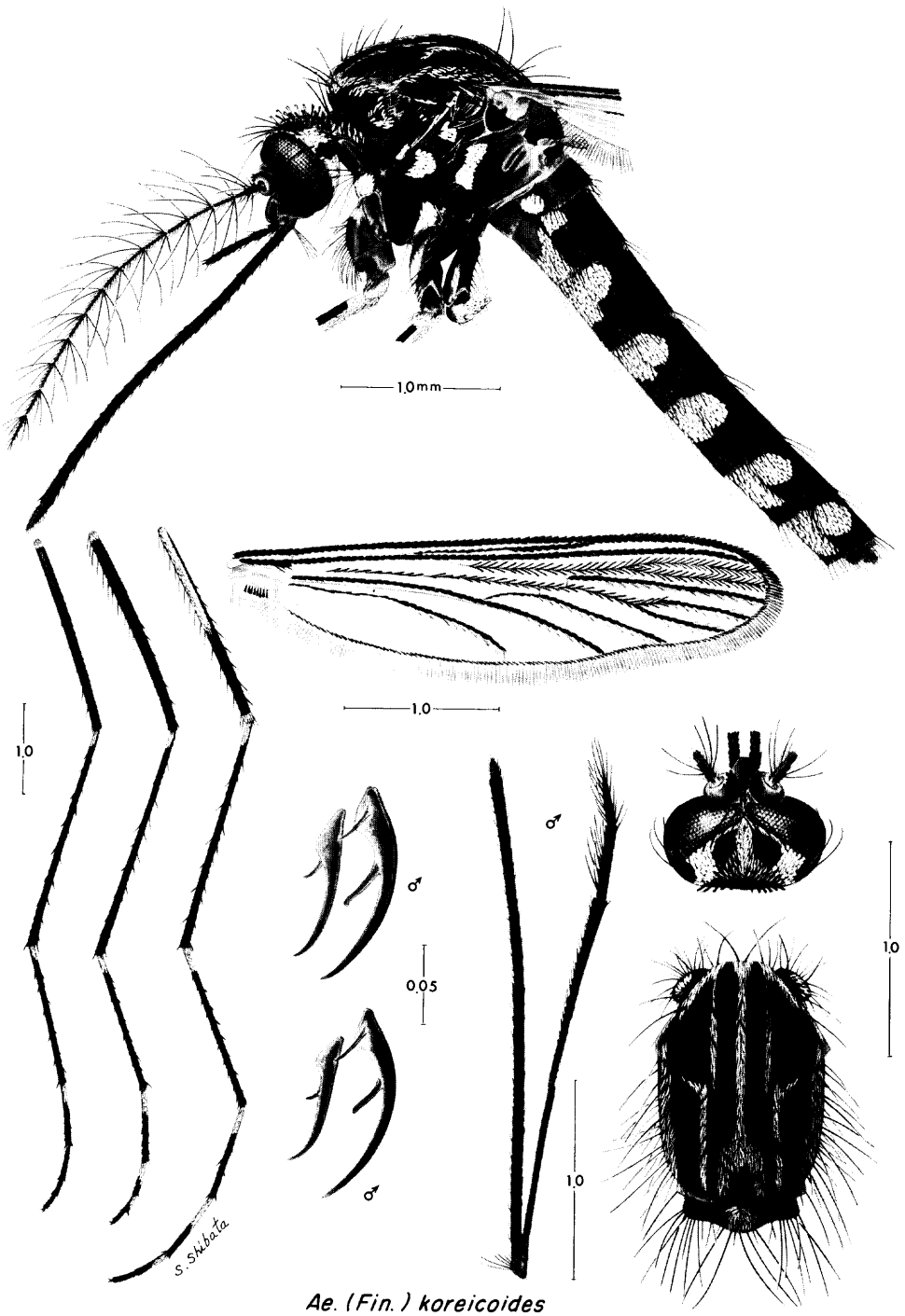
Kei Daishoji

Fig. 224



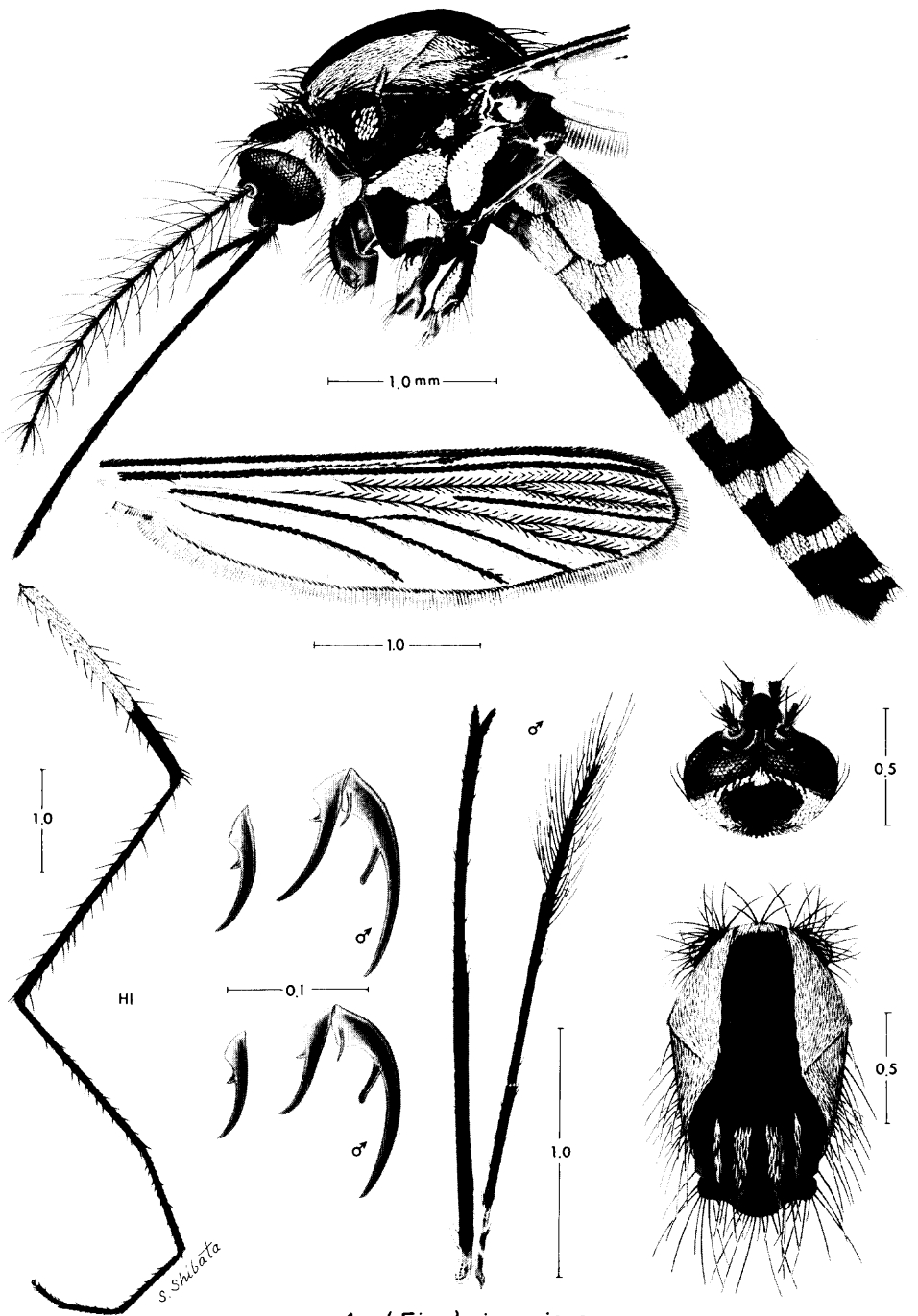
Ae. (Fin.) aureostriatus

Fig. 225



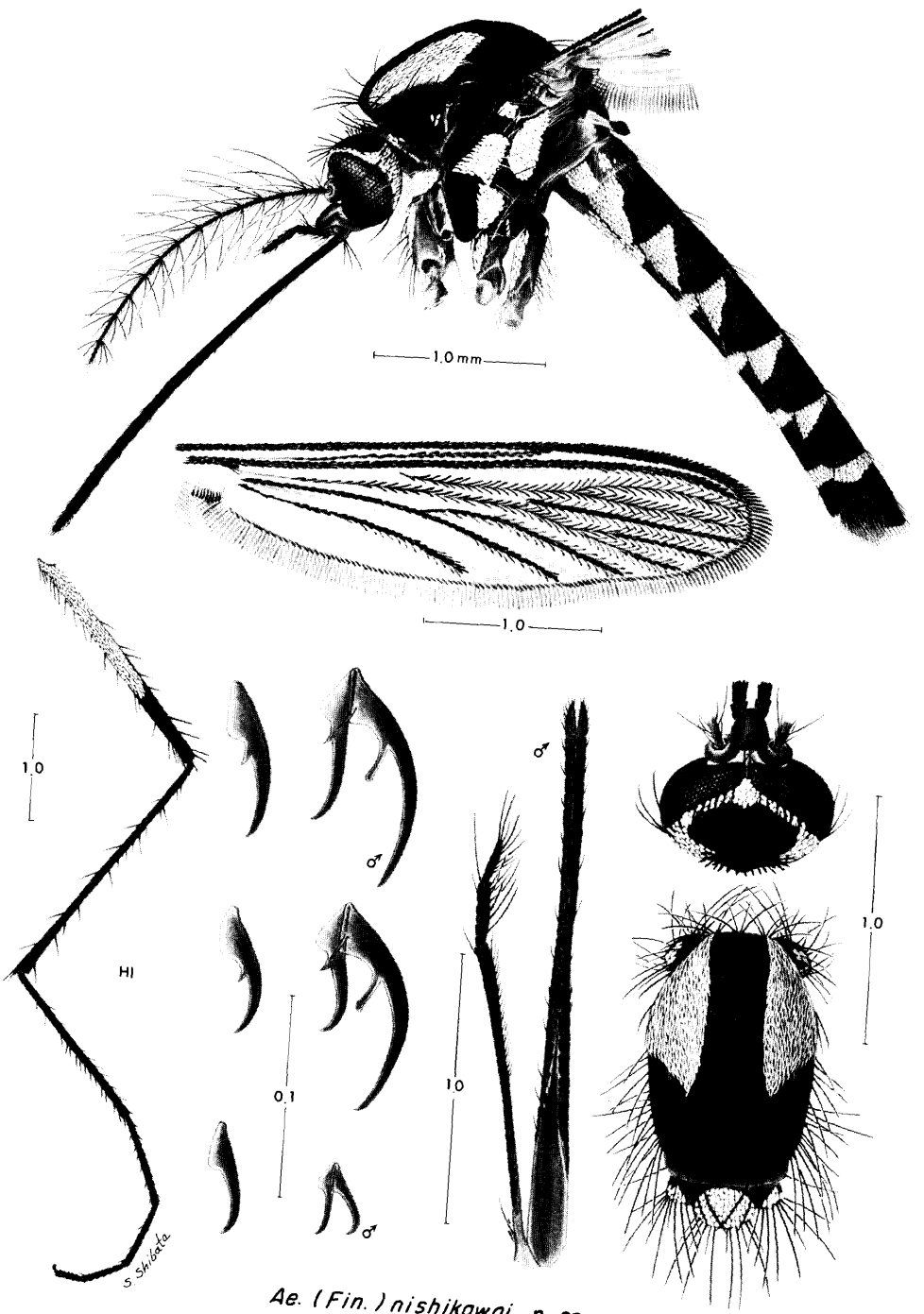
Ae. (Fin.) koreicoides

Fig. 226



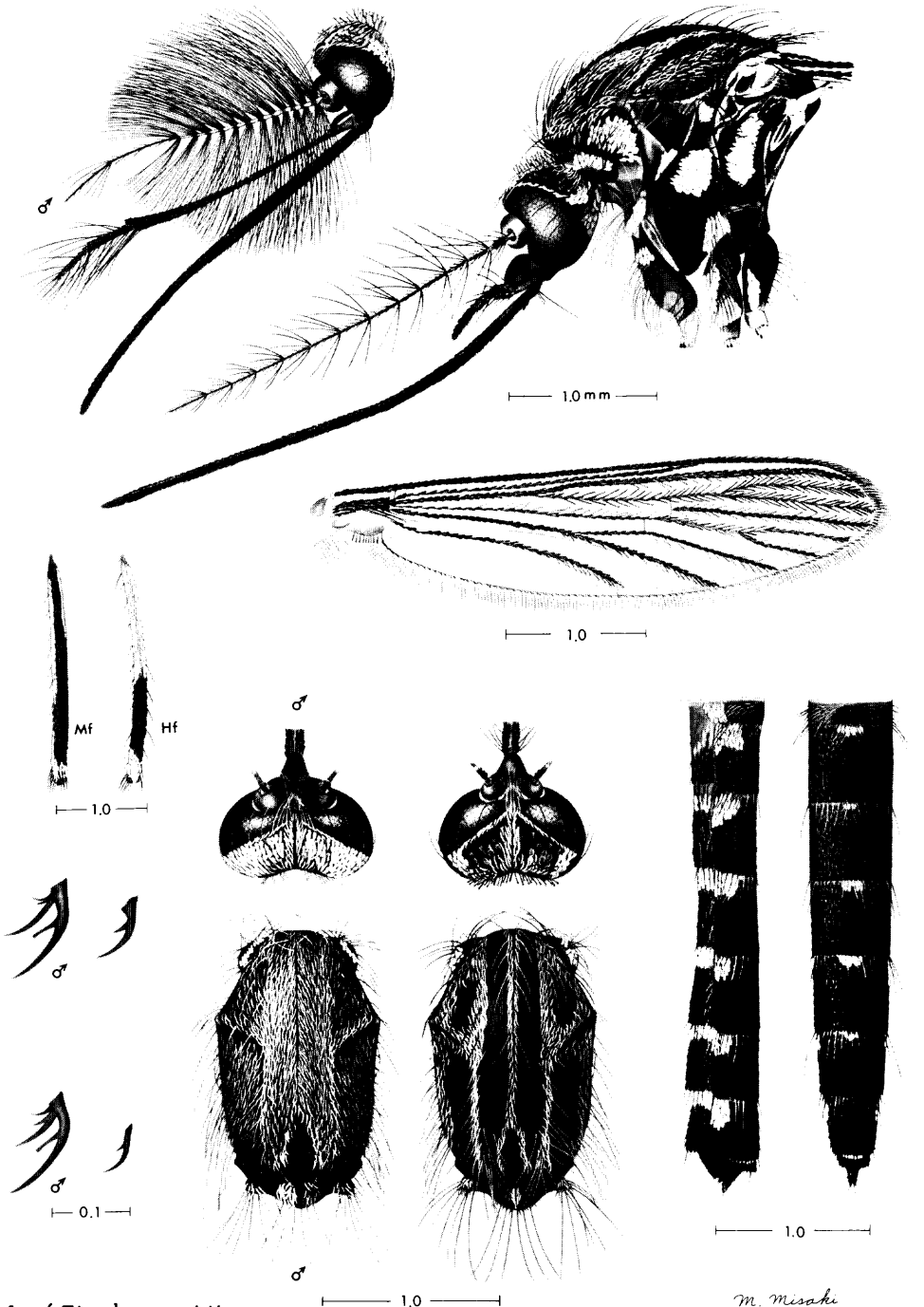
Ae. (Fin.) nipponicus

Fig. 227



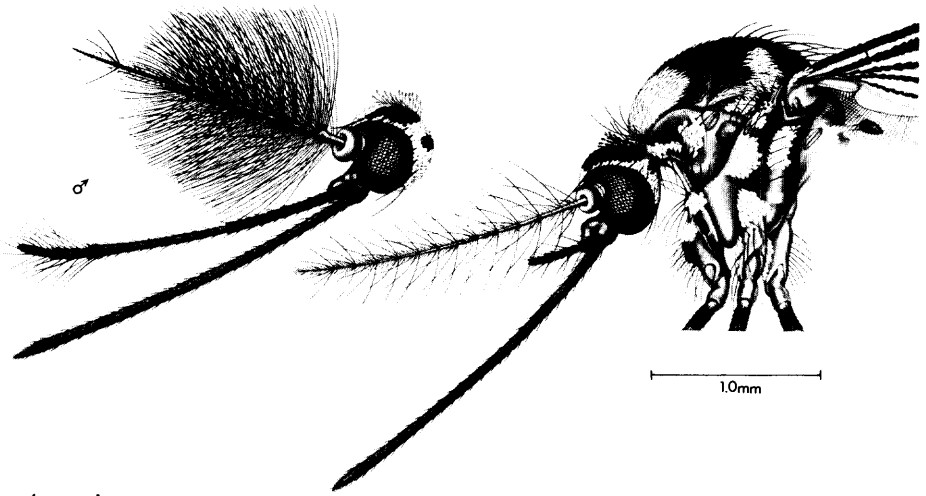
Ae. (Fin.) nishikawai n. sp.

Fig. 228

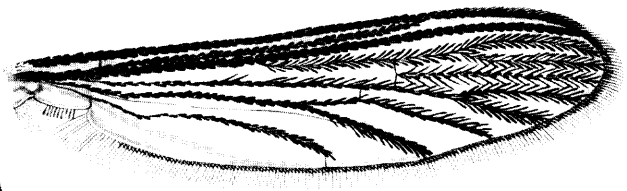


Ae. (Fin.) oreophilus

Fig. 229



Ae. (Fin.) watasei



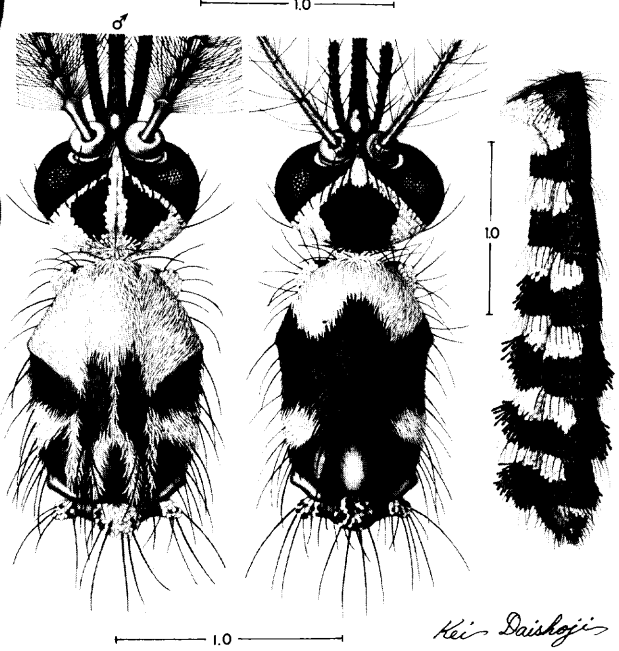
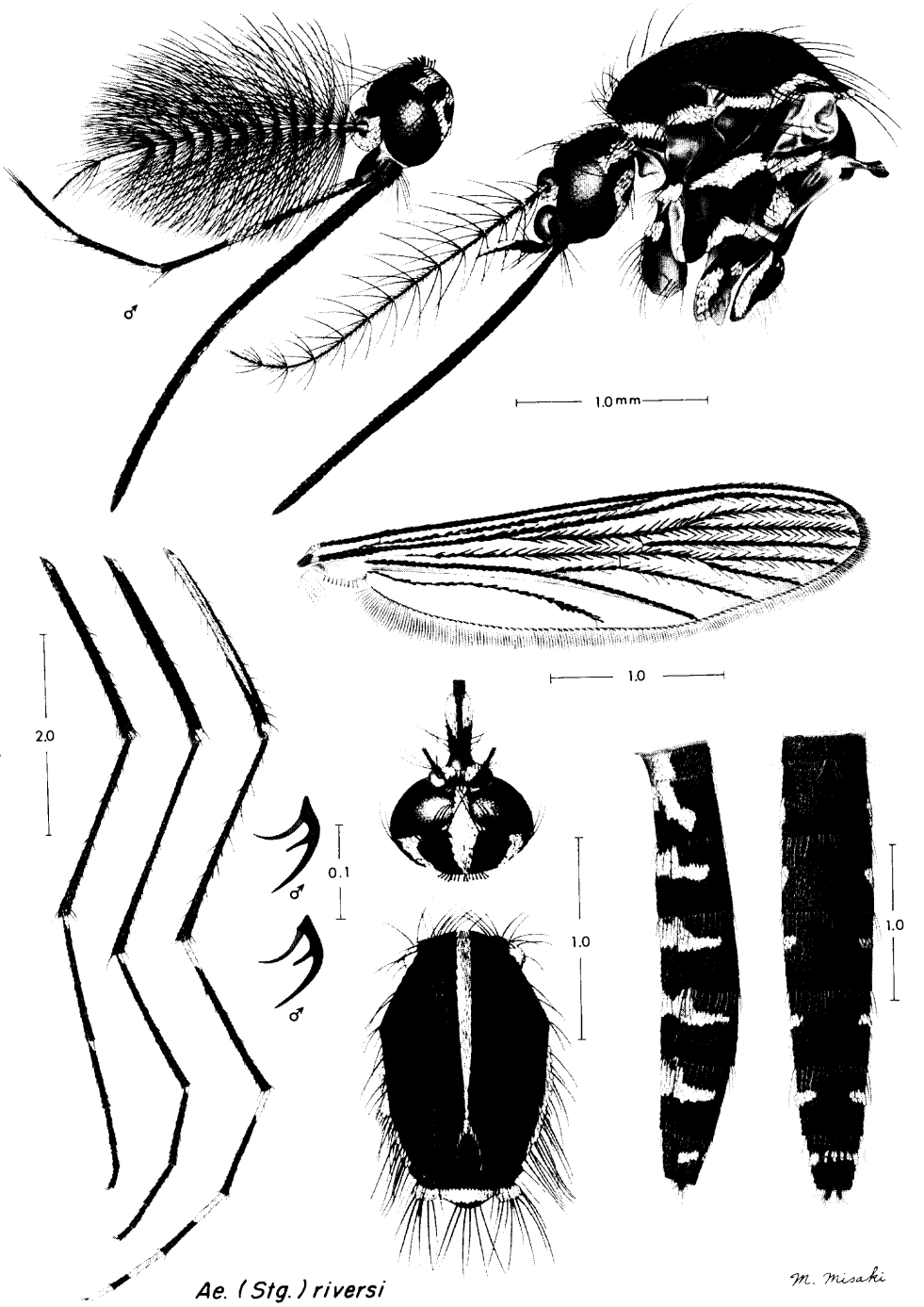
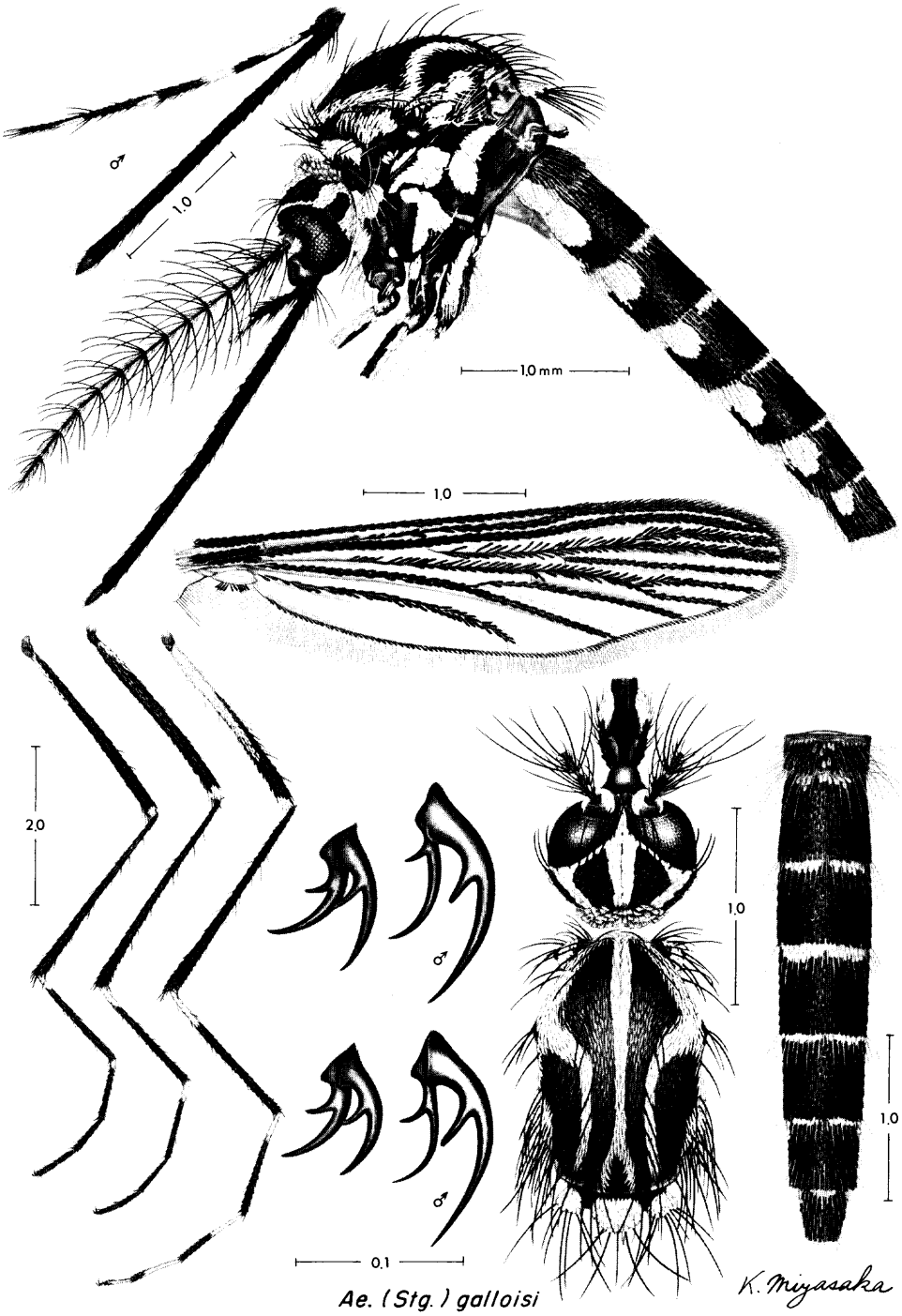


Fig. 230



Ae. (Stg.) riversi

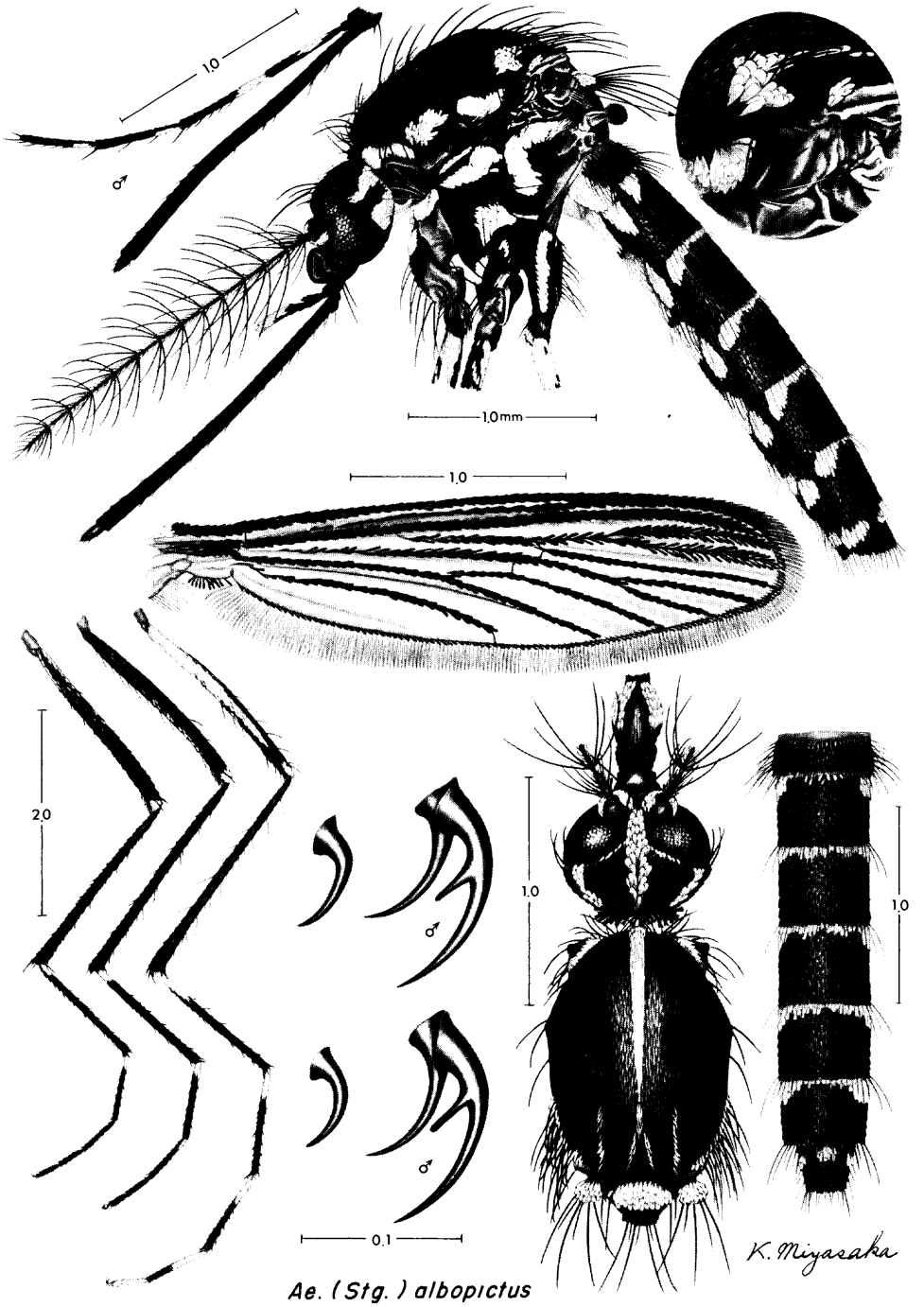
Fig. 231



Ae. (Stg.) galloisi

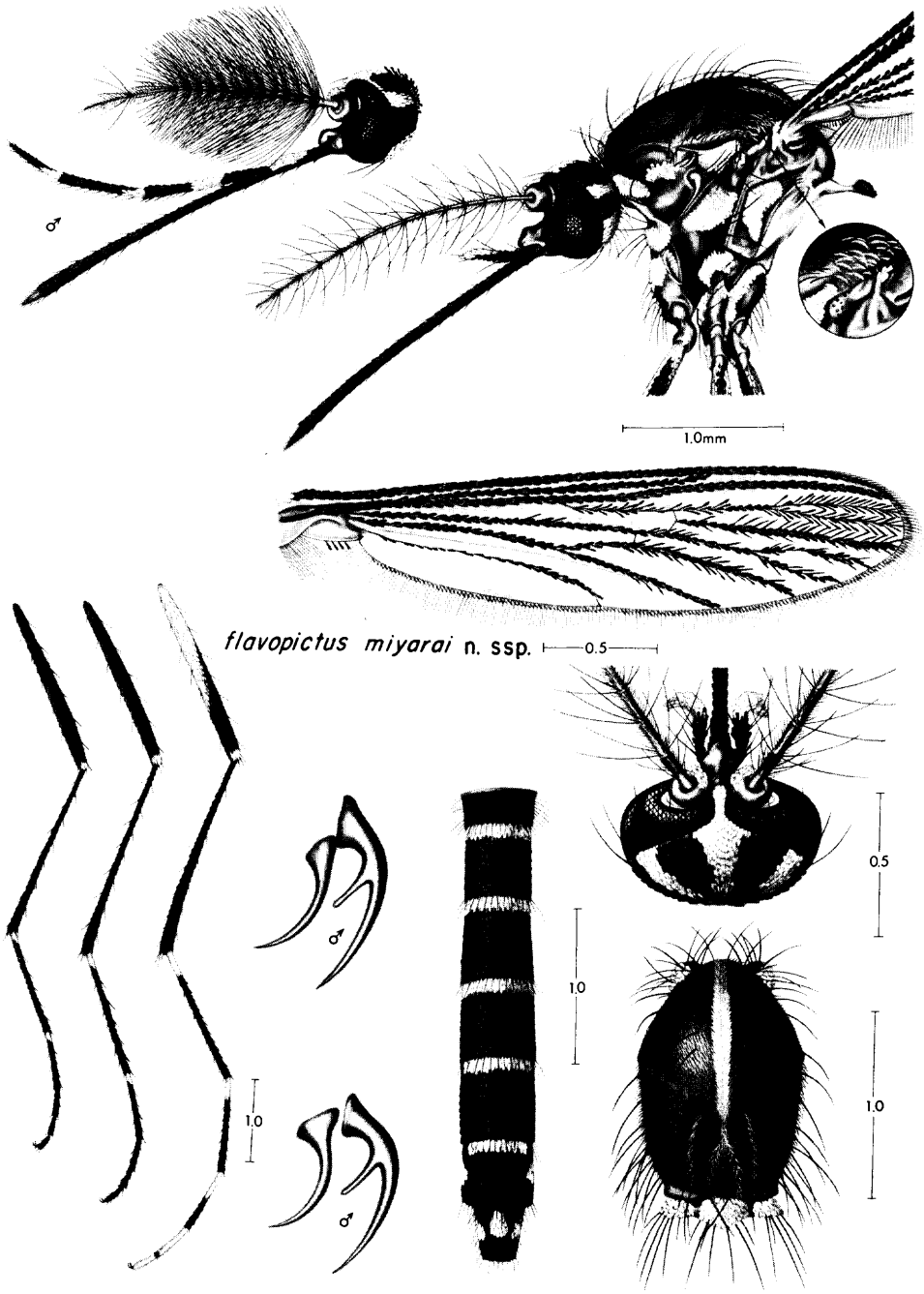
K. Miyasaka

Fig. 232



Ae. (Stg.) albopictus

Fig. 233



Ae. (Stg.) flavopictus downsi

Kei Daishoji

Fig. 234

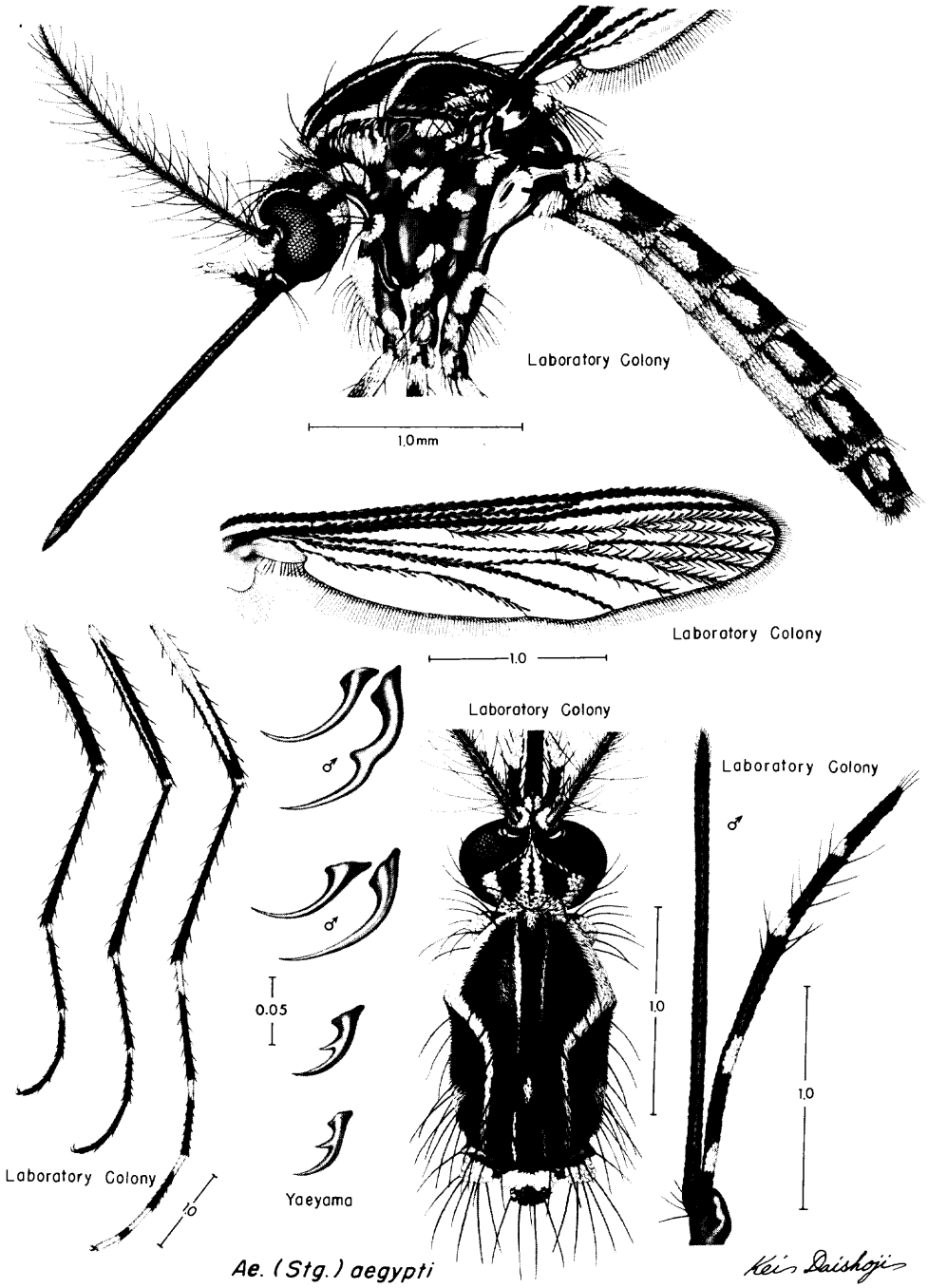
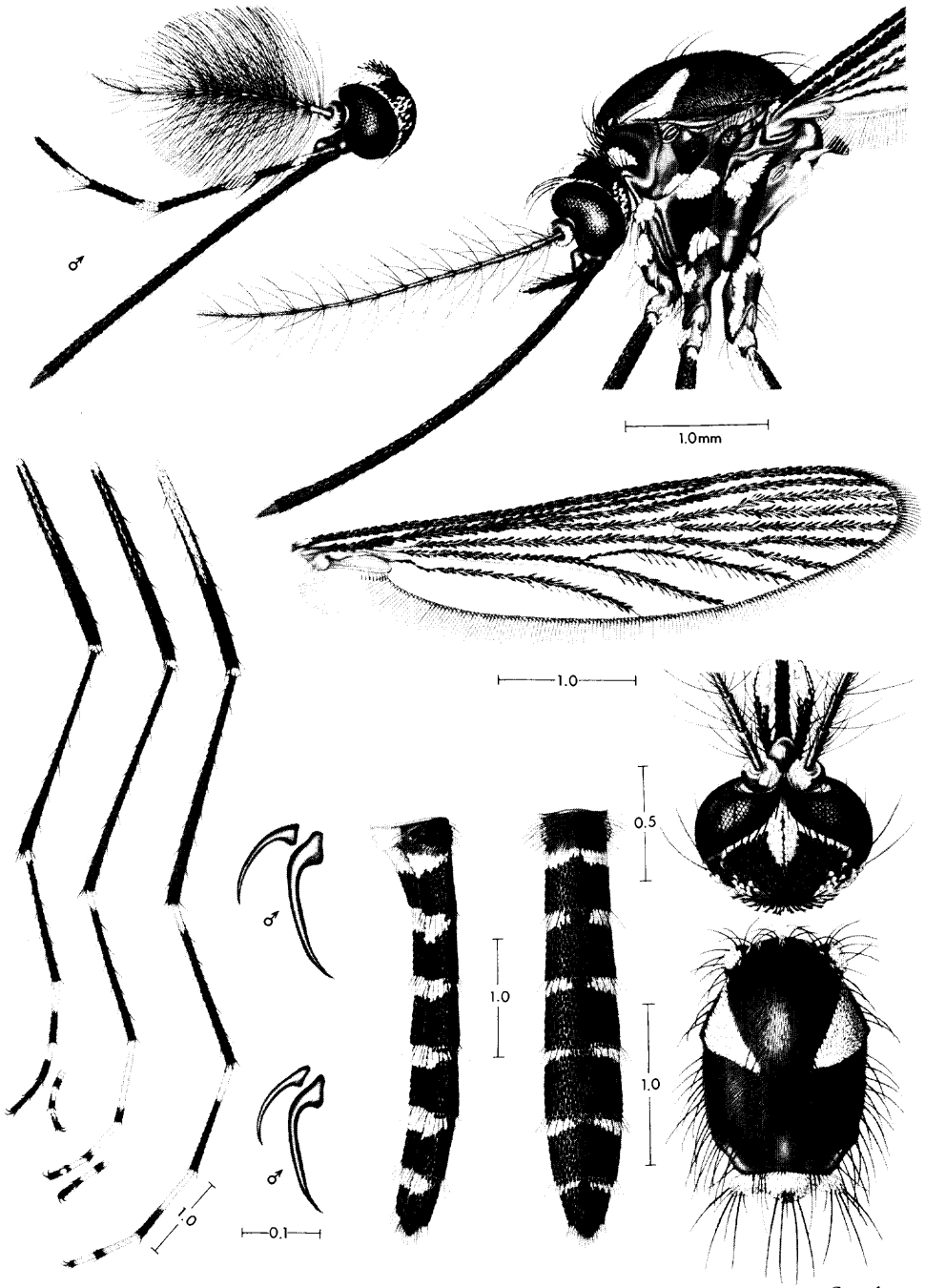

Laboratory Colony
1.0mm
Laboratory Colony
1.0
Laboratory Colony
♂
♂
0.05
Laboratory Colony
1.0
Yaeyama
Laboratory Colony
♂
1.0
Ae. (Stg.) aegypti
Kei Daishoji

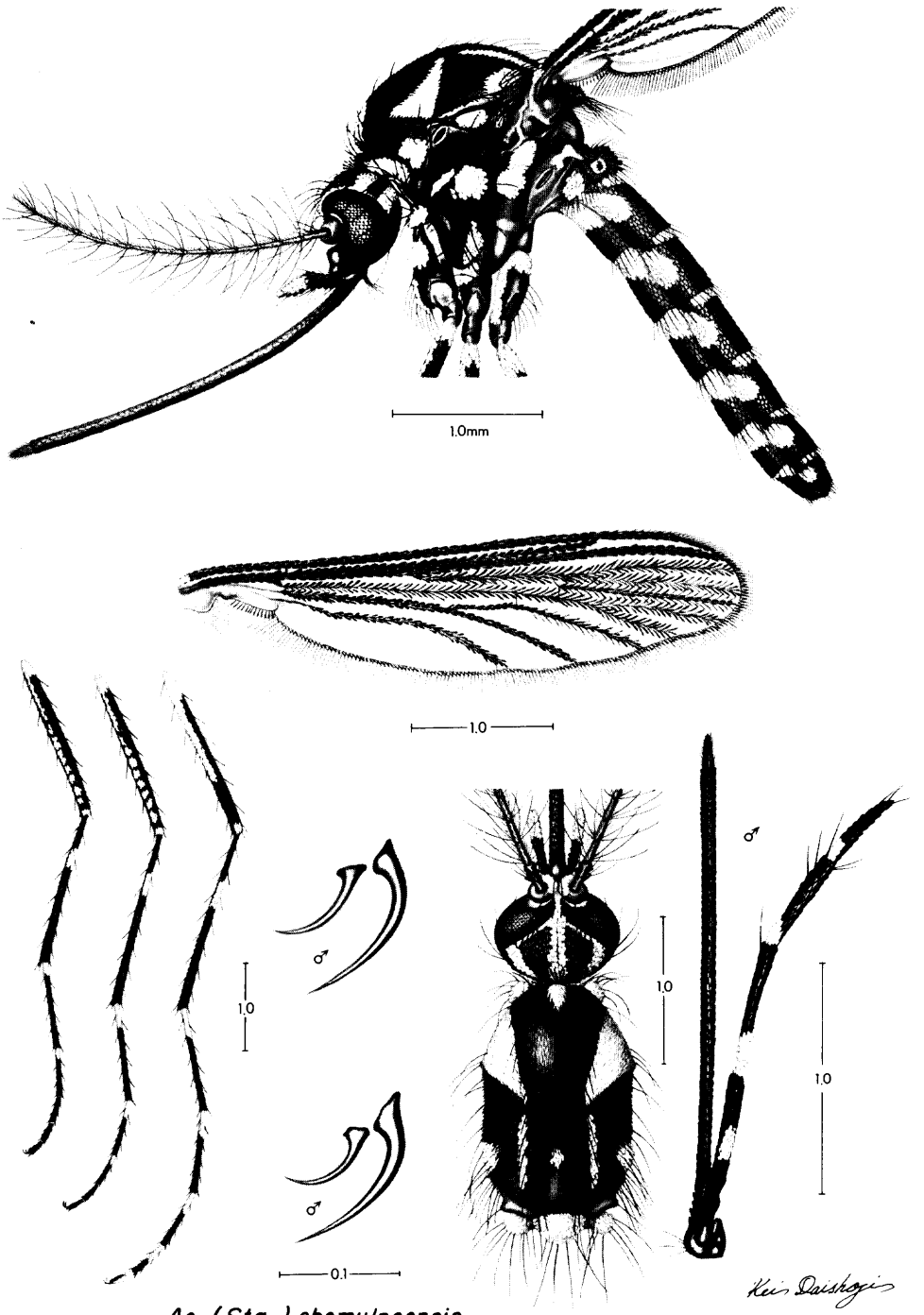
Fig. 235



Ae. (Stg.) wadai n. sp.

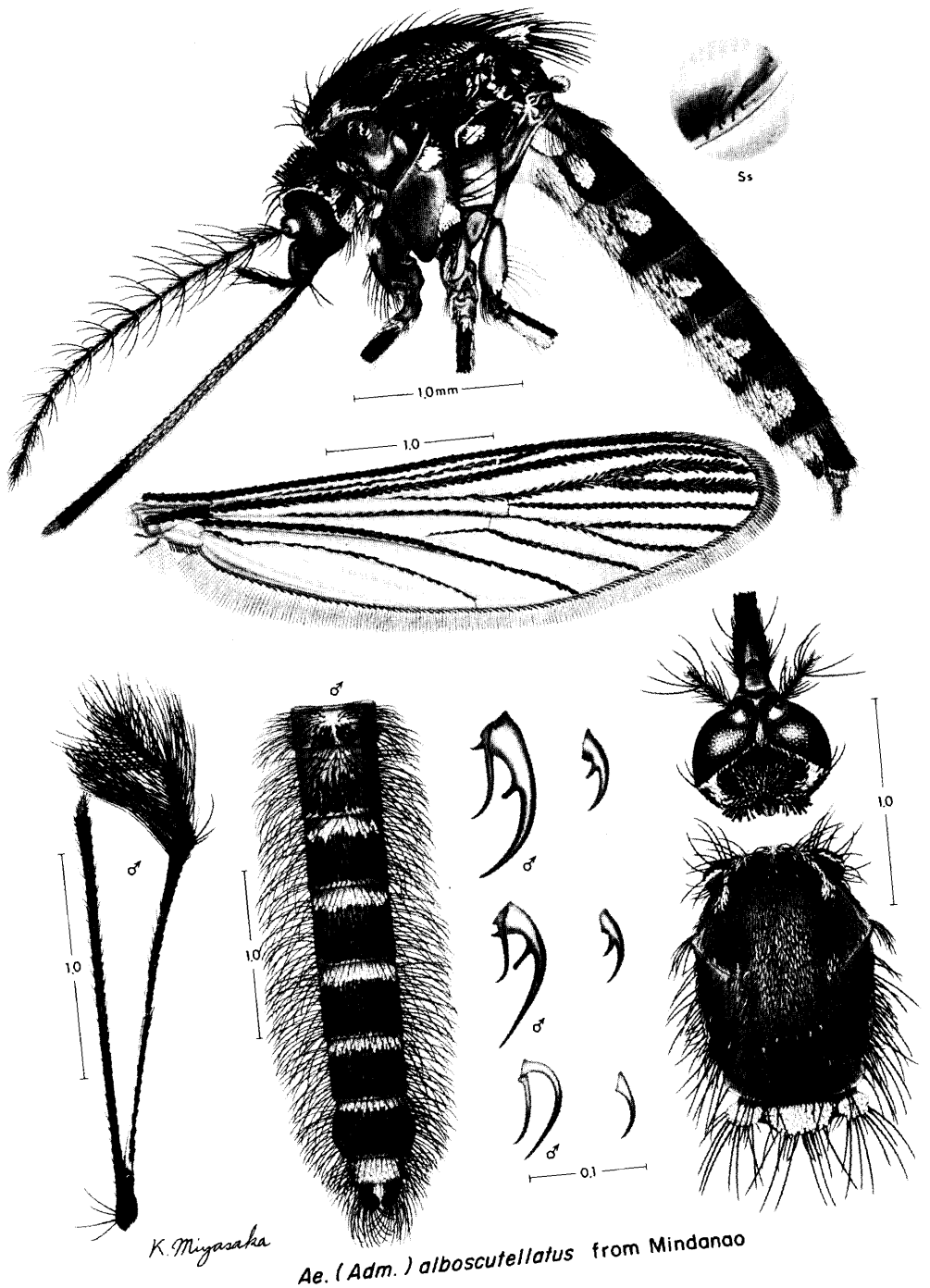
Kei Daishoji

Fig. 236



Ae. (Stg.) chemulpoensis

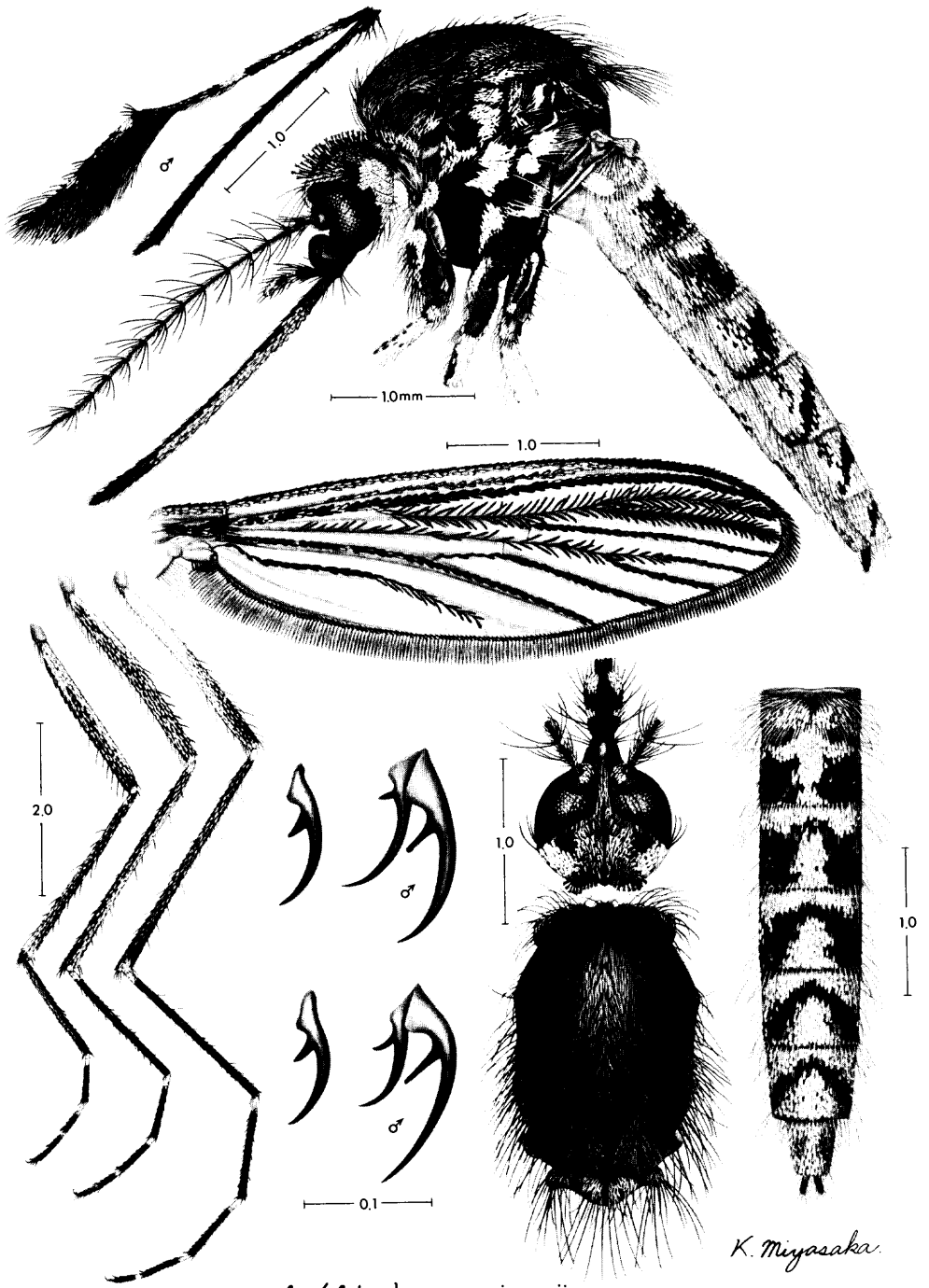
Fig. 237



K. Miyasaka

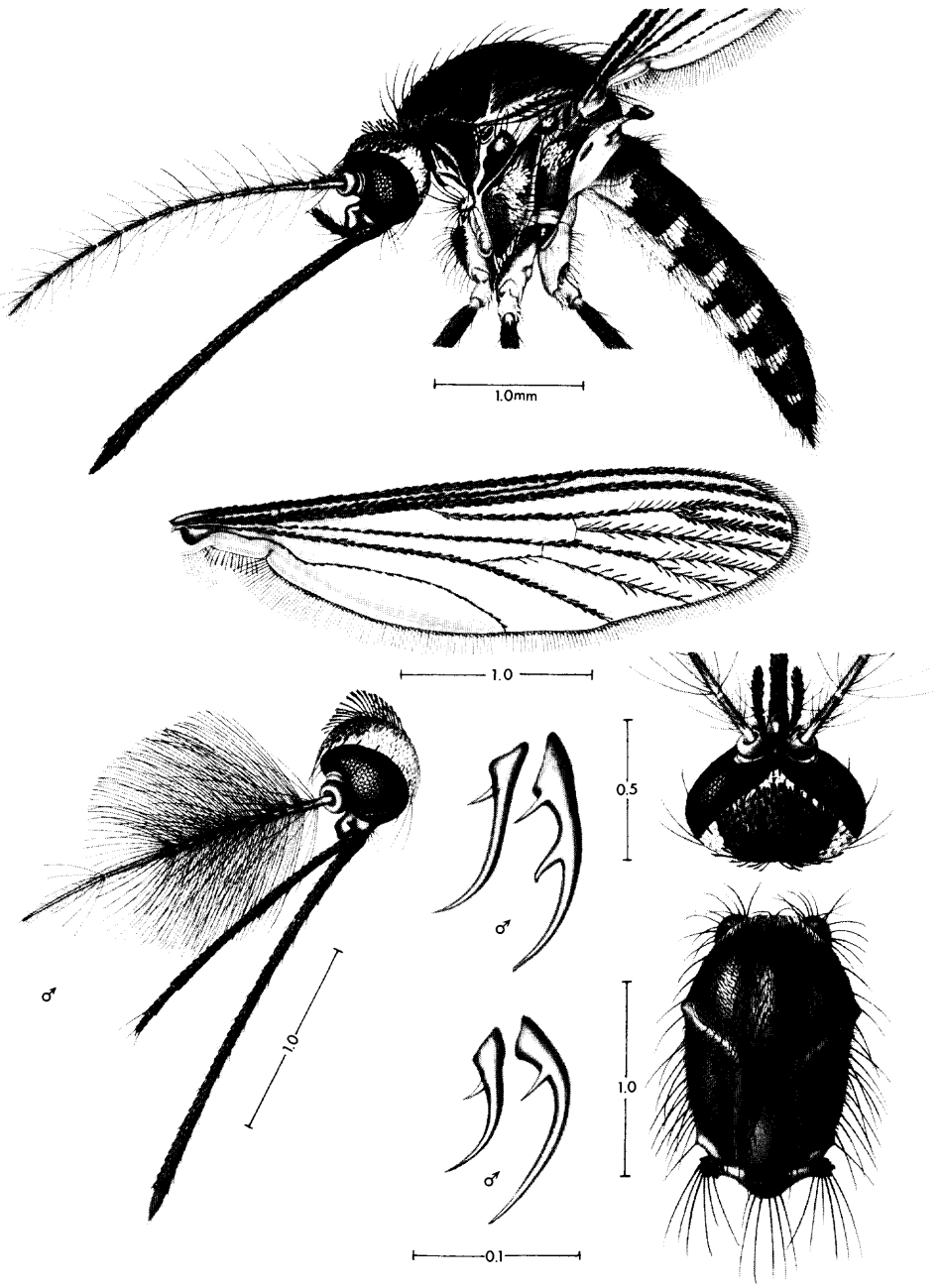
Ae. (Adm.) alboscutellatus from Mindanao

Fig. 238



Ae. (Adm.) vexans nipponii

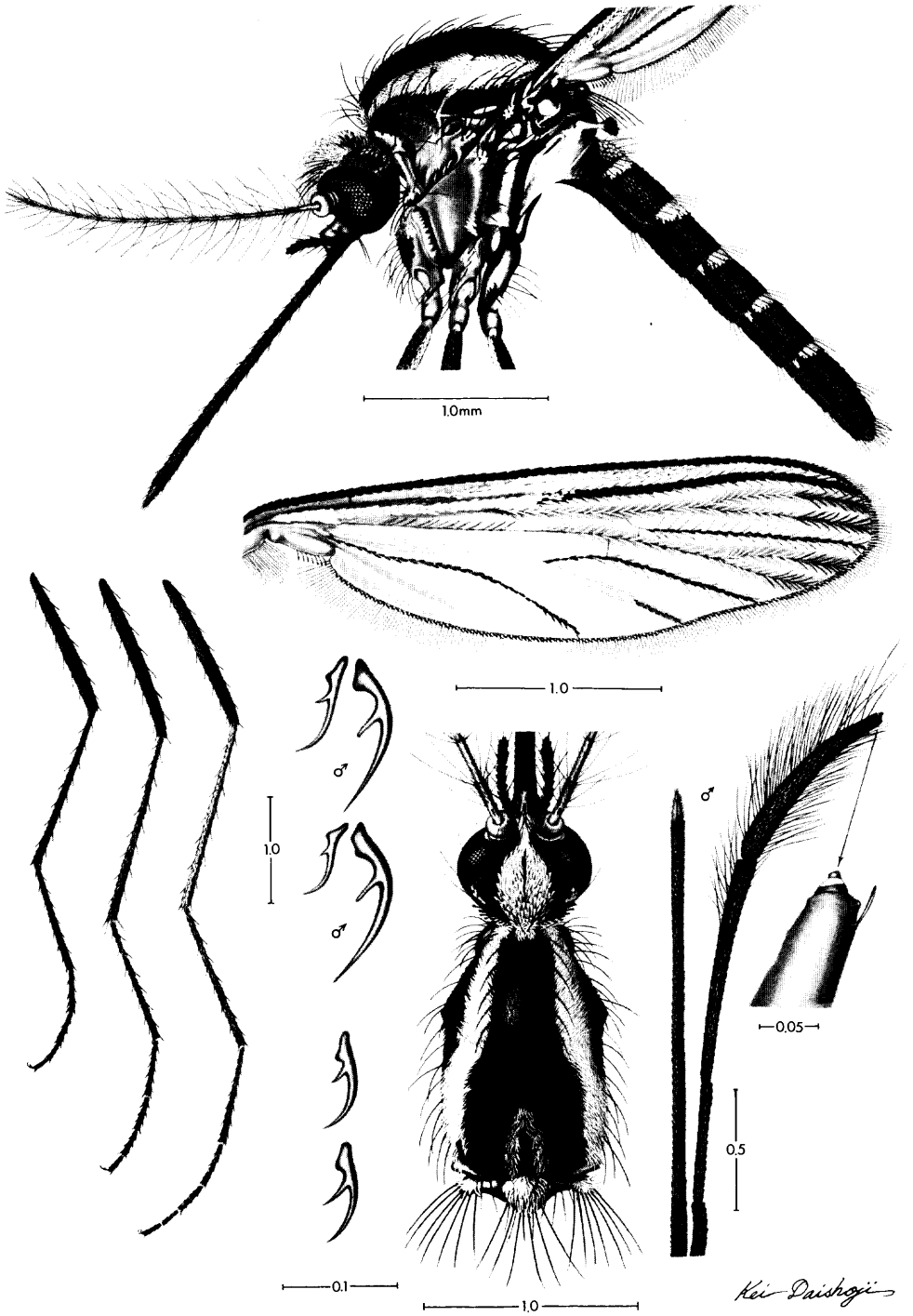
Fig. 239



Ae. (Geo.) baisasi

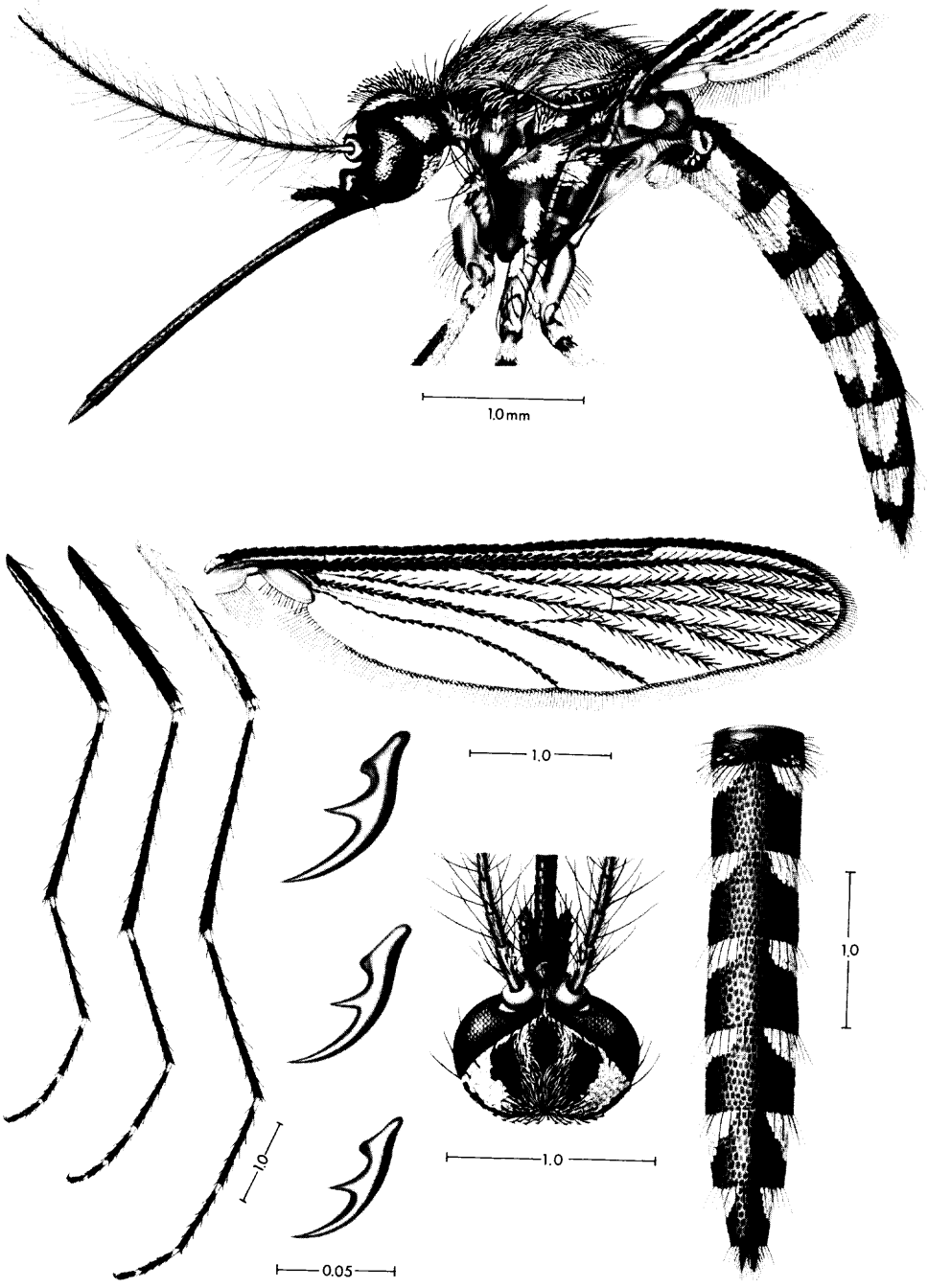
Kei Daishoji

Fig. 240



Ae. (Neo.) lineatopennis from Thailand

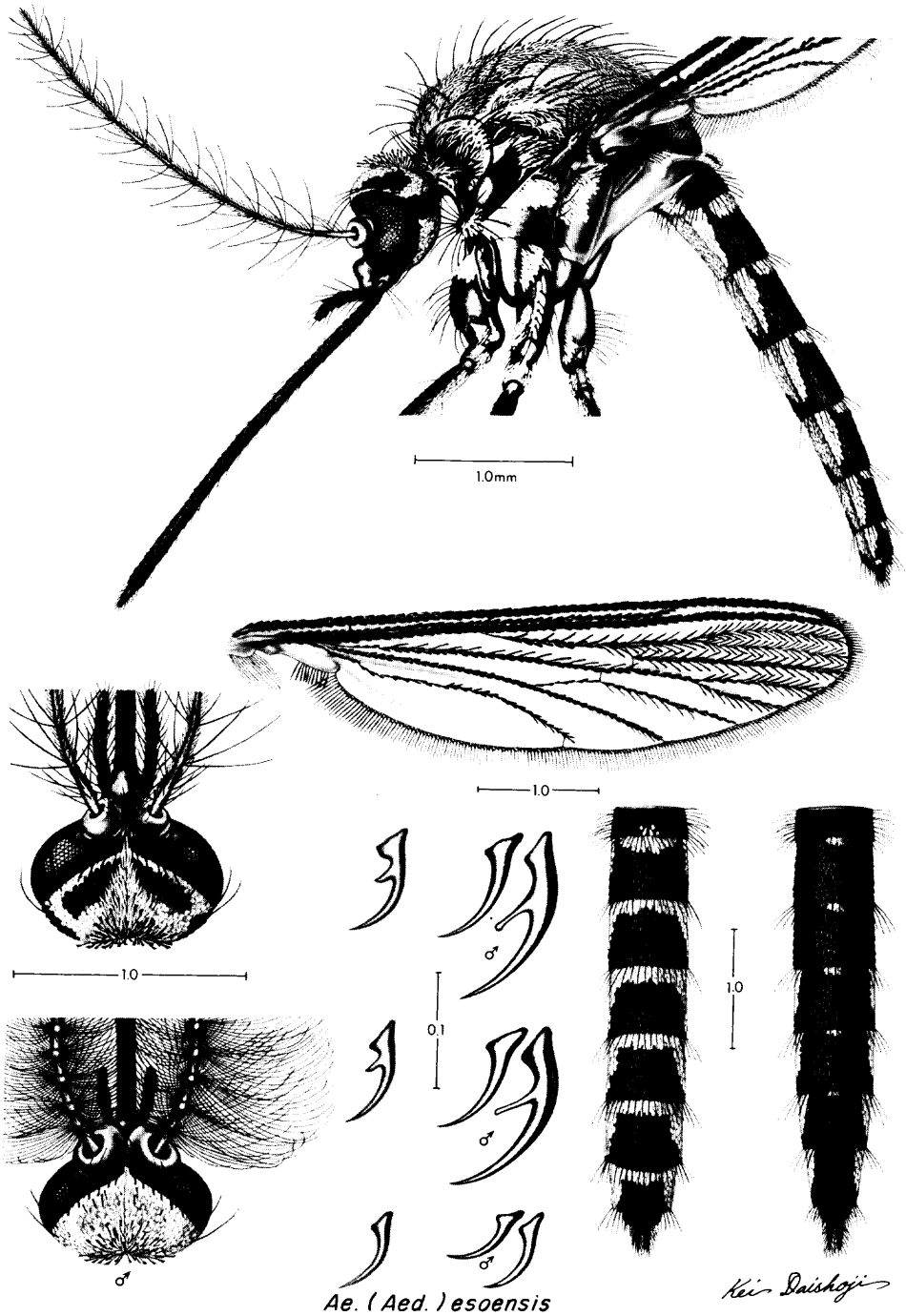
Fig. 241



Ae. (Edw.) imprimens

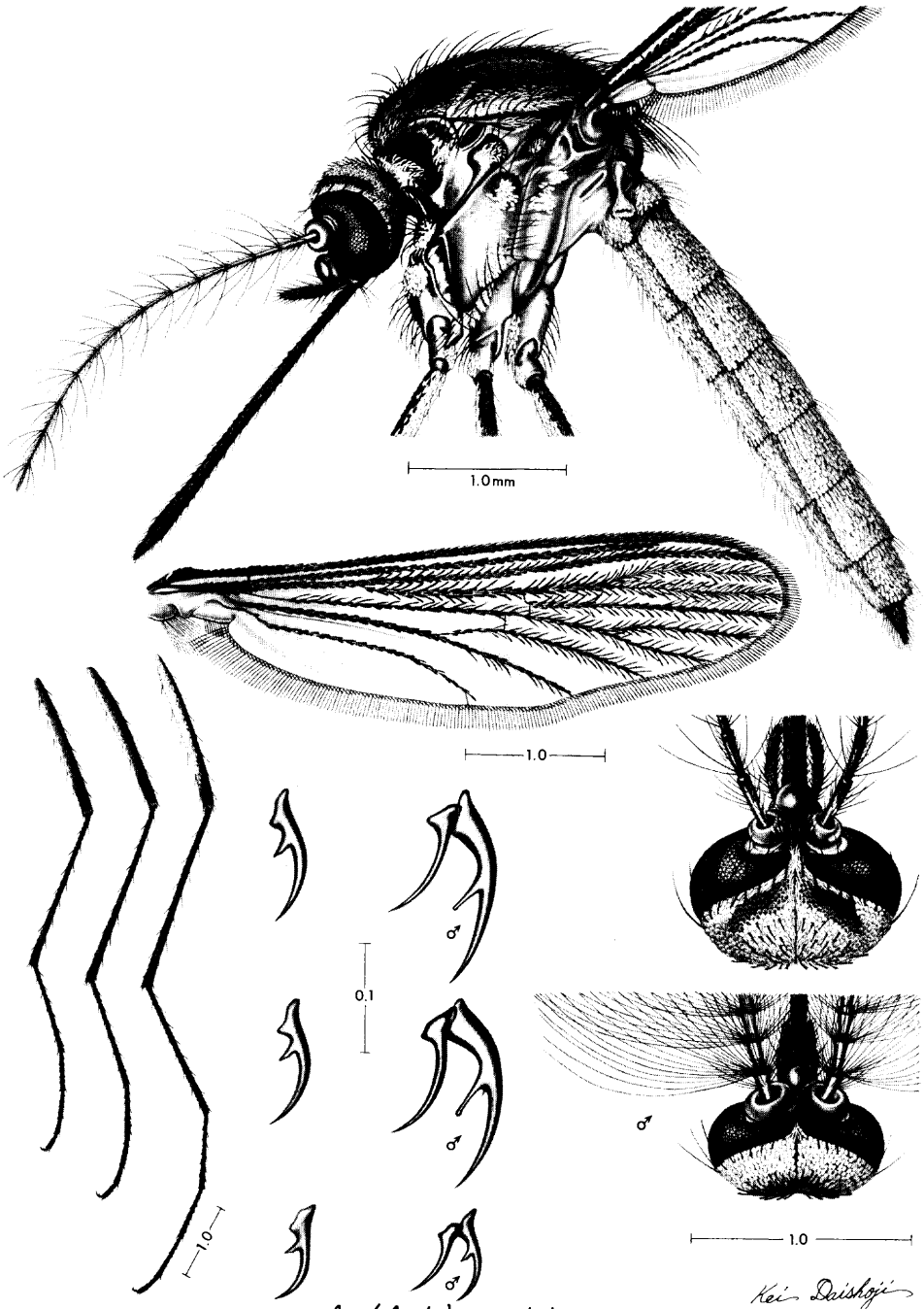
Kei Daishoji

Fig. 242



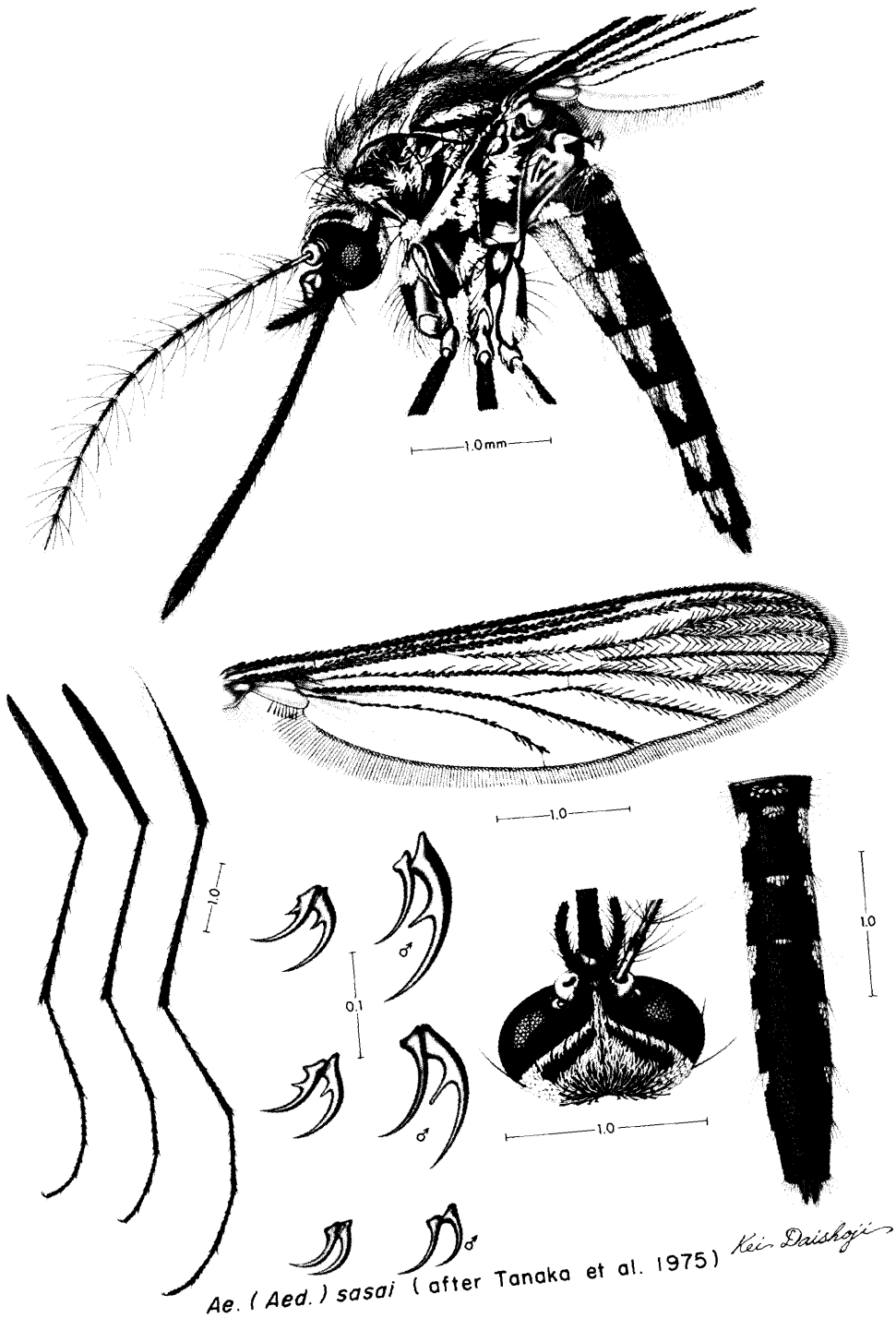
Ae. (Aed.) esoensis

Fig. 243



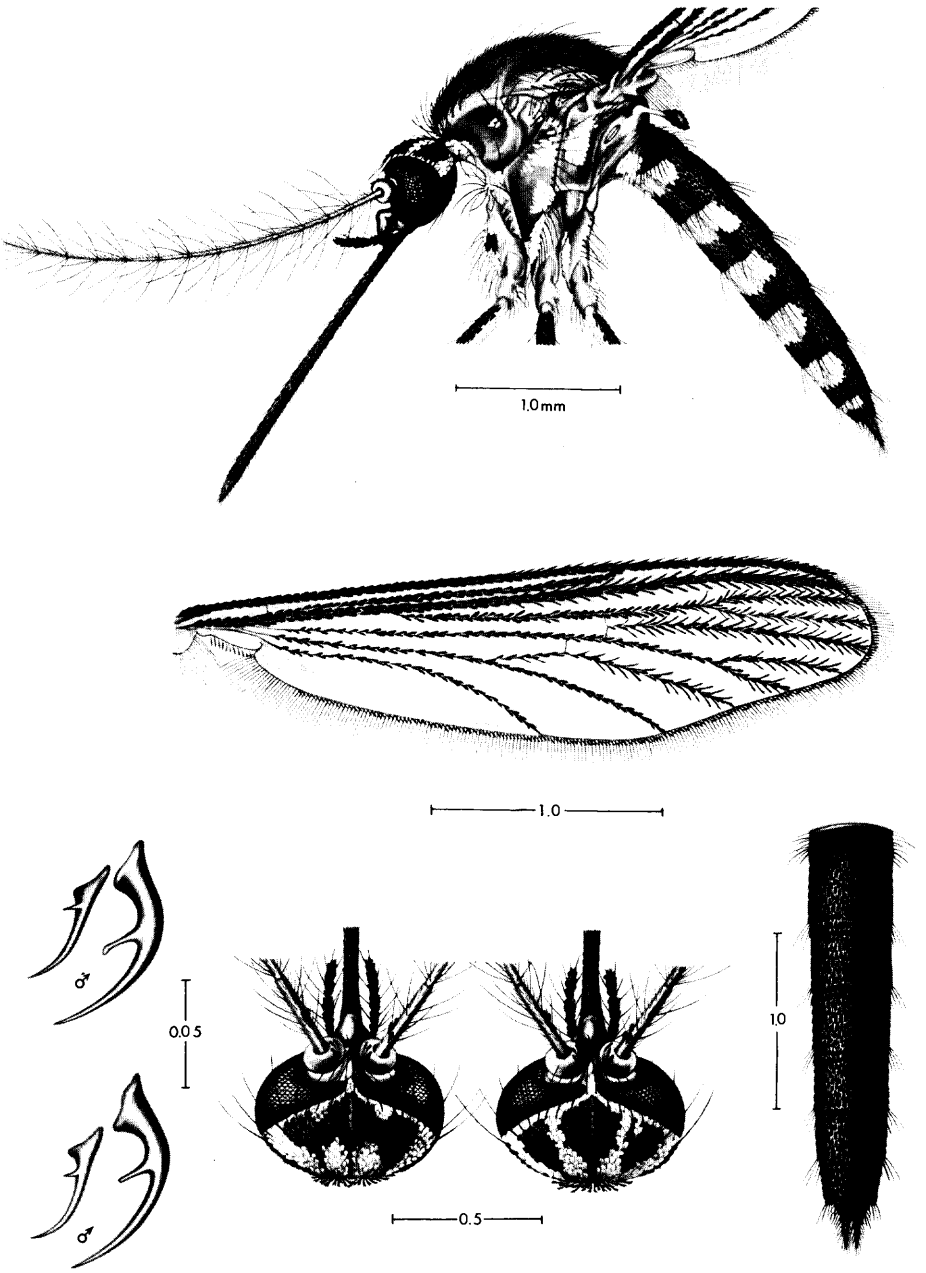
Ae. (Aed.) yamadai

Fig. 244



Ae. (Aed.) sasai (after Tanaka et al. 1975) Kei Daishoji

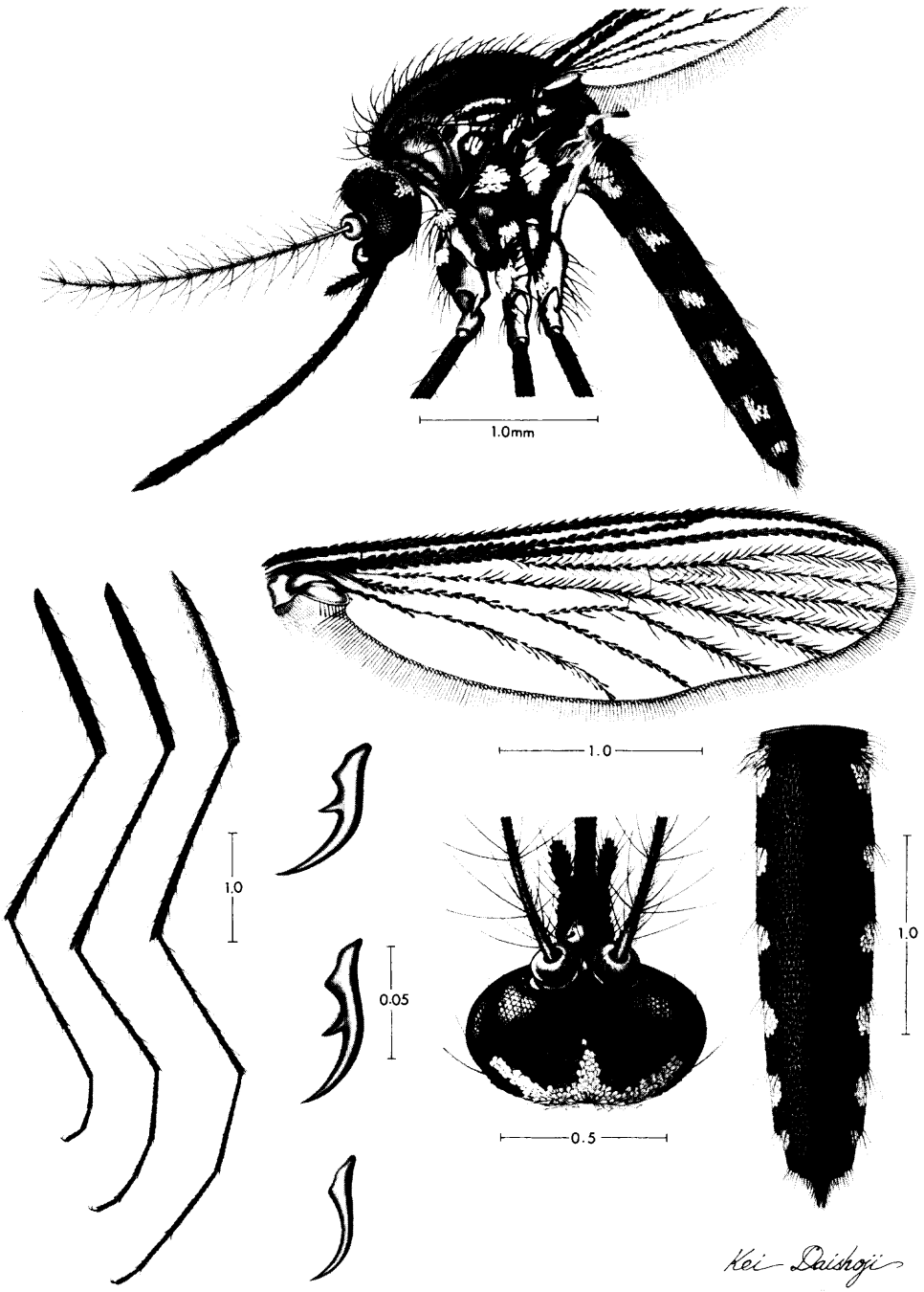
Fig. 245



Ae. (Ver.) nobukonis

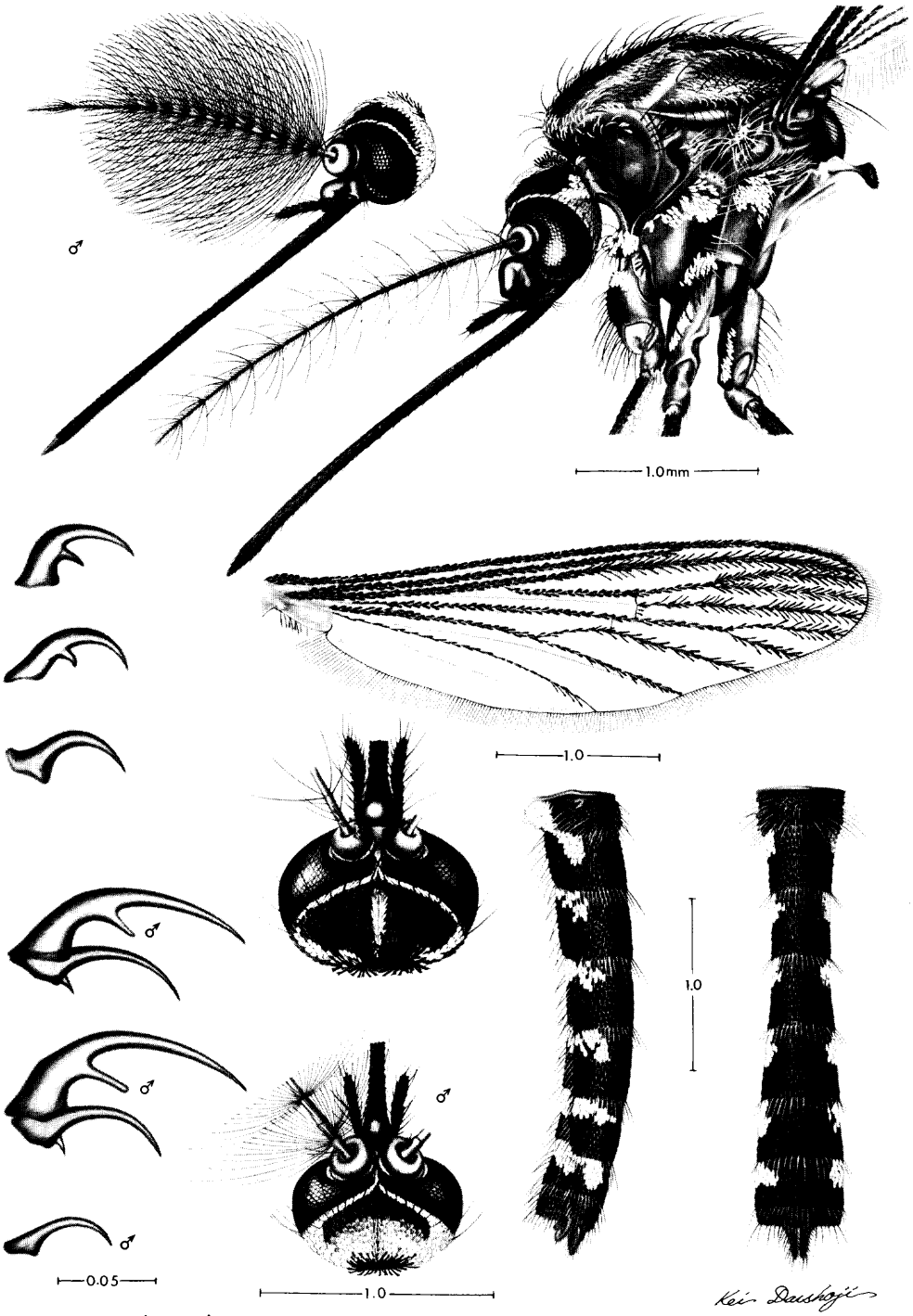
Kei Daishoji

Fig. 246



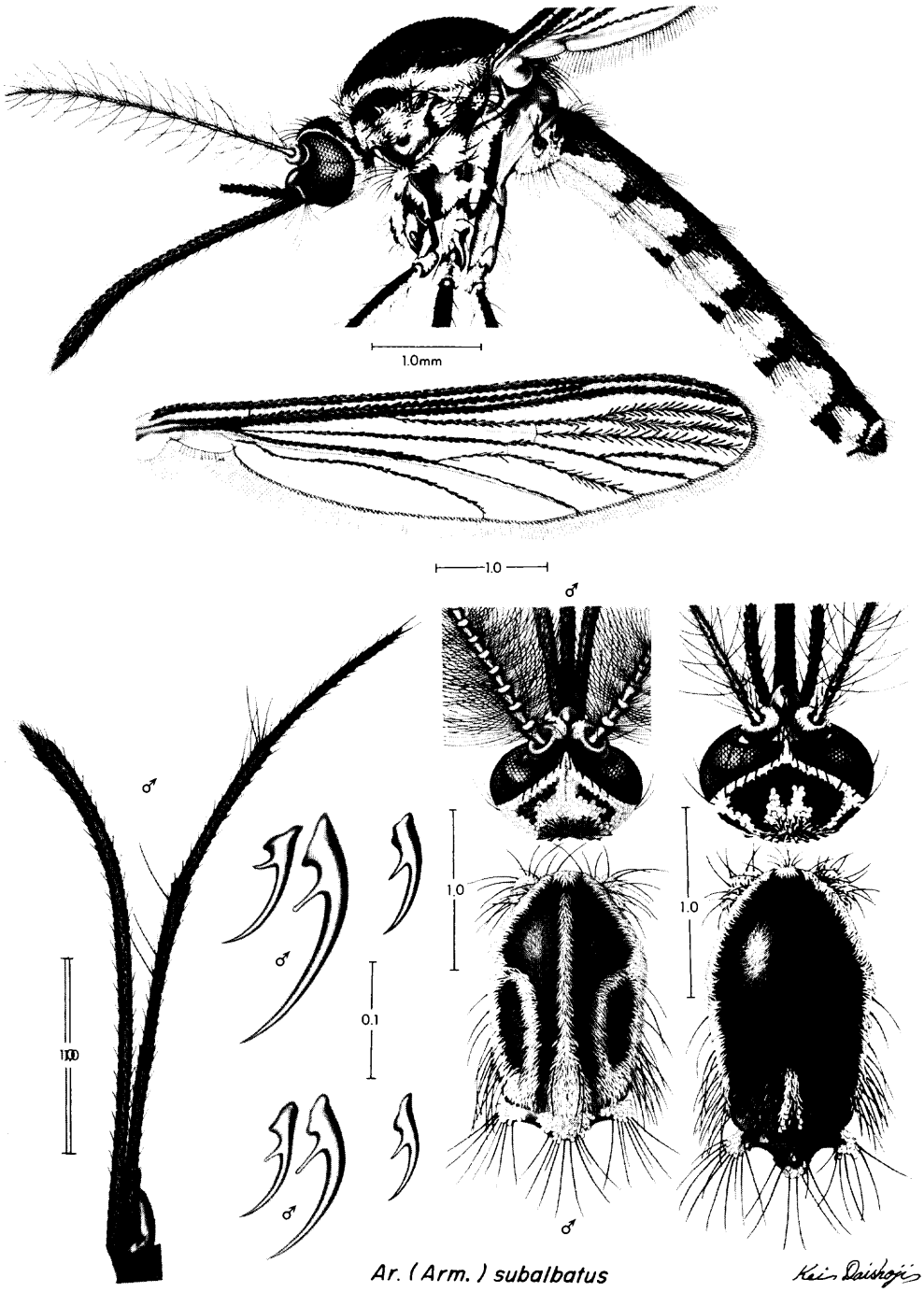
Ae. (Ver.) iriomotensis (after Tanaka and Mizusawa 1973)

Fig. 247



Ae. (Ver.) atriisimilis (after Tanaka and Mizusawa 1973)

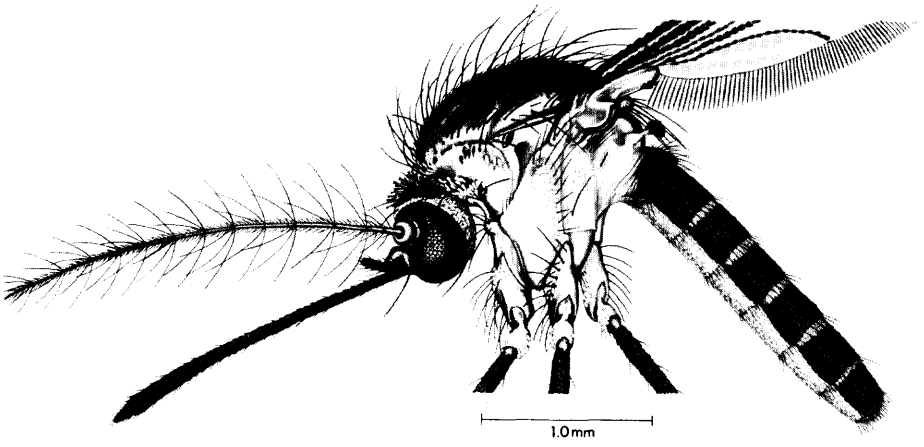
Fig. 248

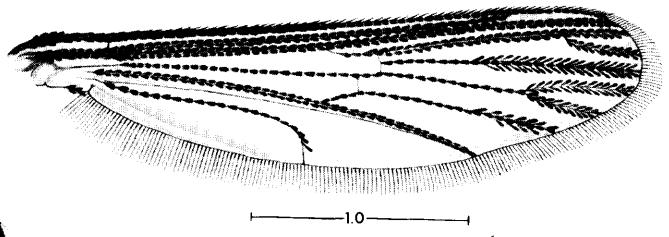


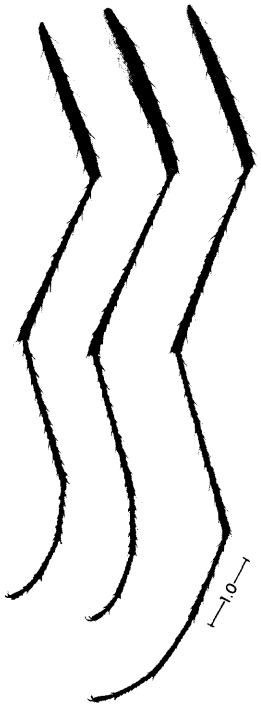
Ar. (Arm.) subalbatus

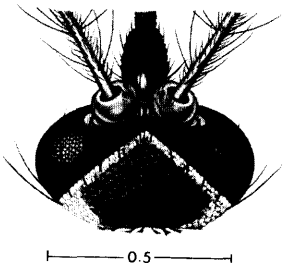
Kei Daishoji

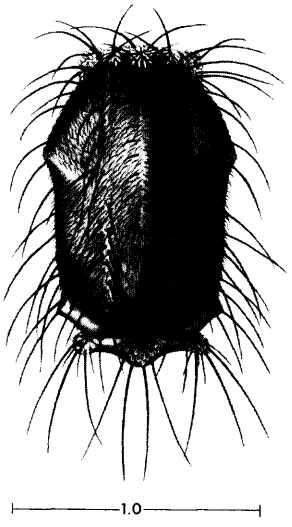
Fig. 249

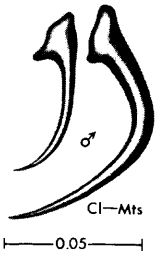








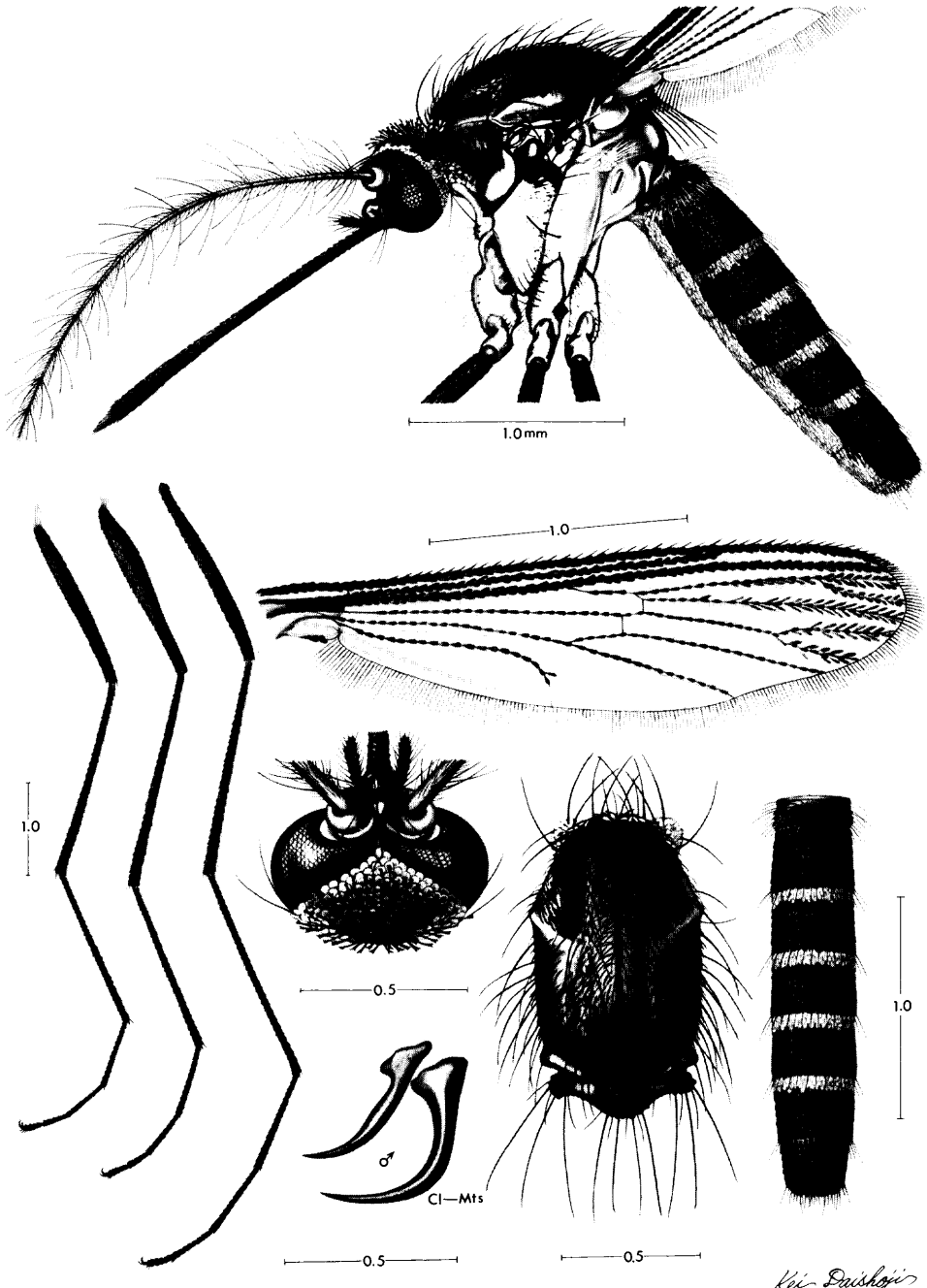




Kei Daishoji

Ur. (Pfc.) jacksoni

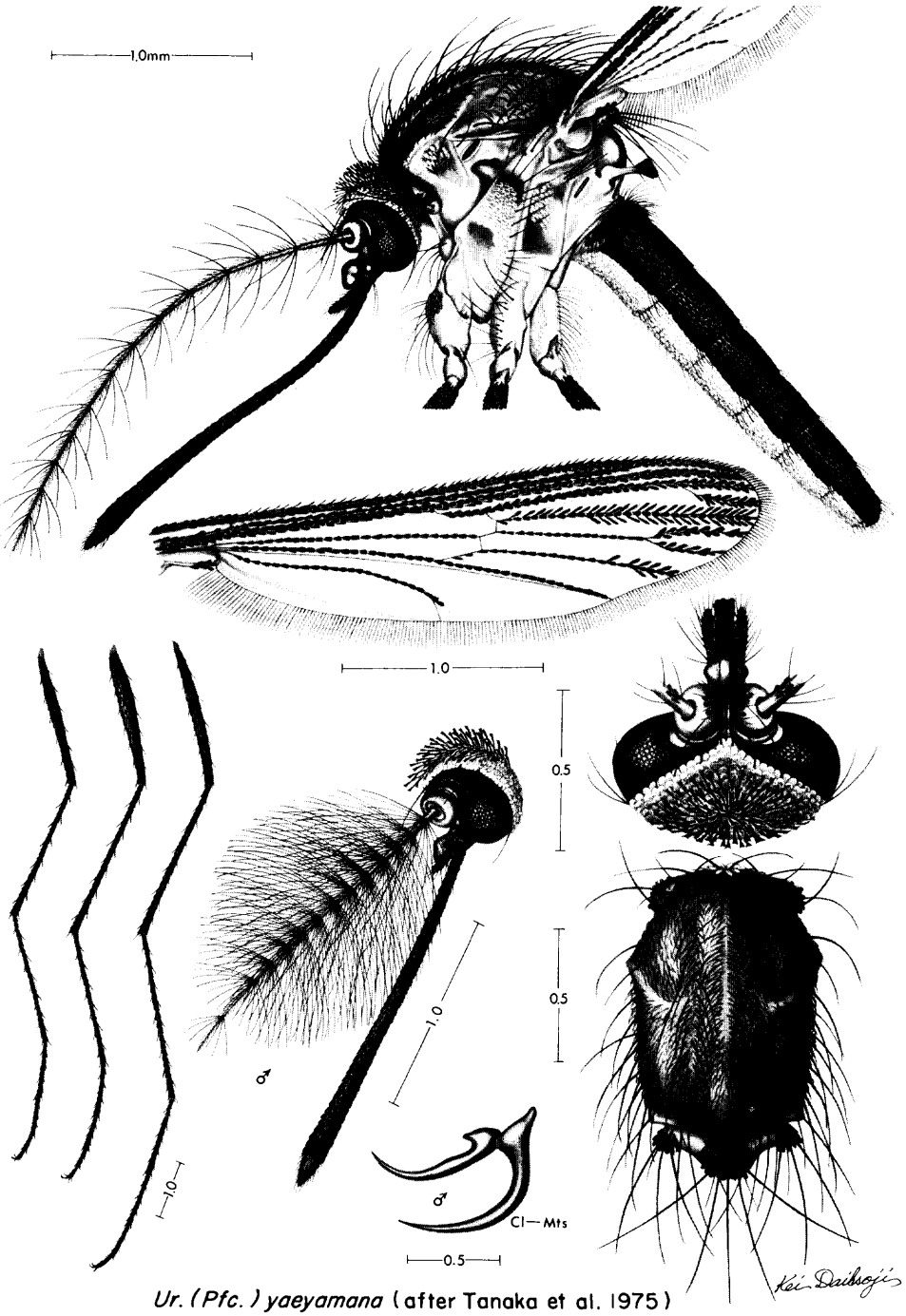
Fig. 250



Ur. (Pfc.) ohamai (after Tanaka et al. 1975)

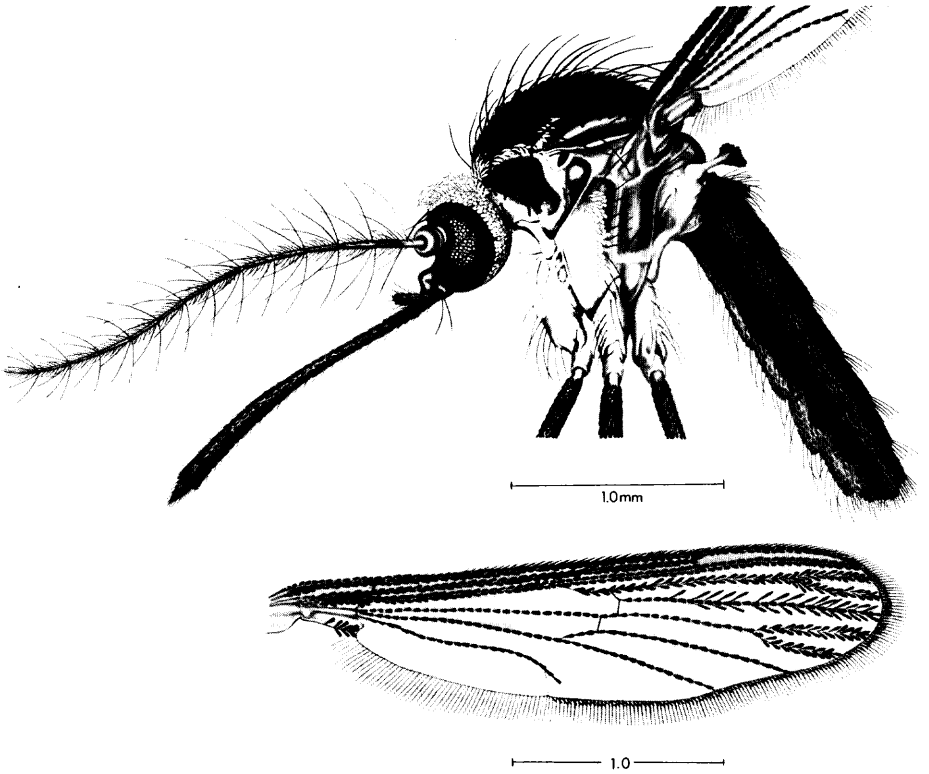
Kei Daishoji

Fig. 251



Ur. (Pfc.) yaeyamana (after Tanaka et al. 1975)

Fig. 252

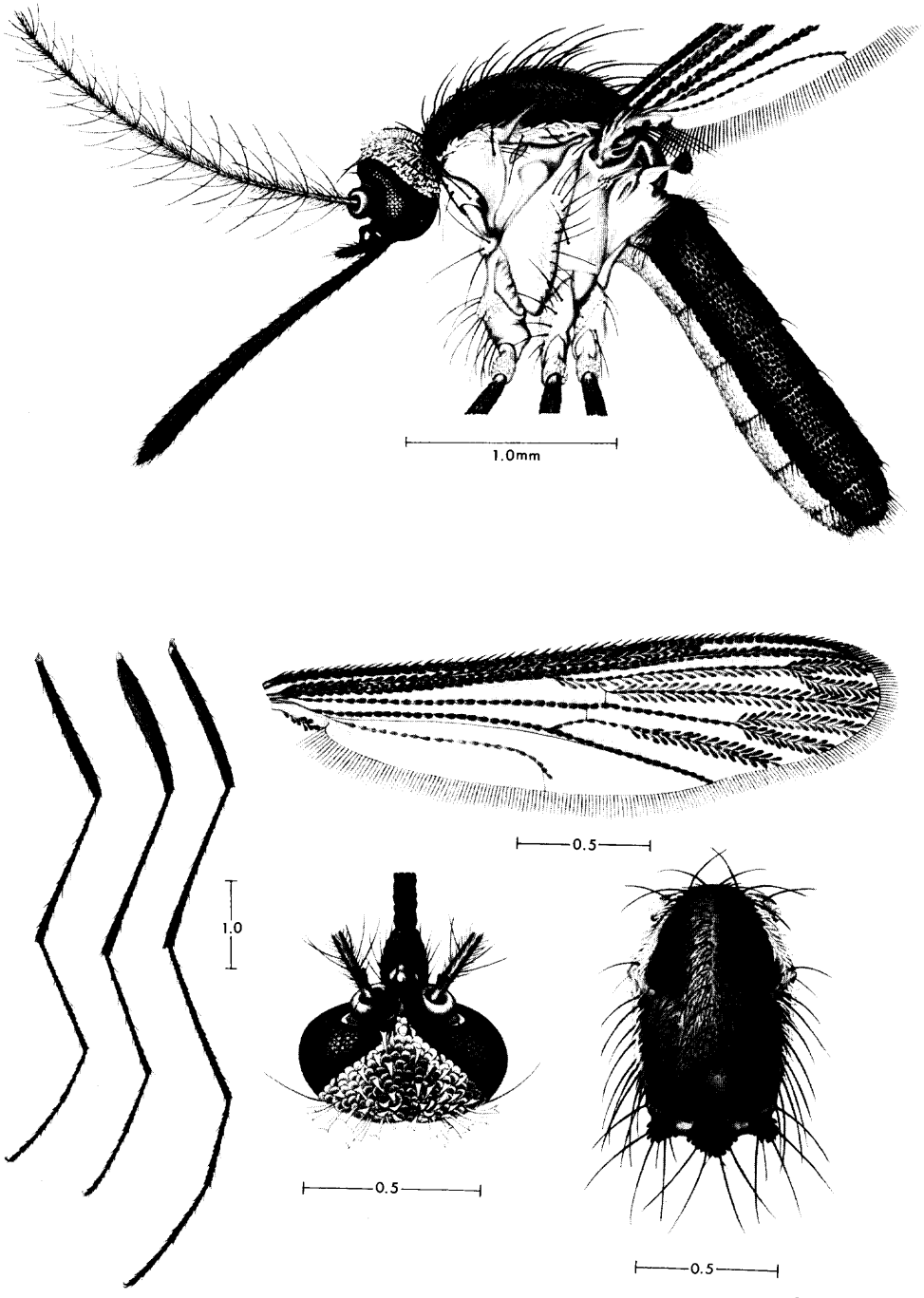


ryukyuana n. ssp.

Ur. (Pfc.) novobscura novobscura

Kei Daishoji

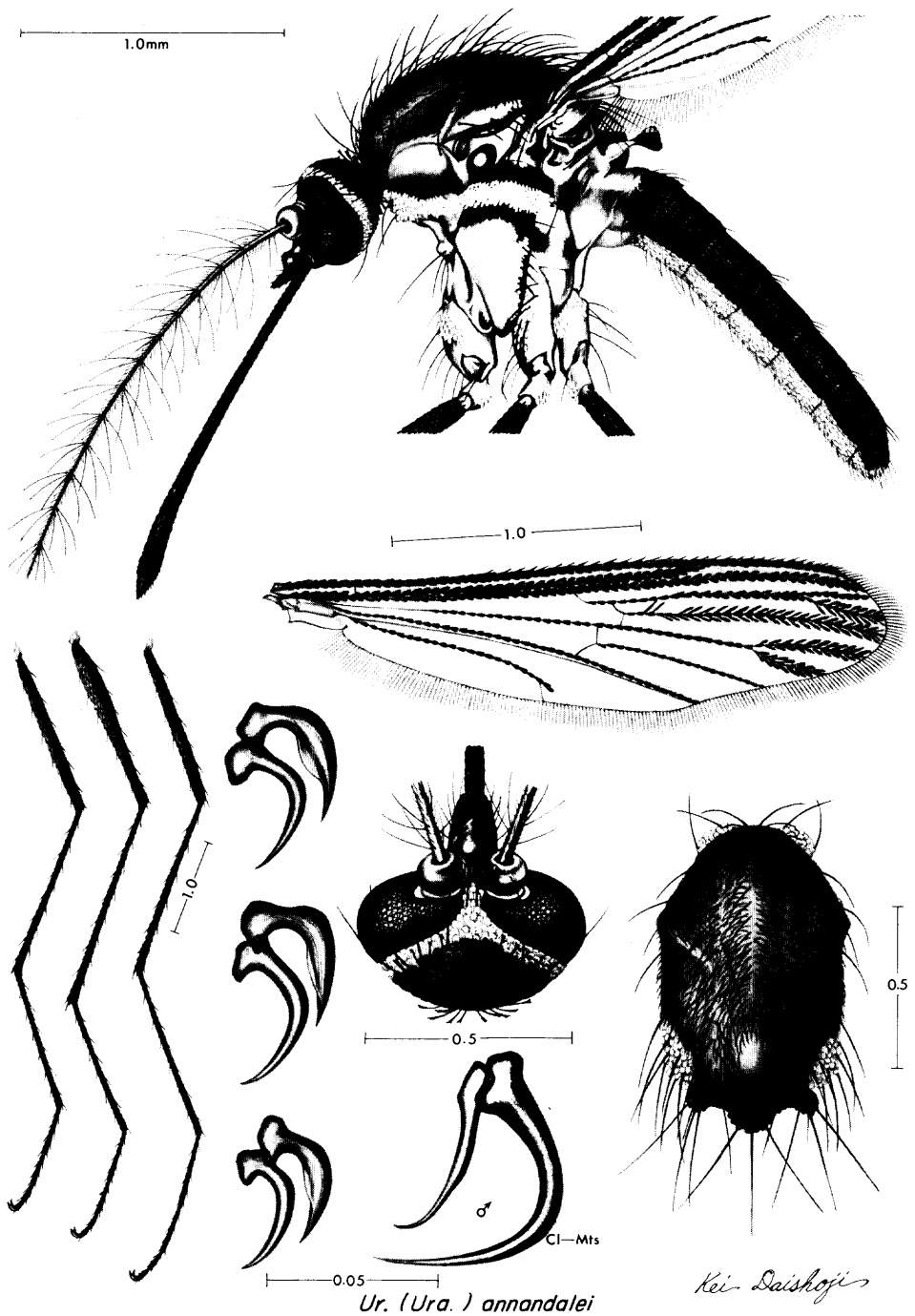
Fig. 253



Ur. (Pfc.) nivipleura

Kei Daishoji

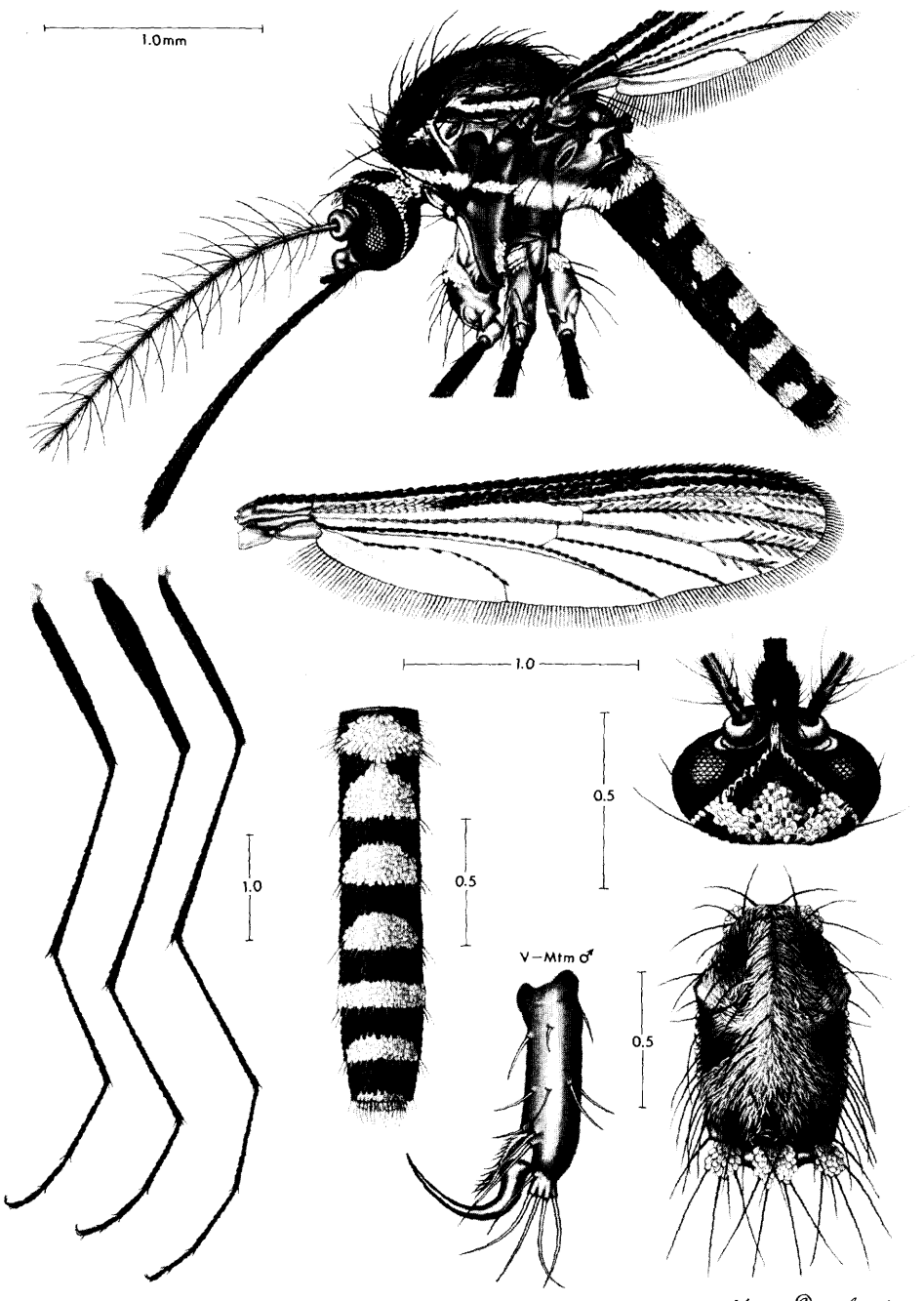
Fig. 254



Ur. (Ura.) annandalei

Kei Daishoji

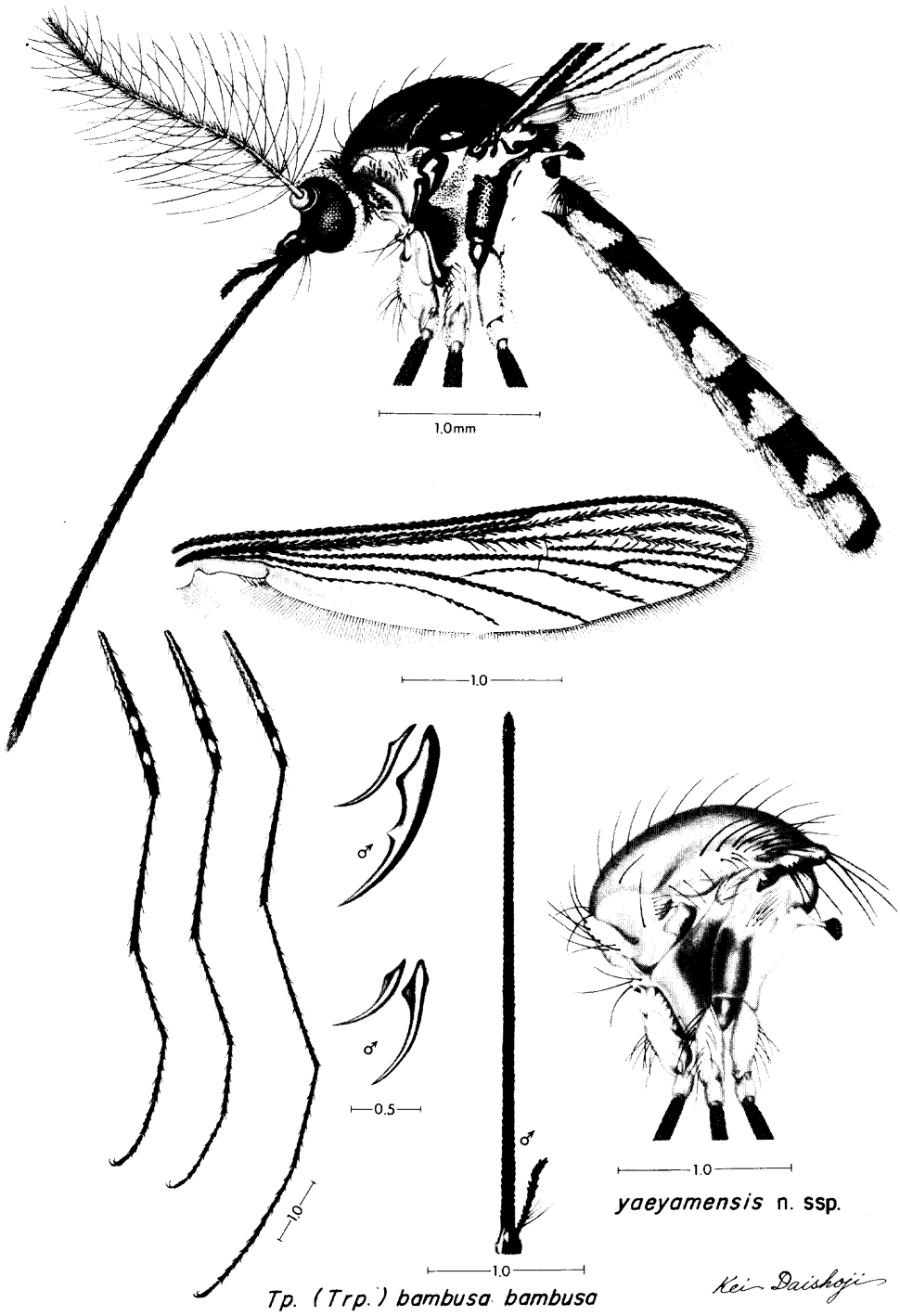
Fig. 255



Ur. (Ura.) macfarlanei

Kei Daishoji

Fig. 256

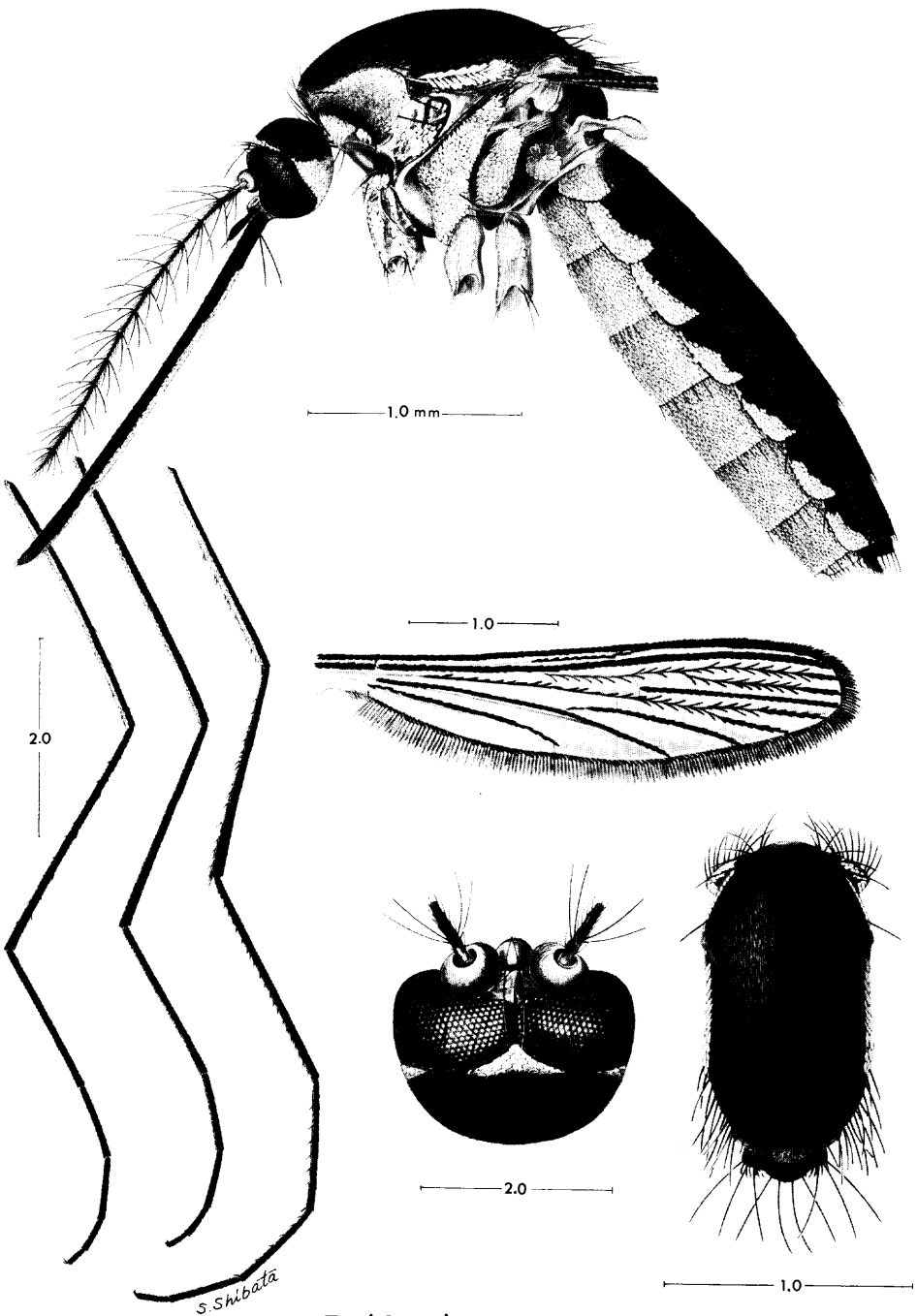


Tp. (Trp.) bambusa bambusa

yaeyamensis n. ssp.

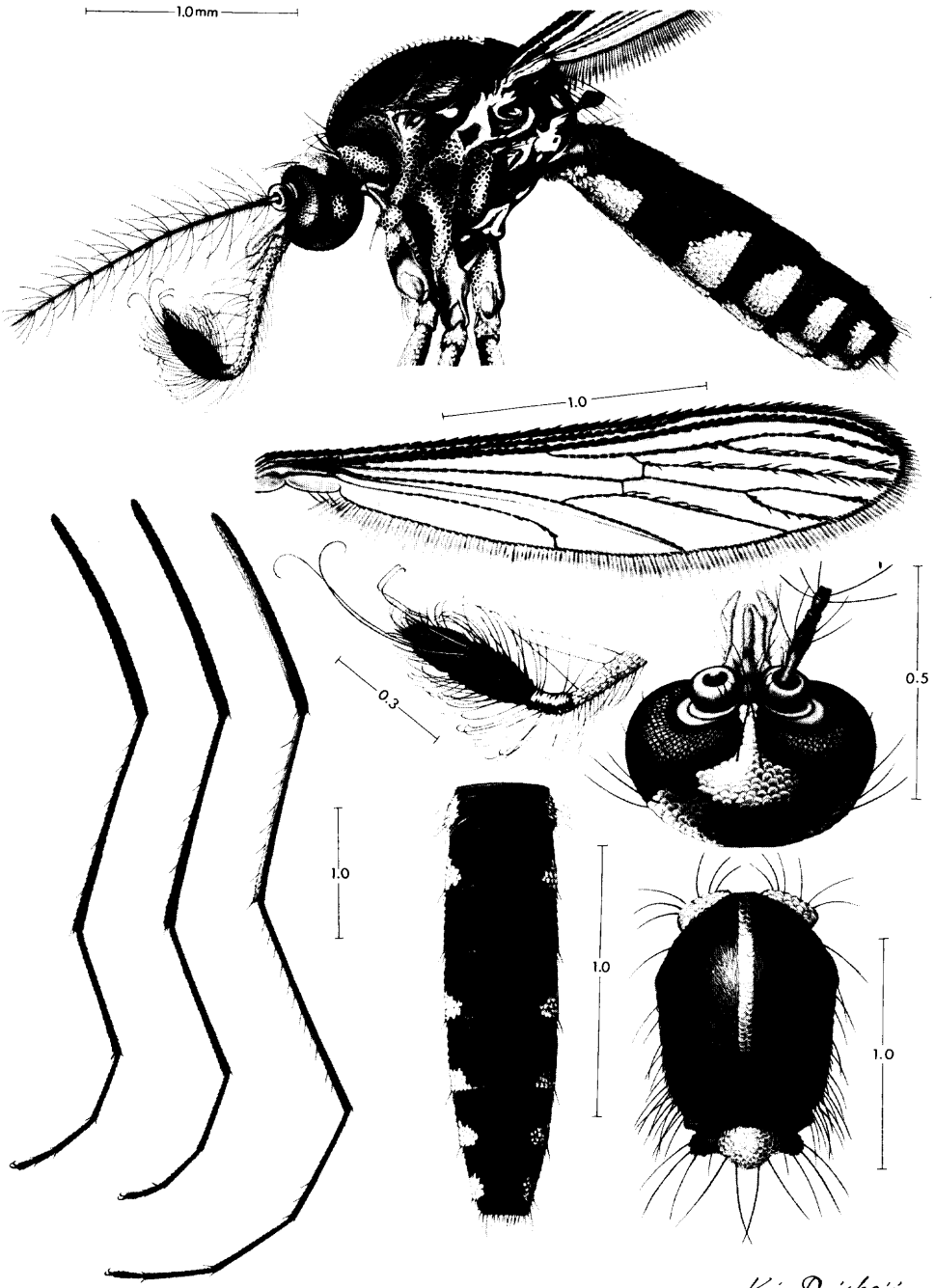
Kei Daishoji

Fig. 257



To. (Sua.) yanbarensis

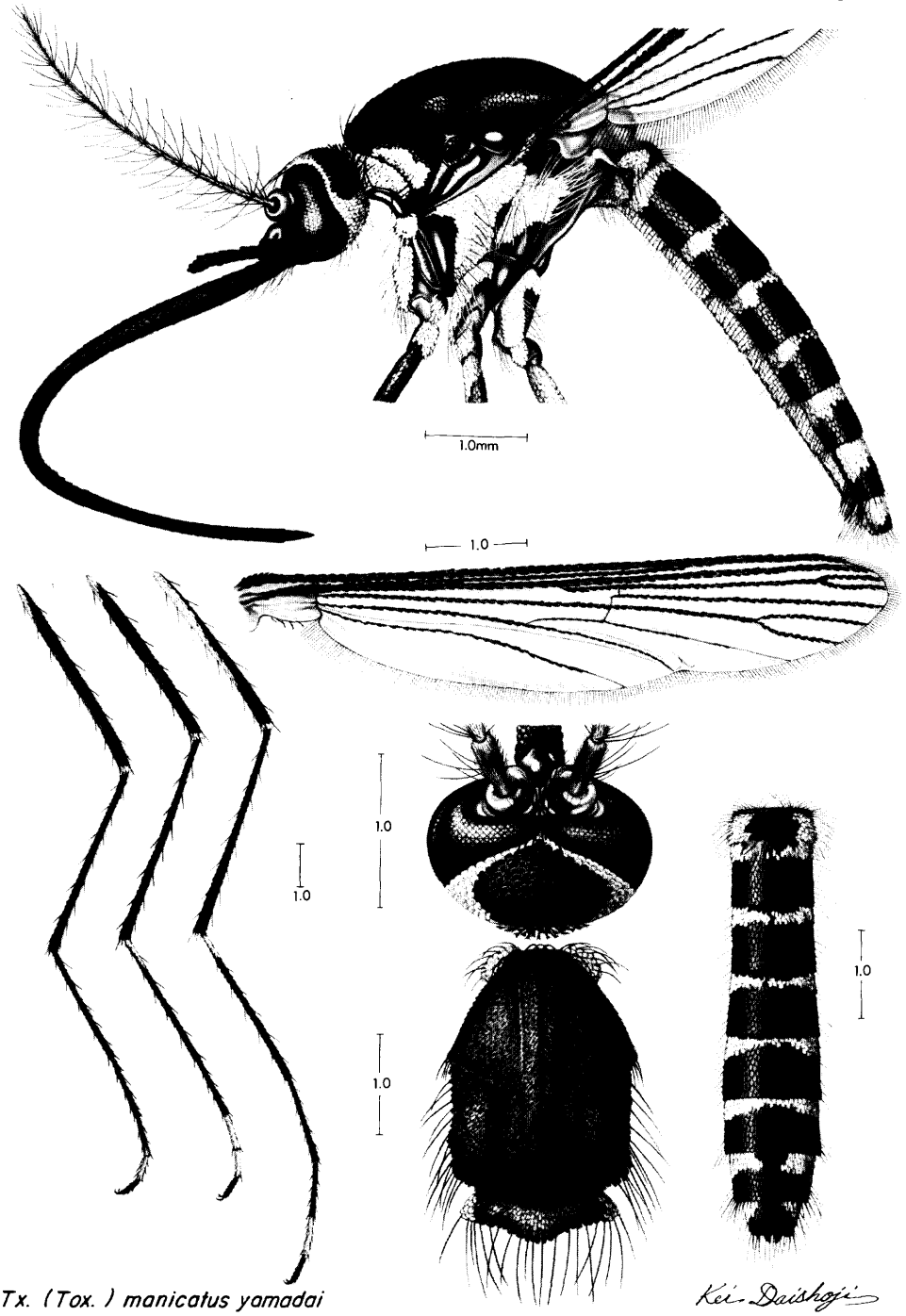
Fig. 258



MI. genurostris

Kei Daishoji

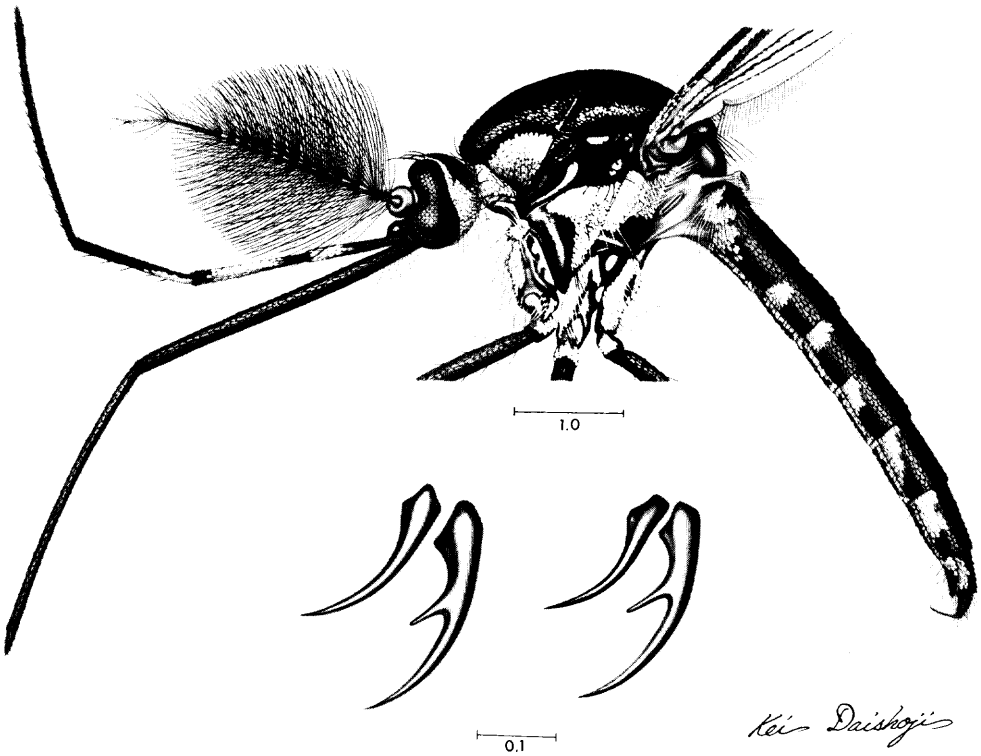
Fig. 259



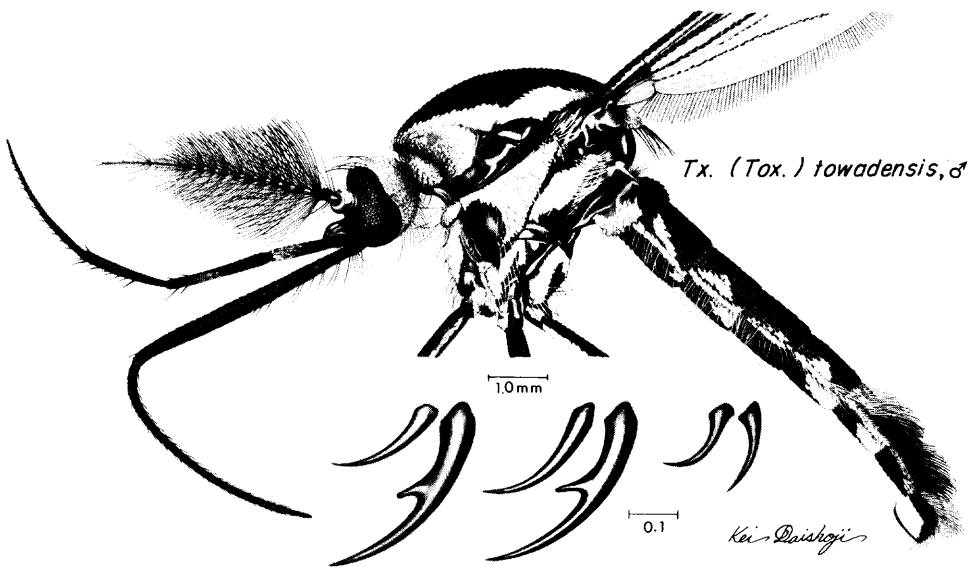
Tx. (Tox.) manicatus yamadai

Kei-Daishoji

Fig. 260

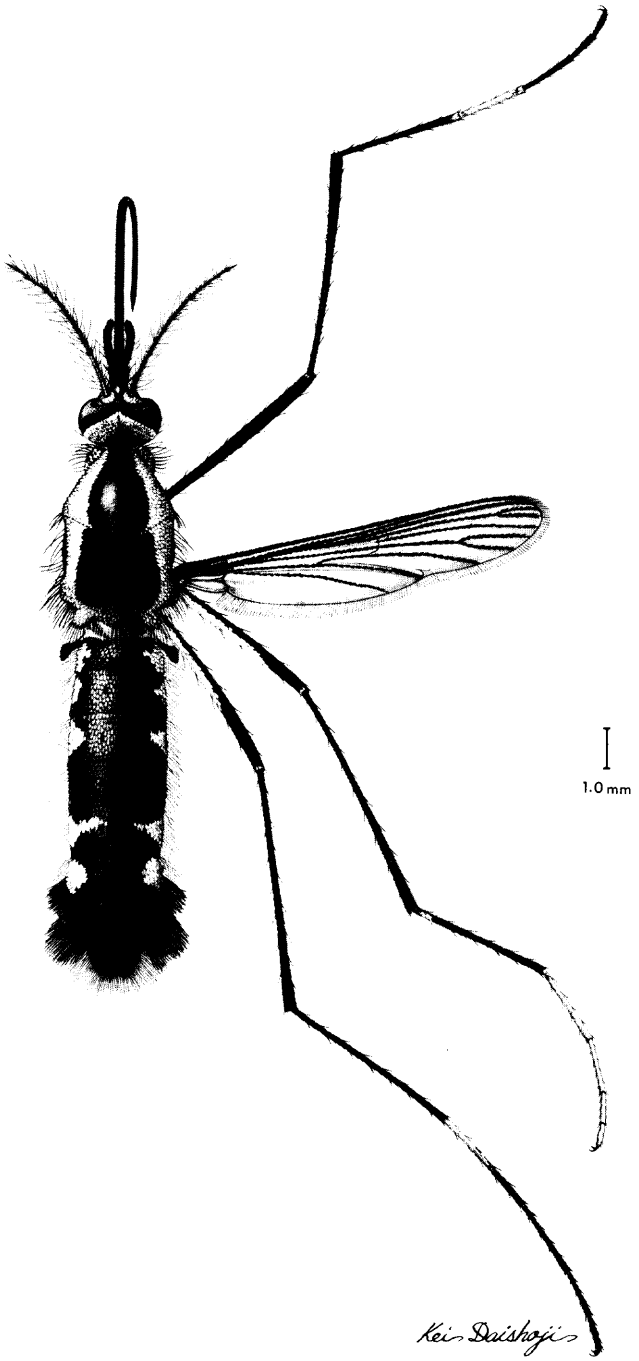


Tx. (Tox.) manicatus yaeyamae, ♂



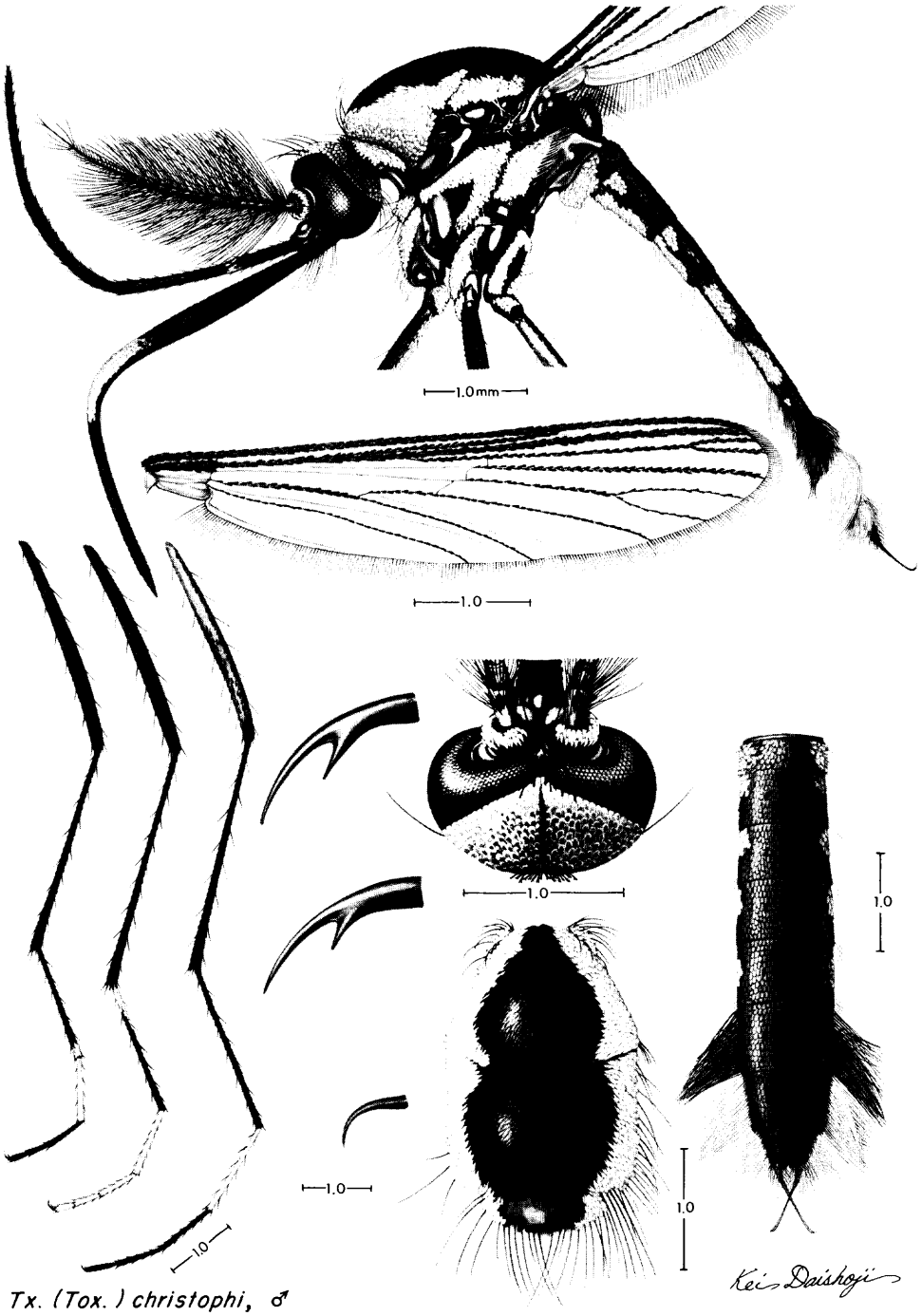
Tx. (Tox.) towadensis, ♂

Fig. 261



Tx. (Tox.) towadensis

Fig. 262



Tx. (Tox.) christophi, ♂

APPENDIX A. Abbreviations

Generic Names (Reinert 1975)

Ae.	-	*Aedes*	*Mi.*	-	*Mimomyia*
An.	-	*Anopheles*	*Ml.*	-	*Malaya*
Ar.	-	*Armigeres*	*Or.*	-	*Orthopodomyia*
Cs.	-	*Culiseta*	*To.*	-	*Topomyia*
Cx.	-	*Culex*	*Tp.*	-	*Tripteroides*
Hz.	-	*Heizmannia*	*Tx.*	-	*Toxorhynchites*
Ma.	-	*Mansonia*	*Ur.*	-	*Uranotaenia*

Subgeneric Names (Reinert 1975)

Aed.	-	*Aedes*	*Geo.*	-	*Geoskusea*
Adm.	-	*Aedimorphus*	*Hez.*	-	*Heizmannia*
Ano.	-	*Anopheles*	*Lop.*	-	*Lophoceraomyia*
Arm.	-	*Armigeres*	*Lut.*	-	*Lutzia*
Bar.	-	*Barraudius*	*Mnd.*	-	*Mansonioides*
Cel.	-	*Cellia*	*Ncx.*	-	*Neoculex*
Coq.	-	*Coquillettidia*	*Neo.*	-	*Neomelaniconion*
Cuc.	-	*Culicella*	*Och.*	-	*Ochlerotatus*
Cui.	-	*Culiciomyia*	*Pfc.*	-	*Pseudoficalbia*
Cus.	-	*Culiseta*	*Stg.*	-	*Stegomyia*
Cux.	-	*Culex*	*Sua.*	-	*Suaymyia*
Edw.	-	*Edwardsaedes*	*Tox.*	-	*Toxorhynchites*
Eto.	-	*Etorleptiomyia*	*Trp.*	-	*Tripteroides*
Eum.	-	*Eumelanomyia*	*Ura.*	-	*Uranotaenia*
Fin.	-	*Finlaya*	*Ver.*	-	*Verrallina*

Specimens

L	-	4th stage larva	P	-	Pupa
l	-	4th stage larval exuvium (skin)	p	-	Pupal exuvium (skin)

Specimen Depositories

BM	British Museum (Natural History), London, Great Britain
EHU	Department of Entomology, Hokkaido University, Japan.
JHCOL	J. Hara Collection, Department of Biology and Medical Zoology, Juntendo University, Japan
IMCOL	I. Miyagi Collection, Laboratory of Medical Zoology, University of the Ryukyus, Japan
IMSUT	Department of Parasitology, Institute of Medical Science, University of Tokyo, Japan
KKCOL	K. Kamimura Collection, Toyama Institute of Hygiene and Medical Microbiology, Japan
MSCOL	M. Sawada Collection, Chiba Agricultural Experiment Station, Japan
NAMRU-2	U. S. Naval Medical Research Unit No. 2, Taipei, Republic of China
NIHK	National Institute of Health, Korea

SSCOL	S. Shinonaga Collection, Department of Medical Zoology, Tokyo Medical and Dental University, Japan
TPMRI	Taiwan Provincial Malaria Research Institute, Taipei, Republic of China
USNM	U. S. National Museum, Washington, D. C., U. S. A.
YHS	Yaeyama Health Station, Okinawa, Japan

TABLE 41. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Cellia) minimus* Theobald, 1901

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	1	-	-	-	1-2	1-2	1-3	2-3	1-2	1-2	1-2
1	1	20-25(p)	27-34(p)	1-2	14-18	14-21	17-23	14-24	17-24	17-21	15-20	1-2
2	1	13-17(p)	1-2	1	4-6	4-5	2-4	1	1	1	2-4	10-12
3	1	1	1	12-18	1	1	1	2-4	1	1	1-3	9-13
4	1	10-14(p)	4-6	3-4	5-9	5-6	3-4	2-4	1-4	1	1	4-5
5	12-15(p)	31-46(p)	1	34-38(L,p)	5-6	5-6	5-7	4-7	7-10	8-12	8-12	4-6
6	13-16(p)	1	4-5	3-5	25-30(L,p)	23-30(L,p)	17-21(L,p)	3	3	2-3	3-6	1-S
7	17-25(p)	23-25(p)	3-4	28-34(L,p)	26-31(L,p)	26-36(L,p)	4-6	4-7	4-6	4-6	4-5	7-10
8	5-6(d)	28-36(L,p)	13-20(p)	27-36(L,p)	-	2-3	2-4	2-3	2-3	1-3	4-6	1-X
9	6-8	12-13(L)	1(L)	6-11(L)	5-7	8-10	6-7	5-8	6-9	6-10	7-12	1
10	2-3	1(L)	1(L)	1(L)	3-4	3-4	2-3	2-4	3-4	3-4	5-7	2-X
11	41-48(p)	2-4	1	1-2	3-5	2-3	2-3	2-4	2-4	3-4	2	19-27(L)
12	4-6	1(L)	2	3-5	3-4	2-5	2-3	3-4	3-5	2-5	2-4	3-X
13	5-9	3-6	5-9	3-4	5-8	6-10	4-9	3-5	3-5	7-10	3-4	9-13(L)
14	m	4-6	9-12	-	-	-	1-4	1-4	2-5	3-5	2-4	1-2
15	7-11	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches): p: plumose
Specimens examined: 10 from Ishigaki Is.

TABLE 42. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Cellia) tessellatus* Theobald, 1901

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0		1-2	-	-	-	1	1	1	1	1	1	1
1	1	3-5	15-19(p)	1-2	4-6	8-11	15-17	15-17	17-18	15-18	11	1
2	1	4-9	3-4	1	1	4-7	5-7	4-5	4-5	4-5	3-6	8
3	1	1	1	?	1	1	1	1	1	1	2-3	8-9
4	1	8-15(p)	2-3	2-4	3-5	4-5	2-3	2-3	2-3	1	1	1
5	5-6	31(p)	1	11	3	4-5	3-4	3	3	4-6	5-7	3-4
6	6-10	1	1-2	1-2			6	1-2	2	3	3-5	1-S
7	6-9	12(p)	1-2				3-4	3	3	3	3	3
8	1-4		12(p)		-	1-2	1-2	2	1-3	2	3-4	1-X
9	1-2	1			3-4	5-6	4-7	4-5	5-7	5-6	3-5	1
10	1				1	2-3	1	1	1	2	3	2-X
11	m(p)	1	1	2	2-3	1	2-3	3	2-3	2-3	2	
12	1-2		1	2	3	1	2-3	2-3	2-3	1	1	3-X
13	5	5-7	3-5	2-3	5	4-5	4-7	3-5	3	5-8	3-4	
14	?	3	4	-	-	-	?	1	1	1-2	1	1
15	1-2	-	-	-	-	-	-	-	-	-	-	-

L: large sized; m: multiple (with more than ten branches); p: plumose
Specimens examined: 2 from Taiwan.

TABLE 43. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) bengalensis* Puri, 1930

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	1	-	-	-	2	1-2	1-3	1-3	2-3	2	1?
1	1	8-11	32-43(p)	1-3	7-m	m	17-22	16-20	17-22	14-20	16-19	1-2
2	4-7	11-15(p)	1-3	1	3-6	4-11	3-6	1	1	1-2	5-6	11-17
3	2-3	1	1	m	1-2	1	1	1-2	1	1	2-3	15-19
4	3-6	17-20(p)	2-4	2-3	3-6	4-7	2-3	1-3	1-2	1	1	3
5	11-15(p)	32-38(p)	1	34-45(L,p)	6-9	10-16	6-11	5-7	7-9	8-12	11-14	8-10
6	12-16(p)	1	3-4	2-3	29-34(L,p)	27-35(L,p)	24-29(L,p)	4-6	4-5	5-8	2-5	1-S
7	13-20(p)	27-30(L,p)	3-4	26-29(L,p)	23-27(L,p)	25-30(L,p)	7-10	6-7	5-8	4-6	10-12	7-11
8	2-3	31-37(L,p)	15-20(p)	26-29(L,p)	-	1-2	1-2	1-2	2-4	4-7	5-6	1-X
9	3-7	3-4	1-2(L)	3-4(L)	6-9	9-19	9-12	9-14	8-16	8-11	6-10	4-6
10	1-3	1(L)	1(L)	1(L)	1-2	3-5	2-4	2-4	2-3	4-7	4-6	2-X
11	48-57(p)	1-4	1	1	4-6	2-4	2-3	3-4	2-5	3-5	2-4	17-24(L,p)
12	2-3	1(L)	1	2-4	3-4	3	2-4	3-5	2-4	2-3	2-3	3-X
13	6-10	8-11(d)	6-9	3-4	7-11	10-17	10-16	10-15	7-10	9-11	5-9	12-17(L)
14	m?	4-8	7-10	-	-	-	1-2	1-2	1-2	1-3	1	1
15	1-2	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 10 from Amami Ôshima.

TABLE 44. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) omorii* Sakakibara, 1959

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	?	-	-	-	1	1	1	1	1	1	1
1	1	2-4	38-42(p)	1-2	1	13-16	14-18	21	16-18	15-22	14-18	1
2	1	14-18(p)	1	1	1	2-4	2-3	1	1	1	1	5-7
3	1-2	1	1	3-6	1	1	1	2-4	1-3	1	1-2	5-6
4	1	16-23(p)	3-4	2-3	6-8	4-7	2-3	2-3	3-4	1	1	1
5	1	29-42(L,p)	1	23-36(L,p)	3	3-5	4-6	3-5	4-5	5-7	5-7	2-4
6	1	1	2-4	4-5	20-24(L,p)	20-25(L,p)	8-19(L,p)	7-11(L,p)	9-12(L,p)	11-17(L,p)	3-5	1-S
7	1	32-40(L,p)	3	28-37(L,p)	15-19(L,p)	14-25(L,p)	3-5	6-8	4-7	2-4	3-4	1-3
8	1	24-35(L,p)	18-26(p)	25-35(L,p)	-	1-3	2-3	1-3	1-3	3-4	4-7	1-X
9	1	1(L)	1(L,B)	1-2(L,B)	5-7	5-8	4-7	2-5	3-4	3-5	3-5	1
10	1-2	1	1	1	1-2	1	1-2	1-2	1-2	1-3	4-6	2-X
11	2	1	1	?	5-6	1	2	1-2	1-3	1	1-2	10(L,p)
12	1-2	1	1	1-2	2-3	2-3	2-3	1-3	1-2	1	1	3-X
13	1-2	6-7	(d)	2-3	6-7	5-7	5-6	3-5	4-5	6-8	4-5	6-7(L)
14	4	3-5	m	-	-	-	1	1	1	1	1	1
15	1-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 5 from Mt. Tochû, Shizuoka Pref., Honshu.

TABLE 45. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) lindesayii japonicus* Yamada, 1917

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	1	-	-	-	1	1-2	1-2	1-2	1-2	1-2	1-2
1	1	9-13(p)	29-39(p)	1-2	1-4	14-21	17-25	20-25	19-25	17-22	12-19	1
2	1	14-19(p)	1-3	1	2-5	5-7	3-6	1	1	2-4	3-6	5-8
3	1	1	1	9-20	1	1	1	1-3	1	1	1-3	6-10
4	1-3	14-26(p)	2-3	1-3	4-7	3-7	4-7	3-5	1-3	1	1	1
5	9-18(p)	33-41(p)	1	31-39(p)	3	3-7	3-6	3-6	5-8	5-9	7-9	3-6
6	9-15(p)	1	2-3	1-2	20-28(p)	22-27(p)	9-14(p)	2-3	2-4	4-5	2-6	1-S
7	16-22(p)	22-31(p)	2-3	22-29(p)	13-20(p)	16-24(p)	2-5	3-5	3-4	2-4	3-4	3-4
8	1-2	27-35(p)	14-24(p)	23-28(p)	-	1-2	1-2	1-3	2-4	3-5	3-5	1-X
9	1-4	1(L)	1(L)	1(L)	3-6	4-9	4-8	5-8	5-8	6-10	3-6	1
10	1-2	1(L)	1(L)	1(L)	1	2-5	1	1	1	2-3	4-6	2-X
11	48-75(p)	1	1	1	3	1	2-4	2-4	2-4	2-4	2-3	15-20(L,p)
12	2-4	1(L)	1	1-2	2-3	1	2-5	2-3	2-3	1-2	1	3-X
13	3-5	6-9	4-7	1-3	4-6	3-7	5-9	3-10	3-6	3-8	2-3	10-12(L)
14	m	3-5	4-7	-	-	-	1-3	1-3	1-3	1-3	1-2	1-2
15	2-4	-	-	-	-	-	-	-	-	-	-	-

L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 10 from Honshu.

TABLE 46. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) koreicus* Yamada and Watanabe, 1918

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	1	-	-	-	1	1	1	1-2	1-2	1-2	1-3
1	1	3-7	18-22(p)	1	m	m	16-24	19-25	19-24	16-22	17-23	1-2
2	1	9-11(p)	1-3	1	3-7	7-10	6-7	1-4	1-2	3-6	5-8	6-11
3	5-6	1	1	m	1	1	1	1-3	1	1	2-4	10-15
4	1-2	12-15(p)	2-3	2-6	4-7	5-7	3-4	2-4	3-6	1	1	1
5	9-17(p)	23-34(p)	1	27-31(L,p)	3-5	5-11	6-11	4-8	5-7	7-9	7-10	4-7
6	12-18(p)	1	3-4	2	18-25(L,p)	19-27(L,p)	18-22(L,p)	2-4	2-3	6-10	3-4	1-S
7	14-20(p)	22-26(L,p)	1-3	19-24(L,p)	15-21(L,p)	18-23(L,p)	4-8	3-6	4-6	3-5	5-9	5-6
8	6-9	21-26(L,p)	12-17(p)	20-24(L,p)	-	2-4	2-3	2-4	2-4	3-5	4-7	1-X
9	6-10	1(L)	1(L)	1(L)	5-7	8-12	8-13	9-15	8-15	7-12	5-9	1
10	2-4	1(L)	1(L)	1(L)	1	2-4	1	1	1	3-4	5-8	2-X
11	31-42(p)	2-3	1	1-3	2-4	1	2-5	3-5	2-4	3-5	3-5	18-21(L,p)
12	3-5	1(L)	1	1-3	2-3	1	2-5	2-4	3-7	1	1	3-X
13	4-9	6-9(d)	5-7	2-4	5-8	6-10	7-10	4-9	4-6	7-12	4-5	9-11(L)
14	m(p)	6-9	8-13	-	-	-	1	1	1-2	1	1	1
15	5-11	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 2 from Korea, 4 from Honshu.

TABLE 47. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) saperoi saperoi* Bohart and Ingram, 1946

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	1-2	-	-	-	1-2	1-2	1-2	1-3	1-2	1-3	2-3
1	1	4-11	21-26(p)	1-2	m	m	19-25	18-24	17-21	20-24	19-24	1
2	1	8-12	1-4	1	3-6	6-9	3-4	2	1-2	2-5	3-5	5-9
3	4-7	1	1	m	1	1	1	2-3	1	1	3-5	11-13
4	1-4	11-15(p)	2-3	4-6	5-10	5-9	3-4	2-4	3-4	1	1	1
5	11-17(p)	19-28(p)	1	26-32(L,p)	3-4	4-9	4-9	4-5	4-6	6-9	5-8	5-7
6	14-19(p)	1	2-3	2-3	20-23(L,p)	22-26(L,p)	17-21(L,p)	2-3	2	3-7	3-4	1-S
7	17-20(p)	16-19(L,p)	2-4	20-24(L,p)	17-22(L,p)	19-22(L,p)	4-5	4-5	4-5	3-4	5-7	4-5
8	5-9	21-26(L,p)	11-16(p)	22-29(L,p)	-	2-3	2-3	2-3	2-4	3-4	3-5	1-X
9	5-8	1(L)	1(L)	1(L)	4-5	6-8	7-11	7-9	8-10	7-10	4-6	1
10	2-3	1(L)	1(L)	1(L)	1	2-3	1	1	1	3-4	4-8	2-X
11	38-39(p)	2-4	1	1-2	2-3	1	2-3	2-3	2-4	2-4	2-3	m(L)
12	3-4	1(L)	1	2-4	2-3	1	2-3	2-3	3-4	1	1	3-X
13	4-6(d)	8-11	4-7	3-4	6-8	7-9	6-9	4-8	5-7	9-10	4-5	9-m(L)
14	m	6-9	9-11	-	-	-	1	1	1	1	1-2	1
15	5-9	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose
Specimens examined: 6 from Okinawa Is.

TABLE 48. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) sinensis* Wiedemann, 1828

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	2?	1-2	-	-	-	2-4	3-4	2-3	2-4	2-4	2-4	2-4
1	1	1-3	21-26(p)	1-3	m	m	17-23	17-25	17-23	17-24	16-23	1
2	1	8-13	1-3	1-2	4-7	6-10	5-8	2-3	2-4	3-10	6-10	9-14
3	30-89(d)	1	1	m	1-3	1-2	1	2-3	1	1	2-5	6-10
4	2-3	13-17(p)	3-6	4-5	6-12	5-8	4-5	2-6	2-6	1	1	1
5	14-20(p)	22-31(p)	1	24-34(L,p)	3-7	8-14	8-12	5-6	5-9	6-11	5-9	4-6
6	12-20(p)	1	3-5	2-3	18-26(L,p)	20-31(L,p)	15-27(L,p)	1-4	1-3	4-9	3-5	1-S
7	12-23(p)	21-30(L,p)	2-3	23-29(L,p)	17-22(L,p)	20-28(L,p)	4-6	4-5	3-6	2-4	4-8	5-6
8	6-10	19-30(L,p)	11-19(p)	22-33(L,p)	-	2-3	2-3	2-4	3-5	4-6	3-6	1-X
9	5-8	1(L)	1(L)	1(L)	6-11	10-18	8-12	8-13	8-15	6-10	6-10	1
10	2-3	1(L)	1(L)	1(L)	1	3-4	1	1	1	2-3	3-5	2-X
11	41-60(p)	3-5	1	1	3-4	1	2-3	2-3	2-4	2-3	1-4	17-23(L,p)
12	3-6	1(L)	1	1-3	2-3	1	2-4	2-4	2-4	1	1	3-X
13	7-12	8-17	6-14	3-4	9-13	8-13	7-12	4-5	3-5	8-15	3-5	9-13(L)
14	m	6-10	12-22	-	-	-	1-2	1-2	1-2	1-2	1-2	1-2
15	9-14	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 8 from Honshu, 1 from Shikoku, 1 from Kyushu; additional 20 from Honshu and Kyushu for important setae.

TABLE 49. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles)* sp. (Engaru race)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1?	1-2	-	-	-	2-5	3-5	2-4	2-4	2-4	2-4	2-4
1	1	1-3	22-33(p)	1-3	m	m	17-28	18-29	18-27	18-32	19-26	1
2	1	9-13	1-5	1	5-9	7-14	5-12	2-5	3-5	5-9	6-13	10-15
3	26-85(d)	1-2	1	m	1-3	1	1	3-4	1	1	3-5	7-13
4	2-5	15-23(p)	3-6	3-6	7-11	4-8	5-8	5-8	4-8	1	1	1
5	12-19(p)	24-35(p)	1	27-40(L,p)	4-8	10-19	10-17	5-9	6-11	9-13	7-12	4-5
6	14-17(p)	1	2-5	2-5	24-29(L,p)	26-33(L,p)	25-30(L,p)	2-5	2-4	6-10	3-9	1-S
7	16-23(p)	26-28(L,p)	2-4	26-32(L,p)	20-28(L,p)	24-33(L,p)	5-7	4-7	4-6	3-5	4-7	5-8
8	6-11	22-30(L,p)	13-17(p)	28-39(L,p)	-	2-4	2-3	2-3	3-5	5-6	4-7	1-X
9	5-9	1(L)	1(L)	1(L)	5-10	9-15	10-15	8-18	9-14	8-11	6-10	1
10	2-3	1(L)	1(L)	1(L)	1	2-4	1	1	1	2-3	4-7	2-X
11	43-56(p)	1-6	1-2	1	3-5	1	2-3	2-3	3	2-3	2-3	18-24(L,p)
12	3-6	1(L)	1	1-3	2-4	1	3-4	2-4	2-3	1	1	3-X
13	8-14	9-14	6-12	2-4	10-14	9-13	8-13	5-13	4-6	8-13	3-4	12-14(L)
14	m	7-11	10-17	-	-	-	1-2	1-2	1-2	1-2	1-2	1-2
15	11-16	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 10 from Hokkaido; additional 10 from Hokkaido for important setae.

TABLE 50. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) sineroides* Yamada, 1924

SETA No.	HEAD	THORAX			ABDOMEN						
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1-2?	1-2	-	-	-	3-6	2-4	2-4	2-4	2-4	2-4	2-4
1	1	1-3	20-30(p)	1-3	m	m	21-26	20-25	16-25	18-27	15-27	1
2	1	7-12	1-4	1	5-10	6-11	5-8	2-4	2-4	4-8	4-9	7-12
3	18-34(d)	1	1	m	2-4	1-2	1	1-4	1	1	3-5	7-12
4	3-5	12-19(p)	5-7	3-5	5-10	5-9	5-6	4-6	4-7	1	1	1
5	10-15(p)	25-34(p)	1	21-35(L,p)	4-7	9-12	7-13	5-7	6-10	8-12	8-11	4-5
6	11-18(p)	1	3-6	2-4	20-24(L,p)	21-29(L,p)	17-23(L,p)	2-5	2-4	7-11	3-6	1-S
7	13-19(p)	23-29(L,p)	2-3	21-30(L,p)	17-23(L,p)	17-25(L,p)	4-8	4-7	3-5	3-4	5-7	5-9
8	6-12	25-29(L,p)	11-16(p)	17-31(L,p)	-	1-3	2-3	2-4	3-5	4-6	4-6	1-X
9	7-11	1(L)	1(L)	1(L)	4-9	6-14	7-13	8-13	7-13	6-10	7-12	1
10	2-3	1(L)	1(L)	1(L)	1	2-3	1	1-2	1	2-4	4-8	2-X
11	36-49(p)	4-7	1-2	1-2	3-5	1	2-3	2-3	2-3	2-3	1-3	13-19(L,p)
12	3-5	1(L)	1	1-4	2-3	1	2-3	3-4	2-4	1	1	3-X
13	6-12	8-15	6-14	3-4	7-m	8-12	4-12	5-6	3-5	8-14	3-5	9-12(L)
14	m	5-10	8-14	-	-	-	1-2	1-2	1-2	1-3	1-2	1-2
15	6-12	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 4 from Hokkaido, 4 from Honshu, 2 from Korea; additional 9 from Hokkaido and 6 from Korea for important setae.

TABLE 51. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Anopheles (Anopheles) lesteri* Baisas and Hu, 1936

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1?	1	-	-	-	3-5	2-5	2-5	2-5	2-5	2-5	2-4
1	1	1-3	22-32(p)	1-3	m	m	16-22	17-23	17-24	16-33	14-23	1-2
2	1	5-15	1-3	1-2	3-8	5-10	4-8	2-4	2-5	3-7	4-8	7-11
3	16-46(d)	1-2	1	m	1-3	1-3	1-2	2-4	1	1	3-4	4-9
4	2-6	11-18(p)	3-7	2-6	5-13	5-10	3-6	4-8	3-9	1	1-2	1
5	11-17(p)	17-28(p)	1	19-33(L,p)	3-6	6-11	6-13	4-6	4-7	5-9	6-11	4-6
6	10-20(p)	1	3-6	2-5	18-24(L,p)	20-31(L,p)	16-26(L,p)	2-4	2-3	5-m	3-9	1-S
7	11-17(p)	21-26(L,p)	2-4	17-28(L,p)	14-22(L,p)	18-29(L,p)	3-6	3-6	3-5	2-4	4-8	4-8
8	5-12	18-27(L,p)	7-18(p)	22-29(L,p)	-	2-4	2-4	2-4	3-6	4-7	4-7	1-X
9	5-11	1(L)	1(L)	1(L)	4-8	5-9	6-10	6-12	7-13	4-10	6-m	1
10	2-4	1(L)	1(L)	1(L)	1	2-4	1	1-2	1-2	2-3	4-6	2-X
11	32-54(p)	3-6	1	1	2-5	1	1-4	1-3	2-5	1-3	1-2	16-25(L,p)
12	3-5	1(L)	1	1-4	2-4	1-2	2-4	2-4	2-4	1	1	3-X
13	6-13	8-14	5-m	2-4	7-m	7-m	6-m	4-6	3-6	m	3-5	9-14(L)
14	m	5-12	m	-	-	-	1-2	1-3	1-3	1-3	1-2	1-2
15	4-m	-	-	-	-	-	-	-	-	-	-	-

d: dendritic; L: large sized; m: multiple (with more than ten branches); p: plumose.
Specimens examined: 10 from Okayama, 4 from Okinawa; additional 3 from Hokkaido and 1 from Amami Ôshima for important setae.

TABLE 52. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Mimomyia (Etorleptiomyia) luzonensis* (Ludlow, 1905)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	1	1	1	1	1	1	1
1	3(st)	1(B)	2-3	2	2-3	3-4(b)	4(B)	4-5(B)	3-5(B)	4(b)	3-5	2-3(b+)
2	-	1	3-5	1-4	2-3(b)	2	1	1	1	1	1	1-2
3	1	3-5(b+)	1	2-5	1-3	2-4	2-4	2-5	1-3	2-3	3-4(B)	4-6(B)
4	6-10	3-5	2-6	2-4	6-10	4-7	1	1	3-7	1-5	2-4	1-2
5	4-6(L,B)	2-4(L,B)	1(L,B)	2-4	2-4	2-4	2-4	2-3	2-4	2-4	2-8	3-4
6	3(L,B)	1(L,B)	3-4(L,B)	1-4	4-6(L,B)	5-7(L,B)	2(L,B)	2-3(L,B)	2(L,B)	2(L,B)	5-10	1-S
7	8-12(B)	3(L,B)	2-3	4-6(L,B)	2(L,B)	3-5(B)	2-5	2-5	3-7	3-4	1	2
8	2-4	2-4	5-6(D,B)	7-11	-	1-3(b+)	2-4	2-4	1-4	3-5	5-10	1-X
9	3-5	1(B)	3-5(L,B)	3(L,B)	2-4	1-3	1	1	1	1	2-4	1(L,B)
10	3-6	1	1(L,B)	1(L,B)	2-3	2-4	2-4	2-4	2-4	2-4	5-10(d)	2-X
11	3-4(L,B)	2-4	1?	1?	3-6(b+)	2-5	1-3	1-3	1	1	1	3-4(L)
12	5-7	1(L,b)	1(L,B)	1-5	1-3	2-3	1	1	1	2-7	3-4	3-X
13	3-5	-	m(d)	4-6	2-4	m(d)	3-4	3-5	4-6	m(d)	3-5	3-4(L)
14	4-7	2-3(b)	m(d)	-	-	-	1?	1?	1?	1	1	1-2
15	4-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 6 from Taiwan, 4 from Okinawa.

TABLE 53. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culiseta (Culicella) nipponica* LaCasse and Yamaguti, 1950

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1-2	1-2	1-4	1	2	2(b+)	2(b+)	2(b+)	2(B)	5-7(B)
2	-	1(L,B)	5-8	2	1	1	1	1	1	1	1	2
3	1	2(L,B)	1	4-7	2	2	2	2	1-2	2	2(B)	6-10(B)
4	2-4	2(L,B)	2-3	2-5	m(d)	7-13	3-5	2-5	5-10	3	2-3	1
5	6-10(B)	1(L,B)	1(L,B)	1-3	4-8	2-4	2-4	3-6	3-5	4-7	6-10	4-5(B)
6	2(L,B)	1(L,B)	1(L,B)	1	6-8(L,B)	7-10(B)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	m(d)	1-S
7	8-12(B)	3-5(L,B)	1(L,B)	7-10(L,B)	3-5(B)	5-9(B)	6-11(B)	8-13	8-12	2-3	1-2	6-9(B)
8	2-3	3(L,B)	5-7(L,B)	m(d)	-	2-4	2-3	2-3	2-4	3-5	4-7	1-X
9	3	1(L,B)	4-7(L,B)	5-8(L,B)	2-3	1	1	1	1	1	3-5	1
10	1-4	1(B)	1(L,B)	1(L,B)	1	1	2	2	1-2	2	2-3(b+)	2-X
11	2-4	2-7	2-4	2-5	2-4	5-10	2-6	3-4	2-5	3-5	2-5	13-18(L)
12	4-9	1(L,B)	1(L,B)	1-4	1-2	2	3-7	2-4	1-2	1	1	3-X
13	2-4	-	m(d)	4-10(B)	2-4	m(d)	3(L)	3(L)	3(L)	m(d)	3-5	3(L)
14	1-2	2-3	m(d)	-	-	-	1-2	1-2	1-2	1-2	1-4	1
15	5-9	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Hokkaido.

TABLE 54. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culiseta (Culiseta) kanayamensis* (Yamada, 1932)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1-4	1-5	5-8	1-2	2-3	2-3(L,b)	3-4(L,B)	2(L,B)	1(L,B)	5-10(B)
2	-	1(L,B)	3-7	2-4	1	1	1	1-2	1	1	1	1-2
3	1	2-5(L,B)	1	m	2-4	2-3	2	2-3	1	1-2	1(L,B)	7-14(B)
4	3-6	5-9(B)	3-4	3-8	m(d)	m	2-4	2-4	6-11(B)	3-6	1-2	1-2
5	9-12(B)	1-2(L,B)	1(L,B)	1-2	6-11	4-7	4-7	5-8	5-8	6-11	7-m	4-6(B)
6	5-8(B)	1(L,B)	1(L,B)	1	3-4(L,B)	4-5(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	m(d)	1-S
7	11-17(B)	5-8(L,B)	1(L,B)	8-12(L,B)	2(L,B)	5-8(B)	m(d)	m(d)	m(d)	1	1	6-9(B)
8	2	2-5(L,B)	7-11(L,B)	m(d)	-	2	1-2	2-4	2-3	2-5	m	1-X
9	2-3	1(L,B)	8-10(L,B)	7-13(L,B)	4-5	1-2	1-2	1-2	1	1-2	2-7	3-4
10	1-5	1(B)	1(L,B)	1(L,B)	1-2	1-2	1-2	1-2	1	2	2-4(b+)	2-X
11	4-6(B)	3-6	2-5	2-4	2-6	2-5	2-4	2-4	2-3	2-4	2-4	11-19(L)
12	5-9	1(L,B)	1(L,B)	2-5	1-2	1-2	2-5	2-3	1-2	1	1-2	3-X
13	2-3	-	m(d)	5-7(B)	1-3	m(d)	2-3(L,B)	3(L,B)	3-5(L,B)	m(d)	3-4(B)	2-4(L)
14	1-2	2-3(b+)	m(d)	-	-	-	1-2	1-2	1-2	1-2	1-2	1
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 3 from Hokkaido, 7 from Honshu.

TABLE 55. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Orthopodomyia anopheloides* (Giles, 1903)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	8-12*(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,b+)	1	1-2	1-3(f)	1-2	1-2(L)	1-3	1-2(L,b)	3-6*(d)	1-3(B)	3-9
2	-	1	1-5	1-2	1	1	1	1	1-2	1-2	1-2	1
3	1	2-5(B)	1	3-5(f)	2-3	2(f)	1	1-2	1	1	1(b)	8-14(B)
4	5-7(B)	4-8(B)	2-3	3-5	4-11*(d)	4-5*(d)	2-4	2-3	2-4(B)	2-3(f)	1	1
5	3-6(B)	1(L,b)	1(L,b)	2-4	3-5	2-4(f)	2-3(B)	2-3(B)	2-3(B)	2-3(B)	3-5	2-6(B,f)
6	6-8(B)	1(L)	1(L,b)	1	5-7(L,B)	4-7(B)	1(L)	1-2(B)	1(L)	1(L)	5-11*(d)	1-S
7	8-11(B)	5-7(L,B)	1	10-13(L,B)	1-3(B)	2-5(B)	6-15(B)	7-14*(d)	6-13*(d)	2-3(f)	1	6-15(B)
8	1-2	5-8(B)	6-11(L,B)	4-10*(d)	-	1-2	1-2	1-2	1-3	4-11(d)	5-9*(d)	1-X
9	1-3	3-5(B)	8-11(L,B)	7-12(L,B)	1-3	2-3	1-3	1-2	1-2	1-3	2-4	1-4(f)
10	1-2	1	1(L,b)	1(L,b)	1-2	2-4	1	2-4	1	1	1-2(B)	2-X
11	4-7*(d)	2-4	1-3	1-3	2-5(f)	1	2-4	2-5	2-5	2-5	3-6	7-11(L)
12	3-7	1	1	1	4-8*(d)	1	2-3	1-3	1	1	1	3-X
13	4-6(B)	-	5-12*(d)	3-6(B)	1-2	5-9*(d)	2-3(B)	2-4(B)	2-4(B)	10-22*(d)	3-6(B)	1(L)
14	1	1-2	7-11*(d)	-	-	-	1	1	1	1-2	1-2	1-2
15	1-2	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; f: frayed; L: large sized; *: No. of main branches (see description).
Specimens examined: 5 from Yaeyama, 5 from Okinawa, 12 from Kyushu.

TABLE 56. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) fuscocephala* Theobald, 1907

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1-3	2-5	2-6	2-3	1-3(L-M)	1-3(L-M)	1-2(L)	1-2(L-M)	2-4	4-8(B)
2	-	1(L,B)	3-6	2-4	1-2	1	1	1	1	1	1	1
3	1	1-2(L,B)	1	2-6	2-4	1-2	1-2	1-3	1	1-2	2-3	6-8(B)
4	1-2	1-2	1-3	4-6	7-13	3-8	2-5	1-3	3-7	1-3	1	1
5	2-3(B)	1(L,B)	1(L,B)	1-2	4-9(d)	1-4	1-3	1-3	1-2	1-3	1-3	3-5(b)
6	2-3(B)	1(L,B)	1(L,B)	1	2-4(L,B)	3-4(L,B)	1(L,B)	2-4(M,B)	1(L,B)	1(L,b)	m(d)	1-S
7	5-7(B)	2-5(L,B)	1(L,B)	4-6(L,B)	1-2(L,B)	4-7	4-8	4-9	5-7	2-3	1	1-4
8	3-5	2-4(B)	4-5(L,B)	m(d)	-	2-3	1-3	2-3	2-3	2-3	4-8	1-X
9	3-5	1-2	3-5(L,B)	3-6(L,B)	2-4	1-2	1	1	1	1	1-4	2-3
10	2-3	1	1(L,B)	1(L,B)	1	1	1-2	1-2	1	1	1	2-X
11	2-3	4-6	1-4	2	3-7	2-4	1-3	1-3	1-3	1-3	1-3	2-3(L)
12	2-4	1(L,B)	1(L,B)	1-3	1-3	2-4	2	1-2	1	1	1	3-X
13	2-4	-	m(d)	6-8	1-3	m(d)	2-5	3-5	3-5	m(d)	2-6	1(L)
14	2-3	1-2	m(d)	-	-	-	1	1	1	1	1	1
15	4-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; M: medium sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Iriomote Is.

TABLE 57. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) vagans* Wiedemann, 1828

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1	2-5	3-7	1-3	2(B)	2-4(B)	2-4(B)	2-3(B)	3-5(B)	6-8(B)
2	-	1(L,B)	2-4	2	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	3-6	1-2	1-2	1	1-2	1	1	1-2	7-9(B)
4	1	2(L,B)	2	4-7	9-m	4-7	1-3	1-2	3-6	2-3	1	1
5	4-7(B)	1(L,B)	1(L,B)	1	4-9	1-3	1-2	2-3	2-4	2-7	3-6	4-6(B)
6	4-6(B)	1(L,B)	1(L,B)	1	3-6(L,B)	3-5(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	m(d)	1-S
7	7-11(B)	2-3(L,B)	1(L,B)	7-10(L,B)	2-3(L,B)	3-7	5-9	6-9	6-10	1	1	2-6
8	2-4	2-3(L,B)	5-8(L,B)	m(d)	-	1	1	1	1	2-5	3-8	1-X
9	4-7	1(b)	5-7(L,B)	5-8(L,B)	1-3	1	1	1	1	1	2-5	1-3
10	2-4	1(b)	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-4(b)	3-7	2-4	2-4	4-8	1-3	1-2	1-3	2-3	1-3	1-3	2-3(L)
12	2-4	1(L,B)	1(L,B)	1	1-3	2-3	1-3	1-2	1	1	1	3-X
13	2-3(b)	-	m(d)	4-7(B)	1-3	m(d)	3-5(b)	3-4(B)	3-4(B)	m(d)	3-5	1(L)
14	1	1	m(d)	-	-	-	1-2	1-3	1	1-2	1-2	1-2
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 7 from Hokkaido, 3 from Honshu.

TABLE 58. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) pipiens quinquefasciatus* Say, 1823

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1	1-4	2-5	1-2	1-3(B)	1-3(B)	1-3(B)	2-3(B)	3-4(B)	4-8(B)
2	-	1(L,B)	1-3	1-2	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	2-5	1	1	1	1-2	1	1	1-2	6-8(B)
4	1	2(L,B)	2-3	3-5	6-12	3-7	1-3	1-3	2-4	1-3	1	1
5	4-6(B)	1(L,B)	1(L,B)	1	3-9	2	1-3	1-3	1-3	1-5	3-7	4-5(B)
6	4-6(B)	1(L,B)	1(L,B)	1	3-4(L,B)	2-4(L,B)	2(B)	2(B)	2(B)	2(B)	9-m(d)	1-S
7	8-11(B)	1-3(L,B)	1(L,B)	6-10(L,B)	2(L,B)	3-4(b)	4-8	6-10	4-9	1	1	3-10(b)
8	2-3	1-2(L,B)	5-7(L,B)	m(d)	-	1	1-2	1-2	1-2	3-6	3-6	1-X
9	2-6	1(b)	5-6(L,B)	5-7(L,B)	1-2	1	1	1	1	1	2-6	1
10	2-3	1(b)	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-4	4-7	2-4	2-3	2-5	2-3	1-2	1-3	2	1-3	1-3	2-3(L)
12	2-4	1(L,B)	1(L,B)	1	1-3	1-3	1-2	1-2	1	1	1	3-X
13	2-4(b)	-	m(d)	3-6	1-2	m(d)	2-5(b)	2-3(b)	2-3(b)	m(d)	3-5	1(L)
14	1-2	1	m(d)	-	-	-	1	1-2	1	1-2	1-2	1-2
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 1 from Amami Oshima, 5 from Yaeyama, 4 from Ogasawara.

TABLE 59. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) pipiens pallens* Coquillett, 1898

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1-2	1-6	2-8	2-4	1-2(B)	1-2(B)	1-2(B)	2-3(B)	3-4(B)	5-8(B)
2	-	1(L,B)	2-4	1-3	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	3-6	1	1	1	1-2	1	1	1	5-9(B)
4	1	2(L,B)	1-2	3-6	7-m	3-7	1-5	1-2	2-5	2	1	1
5	5-7(B)	1(L,B)	1(L,B)	1	5-11	1-4	2-3	1-4	1-5	2-8	2-5	3-7(B)
6	4-6(B)	1(L,B)	1(L,B)	1	3-4(L,B)	2-4(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	9-m(d)	1-S
7	8-11(B)	2-3(L,B)	1(L,B)	6-10(L,B)	2(L,B)	3-5(b)	5-7	6-10	4-9	1	1	2-5(b)
8	2-4	2-3(L,B)	5-8(L,B)	m(d)	-	1	1	1	1-2	3-7	3-7	1-X
9	4-7	1(b)	5-7(L,B)	5-8(L,B)	1-4	1	1	1	1	1-2	3-9	1-2
10	2-4	1(b)	1(L,B)	1(L,B)	1-2	1	1	1	1	1	1	2-X
11	2-4	4-7	2-5	2-4	4-8	2-3	1-3	2	2-4	1-4	2-4	2-3(L)
12	2-3	1(L,B)	1(L,B)	1	2-4	1-2	1-3	1-2	1	1	1	3-X
13	2-4(b)	-	m(d)	3-6(b)	1-3	m(d)	3-4(b)	2-4(b)	2-4(B)	m(d)	2-4	1(L)
14	1-2	1-2	m(d)	-	-	-	1-2	1-3	1-4	1-3	1-2	1-3
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L; large sized; m: multiple (with more than ten branches).
Specimens examined: 4 from Hokkaido, 2 from Honshu, 4 from Korea.

TABLE 60. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) pipiens molestus* Forskal, 1775

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	9-m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1	1-2	2-5	1-3	2-3(B)	2-3(B)	2-3(B)	2(B)	3-5(B)	4-8(B)
2	-	1(L,B)	2-4	1	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	2-4	1	1	1	1	1	1	1	6-8(B)
4	1-2	2(L,B)	1-4	2-3	5-11	3-7	1-2	1	2-4	1-2	1	1
5	5-6(B)	1(L,B)	1(L,B)	1	2-4	1-2	1-2	1-3	1-3	1-3	2-4	3-5(B)
6	3-6(B)	1(L,B)	1(L,B)	1	2-4(L,B)	3-5(L,B)	2(L,B)	2-3(L,B)	2(L,B)	2-3(L,B)	m(d)	1-S
7	9-13(B)	2(L,B)	1(L,B)	7-10(L,B)	2(L,B)	3-5	7-10	8-9	6-9	1	1	2-6
8	2-3	2(L,B)	5-7(L,B)	7-m(d)	-	1	1	1	1-2	2-4	3-4	1-X
9	4-5	1(b)	5-7(L,B)	5-8	1-2	1	1	1	1	1	3-4	1
10	2-3	1(b)	1(L,B)	1	1	1	1-2	1	1	1	1	2-X
11	2-3	2-4	1-4	2-3	3-5	2-4	1-2	2-3	2-3	2-3	2-3	2-3(L)
12	2-3	1(L,B)	1(L,B)	1	1-3	1-2	1-2	1	1	1	1	3-X
13	2-3(b)	-	m(d)	3-5	1-2	m(d)	3	2-3	3-4	m(d)	3-4	1(L)
14	1	1-2	m(d)	-	-	-	1	1	1-2	1-3	1-4	1
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 7 from a laboratory colony (Kawasaki strain) of 406th Med. Lab.

TABLE 61. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) tritaeniorhynchus* Giles, 1901

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1	1	3-9	1-2	2-4	3-4	3-5	3-5	5-7	4-7(B)
2	-	1(L,B)	2-4	2-3	1-2	1	1	1	1	1	1	1
3	1	1(L,B)	1	5-9	2-3	1-3	2-3	2-3	1-2	1	3-5	6-8(B)
4	1-2	1-2(L,B)	2-3	3-5	m	4-10	1-3	1-2	5-11	3-4	1-2	1
5	3-4(L,B)	1(L,B)	1(L,B)	1	3-7	2-3	2-3	2-3	2-4	2-5	2-4	5-7(b)
6	2(L,B)	1(L,B)	1(L,B)	1	3-4(L,B)	3-4(L,B)	2(L,B)	2-3(L,B)	2(L,B)	2(L,B)	m	1-S
7	7-10(L,B)	3-4(L,B)	1(L,B)	5-6(L,B)	2(L,B)	5-9	7-12	7-10	7-m	3-4	1-3	2-4
8	3-5	2(L,B)	4-6(L,B)	6-m(d)	-	1	1	2	2	2-5	4-8	1-X
9	3-7	1	4-5(L,B)	4-7(L,B)	2-4	1	1	1	1	1	2-4	2-4
10	1-3	1	1(L,B)	1(L,B)	1	1	1-2	1	1	1	1-3	2-X
11	2	4-7	2-6	4-6	2-5	2-5	1-2	2-3	1-3	2-3	2-5	2-5(L)
12	2-4	1(L,B)	1(L,B)	1-2	1-4	1-3	1-2	1-2	1	1	1	3-X
13	2-3	-	m(d)	6-11	1-3	9-m(d)	3-5	3-5	3-5	m(d)	4-6	1(L)
14	1-2	1	m(d)	-	-	-	1	1	1	1	1	1-2
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 3 from Honshu, 1 from Kyushu, 2 from Korea, 2 from Okinawa, 2 from Yaeyama.

TABLE 62. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) pseudovishnui* Colless, 1957

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1-2	1	1-3	1-2	4-7	4-9	4-10	4-9	6-10	3-6(B)
2	-	1(L,B)	2-5	2-3	1-2	1	1	1	1	1	1	1
3	1	1(L,B)	1	4-7	3-6	2-4	2-3	2-4	1	1-2	3-8	5-8(B)
4	1-3	2-3(L,B)	2-4	2-5	9-m	3-8	2-3	1-2	4-8	2-4	1	1
5	3-4(L,B)	1(L,B)	1(L,B)	1	4-8	2-4	2-4	2-4	2-5	2-4	3-5	4-8(b)
6	2(L,B)	1(L,B)	1(L,B)	1	2-3(L,B)	2-3(L,B)	2-3(L,B)	3(L,B)	2-3(L,B)	2-4(L,B)	9-m	1-S
7	6-12(L,B)	2-4(L,B)	1(L,B)	4-6(L,B)	1(L,B)	4-12(b)	7-m	7-m	8-m	2-5	1-3	3-6
8	3-5	1-3(L,B)	3-5(L,B)	m(d)	-	1-2	1-2	1-2	1-3	3-6	3-8	1-X
9	4-7	1	3-4(L,B)	3-7(L,B)	2-3	1	1	1	1	1	1-3	2-6
10	1-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1-2	2-X
11	2	4-8	2-5	1-3	3-5	2-3	2-3	2-4	2-3	2-5	2-4	3-4(L)
12	2-5	1(L,B)	1(L,B)	2-3	1-2	1-3	2-3	1-3	1-2	1	1	3-X
13	1-3	-	m(d)	6-16	1-4	m(d)	4-8	4-7	4-7	m(d)	4-7	1(L)
14	1-2	1	m(d)	-	-	-	1	1	1	1	1	1
15	3-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 4 from Amami Oshima, 6 from Yaeyama.

TABLE 63. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) sitiens* Wiedemann, 1828

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1-2(L,B)	1-2	1	1-2	1-2	2-4	2-4	2-4	2-4	3-5	5-8(B)
2	-	1-2(L,B)	2-3	1-2	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	2-5	1-2	1-2	1-2	1-2	1	1	1-2	7-11(B)
4	1	2-3(L,B)	2-3	2-5	6-10(b)	3-7	1-2	1-2	3-6	2-3	1	1
5	5-7(B)	1(L,B)	1(L,B)	1	3-6	1-3	1-3	1-3	1-4	1-3	2-4	3-5(b)
6	4-6(B)	1(L,B)	1(L,B)	1	2-3(L,B)	3(L,B)	2(L,B)	2-3(L,B)	2(L,B)	2(L,B)	8-18	1-S
7	6-10(B)	3(L,B)	1(L,B)	5-10(L,B)	1(L,B)	4-6	4-7	5-9	3-6	1-2	1	3-5(B)
8	2-5	2-3(L,B)	4-6(L,B)	m(d)	-	1	1	1-2	1-2	2-3	2-5	1-X
9	2-5	1	4-6(L,B)	5-7(L,B)	1-3	1-2	1	1	1	1	1-5	1-3(b)
10	2-3	1	1(L,B)	1(L,B)	1-2	1	1	1	1	1	1	2-X
11	2-3	3-6	1-3	1-3	2-5	2-3	1-3	2-3	2-3	2-3	2-3	3-7(L)
12	2-4	1(L,B)	1(L,B)	1-2	1-2	1-2	1-3	1-2	1	1	1	3-X
13	2-3	-	m(d)	3-6	1-2	m(d)	2-3	2-3	2-3	m(d)	2-4	1(L)
14	1-2	1	m(d)	-	-	-	1	1	1	1	1-2	1-2
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout
Specimens examined: 10 from Ishigaki Is.

TABLE 64. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) whitmorei* (Giles, 1904)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1-3	2-3	3-6	1-4	5-7	5-7	4-7	4-6	2-5	4-5(B)
2	-	1(L,B)	3-6	2-5	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	4-6	3-4	1-3	1-2	1-3	1	2	3-6	7-9(B)
4	1	1-2(L,B)	3-4	2-4	m	5-6	2-3	1-2	6-9	3-5	1-2	1
5	2(L,B)	1(L,B)	1(L,B)	1	3-5	1-3	2	2-4	2-3	3-5	3-5	2-3(B)
6	2(L,B)	1(L,B)	1(L,B)	1	3(L,B)	3(L,B)	2(L,B)	2-3(L,B)	2(L,B)	1-2(L,B)	m(d)	1-S
7	8-11(L,B)	2-3(L,B)	1(L,B)	5-6(L,B)	1(L,B)	3-8	7-11	5-11	6-12	3	1-2	2(L,B)
8	4-5	2(L,B)	5-7(L,B)	6-m(d)	-	1	1	2	2	2-4	7-11	1-X
9	5-7	2-3	3-5(L,B)	4-6(L,B)	2-5	1	1	1	1	1	2-4	2-3
10	2-5	1	1(L,B)	1(L,B)	1-2	1-2	2	2-3	2-3	2-3	2-3	2-X
11	1-2	3-5	3-4	3-6	1-2	2-3	1-2	2-3	1-3	1-3	2-5	1(L)
12	2-5	1(L,B)	1(L,B)	1	1-2	1-4	1-2	1-3	1-2	1	1	3-X
13	2-4	-	m(d)	4-6(B)	1-2	m(d)	1-3	3-7	3-5	m(d)	4-8	1(L)
14	2-5	1	m(d)	-	-	-	1	1	1	1	1	1
15	5-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 1 from Honshu, 3 from Amami Oshima.

TABLE 65. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) jacksoni* Edwards, 1934

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1-2	1	1-3	1	1-2	1-3(b+)	2-3(B)	2-4(B)	4-6(B)	4-7(B)
2	-	1(L,B)	4-7	2-4	1	1	1	1	1	1	1	1-2
3	1	1(L,B)	1	2-5	1-3	2-3	2	1-3	1-2	1-3	2-4	6-11(B)
4	3-6	1(L,B)	2-4	2-5	8-13	3-6	1-3	1-2	5-6	2-4	1-2	1-2
5	4-6(B)	1(L,B)	1(L,B)	1	4-6	1-3	1-3	1-2	1-3	1-3	2-3	3-5(B)
6	3-4(B)	1(L,B)	1(L,B)	1	3-6(L,B)	3-7(L,B)	3-4(L,B)	3-4(L,B)	2-3(L,B)	2-3(L,B)	11-16	1-S
7	7-11(B)	2-4(L,B)	1(L,B)	5-9(L,B)	1(L,B)	3-6(B)	6-9	6-8	4-8	2-3	1	3-8
8	4-5	2-3(L,B)	5-6(L,B)	m(d)	-	1-2	1-2	2-3	1-3	2-4	3-5	1-X
9	4-8	1	4-7(L,B)	4-6(L,B)	2-3	1	1	1	1	1	2-4	2-4
10	2-4	1	1(L,B)	1(L,B)	1-2	1	1	1	1	1	1	2-X
11	2-4	4-6	2-3	2-4	2-4	2-3	1-3	1-2	2-3	1-2	1-2	2-3(L)
12	2-4	1(L,B)	1(L,B)	1-3	2-3	2-3	1-2	1-2	1-2	1	1	3-X
13	2-3	-	m(d)	3-9	2-3	m(d)	1-2	1-3(b+)	2-4	m(d)	2-5	1-3(L)
14	1	1-2	m(d)	-	-	-	1	1	1	1	1-2	1
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stiff.
Specimens examined: 10 from Korea.

TABLE 66. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) mimeticus* Noë, 1899

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	8-m	-	-	-	1	1	1	1	1-2	1	1
1	1(st)	1(L,B)	1-2	1	1-3	1	1-2	1-2	2	2	3-4	4-6(B)
2	-	1(L,B)	4-6	1-2	1-2	1	1	1	1	1	1	1-2
3	1	1(L,B)	1	2-3	2	1-2	1-2	1-2	1	1	2-3	6-8(B)
4	3-5	1(L,B)	2-4	2-5	6-9	3-5	2-3	1-2	2-5	1-2	1	1
5	2-4(B)	1(L,B)	1(L,B)	1	3-6	1-2	1-2	1-2	1-2	1-2	3-5	2-4(b)
6	2-3(B)	1(L,B)	1(L,B)	1	3(L,B)	3(L,B)	2-3(L,B)	2-4(L,B)	2-3(L,B)	2(L,B)	7-m	1-S
7	4-7(B)	2-3(L,B)	1(L,B)	5-7(L,B)	1(L,B)	3-5(b+)	3-7	5-7	4-6	1	1	3-5
8	2-5	2-3(L,B)	4-6(L,B)	m(d)	-	1	1	1-2	1-3	2-3	2-4	1-X
9	3-5	1	4-6(L,B)	4-6(L,B)	2-3	1	1	1	1	1	1-3	1-2
10	2-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-3	3-7	2-5	2-4	2-3	1-3	1-2	1-2	1-2	2	1-2	2(L)
12	2-3	1(L,B)	1(L,B)	1-2	2-3	1-2	1-2	1-2	1	1	1	3-X
13	2-3	-	m(d)	1-3	1-2	m(d)	1-2	1-2	2-3	m(d)	1-3	1(L)
14	1(sf)	1-2	m(d)	-	-	-	1	1	1	1	1	1
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff; st: stout.
Specimens examined: 1 from Hokkaido, 9 from Honshu.

TABLE 67. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) orientalis* Edwards, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1-2	1-3	3-7	1-3	3-5	4-6	4-7	4-7	5-8	5-8(B)
2	-	1(L,B)	4-9	2-6	1-2	1-2	1-2	1	1-2	1	1-2	1
3	1	1(L,B)	1	4-7	2-4	1-3	1-3	2-3	1-2	1-2	3-7	6-9(B)
4	1-2	1(L,B)	2-3	4-7	m(b^+)	5-8	2-6	2-4	4-8	2-3	1	1
5	3-5(B)	1(L,B)	1(L,B)	1	5-8	2-4	2-3	2-3	2-3	1-4	2-5	5-7(B)
6	2-3(B)	1(L,B)	1(L,B)	1	3-4(L,B)	3-4(L,B)	2-3(L,B)	2-3(L,B)	2(L,B)	2(L,B)	7-m	1-S
7	7-9(B)	2-4(L,B)	1(L,B)	4-7(L,B)	1-2(L,B)	5-9(b^+)	7-14	8-13	7-14	2-3	1	3-6
8	3-7	2-3(L,B)	4-6(L,B)	m(d)	-	1-2	1-2	2-4	2-4	2-5	3-6	1-X
9	3-7	1-2	4-5(L,B)	5-7(L,B)	4-5	1	1	1	1	1	2-3	2-4
10	2-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	1-3	5-11	2-5	3-5	2-7	2-4	2-3	2-4	3-5	2-5	2-4	2-4(L)
12	2-5	1(L,B)	1(L,B)	2-4	2-3	2-3	2-4	1-3	1	1	1	3-X
13	2-3	-	m(d)	8-m	2-4	m(d)	4-6	4-6	4-6	m(d)	3-6	1(L)
14	1-2	1	m(d)	-	-	-	1-2	1	1-2	1-2	1-2	1
15	3-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 5 from Hokkaido, 5 from Honshu.

TABLE 68. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) boninensis* Bohart, 1956(1957)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1-5	1-3	1-4	1-3	2-4	2-4	2-4	2-4	2-4	5-7(B)
2	-	1(L,B)	2-4	1-2	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	3-4	1-2	1-2	1	1	1-2	1	2-4	7-10(B)
4	1	1(L,B)	2	2-5	7-12(b)	3-6	1-4	1	4-6	1-2	1	1
5	2-4(B)	1(L,b)	1(L,b)	1	3-7	1-4	1-5	1-3	1-2	1-3	2-5	4-5(b)
6	1-2(B)	1(L,b)	1(L,b)	1	2-3(L,B)	3(L,b)	2(L,b)	2-3(L,b)	2(L,b)	2(L,b)	12-21	1-S
7	6-10(B)	2-3(L,B)	1(L,B)	4-9(L,B)	1-2(L,B)	3-7	5-9	6-9	6-9	2	1	6-13
8	2-4	2-3(L,b)	4-7(L,B)	m(d)	-	1	1	1-3	2	1-4	3-7	1-X
9	2-3	1	3-5(L,B)	3-6(L,B)	2-4	1	1	1	1	1	2-4	1-3
10	1-3	1	1(L,b)	1(L,b)	1	1	1	1	1	1	1	2-X
11	1-3	3-6	2-4	2-3	2-6	1-3	2-4	1-3	2	1-2	2-4	2-3(L)
12	1-3	1(L,b)	1(L,b)	1-4	1-2	1-2	1-2	1-2	1	1	1	3-X
13	1-3	-	m(d)	7-10(b)	1-2	m(d)	2-4	2-4	2-5	m(d)	3-5	1(L)
14	1-2	1	m(d)	-	-	-	1	1	1	1-2	1	1-2
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches).
Specimens examined: 10 from Bonin Islands.

TABLE 69. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) bitaeniorhynchus* Giles, 1901

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1	1	1-3	1-2	2-3	2-4	2-4	2-4	1-3	5-7(B)
2	-	1(L,B)	2-6	2-3	1-2	1	1	1	1	1	1	2-4
3	1	1(L,B)	1	3-6	2-3	2-3	2-3	2-3	1-3	2-4	2-3	5-8(B)
4	1-3	1-2(L,B)	2-3	4-7	7-m	3-7	1-3	1-2	4-8	2-4	2-3	2
5	2-3(B)	1(L,B)	1(L,B)	1	4-6	2-3	2-3	1-3	1-3	1-2	1-3	3-4(b)
6	1-3(B)	1-2(L,B)	1(L,B)	1-2	3(L,B)	3(L,B)	3-5(L,B)	3-4(L,B)	2-3(L,B)	2-3(L,B)	m	1-S
7	4-5(B)	3(L,B)	1(L,B)	6-8(L,B)	1(L,B)	4-6(b)	6-10	5-9	4-7	2-3	2	2-4
8	2-4	2(L,B)	5-6(L,B)	m(d)	-	1	1	1-2	2	2	3-6	1-X
9	2-6	1-3	5-8(L,B)	5-9(L,B)	2-4	1	1	1	1	1	1-2	1-4
10	2-3	1-2	1(L,B)	1(L,B)	1-2	1-2	2-3	2	1-2	1-3	2-4	2-X
11	1-2	4-5	2-4	2-4	2-3	2-3	1-2	2	2	2	1-2	3-6(L)
12	2-4	1(L,b)	1(L,B)	1-2	1-3	1-3	2	1-2	1	2-3	2-3	3-X
13	1-3	-	m(d)	3-5	1-3	8-m(d)	2-3	2-3	2-3	m(d)	2-3	1(L)
14	1	1	m(d)	-	-	-	1	1	1	1	1	1
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 6 from Honshu, 2 from Amami Oshima, 2 from Yaeyama.

TABLE 70. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culex) sinensis* Theobald, 1903

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	?	?	?	?	?	?	?
1	1(sf)	1(L,B)	1-2	1	1	1	2-3	4	4	2-4	3	4-6(B)
2	-	1(L,B)	2-4	4	1	1	1	1	1	1	1	1-4
3	1	1(L,B)	1-2	5	3-4	4	2-3	3-4	3	2	4	5-9(B)
4	1	2-3	2-5	3	m	4-5	2-3	2	8	5	3-4	2-3
5	2-3(B)	1(L,B)	1(L,B)	1	4	2	?	2	1-2	1	3	3-4
6	2(B)	1(L,B)	1(L,B)	2	3-4(L,B)	3-5(L,B)	2-4(L,B)	2-3(L,B)	2(L)	2(L)	m(d)	1-S
7	3-5(B)	3(L,B)	1(L,B)	5-9(L,B)	1	4-5	7	9	4-7	2	2-3	2-3
8	2-4	1(L,B)	4-6(L,B)	m(d)	-	2	2	2	2	1-2	4	1-X
9	3-5	1-2	5-8(L,B)	5-7(L,B)	2	1	1	1	1	1	2	2-3
10	2-3	1-2	1(L,B)	1(L,B)	1-2	1	2	2	2	2	4	2-X
11	1-2	5	2-3	4	2-3	2	2-3	2	2	2	1	3-4(L)
12	2-3	1(L,B)	1(L,B)	1-2	1-2	3	1-2	1-3	1	2-3	2	3-X
13	2-3	-	m(d)	3-5	2-3	m(d)	2	2	3	m(d)	4-5	1(L)
14	1	1	m(d)	-	-	-	?	1	?	1	?	1
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 1 from Okinoerabu Is., Ryukyu Arch. A part of the data obtained from LaCasse and Yamaguti (1950).

TABLE 71. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Neoculex) rubensis* Sasa and Takahashi, 1948

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	9-14(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	2-4	1-3	1	1	3-4	3-5	3-5	2-5	4-7	4-7(B)
2	-	1(L,B)	2-3	2-3	1	1	1	1	1	1	1	1
3	1	2-6(B)	1-2	4-6	2-3	1-2	2-3	2-3	1	1	2-4	6-11(B)
4	1-2	1-2(L,B)	2-4	2-4	7-12(b^+)	2-4	1-2	1	3-7	2-4	1	1
5	1-2(L,B)	1(L,B)	1(L,B)	1	2-4	1	1	1-2	1-2	1-2	1-4	3-4(B)
6	2(L,B)	1(L,B)	1(L,B)	1	3-4(L,B)	2-4(L,B)	2-3(L,B)	2-3(L,B)	2(L,B)	2(L,B)	7-17(d)	1-S
7	6-9(B)	2-4(L,B)	1(L,B)	5-7(L,B)	1-3(L,B)	2-7	5-8	5-10	5-7	2-3	1-2	1-4
8	3-5	1-2(L,B)	4-6(L,B)	m(d)	-	1	1	2-3	2-3	2-3	3-7	1-X
9	5-8	1	4-6(L,B)	5-7(L,B)	2-3	1	1	1	1	1	1-2	2-5
10	2-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1(b^+)	2-X
11	2-5	3-6	2-3	1-3	2-3	1-3	1-2	1-2	1-2	1-2	1-2	2-5(L)
12	4-7	1(L,B)	1(L,B)	1-2(f)	1-3	2-4	1	1	1	1	1	3-X
13	3-7	-	m(d)	4-9	2-3	7-15(d)	2-4	2-5	3-6	m(d)	3-6	1(L)
14	2-3	2-3	m(d)	-	-	-	1	1	1	1	1	1
15	3-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b^+: barbing variable; d: dendritic; f: frayed; L: large sized; m: multiple (with more than ten branches); st: stiff.
Specimens examined: 21 from Hokkaido.

TABLE 72. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Eumelanomyia) hayashii hayashii* Yamada, 1917

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1-2	1	1-2	1-2	3-5	4-6	3-6	2-5	4-7	4-7(B)
2	-	1(L,B)	2-4	2-4	1	1	1	1	1	1	1	1
3	1	1-2(B)	1-3	3-6	1-4	1-3	2	1-2	1	1	2-5	6-10(B)
4	2-3	2-4	2-4	2-4	8-12	4-8	1-3	1-3	4-7	2-3	1	1
5	1-3	1-2(L,B)	1(L,B)	1	2-4	2-3	1-3	1-2	1-2	1-2	2-4	2-3(B)
6	2-4(b)	1(L,B)	1(L,B)	1-2	2(L,B)	2(L,B)	3(L,B)	3(L,B)	3(L,B)	3(L,B)	7-11	1-S
7	5-8(B)	2(L,B)	1(L,B)	5-7(L,B)	1(L,B)	3-6	5-9	5-9	5-7	3-5	1	3-7(b)
8	3-6	1(L,B)	3-5(L,B)	m(d)	-	1-2	2-3	2-3	2-3	2-4	3-6	1-X
9	3-6	1	4-6(L,B)	5-7(L,B)	2-3	1	1	1	1	1	2-3	2-4
10	2-5	1	1(L,B)	1*(L,B)	1	1	2	2	1	1	1(B)	2-X
11	1-3	3-5	1-3	2-4	1-3	1-4	1-3	1-3	1-3	2-3	2-4	2-5(L)
12	3-6	1(L,B)	1(L,B)	1-2*	1-2	1-2	2-4	1-3	1	1	1	3-X
13	1-2	-	m(d)	6-9	2-3	m(d)	2-3	2-3	2-4	m(d)	2-5	1(L)
14	2-6	1-2	m(d)	-	-	-	1	1	1	1	1-2	1
15	6-12	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stiff; *: see text.
Specimens examined: 17 from Honshu.

TABLE 73. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Eumelanomyia) okinawae* Bohart, 1953

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1-2	1-2	2-3	2-4	3-4	2-4	2-4	2-4	4-5	4-6(B)
2	-	1(L,b)	3-4	2-3	1	1	1	1	1	1	1	1
3	1	1(B)	1-2	2-5	1-3	1-2	1	1	1	1	2-5	7-9(B)
4	1-2	1-2	2-3	3-4	8-10	7-8	2-3	1-2	4-5	2	1	1
5	1-2	1(L,B)	1(L,B)	1	3-5	3-5	2-3	2-4	2-3	2-3	2-4	2(b)
6	2(B)	1(L,b)	1(L,B)	1	2(L,B)	2(L,B)	2(L,B)	2-3(L,B)	2(L,B)	2(L,B)	8-12	1-S
7	5-6(B)	1-2(L,B)	1(L,B)	6-7(L,B)	1(L,B)	3-7	6-7	6-7	4-7	2-4	1	3-6
8	2-4	1(L,B)	2-4(L,B)	5-8	-	1	2	2	2-3	2-3	2-4	1-X
9	3-4	1	3-5(L,B)	5-6(L,B)	2-3	1	1	1	1	1	2-3	4-6
10	2-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-4	4-5	1-3	2-3	1-2	2-3	1-2	1-2	1-2	1-2	2-3	1(L)
12	3-5	1(L,B)	1(L,B)	1(f)	1-3	1-2	2-3	1-2	1	1	1	3-X
13	3-4	-	m(d)	4-6	1-4	m(d)	1-2	1	1	m(d)	1-2	1(L)
14	3-4	1-2	m(d)	-	-	-	1	1	1	1	1	1
15	6-9	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; f: frayed (see text); L: large sized; m: multiple (with more than ten branches); st: stiff.
Specimens examined: 4 from Okinawa.

TABLE 74. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Eumelanomyia) brevipalpis* (Giles, 1902)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	8-m	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1-3	2-4	1-4	2-5	3-7	4-9	5-9	3-5	3-7	2-4(B)
2	-	1(L)	2-4	1-2	1	1	1	1	1	1	1	1
3	1	1-2(b)	1	4-7	2-5	2-4	1-2	2-5	1	1	3-7	4-6(B)
4	1	1-3(L,B)	1-2	2-4	8-11	4-7	1-2	2	6-8	3-4	1	1
5	2(L,B)	1(L,B)	1(L,b)	1	2-4	2-4	2-7	3-5	2-8	2-5	2-5	1(B)
6	2-3(L,B)	1(L,b$^+$)	1(L,B)	1	2(L,B)	2-3(L,B)	1-2(B)	1-2(B)	1-2(B)	1(L,b)	m(d)	1-S
7	3-9(B)	1-2(L,B)	1(L)	6-8(L,B)	1-2(L,B)	4-6	5-9	6-9	4-10	3-6	3-5	3-5
8	1-2	1(B)	4-5(L,B)	9-m	-	1-2	2	2	2-3	2-6	7-m	1-X
9	5-9	1-2	4-5(L,B)	6-8(L,B)	1-3	1	1	1	1	1	2-4	4-6
10	1-2	1	1(L)	1(L,B)	1	1	1-2	1-2	1	1	2-3	2-X
11	4-6(B)	2-5	1-3	2-4	1-4	2-3	1-2	1-3	1-3	1-2	1	1(L)
12	5-7	1(L)	1(L)	1-2	2-3	2-3	1-2	1-2	1	1	1	3-X
13	4-7(B)	-	m(d)	6-m	2	8-m(d)	3-8	4-9	4-10	m(d)	4-9	1(L)
14	5-7(d)	1-2	m(d)	-	-	-	1	1	1	1	1	1
15	3-8	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b$^+$: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 10 (30 for important hairs) from Iriomote Is.

TABLE 75. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Lophoceraomyia) infantulus* Edwards, 1922

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	10-15(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1	1-2	1-2	1-2	2-4	3-4	4-5	3-5	6-7	4-6(B)
2	-	1(L,B)	3-5	2-3	1	1	1	1	1	1	1	1-2
3	1	1-2(B)	1	3-5	2-4	1-2	1-2	1-2	1-2	1	2-4	6-8(B)
4	1-2	1-2(L,B)	2-3	3-5	5-m	4-9	2-3	1-2	3-5	2	1	1
5	2(L,B)	1(L,B)	1(L,B)	1	3-6	1-3	2-3	1-2	1-2	1-2	2-4	4-6(b)
6	2(L,B)	1(L,B)	1(L,B)	1	3(L,B)	1-3(L,B)	3-4(B)	4-5(B)	3-4(B)	3-4(B)	9-m	1-S
7	5-8(B)	2-3(L,B)	1(L,B)	5-8(L,B)	2(L,B)	3-5	4-7	4-8	4-6	1	1	1-3
8	2-5	2(L,B)	4-5(L,B)	6-m	-	1-2	2	2-3	1-2	2-4	3-6	1-X
9	3-6	1	4-6(L,B)	4-7(L,B)	2-4	1	1	1	1	1	3-4	2-3
10	2-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1-2	2-X
11	3-5	3-6	2	2-4	2-3	3-4	2-3	2-3	1-2	1-3	2-3	2-4(L)
12	4-8	1(L,B)	1(L,B)	1-3	1-4	1-2	2-4	1-2	1	1	1	3-X
13	4-6	-	m(d)	5-7	1-3	m(d)	3-4	3-4	3-5	m(d)	3-4	1(L)
14	2-3	2-3	m(d)	-	-	-	1	1	1	1	1	1
15	3-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 4 from Okinawa, 6 from Yaeyama.

TABLE 76. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Lophoceraomyia) rubithoracis* (Leicester, 1908)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1	1	1	1	4-6	5-7	5-8	4-7	6-9	4-6(B)
2	-	1(L,B)	4-6	3-4	1	1	1	1	1	1	1	1-2
3	1	3-7(B)	1	5-7	3-5	2-3	2-3	3-5	3	1-3	3-6	6-9(B)
4	2-4	2(L,B)	2-4	4-6	m	5-8	2-3	1-2	7-12	3-5	2-3	1
5	2(L,B)	1(L,B)	1(L,B)	1	3-6	2-3	1-3	1-2	1-3	1-3	1-3	4-6(B)
6	1-2(L,B)	1(L,B)	1(L,B)	1	3(L,B)	3(L,B)	5-6(B)	4-5(B)	4-5(B)	4-5(B)	m	1-S
7	8-12(B)	2-3(L,B)	1(L,B)	6-7(L,B)	1(L,B)	6-9	9-13	6-11	7-11	2-4	1-2	1-4
8	5-7	2(L,B)	3-6(L,B)	6-m	-	1-2	1-3	2	2	2-4	5-8	1-X
9	6-11	1-2	4-6(L,B)	6-7(L,B)	3-4	1	1	1	1	1	2-3	3-5
10	2-3	1	1(L,B)	1(L,B)	1	1	1-2	1-2	1	1	2	2-X
11	3	5-7	2-3	2-5	2-4	2-4	2-3	2-4	2-3	2-4	2-4	2-3(L)
12	5-7	1(b)	1(L,B)	2	1-3	2-4	2-4	1-2	1	1	1	3-X
13	3-4	-	m(d)	9-14	2-3	m(d)	3-4	4-7	4-7	m(d)	4-7	1(L)
14	2-4	1-2	m(d)	-	-	-	1	1	1	1	1	1
15	4-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 10 from Amami Ôshima.

TABLE 77. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Lophoceraomyia) bicornutus* (Theobald, 1910)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	1	1-2	1	2	3	3	2-3	2-3	3-4	3-4(B)
2	-	1(L,B)	2-4	2-4	1	1	1	1	1	1	1	1
3	1	1(B)	1	3-6	3-4	2-3	1-2	2-3	1	1	1-2	4-7(B)
4	1	2(L,B)	2-5	2-4	10-14	5-7	1-2	1-2	5-6	3-4	1-2	1
5	2-3(L,B)	1(L,B)	1(L,B)	1	3-7	2-3	1-3	1-2	1-2	1-3	2-4	4-7(B)
6	2-3(L,B)	1(L,B)	1(L,B)	1	2(L,B)	2(L,B)	2-3(L,B)	2-3(L,B)	2-3(L,B)	2-3(L,B)	8-14	1-S
7	6-8(B)	1-3(L,B)	1(L,B)	4-6(L,B)	2-3(L,B)	4-9	6-10	6-9	5-9	2-3	1-2	2-4
8	2-5	1(L,B)	3-4(L,B)	5-m	-	1	2-3	2-3	2-4	2-4	4-6	1-X
9	4-8	1	4(L,B)	3-5(L,B)	2-5	1	1-2	1	1	1	3-4	4-5
10	1-3	1-2	1(L,B)	1(L,B)	1-2	1	1-2	1	1	1	1-2	2-X
11	4-9	4-7	2-4	2-4	2-4	1-3	2	1-2	1-2	1-2	1-3	2-3(L)
12	5-6	1(L,B)	1(L,B)	1	2-4	2-4	1-2	1	1	1-3	1	3-X
13	5-6	-	m(d)	4-5	1-3	m(d)	2-5	2-5	2-4	m(d)	2-4	1(L)
14	2	2	m(d)	-	-	-	1	1	1	1	1-2	1
15	3-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 5 from Ishigaki Is., 5 from Iriomote Is.

TABLE 78. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Lophoceraomyia) tuberis* Bohart, 1946

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	9-m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	1	1	1	2	1-3	1-2	1-2	2-3	2	2-3
2	-	1(L,B)	1-3	2-3	1	1	1-2	1	1	1	1	1
3	1	1	1	3-5	2-4	1-3	1-2	1-2	1	1	2-4	6-8(B)
4	1-2	1-2(L,B)	1-3	3-5	7-10	3-7	1-2	1-2	3-7	2-4	1	1
5	1-2(L,B)	1(L,B)	1(L,B)	1	3-6	1-3	1-2	1-2	1-2	1-2	1-2	2-3
6	1(L,B)	1(L,B)	1(L,B)	1	2-5(L,B)	2-5(L,B)	2(B)	2-3(B)	2-3(B)	2-3(B)	9-13	1-S
7	3-5(B)	2(L,B)	1(L,B)	5-7(L,B)	1(L,B)	3-6	4-7	3-8	3-6	3-4	2-4	2
8	2-3	1-4(B)	4-5(L,B)	6-m?(d)	-	1-2	1-2	2-3	2-3	2-4	3-7	1-X
9	3-5	1	4-6(L,B)	4-7(L,B)	1-2	1	1	1	1	1	1-4	2-5
10	2-4	1	1(L,B)	1(L,B)	1	1-2	1-2	1-2	1	1	1-2	2-X
11	4-6	2-6	3-5	2-5	2-3	1-4	1-2	1-3	1-4	1-3	2-4	2-4(L)
12	4-7	1(L,B)	1(L,B)	2-3	2-4	2-3	2-3	1-2	1	1	1	3-X
13	4-5	-	m(d)	2-6	2-3	6-11(d)	2-3	2-3	1-3	m(d)	2-6	1(L)
14	4-7	2-4	m(d)	-	-	-	1	1	1	1-2	1-2	1
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 5 from Ishigaki Is., 5 from Iriomote Is.

TABLE 79. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culiciomyia) ryukyensis* Bohart, 1946

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	2(L,B)	2-4	2-3	2-5	2-4	1-2	1(L,b+)	1(L,b+)	1	1-2(B)	4-6(B)
2	1	1(L,B)	2-5	1-3	1-2	1	1	1	1	1	1	1
3	1	1-2(B)	1	2-5	2-3	1-2	1	2-4	1	2-3	2-3	6-9(B)
4	1-3(b+)	2(L,B)	1-3	2-5	7-m	4-8	1-4	1-3	3-6	1-3	1	1
5	3-4(B)	1(L,B)	1-2(L,B)	1	4-8	1-4	1-3	1-3	1-3	1-3	2-4	2(b)
6	3-4(B)	1(L,B)	1(L,B)	1	2-3(L,B)	2-3(L,B)	1-2(L,B)	2-4(L,B)	1-2(L,B)	1(L,B)	m(d)	1-S
7	5-8(B)	2(L,B)	1(L,B)	4-7(L,B)	2-3(L,B)	2-4(b)	4-7	5-10	4-7	1	1	1-4
8	1-2	2(L,B)	4-5(L,B)	m(d)	-	1	1	1	1	2-5	4-7	1-X
9	3-6	1	3-5(L,B)	4-6(L,B)	2-4	1-2	1	1	1	1	1-3	1
10	2-3	1	1(L,B)	1(L,B)	1	1	1	1-2	1	1	1	2-X
11	3-5	3-5	1-4	1-4	2-5	1-3	2-3	2-3	2-4	1-4	2-4	1(L)
12	2-5	1(L,B)	1(L,B)	1	1-2	2-3	1-2	1-2	1-2	1	1	3-X
13	4-7(B)	-	m(d)	4-6	1-3	m(d)	2-5	3-6	3-5	m(d)	2	1(L)
14	1-2	1-2	m(d)	-	-	-	1	1	1	1	1	1
15	4-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 1 from Amami, 11 from Okinawa, 4 from Yaeyama.

TABLE 80. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culiciomyia) nigropunctatus* Edwards, 1926

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	3-5	2-4	3-5	2-4	3-5	1(L,B)	1(L,B)	1	1(L,B)	4-7(B)
2	1	1(L,B)	3-6	1-2	1-2	1	1	1	1-2	1	1	1
3	1	1(B)	1	2-3	1-2	1	1-2	1-2	1	2-4	1-3	5-8(B)
4	1	1-2(B)	1-2	3-5	4-7	4-6	1-3	1-3	3-6	1-2	1	1-2
5	3-5(B)	1(L,B)	1(L,B)	1-2	4-7	3-5	3-5	4-6	3-5	3-5	2-4	1-2(B)
6	3-4(B)	1(L,B)	1(L,B)	1	2-4(L,B)	3-4	1(L,B)	1(L,B)	1(L,B)	1(L,B)	m(d)	1-S
7	5-8(B)	2-3(L,B)	1(L,B)	7-9(L,B)	2(L,B)	2-5(b+)	4-6	5-8	4-7	1	1	1-3
8	1-2	2(L,B)	4-6(L,B)	m(d)	-	1	2	2	2-3	2-4	3-6	1-X
9	2-4	1	4-6(L,B)	4-6(L,B)	3-4	1	1	1	1	1	2-3	1
10	2-3	1	1(L,B)	1-2(L,B)	1	1	1	1	1	1	1	2-X
11	3-5	4-6	1-2	1-2	3-4	2-3	1-3	2-3	2-3	2-3	2-4	1(L)
12	3-6	1(L,B)	1(L,B)	1	1-3	1-2	2-3	2-3	1	1	1	3-X
13	4-6(b)	-	m(d)	3-8	1-2	5-14	2-7	3-7	2-6	m(d)	2-3	1(L)
14	1-2	1-3	m(d)	-	-	-	1	1	1-2	1	1	1
15	4-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Yaeyama Gunto.

TABLE 81. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culiciomyia) pallidothorax* Theobald, 1905

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	2(L,B)	2-5	1-2	1-2	1-2	2-3	1(L,b+)	1(L,b+)	1	1(b+)	4-8(B)
2	1	1(L,B)	3-4	2-3	1	1	1	1	1	1	1	1
3	1	2-3(B)	1	3-5	2-4	1-2	1-2	1-3	1	2-6	2-4	7-8(B)
4	1	2(L,B)	2-4	3-5	9-15	3-6	2-4	1-3	2-4	2	1	1
5	2-3(B)	1(L,B)	1(L,B)	1	3-6	1-2	1-2	1-3	1-2	1-3	2-3	2(b)
6	2-4(B)	1(L,B)	1(L,B)	1	2(L,B)	2(L,B)	1(L,B)	1-2(B)	1(L,b+)	1(L,B)	m	1-S
7	6-8(B)	2-3(L,B)	1(L,B)	6-7(L,B)	2(L,B)	2-5(b+)	2-6	4-9	4-7	1	1	2-5
8	1-2	2-3(L,B)	4-5(L,B)	m(d)	-	1	1	1	1	2-5	4-7	1-X
9	3-6	1	3-5(L,B)	5-7(L,B)	1-4	1	1	1	1	1	2-3	2-4
10	1-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-3	3-5	2-3	2-4	2-5	2-4	1-2	2-3	2-4	2-3	2-4	1(L)
12	2-4	1(L,B)	1(L,B)	1	1-2	1-2	1-2	1-3	1	1	1	3-X
13	2-6(b+)	-	m(d)	6-10	1-2	m(d)	2-5	2-4	3-4	m(d)	2-5	1(L)
14	1-2	1	m(d)	-	-	-	1	1	1	1	1	1
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Taiwan.

TABLE 82. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culiciomyia) kyotoensis* Yamaguti and LaCasse, 1952

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	2(L,B)	1-4	2-4	3-7	2-3	1-3	1-2(L,B)	1(L,B)	1-2	1-2(B)	5-8(B)
2	1	1(L,B)	2-5	1-2	1	1	1	1	1	1	1	1
3	1	2-3(B)	1-2	2-4	1-2	1-2	1	1-2	1	2-3	1-3	7-9(B)
4	1-2	2(L,B)	2	4-6	9-13	4-6	2-4	1-3	4-6	2-3	1	1
5	2-5(B)	1(L,B)	1(L,B)	1	4-7	2-4	2-4	1-3	1-3	1-3	1-3	1-3(B)
6	2-5(B)	1(L,B)	1(L,B)	1	2(L,B)	2(L,B)	1-2(L,B)	2-3(L,B)	2-3(L,B)	1(L,B)	10-18(d)	1-S
7	5-10(B)	2(L,B)	1(L,B)	4-9(L,B)	2(L,B)	2-5(B)	4-6	5-9	4-7	1	1	1-3
8	1-3	1-2(L,B)	3-6(L,B)	m(d)	-	1	1-2	1	1	2-5	3-6	1-X
9	3-7	1	3-5(L,B)	4-7(L,B)	2-4	1	1	1	1	1	1-3	1
10	2	1	1(L,B)	1(L,B)	1	1	1	1-2	1	1	1	2-X
11	4-7	3-5	2-3	2-3	3-4	2-4	2-3	2-4	2-4	2-3	2-3	1(L)
12	3-5	1(L,B)	1(L,B)	1	1-3	1-2	1-3	1-2	1	1	1	3-X
13	4-8(B)	-	m(d)	3-7	1-2	m(d)	2-4	3-4	2-4	m(d)	2-3	1(L)
14	1-2	1-2	m(d)	-	-	-	1	1	1	1	1	1-2
15	3-6	-	-	-	-	-	-	-	-	-	-	

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 20 from Honshu.

TABLE 83. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Culiciomyia) sasai* Kano, Nitahara and Awaya, 1954

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	2(L,B)	2-4	2-3	1-3	1-3	2-5	1(L,B)	1(L,B)	1-2	1(L,B)	2-6(B)
2	1	1(L,B)	2-4	2-4	1-2	1	1	1	1	1	1-2	1
3	1	2(B)	1-3	3-5	2-3	1-3	1-2	1-3	1	2-6	2-4	7-11(B)
4	1-3	2(L,B)	1-3	2-5	7-12(b)	3-5	2-4	1-5	3-6	2-4	1	1
5	2-4(B)	1(L,B)	1-2(L,B)	1	2-7	1-3	1-3	2-4	2-4	2-4	1-3	1-2(b)
6	2-4(B)	1(L,B)	1(L,B)	1	2-3(L,B)	2-4(L,B)	2(L,B)	2-3(L,B)	2(L,B)	1(L,B)	8-19	1-S
7	6-8(B)	2-3(L,B)	1(L,B)	5-8(L,B)	2-3(L,B)	3-6(B)	4-6	5-9	4-7	1	1	2-6
8	1-2	1-3(L,B)	5-6(L,B)	m(d)	-	1	1	1	1	2-4	3-7	1-X
9	2-4	1	4-6(L,B)	5-7(L,B)	2-4	1	1	1	1	1-2	1-4	1
10	1-2	1	1(L,B)	1(L,B)	1	1	1-2	1	1	1	1	2-X
11	3-4	3-6	1-3	1-3	3-7	2-3	1-4	2-3	2-4	1-5	2-4	1-2(L)
12	2-4	1(L,B)	1(L,B)	1	1-3	2-4	1-2	1	1-2	1	1	3-X
13	2-5	-	m(d)	3-9	1-2	m(d)	3-5	2-5(b^+)	2-5	m(d)	2-4	1(L)
14	1-2	1	m(d)	-	-	-	1	1	1	1	1-2	-
15	2-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 31 from Mt. Fuji.

TABLE 84. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Barraudius) inatomii* Kamimura and Wada, 1974

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1-2
1	1	1(L,B)	1-2	1-2	1-6	1-2	4-5	4-6	4-6	3-6	4-7(b)	5-8(B)
2	-	1(L,B)	1-3	2-3	1	1	1	1	1	1	1	1
3	1	1(L,B)	1	3-6	2-3	1-2	1-2	1-2	1	1	2-6	6-9(B)
4	1-2	1-2(L,B)	1-3	2-5	6-11(b)	4-7	2-4	1-2	3-6	2-3	1	1-2
5	2-4(B)	1(L,B)	1(L,B)	1	3-8	1-3	1-3	1-3	1-3	1-4	2-6	4-5(B)
6	2-3(B)	1(L,B)	1(L,B)	1	3(L,B)	3-4(L,B)	3(L,B)	3-4(L,B)	3-4(L,B)	3-4(L,B)	8-m	1-S
7	5-9(B)	2-3(L,B)	1(L,B)	5-7(L,B)	2(L,B)	4-7(B)	4-8	4-7	5-7	1-2	1	6-12
8	3-7	2-3(L,B)	4-6(L,B)	m	-	1-2(b)	1-2	2	2-3	2-5	4-7	1-X
9	4-6	1(b)	3-5(L,B)	4-7(L,B)	2-3	1	1	1	1	1	2-5	1-2
10	2-3	1(b)	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	1-3	2-5	3-4	2-4	4-14(d)	1-3	2	2	1-3	1-3	1-3	2-4(L)
12	3-5	1(L,B)	1(L,B)	1(b)	2-4	2-3	1-2	1-2	1	1	1	3-X
13	2-4	-	m(d)	5-9	1-3	m(d)	2-5(b)	3-5(b-B)	3-5(b-B)	m(d)	3-5(b)	1(L)
14	1-3	1-3	m(d)	-	-	-	1	1	1-2	1	1-2	1-2
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches).
Specimens examined: 10 from Utoma, Okayama Pref., Honshu.

TABLE 85. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Lutzia) fuscanus* Wiedemann, 1820

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	7-9	-	-	-	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1-2
2	-	1	2	1-2	1	1	1	1	1	1	1	1-3
3	1	1	1	1-4	1	1	1	1	1	1	1	8-10(B)
4	2-4	1	1	3-5	2-5(B)	2-5	1-2	1-2	2-3	1	1	1
5	1(L)	1	1(L,b)	1	2-4	1	1	1	1	1	1-3	1-2(b)
6	1(L)	1	1(L,b)	1	2(L,B)	2(L,B)	3-5(L,B)	3-4(L,B)	2-4(L,B)	1-2(B)	3-6	1-S
7	1-2	1(b)	1(L,b)	7-13(L,B)	3-4(L,B)	3-7(L,B)	1-4(b)	2-5(b)	2-5	1	1	1-2
8	1-2	2-4(B)	6-9(L,B)	5-10	-	2-3(b)	1-3(b)	1-3(b)	2-4	2-4	3-5	1-X
9	3-5	1	3-4(L,B)	3-6(L,B)	2-4	1	1	1	1	1	1-2	1-2
10	1-2	1	1(L,b)	1(L,b)	1	1	1	1	1	1	1	2-X
11	1	2-5	1-4	1-2	2-5	2	1-3	1-4	1-3	1-3	1	1(L)
12	3-7	1(L)	1(L)	1	1	1	2-3	2-3	1-2	1	1	3-X
13	1	-	8-15	4-8(b)	1-2	3-11	1	1	1	6-10	1(b)	1(L)
14	1-2	1-3	m	-	-	-	1	1	1	1	1	1
15	1-2	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 1 from Okinawa Is., 9 from Taiwan.

TABLE 86. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Lutzia) halifaxii* Theobald, 1903

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	3-9	-	-	-	1	1	1	1	1	1	1
1	1	1	1-2	1	1	1	1-2	1(b)	1(b+)	1	1	1
2	-	1	2	1-2	1	1	1	1	1	1	1	1
3	1	1	1	2-4	1	1	1	1	1	1	1-2	7-13(B)
4	2-5	1	1	2-5	2-4	2-3	1-2	1-4	2-4	1	1	1
5	1	1	1(L,b)	1-3	2-3	1-2	1	1-2	1-2	1	1-3	1-2(B)
6	1	1	1(L,b)	1	2-3(L,B)	2-3(L,B)	3-5(L,B)	2-5(L,B)	2(L,B)	1-2(L,B)	3-9	1-S
7	1	1-2	1(B)	8-12(L,B)	3-6(L,B)	3-6(L,B)	1-3(b+)	2-5(b+)	2-5	1	1	1-3
8	2	2-5(B)	5-10(L,B)	6-12	-	1-2(B)	1-2(B)	1-2(B)	1-4	2-4	2-6	1-X
9	6-10	1(b+)	3-5(L,B)	3-8(L,B)	2-4	1	1	1	1	1	1-3	1
10	2-3	1	1(L,b)	1(L,B)	1	1	1	1	1	1	1	2-X
11	1	2-5	1-4	1-3	2-4	1-2	1-3	1-3	1-3	2-3	1	1(L)
12	4-7	1	1(L)	1	1	1	1-3	1-3	1-2	1	1	3-X
13	1	-	9-15	3-6(B)	1-2	4-8	1-2	1-2	1	7-12	1(b+)	1(L)
14	1	1	8-13	-	-	-	1	1	1	1	1	1
15	1	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized:
Specimens examined: 7 from Honshu, 3 from Kyushu.

TABLE 87. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Culex (Lutzia) shinonagai* n.sp.

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	8-10	-	-	-	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1(b)	1(b)	1	1(b)	1	1(b)
2	-	1	2-3	1	1	1	1	1	1	1	1	1
3	1	1	1	2	1	1	1(b)	1	1	1	1	7(B)
4	4	1	1	3	4	3-4	2	2	2	1	1	1
5	1	1(b)	1(L,b)	1	2	1	1	1	1	1	1	1(b)
6	1	1	1(L,b)	1	2-3(L,B)	2(L,B)	2-3(L,B)	2(L,B)	2(L,B)	1-2(L,B)	10?	1-S
7	1	1(b)	1(L,B)	5-6(L,B)	2-3(L,B)	2-3(L,B)	3	3	3	1	1	2-4
8	2	1-2(b)	3-4(L,b)	m(d)	-	1(b)	1-2(b)	1	2-3	3	10?	1-X
9	4-6	1(L,b)	2(L,B)	3(L,B)	2	1	1	1	1	1	1	2
10	2	1	1(L,B)	1(L,b)	1	1	1	1	1	1	1	2-X
11	1-2	4-5	1	?	2-3	2-3	2	2	2	2-3	1	1(L)
12	4-6	1(b)	1(L,b)	1	1	1-2	2	3	1	1	1(b)	3-X
13	1	-	m	3-5(b)	2-3	m	3	2-3	1	m	1	1(L)
14	1	2	8-10	-	-	-	1	1	1	1	1	1
15	2	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches).
Specimens examined: 1 from Ogasawara Is.

TABLE 88. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) vigilax* (Skuse, 1889)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m	-	-	-	1	1	1	1	1	1	1
1	1(sf)	1(b^+)	1-4	1-3	1	1-3	3-5	3-5	2-5	3-5	1-2	2-4
2	-	1-2	2	3-4	1	1	1	1	1	1	1	1
3	1	2-3	2-4	10(d)	7	?	4-5	3-5	2-4	1-4	4-6	9-14(B)
4	3-6	2-3	4-5	3	8-10	5-10	?	3	5-8	3-6	3-5	1
5	1	2(L,B)	1(L,B)	1	2-4	2-3	3-4	2-3	2-4	2-7	3-5	3-5(B)
6	1	1(L,B)	6-8(L,B)	1	3-4(L,B)	2-4(L,B)	2(L,B)	2(L)	2(L)	1	5-11	1-S
7	6-10(B)	1-2(L,B)	1(L,B)	13-18(L,B)	1-2(L,B)	4	6-8	5-9	5-9	2-3	1	8-12(B)
8	2-4	1-2	9-12(L,B)	6-m(d)	-	1-2	1	1	1	4	5-10	1-X
9	2-4	1	8-14(L,B)	9-12(L,B)	1-2	1	1	1	1	1	2-4	1
10	2-3	1	1(L,B)	1(L,B)	2-3	1	1-3	2-3	1	1	1	2-X
11	1-4	2-4	1-4	1-3	1-2	1	2	1-2	1-2	2-3	1	9-13
12	2-4	1	1(L,B)	1	1-2	2-3	2-4	2-3	1-2	1-2	1	3-X
13	1	-	m(d)	5-9(d)	1-2	?	1-2	1-2	1	m(d)	2-4	1(L)
14	1	2-3	9-m(d)	-	-	-	1-2	1-2	1-2	1-3	1-3	1-2
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 10 from Kuroshima, Yaeyama Gunto.

TABLE 89. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) dorsalis* (Meigen, 1830)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(sf)	1(B)	1-2(B)	3-6	3-10	2-5	4-9	3-7	3-4	3-5	2-4	6-10(B)
2	-	1	3-4	3-5	2-5	1-2	1	1	1-2	1-2	1	1
3	1	1-3	1	m	4-7	3-5	2-3	1-3	1-2	1-2	3-6	8-12(B)
4	3-7	1	2-4	4-10	m	m	2-6	3-5	7-12	3-6	1	1
5	1(b^+)	1-3(L,B)	1(L,B)	1	5-12	4-7	3-5	3-7	3-10	2-7	6-m	5-7(B)
6	1(b^+)	1(L,B)	5-9(L,B)	1-2	2-4(L,B)	3-4(L,B)	2-4(L,B)	2-3(L,B)	2-3(L,B)	2-3(L,B)	m(d)	1-S
7	6-10(B)	2-3(L,B)	1(L,B)	10-13(L,B)	1-2(L,B)	2-7(b^+)	8-13	8-14	6-11	2-4	1-2	4-9(B)
8	1-2	1-2	8-12(L,B)	m(d)	-	1-2	1	1	1-2	5-9	7-m	1-X
9	1-3	1-2	7-11(L,B)	8-13(L,B)	2-3	1-2	1	1	1	1	4-8	1
10	2-4	1	1(L,B)	1(L,B)	1-2	1	1	1-2	1	1	1	2-X
11	4-9(B)	4-9	2-5	2-5	3-6	1-3	3-6	2-6	3-6	3-6	1-2	10-18
12	4-9	1(b)	1(L,B)	1-2	1-3	2-4	3-5	2-4	1-2	1	1	3-X
13	1-2	-	m(d)	m	1-4	m(d)	2	2	2-3	m(d)	3-4	1(L)
14	1-4	2	m(d)	-	-	-	1-2	1-2	1-4	1-3	1-3	1-3
15	4-8	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 10 from Okayama Pref., Honshu.

TABLE 90. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) excrucians* (Walker, 1856)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m	-	-	-	1	1	1	1	1	1	1
1	1(sf)	1(L,B)	1-7	2-4	4-7	2-5	5-m	1-2(L,B)	2(L,B)	3-m	2-3(B)	4-11(B)
2	-	1	1-4	2-3	1-3	1	1	1	1	1	1	1
3	1	2-4	1	m	2-3	2	1	1-2	1	1	3-4	5-9(B)
4	3-5	1	2-3	3-6	m	8-m	3-5	2-5	4-5	2-3	1	1
5	2-4(B)	1(L,B)	1(L,B)	1-2	5-8	3-6	3-5	3-6	4-7	3-6	5-m	3-6(B)
6	2-3(B)	1(L,B)	6-7(L,B)	1	**2(L,B)**	2(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	m	1-S
7	6-10(B)	3(L,B)	1(L,B)	9-17(L,B)	2(L,B)	3-7(B)	6-m	6-m	7-m	1	1	3-5(B)
8	2-3	2(B)	8-12(L,B)	m(d)	-	2-3	1	1	1	3-6	6-10	1-X
9	2-3	1	7-10(L,B)	6-10(L,B)	2-4	1	1	1	1	1	2-4	1
10	1-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-7	3-5	1-6	1-4	1-4	1-2	2-4	2-3	2-3	2-3	1-2	6-9(L)
12	4-m	1(L,B)	1(L,B)	1	1	1	3-5	2-4	1-2	1	1	3-X
13	1-2	-	m(d)	m	1-2	m(d)	1(L,B)	1(L,B)	1(L,B)	m(d)	3-5	1(L)
14	1	1-2	m(d)	-	-	-	1	1-2	1-2	1-3	1-3	2-4
15	4-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches); sf: stiff.
Specimens examined: 10 from Hokkaido.

TABLE 91. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) impiger daisetsuzanus* n. ssp.

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	6-m	-	-	-	1	1	1	1	1	1	1
1	1(sf)	1-2(L,B)	1-3	2-5	4-9	1-5	2-7	1(b^+)	1-2(b^+)	2-4	1-2(b^+)	3-5(B)
2	-	1	2-5	1-2	1-2	1	1	1	1	1	1	1
3	1	1-2	1	3-7	1-2	1-2	1	1	1	1	1-3	6-10(B)
4	2-3	1	1-2	3-6	7-m	4-9	4-6	2-5	2-4	1-2	1	1
5	1(B)	2-3(L,B)	1-2(L,B)	1	3-5	3-6	2-5	2-5	2-4	2-5	4-8	3-5(B)
6	1	1(L,B)	4-8(L,B)	1	2-5(L,B)	2-5(L,B)	2-4(L,B)	2-3(L,B)	1-2(L,B)	1-2(L,B)	3-7	1-S
7	2-4(B)	2-4(L,B)	1-2(L,B)	6-12(L,B)	1-2(L,B)	1-2(L,B)	2-7	2-6	2-5	1-2	1	5-9(B)
8	1-2	1-2	6-9(L,B)	5-m	-	1-3	1	1	1	1-3	5-8	1-X
9	1-2	1-2	5-10(L,B)	5-10(L,B)	1-4	1	1	1	1	1	2-4	1-2
10	1-3	1	1-2	1-2(L,B)	1-2	1	1	1	1	1	1	2-X
11	2-5	1-4	1-3	1-3	1-4	1-2	1-3	2-3	1-3	1-3	1	3-6(L)
12	3-6	1(L,B)	1(L,B)	1	-	1	2-5	2-4	1-2	1	1	3-X
13	1	-	m(d)	6-13	1-3	9-m(d)	1-2(L,B)	1-2(L,B)	1-2(L,B)	m(d)	2-3	1(L)
14	1-2	1-2	m(d)	-	-	-	1-2	1-2	1	1-2	1-3	1-2
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 10 from Yukomanbetsu, Hokkaido.

TABLE 92. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) sticticus* (Meigen, 1838)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	9-10	-	-	-	1	1	1	1	1	1	1-2
1	1(sf)	1(B)	2-3	2-3	3-5	1-3	5-8	2-8	3-6	4	3(B)	6-8(B)
2	-	1	3-4	2-3	1	1	1	1	1	1	1	1
3	1	1-2	1	5-6	2-3	2-3	2	2-3	2	1-2	2-4	7-8(B)
4	2-3	1	2	4	m	5-7	3-4	3	5	2-3	1-2	1
5	2-4	1(L,B)	1(L,B)	1	6-9	2-4	2-4	2-4	2-4	2-3	5	4-5(B)
6	2	1(L,B)	5-8(L,B)	1	2-3(L,B)	2(L,B)	2(L,B)	2(B)	2(B)	1(B)	?	1-S
7	7-9(B)	3(L,B)	1(L,B)	12-15(L,B)	1-2(L,B)	2-3(B)	4-5	5-7	4-6	2-3	1	5-7(b^+)
8	2	1-2	8-10(L,B)	m(d)	-	2	1	1	1	4	6-7	1-X
9	2	1	8(L,B)	7-8	1-4	1-2	1	1	1	1	2-5	1
10	1-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-5	3-4	2	1-2	2-4	2-3	2-4	3	2-3	2-3	1	6-7
12	4-5	1	1(L,B)	1	1-2	1	3-4	2-3	1	1	1	3-X
13	1	-	m(d)	m(d)	1-3	8-m(d)	1	1(b^+)	1(b^+)	m(d)	4-6	1
14	1-2	1	m(d)	-	-	-	1	?	?	1	1	1
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 2 from the United States of America.

TABLE 93. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) communis* (DeGeer, 1776)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m	-	-	-	1	1	1-2	1	1	1	1
1	1(sf)	2(L,B)	1-3	3-7	6-m	3-6	2-8	1-3(b^+)	1-3(b^+)	2-6	2(b^+)	3-5(B)
2	-	1(b^+)	2-4	2-3	1-3	1-3	1	1	1	1-2	1-2	1
3	1	1-3(b^+)	1	7-m	1-3	1-2	1-2	2	1-2	1	2-4	7-12(B)
4	3-4	1	2-3	6-8	m	6-m	3-4	2-3	4-9	2-4	1	1
5	1-2	2-4(L,B)	1(L,B)	1-2	4-9	4-8	4-7	3-7	3-8	4-9	7-m	4-5(B)
6	1	1(L,B)	5-7(L,B)	1	2-3(L,B)	2-3(L,B)	2(L,B)	2(L,B)	1-2(L,B)	1-2(L,B)	8-m	1-S
7	6-8(B)	3-4(L,B)	1(L,B)	7-10(L,B)	1-2(L,B)	1-3(B)	3-9	3-6	3-5	1-2	1-2	4-9(B)
8	2-3	1-3	6-10(L,B)	9-m	-	1-3	1-3	1-2	1	3-8	7-9	1-X
9	2-3	1	7-10(L,B)	5-8(L,B)	1-3	1	1	1	1	1	2-6	1
10	1-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	5-10	2-5	1-6	2-8	1-8	1-3	2-3	2-4	2-4	2-4	1-2	6-11(L)
12	4-8	1(L,B)	1(L,B)	1	1	1-2	2-3	1-3	1	1	1	3-X
13	1-2	-	m(d)	m	1-4	m	1-2(L,B)	1-3(L,B)	1-3(L,B)	m(d)	3-6	1(L)
14	1	1-2	m(d)	-	-	-	1-2	1-4	1-3	1-3	1-5	1-3
15	4-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 6 from Mt. Daisetsu, 4 from Akan, Hokkaido.

TABLE 94. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) punctor* (Kirby, 1837)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	8-m	-	-	-	1	1	1	1	1	1	1
1	1(sf)	1-3(L,B)	1-3	1-5	2-m	1-7	3-6	1(L,B)	1(L,B)	1-7	1-2(L,B)	3-6(B)
2	-	1(L,B)	1-4	2-4	1-3	1	1	1	1	1	1	1-2
3	1	1-2(L,B)	1	5-m	2-4	2-4	1-2	1-2	1	1-2	2-6	6-12(B)
4	2-6	1	1-3	3-7	7-m	6-m	2-5	2-4	3-7	1-3	1	1
5	**1-3(B)**	1(L,B)	1(L,B)	1	4-m	2-6	2-5	1-4	1-4	2-6	4-8	4-7(b)
6	1-3(B)	1(L,B)	3-6(L,B)	1-2	1-2(L,B)	1-2(L,B)	1-2(L,B)	1(L,B)	1(L,B)	1-2(L,B)	5-11	1-S
7	4-8(B)	2-4(L,B)	1(L,B)	6-9(L,B)	1(L,B)	1-2(L,B)	3-7	4-9	4-6	1-2	1	4-7(B)
8	2-5	1-4(L,B)	5-9(L,B)	7-m	-	1-2	1-2	1	1	2-5	4-11	1-X
9	2-4	1-2	5-10(L,B)	3-6(L,B)	1-3	1	1	1	1	1	2-9	1(b)
10	2-4	1	1(L,B)	1(L,B)	1-2	1	1	1	1	1	1	2-X
11	5-m	2-5	1-4	1-4	1-6	1-5	1-4	2-4	1-3	1-3	1-2	5-7(L)
12	3-8	1(L,B)	1(L,B)	1	1-2	1	2-4	1-4	1	1	1	3-X
13	1-2	-	m(d)	m(d)	2-6	m(d)	1(L,B)	1-2(L,B)	1-2(L,B)	m(d)	2-8	1(L)
14	1-2	1-2	m(d)	-	-	-	1-2	1-2	1-2	1-3	1-4	1-2
15	4-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches); sf: stiff.
Specimens examined: 10 (59 for important setae) from Hokkaido.

TABLE 95. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) hexodontus hokkaidensis* n. ssp.

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	7-m	-	-	-	1	1	1	1	1	1	1
1	**1(sf)**	2-3(L,B)	1-3	2-4	1-7	1-3	2-6	1-2(L,b)	1-2(L,b)	2-5	2-3(b)	4-8(B)
2	-	**1**	2-5	1-3	1	1	1	1	1	1	1	1
3	1	2-4	1	3-8	2-3	1-3	1-3	1-2	1-2	1	2-5	5-11(B)
4	2-5	1-2	2-4	3-6	8-m	5-9	2-6	1-4	3-6	2-3	1	1-2
5	1-2(B)	1-3(L,B)	1-2(L,B)	1	4-9	3-5	2-4	1-3	1-3	1-5	4-9	4-7(b)
6	1-3(B)	1(L,B)	5-10(L,B)	1	2-3(L,B)	2-3(L,B)	2-3(L,B)	2-3(L,B)	2-3(L,B)	2-3(L,b)	3-7	1-S
7	5-9(B)	3-5(L,B)	1(L,B)	7-14(L,B)	1-2(L,B)	1-3(B)	2-6	2-7	2-6	1-2	1	4-9(B)
8	2-3	1-2(B)	6-10(L,B)	9-m(d)	-	1-3	1-2	1-2	1-2	2-5	3-6	1-X
9	2-4	1	6-13(L,B)	5-10(L,B)	1-2	1	1	1	1	1	1-4	1-2(b)
10	2-6	1	1(L,B)	1(L,B)	1-2	1	1	1	1	1	1	2-X
11	6-10	2-4	1-4	2-4	1-5	1-3	2-4	1-5	2-4	1-4	1-2	4-8(L)
12	4-7	1(L,B)	1(L,B)	1	1-2	1	1-4	1-3	1	1	1	3-X
13	1-2	-	m(d)	9-m(d)	1-3	9-m(d)	1-2(L,B)	1-3(L,B)	2-3(L,b)	m(d)	2-5	1(L)
14	1	1-2	m(d)	-	-	-	1-2	1-2	1-2	1-2	1-3	1-3
15	3-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 10 (32 for important setae) from Hokkaido.

TABLE 96. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) hakusanensis* Yamaguti and Tamaboko, 1954

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m	-	-	-	1	1	1	1	1	1	1
1	1(sf)	2-4(L,B)	1-2	1-4	8-m	2-4	2-6	1-2(L)	1-3(L)	1-3	2-3(L)	4-7(B)
2	-	1-2(L,B)	2-4	2-3	1-2	1	1	1	1	1-2	1-2	1
3	1	2(L,B)	1	5-10	1-3	1-2	1-2	1-2	1	1	2-4	6-11(B)
4	4-6	1-2	2	1-4	m	9-m	2-5	2-3	3-7	1-3	1	1
5	2-6(b+)	2-3(L,B)	1-2(L,B)	1	3-8	3-4	3-6	2-5	3-6	2-6	4-8	4-6(b)
6	2-4(b+)	1(L,B)	4-9(L,B)	1	2-3(L,B)	2-3(L,B)	2-3(L,B)	2(L,B)	2(L)	2(L)	6-8	1-S
7	7-11(B)	3-6(L,B)	1(L,B)	7-12(L,B)	1-2(L,B)	2-3(B)	4-7	4-7	4-7	1-2	1	6-9(B)
8	2-3	2-3(B)	6-11(L,B)	m(d)	-	1-2	1-2	1	1	2-3	4-7	1-X
9	2-4	1-2	7-10(L,B)	6-7(L,B)	1-2	1	1	1	1	1	2-6	1
10	2-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	m	2-5	2-5	1-3	2-5	1-2	1-4	3-4	2-6	1-3	1	5-10
12	4-9	1(L,B)	1(L,B)	1	1	1	1-3	2-3	1	1	1	3-X
13	1-2	-	m(d)	m(d)	1-3	m(d)	1-3(L)	1-3(L)	1-3(L)	m(d)	2-4	1
14	1	1-2	m(d)	-	-	-	1	1-2	1	1-2	1-3	1-2
15	5-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than 10 branches); sf: stiff.
Specimens examined: 20 from Mt. Hakusan, Honshu.

TABLE 97. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) intrudens* Dyar, 1919

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	1	1-2	1	1	1	1	1
1	1(sf)	1(L,B)	1-2	2-3	1-3	1-4	6-9	6-10	4-9	4-8	2-5(b^+)	5-6(B)
2	-	1	2-4	2-3	1-2	1	1	1	1	1	1	1-2
3	1	1-4	1	5-9	3-5	2-3	2-3	2-4	2	1-2	3-5	7-9(B)
4	5-9	1	2-4	3-7	m	7-m	1-5	2-3	6-9	3-4	2-3	1-2
5	4-6(B)	1(L,B)	1(L,B)	1	2-6	2-4	2-4	2-3	2-4	2-6	5-11	4-7(B)
6	1-4(B)	1(L,B)	4-6(L,B)	1	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	1-2(L,B)	1-2(L,B)	m	1-S
7	5-9(B)	2-3(L,B)	1(L,B)	7-11(L,B)	1(L,B)	2-4(B)	6-9	7-11	6-11	2-4	1-3	6-8(b^+)
8	2-3	1-3(L,B)	5-9(L,B)	m(d)	-	1-3	1-2	1	1-2	2-6	9-m	1-X
9	1-3	1	4-7(L,B)	4-6(L,B)	2-3	1	1	1	1	1	3-8	1
10	1-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	5-9	2-6	1-4	2-4	2-5	2-5	2-3	2-4	1-3	2-5	1-2	5-8(L)
12	4-9	1(B)	1(L,B)	1	1	1-2	2-4	1-3	1	1	1	3-X
13	1-2	-	m(d)	m(d)	1-3	m(d)	1	1(b^+)	1-2(b^+)	m(d)	9-m	1(L)
14	1	2-4	m(d)	-	-	-	1	1	1	1	1-2	1-2
15	4-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than 10 branches); sf: stiff.
Specimens examined: 2 from Shiretoko-Goko, 3 from Akan, and 5 from Zenibako, Hokkaido.

TABLE 98. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Ochlerotatus) diantaeus* Howard, Dyar and Knab, 1913

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m	-	-	-	1	1	1	1	1	1-2	1
1	1(sf)	1-2(L,B)	2-6	3-7	2-10	1-4	6-9	3-7	2-5(b+)	5-10	2-4(B)	5-7(B)
2	-	1	2-4	2-3	1-4	1-3	1-2	1	1	1	1-2	1
3	1	2-4	1-2	4-m	2-5	2-5	2-4	3-4	2-3	1-2	4-8	6-11(B)
4	6-10	1-2	3-4	4-6	m	7-m	2-5	2-3	4-9	3-5	2-3	1
5	3-4(B)	1(L,B)	1(L,B)	1-3	4-6	3-6	2-6	4-7	3-5	3-6	6-11	4-6(B)
6	2-3(B)	1(L,B)	4-5(L,B)	1	2-3(L,B)	2(L,B)	1-2(L,B)	1(L,B)	1(L,B)	1(L,B)	9-m	1-S
7	4-5(B)	2-3(L,B)	1(L,B)	7-12(L,B)	1(L,B)	5-11	5-9	5-9	5-9	2-3	1-2	5-8(B)
8	2-3	1(L,B)	5-8(L,B)	m(d)	-	1-3	1-2	1-2	1	5-10	9-m	1-X
9	2-4	1-2	4-8(L,B)	4-6(L,B)	2-3	1	1	1	1	1	4-8	1
10	2-5	1	1	1	1	1	1-2	1	1	1	1	2-X
11	5-9	2-6	2-6	3-5	2-5	1-3	1-5	2-4	1-4	2-3	1	9-m
12	7-m	1	1(L,B)	1-2	1	2-3	2-3	2-3	1	1	1	3-X
13	2-5	-	m(d)	m	2-5	m(d)	1-m	1(b+)	1(B)	m(d)	7-m	1(L)
14	1	1-3	m(d)	-	-	-	1	1-2	1-2	1-2	1-3	1-2
15	4-8	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 5 from Hisagonuma, 2 from Akan, Hokkaido.

TABLE 99. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) japonicus japonicus* (Theobald, 1901)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	6-13	-	-	-	1	1	1	1	1	1	1
1	1	2-5(B)	1-5(b+)	1-6	1-6	1-4	1-4	1-4(b+)	1-4(b+)	1-2(b+)	1-4(B)	1-2(B)
2	-	1(B)	2-3	1	1-2	1-2	1	1	1	1-2	1	1
3	1	3-9(B)	1(b+)	2-4	1	1	1	1	1	1	1-2(B)	4-12(B)
4	2-5	1-2(b+)	1-2	3-6	3-7	3-6	1-4	1-3	1-3	1	1-2	1
5	4-7	2-3(L,B)	1(L,B)	1	3-7	1-5	1-4	1-3	1-2	1-3	1-5	1-3(B)
6	3-7	1(L,B)	4-6(L,B)	1-2	2-3(L,B)	2-3(L,B)	2-4(L,B)	2-5(L,B)	1-3(L,B)	1-2(L,B)	1-4	1-S
7	4-8(B)	2-4(L,B)	1(L,B)	5-8(L,B)	1-2(L,B)	1-2(L,B)	1-3	2-5	1-2	1	1	3-6(B)
8	1-4	2-6(b+)	5-10(L,B)	5-11	-	1-3	1	1-2	1-2	2-6	3-6	1-X
9	2-3	1-2	4-7(L,B)	3-4(L,B)	2-5	1-2	1	1	1	1	1-4	1-2(B)
10	1-2	1-3	1(L,B)	1(L,B)	1-2	1	1	1	1	1	1	2-X
11	3-8	1-5	1?	1?	1-2	1-2	1-2	1-2	1-4	1-3	1	2-4(L)
12	2-7	1(B)	1(L,B)	1	1-2	1	1-3	1-3	1-2	1	1	3-X
13	1	-	5-12	3-10	1-4	2-10	1-4(b+)	2-5(B)	1-5(B)	4-11	1-3(b+)	1(L)
14	1-2	1-4	2-17	-	-	-	1-2	1-2	1-2	1-3	1-3	1-2
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized.
Specimens examined: 13 from Hokkaido, 30 from Honshu; 15 from Korea.

TABLE 100. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) koreicus* (Edwards, 1917) "Typical" form

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1?	5-9	-	-	-	1	1	1	1	1	1	1
1	1	2-4(B)	1-3(b+)	3-5	4-8	2-6	2	1-4(b)	1-3(b+)	1-3	1-2(B)	1-2(b+)
2	-	1(b)	1-3	1	1-2	1-2	1	1	1	1-2	1	1
3	1	2-7(B)	1	3-6	1-3	1	1	1-2	1	1	1(B)	5-10(B)
4	2-6	1(b)	1	2-4	4-9	4-8	1-3	1-2	2-4	1-2	1	1
5	4-7	2-3(L,B)	1(L,B)	1	2-5	1-4	1-3	1-3	1-2	1-3	2-4	1-3(B)
6	3-6	1(L,B)	5-6(L,B)	1	2(L,B)	2(L,B)	2-3(L,B)	2-3(L,B)	2(L,B)	1-2(B)	1-5	1-S
7	4-7(b)	2-3(L,B)	1(L,B)	5-10(L,B)	1-2(L,B)	1-2(L,B)	2-5	3-5	2-4	1-2	1	5-7(B)
8	1	1-3	5-10(L,B)	4-10	-	1-3	1	1	1-2	2-6	2-5	1-X
9	1-3	1	5-9(L,B)	3-5(L,B)	1-2	1	1	1	1	1	1-3	1(B)
10	1	1	1-2(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-6	1-3	1-2	1-2	1-7	1-3	1-2	1-3	1-3	1-3	1	3-5(L)
12	2-3	1(B)	1(L,B)	1	1	1	1-2	1-3	1-2	1	1	3-X
13	1	-	6-15	4-10	1-6	2-9	2-4(b)	2-4(b+)	2-4(B)	5-11	1-2(b+)	1(L)
14	1-2	2-3	5-11	-	-	-	1	1-3	1	1-2	1-3	1
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized.
Specimens examined: 10 from Korean peninsula.

TABLE 101. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) koreicus* (Edwards, 1917) "Robust" form

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1?	5-11	-	-	-	1	1	1	1	1	1	1
1	1	3-8(B)	2-8(B)	3-7(b+)	3-8(b)	2-8	2-9(b)	3-7(b+)	2-7(B)	1-5(b+)	1-5(B)	1-3(B)
2	-	1(B)	2	1	1-2	1-2	1	1	1	1-2	1	1
3	1	3-9(B)	1	3-7	1-3	1-2	1	1-2	1	1	1-3(B)	6-13(B)
4	2-4	1(b+)	1	2-5	5-11	5-9	1-2	1-2	2-4	1	1	1
5	5-8	2-4(L,B)	1-2(L,B)	1	2-4	2-4	2-5	1-4	1-3	1-3	2-4	2-5(B)
6	4-6	1(L,B)	4-8(L,B)	1	2-3(L,B)	2-3(L,B)	2-4(L,B)	2-4(L,B)	2-4(L,B)	2-4(B)	1-6(b+)	1-S
7	4-7(b)	2-4(L,B)	1(L,B)	6-10(L,B)	1-2(L,B)	1-2(L,B)	2-4	2-5	2-3	1	1	4-9(B)
8	1	2-4(b+)	7-11(L,B)	m	-	1-2	1	1-2	1-2	2-4	3-6	1-X
9	1-2	1	5-9(L,B)	4-5(L,B)	1-3	1	1	1	1	1	1-2	1(B)
10	1-2	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-10(b)	1-3	1-2	1?	2-8	1-2	1-2	1-2	1-2	1-2	1	3-5(L)
12	1-3	1(L,B)	1(L,B)	1	1	1	1-3	1-2	1-2	1	1	3-X
13	1	-	m	2-10(B)	1-6(b)	2-6(b)	3-9(b+)	4-7(B)	3-6(B)	3-12	1-3(b+)	1(L)
14	1-2	2	3-9(B)	-	-	-	1-2	1-2	1-2	1-2	1-2	1
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 44 from Korean peninsula.

TABLE 102. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) hatorii* Yamada, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m	-	-	-	1	1	1	1	1	1	1
1	1	2(L,B)	1-3(st,B)	1-2(st,b)	1-3(st,b)	2-4	1-2	1(b)	1(b)	1-3	1-2(B)	1(b)
2	-	1(b)	1-3	1	1-2	1	1	1	1	1	1	1
3	1	2(B)	1(B)	4-10	1	1	1	1	1	1	1-2(B)	8-14(B)
4	5-6	1(b)	1-3	3-6	8-14	4-7	1-2	1-2	2-4	1-2	1-2	1
5	6-9	2(L,B)	1(L,B)	1	3-6	1-5	1-2	1	1-3	1-4	2-5	2-4(B)
6	4-7	1(L,B)	6-10(L,B)	1	2(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	3-7	1-S
7	5-9(B)	**3(L,B)**	**1(L,B)**	7-10(L,B)	1-2(L,B)	1-2(L,B)	3-6	4-6	3-4	1-3	1(b)	6-12(B)
8	1	1-3(b+)	8-12(L,B)	7-12	-	1-2	1	1	1	2-3	3-6	1-X
9	1-2	1	6-9(L,B)	3-4(L,B)	1-3	1	1	1	1	1	2-4	1-2(B)
10	1-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1-2(B)	2-X
11	3-9(B)	2-5	1-2	1-2	2-5	1-3	2-4	1-4	1-4	1-2	1	4-6(L)
12	2-5	1(B)	1(L,B)	1-2	1	1	1-2	1-2	1	1	1	3-X
13	1	-	m	5-14	1-2	6-11	2-3(B)	2-3(B)	2-3(B)	7-11	2-6	1(L)
14	1-2(st)	2	m	-	-	-	1	1	1	1	1-2	1
15	1-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized; m: multiple (with more than ten branches); st: stiff.
Specimens examined: 17 from Honshu

TABLE 103. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) togoi* (Theobald, 1907)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	5-10	-	-	-	1	1	1	1	1	1	1
1	1	2-3(L,b)	1-5	2-4	3-m	2-6	2-5	2-4	2-4	2-6	1-6	1-3
2	-	1	1-3	1-2	1-3	1	1	1	1	1	1	1-2
3	1	2-3	1(b)	4-7	1-3	1-2	2	1-3	1-2	1-2	1(b)	10-14(B)
4	4-8	1-2(b)	2-4	1-5	6-13	3-9	2-3	1-2	3-6	2-4	1-2	1
5	6-14	2-4(L,b)	3-6(L,B)	1-3	3-8	1-4	2-3	2-5	1-5	2-4	2-3	3-6(sf,b)
6	7-13	1(L,b)	6-10(L,B)	1	3-5(L,B)	3-5(L,B)	3-6(L,B)	2-6(L,B)	2-4(L,b)	1-3(b)	2-5	1-S
7	6-10(b)	2-4(L,b)	1(b)	8-13(L,B)	2-3(L,B)	2-3(L,B)	3-6	3-6	2-5	1-2	1-2	6-9(B)
8	1	1-4	7-12(L,B)	6-m	-	2-3	1	1	1-2	1-4	5-m	1-X
9	1-3	1-3	7-10(L,B)	5-7(L,B)	2-3	1	1	1	1	1	1-3	1-3(b)
10	1-2	1	1(L,B)	1(L,B)	1-2	1	1	1	1	1	1	2-X
11	6-13	2-4	1-2	1-2	1-6	1-2	1-2	1-2	1-3	1-3	1	8-11(L)
12	2-4	1	1(L,B)	1	1-2	1	2-3	1-2	1-2	1	1	3-X
13	1	-	m	2-9	2-5	3-10	1-4	3-6(b)	4-7(b)	6-m	3-12	1(L)
14	1-2	1-2	4-m(d)	-	-	-	1-3	1-2	1	1-2	1-2	1-3
15	1-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 5 from Honshû; 5 from Mikura Is., Izu Shichitô; 5 from Ogasawara Is.

TABLE 104. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) savoryi* Bohart, 1956(1957)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	4-7	-	-	-	1	1	1	1	1	1	1
1	1	1-2(L,b)	2-3	2-3	4-10	2-4	1-5	2-3	1-3	2-5	1-2	1-2
2	-	1(b)	1-2	1	1	1	1	1	1	1	1	1
3	1	1-2	1(b)	4-5	1-2	1	1-2	1-2	1	1	1-2(b)	8-10(B)
4	4-6	1-2(b)	1-2	2-5	4-9	4-6	1-3	1-2	3-5	1-3	1	1
5	9-16	3-4(L,b)	3-5(L,b)	1	3-5	2-3	1-3	1-3	1-2	1-2	2-3	3-6(sf,b)
6	6-12	1(L,b)	6-9(L,B)	1	3-4(L,B)	3-5(L,B)	3-5(L,B)	3-4(L,B)	2-4(L,B)	2(b)	2-4	1-S
7	6-9(b)	2-3(L,b)	1(L,b)	8-12(L,B)	2-3(L,B)	2(L,B)	2-4	2-4	2-4	1-2	1	7-10(B)
8	1-2	2-3	7-11(L,B)	2-4	-	2-3	1-2	1-2	1-2	1-3	2-3	1-X
9	2-4	1-2	5-9(L,B)	5-7(L,B)	1-3	1	1	1	1	1	1-2	1(b)
10	1-2	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-6	2-4	1	1	1-2	1-2	1-2	1	1	1	1	5-9(L)
12	1-4	1	1-2(L,B)	1	1-2	1	1-2	1-2	1	1	1	3-X
13	1	-	5-9	3-5	1-2	2-6	2-4	4-5(b)	4-7(b)	4-8	2-5	1(L)
14	1	1-2	5-9	-	-	-	1	1-2	1-2	1-5	1-5	1
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized; sf: stiff
Specimens examined: 10 from Ogasawara islands.

TABLE 105. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) seoulensis* Yamada, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	5-7(b^+)	-	-	-	1	1	1	1	1	1	1
1	1(f)	4-6(B)	5-7(B)	4-8(B)	4-8(B)	4-8(B)	2(L,B)	4-6(B)	2(L,B)	4-6(B)	3-5(B)	4-9(B)
2	-	1(b^+)	1-3	1(b^+)	1-2	1-2	1-2	1	1	1-2	1	1(b^+)
3	1	4-6(B)	1(b^+)	3-5(B)	1(B)	1-2(b^+)	1-2(b^+)	1-2(b^+)	1(b^+)	1(b^+)	2-4(B)	4-6(B)
4	7-12(B)	3-4	1-2(b^+)	1-2	4-6(B)	3-5(b^+)	1-2(b^+)	1-2(b^+)	1-4(B)	1(b^+)	1(b)	1(B)
5	4-6(B)	3-4(L,B)	1(L,B)	1-2	3-4	3-4(B)	3-5(B)	3-4(B)	3-4(B)	3-4(b^+)	3-6(B)	3-4(B)
6	6-9(B)	1(L,B)	2-3(L,B)	1(B)	3-5(L,B)	3-6(L,B)	2-3(L,B)	2-3(L,B)	2(L,B)	2(L,B)	3-5(B)	1-S
7	6-9(B)	4-6(L,B)	1(L,B)	4-8(L,B)	2-4(B)	3-6(B)	3-7(B)	3-5(B)	2-6(B)	1-4(b^+)	1(b)	5-9(B)
8	1-2(b)	3-5(b^+)	3-7(L,B)	3-9(B)	-	1-2(b^+)	1-2(b^+)	1-3(b)	2(b)	2-4(b^+)	5-8(B)	1-X
9	3-7(b^+)	1-2(b)	5-8(L,B)	4-6(L,B)	1	1-2	1	1-2	1	1-2	3-4(b^+)	2-4(B)
10	1-3(b^+)	1(b)	1(L,B)	1(L,B)	1	1	1	1	1	1	1-2(B)	2-X
11	7-14(B)	2-5	2-5	2-3	3-5(B)	2-4	2-4	2-4	2-4	2-4	1-2	3-5(L)
12	3-4	1(b^+)	1(L,B)	1(b^+)	1-2	1-2	1-2	1-2	1-2	1	1(b^+)	3-X
13	5-8(B)	-	5-8(B)	6-10(B)	1-3	7-11(B)	6-9(B)	6-8(B)	6-8(B)	5-9(B)	4-7(B)	1(L)
14	3-6	2-4	4-6(B)	-	-	-	1	1	1-2	1-2	1-2	1-2
15	3-4(B)	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b^+: barbing variable; f: frayed; L: large sized.
Specimens examined: 15 from Korea.

TABLE 106. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) kobayashii* Nakata, 1956

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	2(b)	2-3	5	10-11	3-5	1	1	1	1	1	2-4
2	-	1	2-3	3-4	1	1	1-2	1-2	1-2	1?	1	3-4
3	1	5-8	1	5-10	3-4	3-5	4	3-4	2-3	2-3	4-5	3-5(B)
4	8-15(d)	2-3	2-3	5-6	m	10-13	5-7	3-4	6-8	3-4	3-4	2
5	3-5(L,B)	2-3(L,B)	1(L,B)	1	6-10	6-8	4-6	3	2-3	3-5	6-8	3-5
6	1(L,B)	1(B)	3-4(L,B)	1	2-3(B)	1-2(B)	1(b)	1(b)	1(b)	1	m(d)	1-S
7	6-9(B)	2(L,B)	1(L,B)	8-9(L,B)	2(B)	6-8	6-8	6-7	7-9	3-4	2	3(b)
8	2-4	1-2(b^+)	5-6(L,B)	m(d)	-	3-4	1-2	1	1	5-6	m	1-X
9	5-7	1	5-7(L,B)	5-6(L,B)	2-3	1	1	1	1	1	5-8	1-3(b^+)
10	3-4	1	1(L,b)	1(L)	1	2	2-3	2-3	2	2	2-3	2-X
11	4-5(b)	3-4	4-5	1-2	2-4	1-2	1-2	2-3	2-4	2-4	1	1-2(L)
12	6-8	1	1(L,b)	1	2	2-4	4-5	3-4	1	2-3	3	3-X
13	4-6	-	m(d)	9-14	1	m(d)	5-6	4-5	7-8	m(d)	3-5	1(L)
14	1-2	3-4	m(d)	-	-	-	1	1	1	1?	1	1
15	5-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b^+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 2 from Korea.

TABLE 107. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) aureostriatus okinawanus* Bohart, 1946

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1?	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	2-3(b)	1-3(b)	4-8	10-16	1-3	1-2	1-2(b)	1(b)	1(b)	1(b)	3-5(b)
2	-	1	1-3	3-6	1-3	1-2	1-3	1-2	1-2	1-2	1	2?-6
3	1	3-6	1	5-8	3-5	2-5	3-5	3-6	2-4	2-4	3-6	2-5(B)
4	8-15(d)	2-4	2-5	3-7	m	9-15	2-4	2-3	5-9	2-6	3-5	1-2
5	3-6(B)	3(b)	1(b)	1	6-9(d)	9-14(d)	2-7	2-4	2-4	2-4	8-10(d)	5-7(b)
6	1(b)	1(b)	3-4(B)	1	2-4(B)	2-3(B)	1(b)	1(b)	1(b)	1(b)	m(d)	1-S
7	8-11(B)	3-4(B)	1(b)	6-8(B)	2-3(B)	5?-10	6-10	5?-12?	5?-12	5-8	3-6	4-9(B)
8	2-3	2-5	5-6(B)	m(d)	-	2-5	1	1	1	4-8	m(d)	1-X
9	4-7	1	4-5(B)	4-5(B)	3-7	1	1	1	1	1	5-7	2-4
10	2-4	1	1(b)	1-2(b)	1	1-3	2-3	2-4	1-3	1-3	2-4	2-X
11	3-7(B)	2-4	2-4	2-4	5-6	2	1-3	2-3	2-3	2-3	1	3
12	4-6	1	1	1	1-3	2-4	2-4	2-4	1-2	2-4	3-5	3-X
13	2-5	-	m(d)	8-15	1-3	m(d)	2-4	2-4	2-3	m(d)	5-7	1
14	1	2-3	m(d)	-	-	-	1	1	1	1	1-3	1-2
15	3-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; m: multiple (with more than 10 branches).
Specimens examined: 5 from Amami Ôshima, 5 from Okinawa Is.

TABLE 108. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) koreicoides* Sasa, Kano and Hayashi, 1950

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	5-12	-	-	-	1	1	1	1	1	1	1
1	1	3(B)	2-4	2-4	2-5	2-4	2-4	2	2(B)	1-3	1-3	2-4(B)
2	-	1(B)	1	1	1-2	1	1	1	1	1	1	1
3	1	2-3(B)	1	2-5	1-2	1-2	1	1	1	1	1-3	3-5(B)
4	8-16(B)	2	1-2	1-3	4-7	2-6	1-2	1	1-2	1	1	1
5	6-8(B)	2(L,B)	1(L,B)	1	1-3	2-4	1-3	1-2	1-2	1-2	2-3	3-5(B)
6	5-8(B)	1(L,B)	3-4(L,B)	1	2(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	1-5	1-S
7	5-10(B)	2-3(L,B)	1(L,B)	3-6(L,B)	1(L,B)	1-3(B)	2-5	2-4	2-3	1	1	2-4(B)
8	2	1-5	3-6(L,B)	5-m	-	2-3	1-2	1	1	2	3-6	1-X
9	2-3	1-2	2-5(L,B)	3-4(L,B)	1-3	1	1	1	1	1	1-2	1(b)
10	2-4	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	10-16(B)	1-4	1-3	1-2	1-5	1-2	1	1	1	1	1	3-4(L)
12	2-5	1	1(L,B)	1	1-2	1	1	1	1	1	1	3-X
13	2-4	-	5-m	2-5	1-3	4-10	2	1-2(b)	2(B)	6-m	2-3	1(L)
14	1	1-2	6-9	-	-	-	1	1	1	1-2	1-2	1-2
15	2-8	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 4 from Honshu.

TABLE 109. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) nipponicus* LaCasse and Yamaguti, 1948

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	7-13	-	-	-	1	1	1	1	1	1	1
1	1	3-6(B)	2-9(b+)	3-7	4-12	3-7	2-6	2-6(b+)	3-6(b+)	2-5(b+)	2-5(b+)	4-8(B)
2	-	1(B)	1-2	1-2	3-7(b+)	2-6	1-2	1-2	1-2	1	1-2	1
3	1	3-10(B)	1	4-8(b+)	1-3	1-2	1	1-2	1	1	2-5	5-11(B)
4	6-15(B)	1-2(b+)	1-2	2-4	4-11(b+)	4-9	1-4	1-3	2-5	1	1	1
5	7-15(B)	1-3(L,B)	1(L,B)	1-3	3-7	3-5	3-5	3-5	3-4	2-5	3-5(b+)	5-11(B)
6	7-12(B)	1-2(L,B)	3(L,B)	1	2-4(L,B)	2-3(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	5-11(b+)	1-S
7	10-14(B)	2-6(B)	1(B)	6-10(L,B)	1-2(B)	2-10(b+)	4-10	4-8	4-8	3-6(b+)	1-3	3-6(B)
8	1-2	4-8(B)	4-7(L,B)	6-10(b+)	-	1-3	1-2	1	1	1-5	4-11	1-X
9	4-7	1-3(b+)	4-6(L,B)	3-6(L,B)	2-5	1-2	1	1	1	1	1-5(b+)	2-4(B)
10	2-4	1(b+)	1(L,B)	1(L,B)	1	1	1	1	1	1	1(B)	2-X
11	m(B,d)	2-4	1-3	1-3	4-9(B)	1-2	1	1-2	1-2	1-2	1	2-4(L)
12	2-5	1(b+)	1(L,B)	1(b+)	1-2	1	1-2	1-2	1	1	1	3-X
13	1(b+)	-	m	4-9(b+)	4-7(b+)	4-9(b+)	3-7(B)	3-6(b+)	3-7(b+)	8-12	2-7(b+)	1(L)
14	2-4	2-3	4-11(b+)	-	-	-	1	1	1	1-2	1-2	1-2
15	2-3(B)	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 2 from Hokkaido, 7 from Honshu, 12 from Korea (incl. 3 robust form).

TABLE 110. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) nishikawai* n. sp.

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m	-	-	-	1	1	1	1	1	1	1
1	1	2-5(B)	3-5(b+)	3-4	4-7	3-4	3-4	3-5(b+)	2-4(b+)	2-4(b+)	2-4(b+)	4-7(B)
2	-	1(B)	1-2	1	3-8(b+)	3-7	1-2	1-2	1	1	1-2	1
3	1	3-9(B)	1	5-10(b+)	1-2	1-2	1	1-2	1	1	2-4	5-8(B)
4	7-14(B)	1-2(b+)	1-2	1-5	8-10(b+)	7-12	2-4	1-3	3-5	1	1	1
5	9-13(B)	2-3(L,B)	1(L,B)	1-4	2-6	3-5	2-4	2-4	2-3	3-4	2-4(b+)	4-7(B)
6	7-10(B)	1(L,B)	2-4(L,B)	1	2-3(L,B)	2-3(L,B)	2(L,B)	2(L,B)	2-3(L,B)	1-3(L,B)	5-10(b+)	1-S
7	10-14(B)	3-6(B)	1(B)	6-9(L,B)	1-2(B)	3-8(b+)	6-10	6-9	6-8	3-6(b+)	1-3	4-7(B)
8	1-2	5-10(B)	4-8(L,B)	7-12(b+)	-	2-4	1-3	1	1-2	2-4	6-11	1-X
9	3-7	1-4(b+)	4-7(L,B)	4-6(L,B)	2-4	1-2	1-2	1-2	1-2	1	2-9(b+)	2-4(B)
10	2-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1-2	2-X
11	m(B,d)	3-6	2-4	2-3	5-9(B)	1	1-2	1-2	1-2	1-2	1	2-4(L)
12	2-3	1(b+)	1(L,B)	1(b+)	1-2	1-2	1-3	1-2	1	1	1	3-X
13	1-2(b+)	-	m	4-10(b+)	4-9(b+)	6-11(b+)	3-6(b+)	3-6(b+)	3-6(b+)	m	3-5(b+)	1(L)
14	2-6	2-3	7-14(b+)	-	-	-	1	1	1-2	1-2	1-2	1-4
15	2-3(b)	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Amami Oshima (incl. 1 robust form).

TABLE III. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) oreophilus* (Edwards, 1916)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	3-10	-	-	-	1-2	1-2	1	1	1-2	1	1
1	1(st)	2(B)	2-3	2-3	2-3	2-3	2-3	2-4	2-3	2-3	2-3	3-5(b)
2	-	1(b)	1	1	1-2	1	1	1	1	1	1	1
3	1	2-4(b)	1	3-6	1-2	1-2	1	1-2	1	1	1	4-9(B)
4	2-4	1-2	1-2	2-4	5-8	4-7	1-2	1	2-5	1-3	2-3	1
5	1-2(b)	1-2(L,B)	1(L,B)	1-2	3-6	2-3	3-4	2-3	1-3	2-3	2-4	4-7(B)
6	2-4	1(L,B)	3-4(L,B)	1	3-4(L,B)	2-3(L,B)	2(L,B)	2-3(L,B)	2-3(L,B)	2(L,B)	4-7	1-S
7	3-5(b)	1-3(L,B)	1(B)	4-10(L,B)	2-3(B)	3-8	3-5	4-5	3-5	2-3	1-2	3-5(b)
8	1-2	4-8	4-8(L,B)	6-10	-	1-2	1	1	1	2-4	4-8	1-X
9	2-3	1-3	4-6(L,B)	3-6(L,B)	1-3	1	1	1	1	1	2-3	2-3
10	1-2	1(B)	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	4-10	3-5	2-3	2-3	2-6	1	1	1	1	1	1	3-4(L)
12	1-2	1(B)	1(L,B)	1	1-2	1	1	1	1	1	1	3-X
13	1	-	m	3-6	2-3	2-5	3-5	3-5	3-4	5-8	2-3	1(L)
14	1-2	1	4-7	-	-	-	1-2	1-2	1	1-2	1-2	1
15	1-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized; m: multiple (with more than 10 branches); st: stout.
Specimens examined: 10 (30 for important setae) from Hakkoda Mts., Honshu.

TABLE 112. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Finlaya) watasei* Yamada, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	8-15	-	-	-	1	1	1	1	1	1	1
1	1(st)	1-2(b)	1-2(b)	2-3	3-4(b)	2-3	2-4	2-3	2-3	1-3	1-3(b)	3-5(b)
2	-	1	1-3	1	1-2	1	1	1	1	1	1	1
3	1	3-6(b)	1	3-8	1-3	1-2	1-2	2	1	1	2-3	5-8(b)
4	3-7	2-3	1-2	2-4	6-9	3-7	1-3	1	3-6	2-3	1	1
5	1	1(L,B)	1(L,B)	1-2	2-5	3-7	3-7	1-5	1-5(b)	1-4(b)	2-4	3-5(b)
6	1	1(L,b)	4-7(L,B)	1	3-4(L,B)	2-4(L,b)	2(L,b)	2(L,b)	2-3(L,b)	1-2(L,b)	2-5	1-S
7	1-2	2(L,B)	1	7-10(L,B)	2-3(b)	2-9	4-6	3-5	4-5	2-4	1-2	5-8(b)
8	2	3-8	5-8(L,B)	m	-	1-4	1-2	1	1	1-3	3-6	1-X
9	2-4	1-3	5-7(L,B)	4-6(L,B)	2-3	1	1	1	1	1	1-5	1-4(b)
10	1-2	1	1(L,B)	1(L,b)	1-2	1	1	1	1	1	1	2-X
11	3-7	2-4	1-3	3-8(b)	1	1	1	1	1	1	1	3-5(L)
12	2-8	1(b)	1(L,b)	1	1	1-2	1-2	1	1	1	1	3-X
13	1	-	m	4-8	2-3(b)	4-7	3-4	3-5	2-5(b)	3-9	2-5(b)	1(L)
14	1	1-2(b)	3-7	-	-	-	1	1	1	1	1	1-2
15	1-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized; m: multiple (with more than 10 branches); st: stout.
Specimens examined: 9 from Amami Ôshima.

TABLE 113. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) riversi* Bohart and Ingram, 1946

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	3-6	-	-	-	1	1	1	1	1-2	1	1
1	1	3(B)	2-5	2-5	3-5	3-4	2-4	3-4	3-4	2-4	2-3(b+)	2-6(b+)
2	-	1	1-2	1	2-5	1-5	1-2	1-2	1	1	1-2	1
3	1	2	1	2-4	1	1	1	1	1	1	1-2	5-7(B)
4	9-13(B)	1-3	1	2-9	3-4	2-4	1-2	1-2	1-3	1	1	1
5	1(b)	1(L,B)	1-2(L,B)	2-4	3-6	3-5	3-5	3-5	2-4	2-3	3-4	3-6(b+)
6	1-2	1(L,B)	3-4(L,B)	1	2-4(L,B)	2-3(L,B)	2(L,B)	2(L,B)	2-3(L,B)	1-2(L,b)	1-6	1-S
7	1-3(B)	2(L,B)	1(L,B)	4-8(L,B)	1-2(L,B)	1-4	2-4	1-3	1-3	1-2	1	3-5(b+)
8	1	3-12(b+)	4-7(L,B)	3-9	-	2-3	1-2	1-2	1	1-3	2-6	1-X
9	1	1	2-4(L,B)	2-3(L,B)	1-3	1-2	1-2	1-2	1-2	1-3	1-4	2-4(B)
10	1-2	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-6(b+)	1-2	1-2	1-2	3-6(b+)	1	1	1	1	1	1	2(L)
12	2-3	1	1(L,B)	1	-	1	1	1	1	1	1	3-X
13	1	-	5-12	2-6(b+)	2-6	3-6	2-6(B)	2-5(B)	2-5(B)	2-4(b+)	1-4(b+)	1(L)
14	1-5	2-5	2-7	-	-	-	1	1	1	1-2	1-2	1
15	1-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized.
Specimens examined: 10 (30 for important setae) individually reared specimens: 4 from Amami, 2 from Okinawa, 4 from Yaeyama.

TABLE 114. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) galloisi* Yamada, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	8-16(b)	-	-	-	1	1	1	1	1	1	1
1	1	3-5(L,B)	6-10(b)	7-16(b)	7-12(b)	7-13(b)	6-12(b)	6-13(b)	4-9(b)	4-9(b)	6-12(b)	6-14(b)
2	-	1	1-2	1	5-10(b)	6-10(b)	5-11(b)	6-12(b)	5-11(b)	5-10(b)	6-11(b)	1
3	1	5-11(b)	1	1-2	1	1	1	1	1	1	1	4-13(B)
4	9-16(B)	1-2	1	5-8(b)	1(b)	1	1	1	1	1	1	1
5	1(b)	1(L,B)	1(L,B)	6-13(b)	6-11(b)	8-13(b)	8-15(b)	6-16(b)	7-13(b)	5-13(b)	6-10(b)	7-18(b)
6	2	1(L,B)	2-3(L,B)	1	2-3(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	2-9(b)	1-S
7	2(b)	1-2(L,B)	1(L,B)	2-4(L,B)	1(L,B)	3-6(b)	4-6(b)	3-6(b)	2-5(b)	1-3(b)	1	3-7(B)
8	1	11-20(b)	2-4(L,B)	7-9(b)	-	1-2	1	1	1	1-2	4-11(b)	1-X
9	1	1	3-4(L,B)	2-3(L,B)	1-2	3-7(b)	5-11(b)	4-10(b)	4-9(b)	4-10(b)	4-10(b)	4-9(b)
10	1	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-6(b)	2-7	1-2	1	7-15(b)	1	1	1	1	1	1	2(L)
12	1-2	1	1(L,B)	1	-	1	1	1	1	1	1	3-X
13	1-2	-	9-15(b)	9-17(b)	6-10(b)	7-19(b)	8-20(b)	7-19(b)	7-15(b)	6-15(b)	6-14(b)	1(L)
14	2-8	2-3(b)	9-20(b)	-	-	-	1	1	1	1-3	1-3	1-2
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized.
Specimens examined: 10 (20 for important setae) from Hokkaido.

TABLE 115. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) albopictus* (Skuse, 1894)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	3-5	-	-	-	1	1	1	1	1	1	1
1	1	2-4(B)	2-4	2-6	3-5	2-5	1-5	3-4	2-5	1-4	2-4(B)	2-5(B)
2	-	1	1-2	1	1-3	1-3	1-3	1-3	1-2	1-3	1-3	1
3	1	2	1	1-4	1	1	1	1	1	1	1	3-7(B)
4	8-15(B)	1-3(b)	1	2-4	2-3	2-4	1-2	1-2	1-2	1	1	1
5	1(B)	1-2(L,B)	1(L,B)	1-4	3-5	2-4(b)	3-4(b)	2-3	1-4	1-4	1-4	2-6(b)
6	1-2	1-2(L,B)	2-4(L,B)	1	2-3,4(L,B)	2-3(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	2-3	1-S
7	1-3(B)	2-3(L,B)	1-2(L,B)	4-6(L,B)	1(L,B)	2-3(B)	2-4(b)	2-4	1-3	1	1	2-3(B)
8	1-2	5-9(b)	3-5(L,B)	3-7	-	2-3	1-2	1	1	2-3	3-4	1-X
9	1	1	2-3(L,B)	1-2(L,B)	1-3	1-3	1-3	1-3	1-3	1-3	1-3	2-4(B)
10	1-2	1	1(L,B)	1	1	1	1	1	1	1	1	2-X
11	2-3(B)	1-2	1	1	2-7	1-2	1	1	1	1	1	1-2(L)
12	2-4	1	1(L,B)	1	-	1	1	1	1	1	1	3-X
13	1	-	4-12	2-5	1-6	3-5(b)	2-5(B)	2-5(B)	2-5(B)	1-4(b)	1-4	1(L)
14	2-3	2-5	1-5	-	-	-	1-2	1-2	1	1-2	1-3	1-2
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized.
Specimens examined: 10 (30 for important setae) individually reared specimens: 3 from Honshu, 2 from Kyushu, 2 from Amami, 1 from Okinawa, 1 from Ogasawara, 1 from Yaeyama.

TABLE 116. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) flavopictus flavopictus* Yamada, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-11	-	-	-	1	1	1	1	1	1	1
1	1	3-6(B)	4-12(b+)	5-10(B)	5-10(B)	5-12(b+)	4-11(b+)	3-11(b+)	4-11(b+)	4-10(b+)	3-10(B)	5-19(B)
2	-	1	1	1	3-7(B)	3-8(B)	3-9(B)	4-8(b+)	3-8(b+)	4-8(B)	4-8(B)	1
3	1	2-10(b+)	1	2-5(b+)	1	1	1	1	1	1	1	4-11(B)
4	9-18(B)	3-18(b+)	1	3-11(b+)	1-3(b+)	1-3	1	1	1(b+)	1	1	1
5	1-2(b)	1-2(L,B)	1(L,B)	4-13	4-11(B)	4-12(b+)	5-12(B)	5-13(B)	3-13(B)	5-12(B)	4-14(B)	6-22(B)
6	2	1(L,B)	2-4(L,B)	1	2-3(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	1-3(b+)	1-S
7	2-3(B)	1-2(L,B)	1(L,B)	3-6(L,B)	1(L,B)	2-5(B)	3-7(B)	3-7(b+)	2-5(B)	1-3(B)	1(b+)	3-5(B)
8	1	7-21(B)	3-5(L,B)	5-16	-	1-3	1-2	1	1	2-3	4-11(b+)	1-X
9	1	1-7(b+)	2-3(L,B)	2-3(L,B)	1-3	2-8(b+)	3-8(b+)	3-8(b+)	3-10(b+)	4-11(b+)	3-10(b+)	2-10(B)
10	1-2	1-2	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-10(B)	1-5	1-4	1-4	6-11(B)	1-2	1	1	1	1	1	1-2(L)
12	1-2	1	1(L,B)	1	-	1	1	1	1	1	1	3-X
13	1-2	-	9-19(b+)	5-12(B)	4-11(B)	5-13(B)	5-12(B)	5-12(B)	5-12(B)	4-13(B)	3-14(b+)	1(L)
14	3-11(b+)	4-16(b+)	5-19(B)	-	-	-	1	1	1	1-2	1-2	1
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized.
Specimens examined: 10 (30 for important setae) individually reared specimens: 1 from Hokkaido, 7 from Honshu, 1 from Korea, 1 from Cheju Do.

TABLE 117. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) flavopictus downsi* Bohart and Ingram, 1946

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-7	-	-	-	1	1	1	1	1	1	1
1	1	3-4(B)	3-6	3-7(b+)	4-9(b+)	3-7(b+)	3-6(b+)	3-5(b+)	3-6(B)	3-4(b+)	3-4(B)	3-6(B)
2	-	1-2	1-2	1	2-5	2-5	1-5	1-4	1-5	1-5	1-3	1
3	1	2-3	1	3-6	1	1	1	1	1	1	1	3-7(B)
4	10-19(B)	2-5	1	3-6	2-4	2-4	1-2	1	1-2	1	1	1
5	1(b)	1-2(L,B)	1(L,B)	2-4	4-5(b+)	3-4(b+)	2-4(B)	2-3(B)	1-3(B)	3-4(b+)	2-5(B)	4-7(B)
6	1-3	1-2(L,B)	3-4(L,B)	1	2-4(L,B)	2-3(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	2-3	1-S
7	2-3(b)	2-4(L,B)	1(L,B)	3-7(L,B)	1-2(L,B)	2-4(b+)	3	2-3	2-4	1-2(b+)	1	3-5(b+)
8	1	6-13	3-5(L,B)	5-10	-	2-4	1-2	1	1	2-3	3-5	1-X
9	1	1-2	2-3(L,B)	2-3(L,B)	1-2	2-3	1-4	1-3	1-3	2-5	3	2(B)
10	2	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	3-4(B)	1-2	1	1	4-7(b+)	1	1	1	1	1	1	1-3(L)
12	2-3	1	1(L,B)	1	-	1	1	1	1	1	1	3-X
13	1	-	5-12(b+)	4-8(b+)	2-5(b+)	4-6(b+)	3-5(B)	3-4(B)	3-5(B)	3-4(B)	3-4(B)	1(L)
14	3-4	2-4	3-6(b+)	-	-	-	1-2	1	1	1-2	1-2	-
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized.
Specimens examined: 10 (19 for important setae) individually reared specimens: 7 from Amami, 3 from Okinawa.

TABLE 118. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) flavopictus miyarai* n. ssp.

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-8	-	-	-	1	1	1	1	1	1	1
1	1	2-4(B)	2-5(b+)	4-5	4-6(b+)	4-6(b+)	3-5(b+)	3-5(b+)	3-5(b+)	3-4(b+)	3-4(B)	4-6(B)
2	-	1	1	1	3-4	3	1-3	1-3	1-4	1-4	1-4	1
3	1	2	1	2-5	1	1	1	1	1	1	1	4-7(B)
4	9-21(B)	2-4	1	3-7	2-4	2-4	1	1	1-3	1	1	1
5	1(B)	1-2(L,B)	1(L,B)	2-4	3-6(b+)	3-4(b+)	3-5(b+)	3-4(b+)	3-4(b+)	3-4(b+)	3-5(b+)	4-8(B)
6	1-2	1(L,B)	3-4(L,B)	1	2-4(L,B)	2-3(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	1-3	1-S
7	2-3(b+)	2-3(L,B)	1(L,B)	4-6,9(L,B)	1(L,B)	2-4(b+)	2-4(b+)	2-4	2-3	1-2	1	3-5(B)
8	1	7-13(b+)	4-6(L,B)	4-7	-	1-3	1-2	1	1	2-4	3-4	1-X
9	1	1-2	2-3(L,B)	1-3(L,B)	2	2-4	2-4	2-4	2-4	2-5	2-3(b+)	2-3(B)
10	1-3	1	1(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-3(b+)	1-2	1	1	4-7(b+)	1	1	1	1	1	1	2(L)
12	1-2	1	1(L,B)	1	-	1	1	1	1	1	1	3-X
13	1-2	-	6-13	3-9(b+)	2-5	3-5(b+)	3-5(B)	3-5(B)	3-4,7(B)	3-4(B)	3-5(b+)	1(L)
14	2-4	2-4	4-9(b+)	-	-	-	1	1	1	1-2	1-3	1
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized.
Specimens examined: 10 (20 for important setae) individually reared specimens from Yaeyama.

TABLE 119. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) aegypti* (Linnaeus, 1762)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	3-6	-	-	-	1	1	1	1	1	1	1
1	1	3-4(B)	1-3	2-3	3-4	2-4	2-3	1-3	2-3	2-3	2-5(B)	3-4
2	-	1	1-2	1	2-3	1-2	1-2	1	1	1	1	1
3	1	2	1	1-3	1	1	1	1	1	1	1	5-9(B)
4	4-8	1-2	1	2-3	2-4	2-3	1-2	1-2	1-2	1	1	1
5	1(B)	2-3(L,B)	1-2(L,B)	2-3	2-4	3-4	2-4	3	2-3	2-3	2-3	3-6
6	1	1-2(L,B)	3-4(L,B)	1	3-5(L,B)	3-5(L,B)	3-5(L,B)	2-3(L,B)	2-3(L,B)	1-2(L,B)	2-3	1-S
7	1(b)	2-3(L,B)	1(L,B)	3-5(L,B)	2-3(L,B)	2-4(B)	2-4(B)	2-3	1-3	1-2	1-2	3-4(B)
8	1	3-4	3-4(L,B)	3-6	-	2-3	1-2	1-2	1-2	2-3	3-5	1-X
9	1	1	2-3(L,B)	2-3(L,B)	1-2	1-2	1	1	1	1	1-3	1-2(B)
10	1	1	1-2(L,B)	1(L,B)	1	1	1	1	1	1	1	2-X
11	2-3	1-2	1	1	3-4	1	1	1	1	1	1	2-4(L)
12	1-3	1	1-2(L,B)	1	-	1	1-2	1-2	1	1	1	3-X
13	1	-	2-3	2-4	2-3	1-3	2-3(b)	2-4(B)	2-4(B)	2-3	2-3	1-3(L)
14	2-3	2-4	2-3	-	-	-	1-2	1	1-2	1-2	1	1-2
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized.
Specimens examined: 10 from a laboratory colony of the Med Lab, Pacific.

TABLE 120. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) wadai* n. sp.

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-10(b)	-	-	-	1-2	1-3	1-2	1-2	1-2	1	1
1	1	2-4(B)	2-4(b)	2-4(B)	2-4(sf,B)	2-4(sf,B)	2-3(sf,B)	2-3(sf,B)	2-4(sf,B)	2-4(sf,B)	2-3(sf,B)	4-7(sf,B)
2	-	1(b)	1	1(b)	3-7(sf,b)	3-5(sf,B)	3-6(sf,B)	2-8(sf,B)	2-6(sf,B)	3-7(sf,B)	3-6(sf,B)	1
3	1	2-3(b)	1(b)	1-2(B)	1(b)	1(B)	1(b)	1(b)	1(b)	1	1(b)	2-5(B)
4	2-6	3-7(*,B)	1(b)	2-4(sf,B)	1-3(sf,B)	2-4(B)	1	1	1-2(b)	1(b)	1	1(b)
5	1	2-4(B)	1-2(L,B)	3-7(sf,B)	4-6(sf,B)	3-4(sf,B)	3-5(sf,B)	3-4(sf,B)	3-4(sf,B)	3-4(sf,B)	2-6(sf,B)	3-8(sf,B)
6	1	1(B)	3-4(L,B)	1(B)	2-5(L,B)	3-4(L,B)	2-3(L,B)	2-3(L,B)	2-3(L,B)	1-2(L,B)	1-4(B)	1-S
7	1	2-3(L,B)	1(L,B)	2-5(L,B)	1-2(L,B)	2-4(sf,B)	3-5(sf,B)	2-5(sf,B)	2-4(sf,B)	1-4(sf,B)	1-3(sf,B)	2-4(b)
8	1	8-11(*,B)	2-3(L,B)	4-9(*,B)	-	1-2(b)	1	1	1	1	2-5(B)	1-X
9	1-2	1-2(b)	2-3(L,B)	1-2(L,B)	2-3	3-5(sf,B)	2-5(sf,B)	2-4(sf,B)	2-4(sf,B)	2-5(sf,B)	3-5(B)	2-3(B)
10	1	1	1(L,B)	1-2(L,B)	1	1(b)	1(b)	1(b)	1	1	1(b)	2-X
11	3-7(B)	1-3	1-2	1-2	3-8(sf,B)	1-2(b)	1-2	1-2	1	1	1	2-3(L)
12	1-3	1(b)	1(L,B)	1	-	1(b)	1-2	1	1	1-2	1	3-X
13	1-2	-	5-12(*,B)	3-9(sf,B)	2-10(sf,B)	3-8(B)	2-4(B)	1-4(L,B)	2-5(B)	2-3(B)	2-4(sf,B)	1-3(L)
14	3-10(b)	6-15(*,B)	2-5(B)	-	-	-	1-3	1-3	1-4	1-6	1-4	1-3
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized; sf: stiff; *: stellate.
Specimens examined: 10 from Ogasawara islands.

TABLE 121. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Stegomyia) chemulpoensis* Yamada, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	11-17(B,*)	-	-	-	1	1-2	1	1	1	1	1
1	1	3-4(L,B)	6-11(B,*)	8-14(B,*)	9-14(B,*)	9-13(B,*)	10-14(B,*)	10-15(B,*)	10-16(B,*)	10-15(B,*)	9-16(B,*)	9-20(B,*)
2	-	1-2(b+)	1	1	9-13(B,*)	9-11(B,*)	8-11(B,*)	8-10(B,*)	6-9(B,*)	7-11(B,*)	6-11(B,*)	1
3	1	9-16(B,*)	1(b+)	1-4(b+)	1(b+)	1-2	1	1	1	1	1	6-11(B,*)
4	2-5	15-22(B,*)	1(b)	8-14(B,*)	1(B)	1-3	1	1	1-3(b+)	1	1	1
5	1	1-2(L,B)	1(L,B)	9-14(B,*)	10-13(B,*)	8-11(B,*)	9-12(B,*)	10-15(B,*)	10-13(B,*)	10-13(B,*)	9-12(B,*)	15-29(B,*)
6	1	1(L,B)	1-2(L,B)	1(b)	2-3(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	1†(L,B)	2-4(B)	1-S
7	1	2(L,B)	1(L,B)	3-5(L,B)	1(L,B)	5-8(B,*)	8-11(B,*)	8-12(B,*)	8-12(B,*)	10-11†(B,*)	2-5(B)	3-5(B)
8	1	14-20(B,*)	2-3(L,B)	11-16(B,*)	-	1-2	1	1	1(b)	2-4	6-10(B,*)	1-X
9	1	6-11(B,*)	2(L,B)	1-2(L,B)	2-6	4-6(B)	4-8(B)	6-8(B,*)	7-10(B,*)	8-11(B,*)	6-11(B,*)	6-19(B,*)
10	1	1(b+)	1(L,B)	1(L,B)	1(b+)	1(b+)	1	1	1	1	1	2-X
11	2-5(b)	1-3	1	1-2	9-14(B,*)	1	1	1	1	1	1	2-3(L)
12	1-2	1(b+)	1(L,B)	1(b)	-	1	1	1	1	1	1	3-X
13	1	-	13-19(B,*)	14-18(B,*)	11-15(B,*)	11-16(B,*)	10-15(B,*)	11-18(B,*)	12-18(B,*)	9-19(B,*)	11-19(B,*)	1(L)
14	3-8	25-35(B,*)	10-14(B,*)	-	-	-	1-2	1	1-2	1	1-2	1
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized; *: stellate.
†: These setae missing on most specimens examined.
Specimens examined: 6 from Korea.

TABLE 122. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Aedimorphus) alboscutellatus* (Theobald, 1905)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m	-	-	-	1	1	1	1	1	1	1
1	1	1	5-8	1	1-2	1-2	5-9	5-9	6-10	6-8	4-9	6-10(B)
2	-	2-5	2-4	6-9	1	1	1	1	1	1	1	3-4
3	1	4-5	2-4	m(d)	4-8	5-11	4-7	4-8	3-5	3-4	6-8	m
4	5-12(d)	4-6	4-10	4-8	m(d)	9-m(d)	2-3	2-3	6-11	4-9	3-5	1-2
5	3-4(B)	1(L,B)	1(L,B)	1	3-7	2-4	1-3	1-2	1-3	2-4	2-5	4-8(B)
6	2-3(B)	1(L,B)	3-5(L,B)	3-4	4-5(L,B)	3-5(L,B)	2-3(B)	2-5	2-6	3-5	m	1-S
7	5-7(B)	2-3(L,B)	1(L)	5-9(L,B)	2(L,B)	4-8(B)	7-12	m	m	3-7	2-3	4-8
8	3-5	1-2	4-8(L,B)	m(d)	-	1-4	1	1	1	3-6	m	1-X
9	2-5	2-4	6-8(L,B)	5-6(L,B)	2-4	1	1	1	1	1	1-3	1-3
10	2-5	1	1(L,B)	1(L,B)	1-2	1	2-3	2-3	2-3	1	1-3	2-X
11	3-7	3-4	1-2	1-2	1-2	3-9	2-5	2-5	2-4	2-4	1-3	m
12	4-7	1	1(L,B)	2-4	-	2-3	1-3	1-4	1	2-3	3-4	3-X
13	2-3	-	m(d)	m(d)	1-2	m(d)	4-7	4-5	3-6	m(d)	7-m	1(L)
14	1	1-2	m(d)	-	-	-	1	1	1-2	1-2	1-3	1-2
15	4-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Mindanao Is., Philippines.

TABLE 123. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Aedimorphus) vexans nipponii* (Theobald, 1907)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	-	1	1	1	1	1	1
1	1	1(b)	3-5	2-3	1-4	1-3	5-10	6-m	6-10	4-12	2-7	7-10(B)
2	-	1	2-4	2-4	1	1	1	1	1	1	1	2-3
3	1	2-4	1	5-m	2-5	2-4	2-3	2-4	2-3	2-3	4-8	6-10(B)
4	4-6	1-2	2-4	3-8	7-m	6-m	2-6	2-4	3-8	3-5	2-3	2-3
5	2-5(B)	1-2(L,B)	1(L,B)	1	4-8	3-7	3-7	2-5	2-6	2-5	4-7	7-11(B)
6	1-3(B)	1(L,B)	5-7(L,B)	1	3-5(L,B)	3-5(L,B)	2-3(L,B)	1-3(L,B)	1-2(L,B)	1-2(L,B)	5-11	1-S
7	7-11(B)	2-4(L,B)	1(L,B)	8-12(L,B)	2-4(L,B)	3-6(B)	4-6(B)	5-11	4-8	2-6	2-3	4-7
8	1	1-3(B)	6-10(L,B)	m(d)	-	2-3	1-2	1	1-2	1-5	6-11	1-X
9	2	1-2	6-8(L,B)	4-6(L,B)	2-4	1-2	1	1	1-2	1-2	2-6	1-3
10	2-3	1	1(L,B)	1(L,B)	1	1	1-2	1	1	1	1-2	2-X
11	5-9	4-7	2-4	2-6	1-5	1-2	1-3	1-4	1-3	1-3	1-3	6-9
12	3-7	1	1(L,B)	1	-	1-3	2-3	2	1-2	1	1	3-X
13	1-2	-	m(d)	7-m	1-2	8-m(d)	1-2	1	1-2	m(d)	4-11	1(L)
14	1-2	1	m(d)	-	-	-	1-2	1	1-2	1-2	1-2	1
15	4-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 7 from Hokkaido, 2 from Honshu, 1 from Okinawa, 1 from Yaeyama.

TABLE 124. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Geoskusea) baisasi* Knight and Hull, 1951

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	5-15(d)	-	-	-	1	1	1	1	1	1	1
1	1	1	2-6	2-4	3-7	2-6	4-8	5-9	4-8	3-6	3-6	4-7
2	-	1	1-2	2-4	1-2	1	1	1	1	1	1	1
3	1	2-3	1	7-11	2-6	2-5	2-4	3-5	1-2	1-2	4-5	2-6(f)
4	4-11	2-3	1-5	2-3	6-9	5-9	2-3	1-2	5-9	3-6	2-3	1-2
5	1-3(L,b)	1(B)	1(b)	1	3-6	2-5	1-2	1-2	1-2	1-3	2-5	4-8
6	1(L,B)	1(b)	4-6(B)	1	2-4(L,B)	3-4(L,B)	2-3	1-2	1-2	1-2	8-12	1-S
7	9-16(B)	2-3(B)	1	10-12(L,B)	1-2(L,b)	2-6	2-7	4-6	3-6	3-6	1-3	3-5
8	1	1-2	8-10(L,B)	m(d)	-	3-5	1-2	1	1	3-5	4-10	1-X
9	3-7	1-2	5-8(L,B)	6-8(L,B)	2-4	1-2	1	1	1	1	2-4	1-2
10	2-5	1	1(L,b)	1(L,b)	2-3	1	1-2	1-2	1	1	1-2	2-X
11	5-8	1-3	2-4	1-5	2-3	1-4	1-3	1-2	1-2	2-3	1	10-16
12	2-5	1	1(L,b)	1	1-2	1-5	1-2	1-2	1	1	1	3-X
13	4-8	-	m(d)	6-10	1-2	m(d)	2-3	1-2	3-4	m(d)	4-6	1(L)
14	1-2	2-4	m(d)	-	-	-	1	1	1-2	1-4	1-3	1-2
15	2-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; f: frayed; L: large sized; m: multiple (with more than 10 branches).
Specimens examined: 20 from Iriomote Is.

TABLE 125. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Neomelaniconion) lineatopennis* (Ludlow, 1905)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	?	?	?	?	?	?	1
1	1	1-2	3-4	4-5	?	?	4?	?	4-7	4?	5?	6-7(B)
2	-	2	3-4	3-4	1	1	1	1	1	1	1	2-3
3	1	3-7	1-2	13-15	2-4	3-4	2-3	3?	2-3	2?	6	9-10(B)
4	7-8	3	2-4	4-5	m(d)	m(d)	?	?	10?	4	3	2-3
5	4-7*	1(L,B)	1-3(L,B)	1	4-5	3-5	3-4	2?	3	4?	5?	9(B)
6	6(B)	1(L,B)	5-6(L,B)	1-2	3(L,B)	3-4(B)	1-2(B)	1-2(B)	1(B)	1(B)	m(d)	1-S
7	8-11(B)	2-4(L,B)	1(L,B)	8-11(L,B)	2(L,B)	6-9(B)	8-10	8-12	10-12	4	?	4-7
8	2	2-4(L,B)	7-10(L,B)	m(d)	-	2-3	2-3	2	2-3	3?	10?	1-X
9	3-4	1-2	5?(L,B)	3(L,B)	3	1-2	1	1	1	1	4	1
10	3-6	1	1(L,B)	1(L,B)	1	1-2	2-3	2	1-2	2	?	2-X
11	5-7	3-4	?	?	1	2-4	3-4	2-3	1-4	2?	?	9-12
12	7-9	1	1(L,B)	1-3	1	2-4	3	3	2	2-3	?	3-X
13	2-3(B)	-	m(d)	m(d)	1	m(d)	6-7	4	4-7	m(d)	?	1(L)
14	1	2-3	m(d)	-	-	-	?	?	1	1	?	1
15	4-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); ?: Could not be seen clearly, or position undeterminable on our specimens; *: from Knight and Hull (1953), and Mattingly (1961), (missing on specimens examined).
Specimens examined: 2 from Thailand.

TABLE 126. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Aedes) esoensis* Yamada, 1921

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m	-	-	-	1	1	1	1	1	1	1-2
1	1	1	3-7	2-5	1-10	2-7	5-13	6-12	5-12	4-12	3-12	4-8
2	-	1-3	2-6	3-6	1-3	1-2	1-2	1-2	1	1	1	1-3
3	1	2-5	1-2	m	4-8	3-8	2-5	3-6	2-5	2-4	5-12	5-10(B)
4	6-13(d)	2-4	3-6	2-7	m	7-m	1-7	1-4	5-m	3-7	2-4	1
5	5-9(B)	1(L,B)	1(L,B)	1-2	3-10	2-6	2-6	1-5	2-4	2-5	4-9	4-12(B)
6	4-8(B)	1(L,B)	4-7(L,B)	1	3-4(L,B)	2-4(L,B)	1-2(L,B)	1-2(L,B)	1-2(L,B)	1-2(B)	7-m	1-S
7	9-15(B)	3-4(L,B)	1(L,B)	4-10(L,B)	1-2(L,B)	3-11(B)	6-13	7-m	6-m	3-8	1-4	3-6
8	1-5	1-3(L,B)	4-8(L,B)	m	-	2-4	1-2	1-2	1-3	2-5	5-m	1-X
9	2-6	1-4	4-9(L,B)	3-4(L,B)	1-4	1-2	1	1	1-2	1-2	1-5	1-3
10	1-6	1-2	1(L,B)	1(L,B)	1-3	1	1-3	1-4	1-3	1-2	1-3	2-X
11	5-12	2-7	1-4	1-4	2-6	1-5	1-5	1-4	1-3	1-3	1-3	5-11(L)
12	5-13	1	1(L,B)	1	-	2-5	1-5	1-4	1	1-3	1-3	3-X
13	2-5	-	m(d)	m	1-4	m(d)	3-9	2-7	2-6	m(d)	4-13	1(L)
14	1	2-3	m(d)	-	-	-	1	1-2	1	1-3	1-4	1-2
15	3-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Hokkaidô, and 22 from Honshû.

TABLE 127. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Aedes) yamadai* Sasa, Kano and Takahasi, 1950

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1	4-7	3-5	1-5	1-5	5-12	7-13	7-11	7-14	3-7	4-7(B)
2	-	2-3	2-3	4-8	1	1	1	1	1	1	1	2-5
3	1	4-7	2-3	m	4-10	4-8	4-5	3-6	3-5	3-6	7-12	5-11(B)
4	7-12(d)	3-5	3-6	4-8	m	8-m	2-4	2-3	6-10	4-7	2-4	2-3
5	6-10(B)	1(L,B)	1(L,B)	1	4-8	4-8	3-6	2-5	2-5	2-5	2-6	6-9(B)
6	4-6(B)	1(L,B)	4-6(L,B)	2-3	2-4(L,B)	3-4(L,B)	1(L,B)	1(L,B)	1(L,B)	1(B)	9-12	1-S
7	8-15(B)	2-3(L,B)	1(L,B)	7-9(L,B)	1(L,B)	5-13(B)	6-11	7-13	8-12	5-7	3-5	4-7
8	3-5	1-2(L,B)	4-8(L,B)	9-m	-	2-4	1-2	1-3	2-3	2-5	7-m	1-X
9	2-5	1-3	5-7(L,B)	3-4(L,B)	1-3	1-3	1	1	1	1	2-5	2-3
10	4-6	1	1(L,B)	1(L,B)	1-3	1-2	2-3	2-3	2-3	1-4	2-4	2-X
11	6-10	2-4	1-3	1-2	1-3	2-5	2-3	1-3	1-2	2-3	1-3	7-10(L)
12	7-14	1	1(L,B)	1	-	2-4	2-3	1-3	1-2	2-3	2-3	3-X
13	2-3	-	m(d)	8-m(d)	1-4	m(d)	4-8	3-6	3-5	m(d)	7-13	1(L)
14	1	2-3	m(d)	-	-	-	1-2	1	1-2	1-2	1-2	1-2
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 7 from Hokkaidô.

TABLE 128. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Aedes) sasai* Tanaka, Mizusawa and Saugstad, 1975

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	?	m(d)	-	-	-	1	1	1	1	1	1	1
1	1-2	1-2	2-4	1-4	2-4	2-5	4-8	4-8	5-8	5-11	3-8	3-6(b)
2	-	1	2-4	2-4	1-2	1-3	1	1-2	1-2	1	1	1-2
3	1	2-4	1	7-m	2-7	3-5	2-3	2-3	2-3	1-3	4-8	6-10(B)
4	6-11	2-4	2-4	3-7	m	6-m	2-5	1-3	5-9	3-6	2-3	1
5	3-9(B)	1(L,B)	1(L,B)	1	6-12	3-6	1-4	2-4	2-4	2-5	4-7	5-7(b)
6	4-9(B)	1(L,B)	4-8(L,B)	1	2-4(L,B)	2-3(L,B)	1(L,B)	1-2(L,B)	1(b)	1(b)	5-11	1-S
7	5-16(B)	2-3(L,B)	1(L,B)	6-9(L,B)	1(L,B)	3-7(B)	5-13(B)	8-13	7-12	3-6	1-3	3-7
8	1-3	1-3(B)	5-8(L,B)	m(d)	-	1-3	1-2	1	1-2	1-4	4-9	1-X
9	2-3	1-2	4-8(L,B)	2-5(L,B)	1-4	1	1	1	1	1	1-5	1-2
10	2-4	1	1(L,B)	1(L,B)	1-2	1	1-2	1-2	1	1	1-3	2-X
11	5-14	3-7	2-5	1-5	2-5	1-4	1-2	1-2	1-2	1-3	1-4	4-9(L)
12	5-9	1	1(L,B)	1	-	1-3	1-4	1-3	1-2	1-2	1-2	3-X
13	2-4	-	m(d)	m(d)	1-4	m(d)	2-4	2-4	2-4	m(d)	4-16	1(L)
14	1	2-5	m(d)	-	-	-	1-2	1-2	1-2	1-2	1-3	1-3
15	3-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 19 (29 for important setae) from Honshu.

TABLE 129. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Verrallina) nobukonis* Yamada, 1932

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	9-m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1	3-4	2-3	1-2	1-2	5-8	4-7	4-6	4-5	4-5	3-6
2	-	2-3	2-4	5-7	1	1	1	1	1	1	1	2-4
3	1	2-4	3-4	6-9	4-6	4-6	4-6	4-6	3-5	3-5	3-5	5-8(B)
4	4-7	3-4	5-7	5-7	m	7-m	2-3	2-3	6-8	4-6	2-5	1
5	2(B)	1(L,B)	1(L,B)	1	2-4	2-4	1-3	1-2	1-2	1-2	2-5	5-8(B)
6	2(B)	1(L,B)	6-7(L,B)	2-3	2-3(L,B)	1(L,B)	1(B)	1(b)	1(b)	1-2	5-9	1-S
7	4-7(B)	2(L,B)	1(L,B)	4-8(L,B)	1(L,B)	4-6	5-8	4-8	5-8	2-3	2-3	3-5
8	3-6	1(B)	6-9(L,B)	9-m(d)	-	2	1	1	1	2-7	3-m	1-X
9	4-6	1-3	5-9(L,B)	3(L,B)	2-3	1	1	1	1	1	2-3	1-2
10	3-5	1	1(L,B)	1-2(L,B)	2-3	1-2	2-5	3-5	2-4	1-3	3-4	2-X
11	2-4	3-6	1-2	1-2	1-4	2-3	2-4	2-3	2	1-3	2-3	3-4(L)
12	4-6	1-2	1(L,B)	1-3	-	3-5	2-3	2-3	1-2	3-5	2-4	3-X
13	2-4	-	m(d)	4-8	1	7-m	5-9	4-9	4-m	m	5-m	1(L)
14	1	2-3	?	-	-	-	1	1	1	1-2	1	1
15	4-8	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 10 from Ishigaki Is.

TABLE 130. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Aedes (Verrallina) atriisimilis* Tanaka and Mizusawa, 1973

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1?	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1	3-6	3-6	1	1	4-9	6-8	4-12	4-8	4-7	4-6(B)
2	-	2	2-4	2-5	1	1	1	1	1	1	1	2
3	1	2-3	1	m	5-8	3-6	2-4	2-4	2-4	2-4	3-7	6-10(B)
4	5-8	2-4	3-5	3-7	m(d)	m	2-3	2-3	7-10	3-5	3-4	2
5	5-8(B)	1(L,B)	1(L,B)	1	3-6	4-6	2-4	2-4	2-4	2-5	4-7	8-10(B)
6	5-7(B)	1(L,B)	4-7(L,B)	2-3	2(L,B)	2-3(L,B)	1(L,B)	1(L,B)	1(B)	1	8-12	1-S
7	11-16(B)	2(L,B)	1(L,B)	6-10(L,B)	1(L,B)	4-12(B)	6-9	10-13	7-11	4-5	2-3	1-3
8	2	1(L,B)	6-9(L,B)	m(d)	-	1-2	1	1	1	4-6	5-11	1-X
9	3-5	1-2	7-10(L,B)	2-3(L,B)	3-4	1	1	1	1	1	2-3	1-2
10	2-3	1	1(L,B)	1(L,B)	2-4	1-2	1-3	1-2	1	1	2-4	2-X
11	4-7	3-5	1	1-2	2-3	2-3	1-3	2-3	1-3	1-3	1-3	6-7
12	5-8	1	1	1-2	-	2-4	2-3	2-3	1-2	2-3	2-3	3-X
13	2-4	-	m(d)	m(d)	1-2	m(d)	2-5	2-5	2-4	m(d)	5-9	1(L)
14	1	2-3	m(d)	-	-	-	1	1	1	1	1	1
15	4-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches).
Specimens examined: 7 paratypes from Iriomote Is.

TABLE 131. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Armigeres (Armigeres) subalbatus* (Coquillett, 1898)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	3-8	-	-	-	1	1	1	1	1	1	1-2
1	1	1-3(B)	2-6	2-6	5-9	4-8	2-6	1-5	1-2(b)	1-5	4-7	7-12
2	-	1-2	1-3	1-2	1	1	1	1	1	1	1	3-5
3	1	2-5	1(b)	6-9	5-8	5-9	3-5	3-4	4-10	4-7	5-8	6-10(B)
4	3-8	4-8	5-10	2-4	7-12	7-11	6-9	3-6	4-7	5-8	3-6	3-4
5	2-4(b)	2-4(B)	3-5(L,B)	1	3-6	2-4	2-5	3-6	3-5	3-6	2-5	1(b,sf)
6	1	1-3(B)	4-9(L,B)	1-2	6-12(L,B)	5-8(L,B)	2-4(L,B)	2(L,B)	1-2(L,B)	4-11	6-13	1-S
7	2-3(B)	5-8(L,B)	1-3(L,B)	8-14(L,B)	2-3(B)	1-4(B)	5-8	6-10	4-10	2-5	3-5	2-6
8	2	3-7(B)	8-16(L,B)	7-m	-	3-6	2-4	1-2	1-2	2-4	6-m	1-X
9	2-3(B)	3-6	7-16(L,B)	5-10(L,B)	2-4	1-2	1	1	1	1	2-7	3-5
10	1-3	1	1-2(L,B)	4-9(L,B)	5-7	2-4	2-5	3-5	2-4	1-2	1-3	2-X
11	5-10	4-10	3-5	3-5	5-11	3-5	2-4	2-4	2-4	2-4	2-7	3-6(L,B)
12	3-8	1(b)	3-7(L,B)	1-2	-	5-8	2-3	1-3	1	2-4	2-4	3-X
13	2-4	-	m(d)	7-m	1-2	8-m(d)	1-3(B)	1-3(B)	1-3(B)	m(d)	8-m	3(L,B)
14	1-3	3-5	m(d)	-	-	-	1-2	1-2	1-2	1-3	1-2	2-3
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 3 from Honshu, 1 from Kyushu, 3 from Amami, 2 from Okinawa, 1 from Yaeyama.

TABLE 132. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Uranotaenia (Pseudoficalbia) jacksoni* Edwards, 1935

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-6	-	-	-	1	1	1-2	1	1	1	1
1	1	2(L,B)	3-5(sf)	2-4(sf)	1	1	1-2	1-2	1-2	2	1-2	1(b)
2	-	1(L,B)	1	1	1(sf)	1(sf)	1	1	1	1	1	1
3	1	6-10(L,B)	1	2-3(sf)	1	1	1	1-2	1	1	2-3	7-9(B)
4	2-5	7-10(L,B)	2-3	2-4	5-7	2-5	2-3	2	2-4	2-3	1	1-4
5	2-4	1(L,B)	1(L,b)	1(sf)	2-4	1-3	1	1(sf)	1(sf)	1(sf)	2-3	2-3
6	1	1(L,B)	1(L,b)	1	2(L,B)	2(L,B)	1-2(L,B)	1-2(L,B)	2(L,B)	2-3(L,b)	3-6	1-S
7	5-10	3-5(L,B)	1(b)	7-11(L,B)	1(L,b)	1(L,b)	4-6	4-7	4-6	3-5	1-2	5-8(b)
8	1	6-10	6-9(L,B)	4-10	-	1	1-2	1-2	1-3	2-4	4-9	1-X
9	1-2	2-3	5-7(L,B)	4-9(L,B)	1	1(sf)	1(sf)	1(sf)	1(sf)	1	1-2	2-3
10	2	1(L,b)	1(L,B)	1(L,B)	1-3	1	1	1	1	1	1-2	2-X
11	3-5	1-3	1	1	1(sf)	1-3	1-2	2-3	1-3	1-3	1-2	2(L)
12	2-4	2-3	1(L,B)	1	2-4	1-3	2-3	2	2-3	1	1-2	3-X
13	1-3	-	m(d)	4-5	1	2	2	2	2-3	5-10	2-4	1-3(L)
14	2-4	10-19(B)	4-7	-	-	-	1	1	1	1-2	1	1-2
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: larged sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 11 from Okinawa Is.

TABLE 133. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Uranotaenia (Pseudoficalbia) ohamai* Tanaka, Mizusawa and Saugstad, 1975

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	5-13	-	-	1	1	1	1	1	1	1	1
1	1	1-2(L,B)	3-7(sf)	4-6(sf)	1-4(sf)	2-4	1-4	2-4	2-4	2-4	2-4	2-3
2	-	1(L,B)	1	1-2	1-2(sf)	1(sf)	1	1	1	1	1	1
3	1	5-10(L,B)	1	2-3(sf)	1	1	1	1-2	1	1-2	3(b)	6-9(B)
4	2-4	4-9(B)	2-3	2-4	2-3(sf)	1-3	1-3	2-3	2-3	1-2	1	1-3
5	3-7	1(L,B)	1(L,B)	1(sf)	2-3	1-2	1(sf)	1(sf)	1(sf)	1(sf)	1-2	2-5
6	1	1(L,B)	1(L,B)	1	2(L,B)	2-3(L,B)	1-3(L,b)	2-3(L,b)	2-3(L,b)	2-3(L,b)	2-4	1-S
7	7-11	3-4(L,B)	1(B)	8-14(L,B)	1(L,B)	1(L,B)	2-4	2-4	2-4	2-4	1-2	4-7(b)
8	1-2	5-11	7-10(L,B)	m(d)	-	1-2	1-2	1-2	1-2	1-3	3-6	1-X
9	1-2	2-3	6-10(L,B)	6-8(L,B)	1-3	1(sf)	1(sf)	1(sf)	1(sf)	1	1-2	2-3
10	1-3	1(L,b)	1(L,B)	1(L,B)	2-4	1-3	1-2	1-2	1-2	1-3	1-2	2-X
11	2-3	1-3	1	1	2-3(sf)	1-3	1-3	1-2	1-2	1-3	1-2	2(L)
12	1-3	2-5	1(L,B)	1	2-5	1-2	2-3	1-3	1-3	1-2	1-2	3-X
13	1-3	-	m(d)	3-6	1-2	2-4	2-4	3-4	3-4	3-7	2-4	2(L)
14	1	5-12(sf,B)	4-8(sf)	-	-	-	1	1	1	1	1-2	1
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 20 from Yaeyama.

TABLE 134. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Uranotaenia (Pseudoficalbia) yaeyamana* Tanaka, Mizusawa and Saugstad, 1975

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-8	-	-	-	1	1-2	1-2	1-2	1-2	1	1
1	1	1-3(L,B)	3-6(sf)	2-5(sf)	1-2	1-3	1-3	1-3	1-3	1-3	2-3	1-2(b)
2	-	1(L,B)	1	1-2	1(sf)	1(sf)	1	1	1	1	1	1-2
3	1	7-13(L,B)	1-3	2-3(sf)	1-2	1-2	1-2	1-3	1-2	1-3	2-3	6-9(B)
4	2-5	8-12(L,B)	1-4	2-4	4-9	2-4	1-3	1-3	3-6	1-4	1-2	1-4
5	3-6	1(L,B)	1(L,b)	1(sf)	1-4	1-4	1-3	1(sf)	1(sf)	1(sf)	1-2	2-4
6	1	1(L,B)	1(L,b)	1	2(L,B)	2(L,B)	1-3(L,B)	2-3(L,b)	2(L,b)	2(L,b)	4-7	1-S
7	7-10	3-6(L,B)	1(b)	8-12(L,B)	1(L,B)	1-2(L,B)	3-7	3-8	3-6	3-7	1-2	5-9(B)
8	1	7-14	6-9(L,B)	4-10	-	1	1	1-3	1-3	1-5	3-10	1-X
9	1-2	3-4	4-8(L,B)	5-7(L,B)	1	1(sf)	1(sf)	1(sf)	1(sf)	1	1-2	1-3
10	1-4	1(L)	1(L,B)	1(L,B)	1-3	1-3	1-2	1-2	1-2	1-3	1-2	2-X
11	4-7	1-4	1-2	1	1-3(sf)	1-4	1-3	1-2	1-2	1-2	1-2	1-3(L)
12	2-5	1-5	1(L,B)	1	2-3	1-3	2-6	2-4	2-3	1-2	1-2	3-X
13	1-3	-	m(d)	5-11	1-2	2-6	2-5	2-5	2-4	5-9	2-4	1-2(L)
14	2-4	9-20(sf,B)	5-10	-	-	-	1	1	1	1-2	1-2	1-2
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; M: multiple (with more than ten branches); sf: stiff.
Specimens examined: 20 from Yaeyama.

TABLE 135. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Uranotaenia (Pseudoficalbia) novobscura novobscura* Barraud, 1934

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	6-m	-	-	-	1	1	1	1	1	1	1
1	1	1(L,B)	3-6	2-8	2-7	2-5	4-8	4-7	4-8	5-7	2-5	6-9(d)
2	-	1(L,B)	1-2	2-5	1-2	1	1	1	1	1	1	1-3
3	1	1-3(B)	1-3	6-10	2-4	1-3	1-3	2-4	1-2	1-3	1(b)	4-6(B)
4	8-m	1-3(b)	3-6	2-3	5-11	3-5	1-3	1-3	3-5	3-4	1-2	1-2
5	1	1(L,B)	1-2(B)	1	1-3	2-6	2-4	1-3	2-4	2-4	2-3	2-6
6	1	1(B)	1(B)	1-3	1(L,B)	1(L,B)	1-3(B)	1-3(B)	1-3(B)	1(B)	6-7	1-S
7	4-7	1-2(L,B)	1(b)	6-8(L,B)	1(L,B)	1(L,B)	4-9	3-6	4-9	4-6	1-3	3-6(B)
8	1-3	5-10	4-7(L,B)	m(d)	-	2-3	1-3	2-5	1-3	1-4	4-8	1-X
9	2-3	1-2	4-6(L,B)	4-6(L,B)	1	1-2	1	1-2	1	1	2-3	3-7(B)
10	1-4	1	1(L,B)	1(L,B)	2-5	1-3	2	2-3	2-3	1-3	2-4	2-X
11	8-m(d)	2-5	1-2	1-2	2-5	1-2	1-2	2-3	2-3	1-2	1	1-2(L)
12	2-6	2-5(b)	1(L,B)	1-2	2-4	2-4	2-3	1-2	1-2	1-3	1-2	3-X
13	1	-	m(d)	7-m(d)	1	8-m	4-9	5-m	3-10	m(d)	3-8	1(L)
14	1	2-3(b+)	m(d)	-	-	-	1	1	1	1	1	1-3
15	3-5	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 8 from Honshu, 2 from Shikoku, 1 from Kyushu.

TABLE 136. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Uranotaenia (Pseudoficalbia) nivipleura* Leicester, 1908

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-6	-	-	-	1	1	1	1	?	1	1
1	1	1(L,B)	2-8	2-3	1-3	3-6	3(b)	3(b)	3(b)	2-3	2-3(b)	2-4
2	-	1(L,B)	1	1-2	1	1-2	1	1-3	1-2	1	1	2
3	1	3-4(B)	1-3	3	3	3	2-3	2-3	1	2-3(b)	2-3(B)	3(B)
4	1	2(B)	2-5	2-3	5-7	4	2	1-2	3-5	2-3	2-3	1
5	1(B)	1(L,B)	1(L,B)	1	2	2-3	2-3	2-3	1-2	1-3	1-4	3-4(B)
6	1	1(L,B)	1(L,B)	2-3	3(L,B)	3(L,B)	2(L,B)	2(L,B)	2(L,B)	2(B)	3-5	1-S
7	3-4	3(L,B)	2-3	4-5(L,B)	1(L,B)	1(L,B)	3-6	5	4-7	4-5	2-3	3-4(B)
8	2	4-5	3-4(L,B)	4-8	-	2-3	2-3	2-3	2-3	1-3	2-3	1-X
9	2-4	2(B)	2(L,B)	2(L,B)	1-2	1-2	1	1-2	1-2	1	1-2	2(B)
10	1	1(B)	1(L,B)	1(L,B)	2-4	1	2-3	1-2	1-2	2-4	2-3	2-X
11	4-5	2-4	1	1	2-4	2-4	2-3	1-2	2	1-2	1-2	4-5(L,B)
12	2	1	1(L,B)	1	2-3	2	2	1	1	1	1	3-X
13	1-2	-	8-10(d)	5-7	1	3-5	3(B)	3(B)	3-5(B)	8-10(d)	3-6	4(L,B)
14	?	2(B)	7-13(d)	-	-	-	1	1	1	1-2	?	1-2
15	2	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches).
Specimens examined: 2 from Taiwan.

TABLE 137. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Uranotaenia (Uranotaenia) annandalei* Barraud, 1926

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	6-9	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(B)	8-14	7-11	1-2	4-6	5-8	6-7	5-7	3-7	4-7	3-6
2	-	1(B)	1	2-5	1-2	1	1	1	1	1	1	1-3
3	1	6-9(b)	3-7	5-8	5-8	3-6	2-3	3-5	1-3	3-7	8-9	4-6(B)
4	1-2	3-4(B)	3-5	2-4	7-11	5-9	2-3	1-3	5-8	2-6(b)	1-3	1-3
5	1(+)	1(L,B)	1(L,b)	1	2-3	2-5	1-3	1-3	1-2	2-3	2-3	4-7
6	1(+)	1(L,B)	1(L,B)	1-2	3(L,B)	3(L,B)	2(L,B)	4-6	4-6	5-8	3-7	1-S
7	1-2(b)	1-2(L,B)	1	5-7(L,B)	1(L,B)	2-4	2-6	2-4	3-5	2-5	1-3	7-10(B)
8	1-2	2-5	5-7(L,B)	6-10	-	1-2	1-2	2-4	2-4	2-4	3-6	1-X
9	2-3	2-4	4(L,B)	4(L,B)	2	1	1	1	1	1	1	1
10	1	1	1(L,b)	1(L,b)	2-5	1-3	1-2	1-2	1-3	1-3	3	2-X
11	2-4	3-5	1-3	2	4-6	1-3	1-3	2	1-3	1-2	1	2(L)
12	1-4	2-5	1	1-2	2-4	2-3	2-4	1-2	1-3	2-3	1-3	3-X
13	1-2	-	m	4-7	1-5	4-7	2-4	3-4	3-5	m(d)	3-5	2(L)
14	1(+)	1-2(b)	m(d)	-	-	-	1-2	1-2	1	1-2	1-2	1-2
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches); st: stout;
+: unusually well developed.
Specimens examined: 10 from Ishigaki Is.

TABLE 138. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Uranotaenia (Uranotaenia) macfarlanei* Edwards, 1914

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1(st)	1(L,B)	7-8(*)	6-8(*)	1	4-6(*)	8-10(*)	8-10(*)	8-10(*)	7-9(*)	7-8(*,b)	4-6(b)
2	-	1(L,B)	1	1-4	1	1	1	1	1	1	1	1-3
3	1	5-9(b)	3-4	4-6(*)	5-7(*)	5-7(*)	1-3	1-3	2	1-4	9-11(*,b)	5-7(B)
4	2-4	2(L,B)	3-5	3-7	5-12	2-5	1-2	1-2	3-5	2-3	1-3	1-3
5	1(+)	1(L,B)	1(L,B)	1-2	2-6	2-3	2-3	2-3	2-4	2-3	4-7	8-12
6	1(+)	1(L,B)	1(L,B)	1-3	3(L,B)	3(L,B)	6-9(*)	8-10(*)	6-10(*)	9-12(*)	5-7	1-S
7	3-5(b)	2-3(L,B)	1(b)	7-9(L,B)	1(L,B)	1(L,B)	3-5	2-5	3-6	2-5	3-5	9-12(b)
8	1-3	4-7(B)	5-7(L,B)	m	-	1-2	1-3	1-3	2-3	2-4	6-10	1-X
9	3	2(B)	5-6(L,B)	4-6(L,B)	1-2	1	1-2	1	1	1	2-4	5-6
10	1-2	1(L,B)	1(L,B)	1(L,B)	1-4	2-4	1-2	1-2	2-3	1-4	2-3	2-X
11	4-9(B)	2-5	2-4	2-4	4-7	2-3	1-2	2-3	1-2	1-3	1	3(L)
12	4-8	1-4	1(L)	1-5	3-5	1-2	1-3	1	1	1-3	1-2	3-X
13	2-4	-	m(d)	7-11(*)	1-2	6-7(*)	6-7(*)	5-8(*)	7-9(*)	m(d)	5-9(*)	2(L)
14	1(st)	1(b)	m(d)	-	-	-	1	1	1	1-2	1	1
15	2-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than 10 branches); st: stout; *: stellate; +: unusually well developed.
Specimens examined: 10 from Yaeyama Gunto.

TABLE 139. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Tripteroides (Tripteroides) bambusa bambusa* (Yamada), 1917

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	15-23(b)	-	-	-	8-10(b,*)	8-11(b,*)	9-13(b,*)	10-14(b,*)	13-17(b,*)	14-19(b,*)	1
1	1(st)	18-29(b)	17-27(b,*)	16-23(b,*)	15-20(b,*)	14-18(b,*)	17-22(b,*)	18-25(b,*)	23-27(b,*)	23-29(b,*)	21-32(b,*)	31-37(b,*)
2	-	1	1	1	15-21(b,*)	13-18(b,*)	12-19(b,*)	15-20(b,*)	16-20(b,*)	17-21(b,*)	16-22(b,*)	1
3	1	10-15(b,*)	1(b)	1	1	1	1	1	1	1	1(L,b)	9-14(*)
4	1	10-17(b,*)	1	12-18(b,*)	1(b)	1	1	1	1(b)	1	1	1
5	1	1(L,b)	1(L,b)	18-28(b,*)	11-18(B,*)	12-17(B,*)	16-24(b,*)	13-20(b,*)	18-21(b,*)	18-21(b,*)	21-24(b,*)	4-9(*)
6	1-2	1(L,b)	1(st,B)	1	2(L,B)	2(L,B)	2-3(L,b)	2-4(L,b)	2(L,b)	1(L,b)	1-2(b)	1-S
7	2-4	11-16(b,*)	1	2-4(st,b)	1(L,b)	1(L,b)	1	1	1	1	1	3-6
8	1-2	17-23(b,*)	15-20(b,*)	15-20(b,*)	-	1	1	1	2-3	3-6	15-21(b,*)	1-X
9	1-4	2-5(L,b)	6-9(L,B)	6-8(L,B)	4-7(b,*)	6-9(b,*)	7-10(b,*)	4-14(b,*)	12-15(b,*)	13-16(b,*)	14-18(b,*)	
10	1	1(L,b)	1(L,b)	1(L,b)	1	1	1	1	1	1	1	2-X
11	10-13(b)	2-7	2-4	2-5	12-17(b,*)	12-16(b,*)	14-20(b,*)	16-22(b,*)	18-24(b,*)	20-25(b,*)	16-25(b,*)	4-6(B)
12	1	1(L,b)	1(L,b)	1	-	1	1	1	1	1	1	3-X
13	1	21-28(B,*)	19-27(b,*)	13-22(b,*)	19-25(b,*)	17-23(b,*)	17-22(b,*)	17-24(b,*)	19-25(b,*)	18-28(b,*)	17-23(b,*)	1(B)
14	3-9	24-31(b,*)	16-27(b,*)	-	-	9-11(b,*)	9-12(b,*)	9-13(b,*)	10-13(b,*)	11-14(b,*)	11-14(b,*)	1
15	4-6	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized (long); st: stout; *: stellate.
Specimens examined: 9 from Honshu, 1 from Hokkaido.

TABLE 140. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Topomyia (Suaymyia) yanbarensis* Miyagi, 1976

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	6-7	-	-	-	1	1	1	1	1	1	1
1	1(st)	5-7(B)	1	1-2	4-7	1-2	1	1-2	1	1	1	3-4
2	-	1(B)	1	1	1	1	1	1-2	1-3	1	1-2	1
3	1	2-4	1	4-6	2	1-2	1	1	1	2-3	1-2	1-2
4	2-3	5-9	1	1	4-6	4-6	1-3	2-3	5-7	3-4	1	1
5	1	8-9(L,B)	1(L,B)	1-2(b+)	1	1-2	1-2	1-2	1-3	1-2	2-3	1-2
6	1	9-11(L,B)	1(L,B)	1(b+)	2(L,B)	2-3(L,B)	3-4(L,B)	3-4(L,B)	2(L,B)	1	6-7	1-S
7	2	1-2(L,B)	1(L,B)	6-7	3-5(L,B)	3-5(L,B)	5-7	5-7	5-9	3-6	1	1-2
8	1	4-5(b+)	5-7(L,B)	3-5	-	1-2	2-4	2-5	3-4	3-5	6-8	1-X
9	2	4-5(B)	4-7(L,B)	7-10(L,B)	1	1	1	1	1	1	2	4-6(L,B)
10	1	2(B)	1(L,B)	1-2(L,B)	1-2	1	1-2	1-2	2-3	4-6	2-3	2-X
11	4-5(B)	1	1	1	5-7(b)	2-4	2-4	2-4	3-5	3-4	4-6	4-5(L)
12	2	1(L,B)	1(L,B)	1	-	2-4(b)	1	1	1-2	1-2	1	3-X
13	1-3	-	5-10(B)	m(B)	7-13(b)	8-11(b)	4-7(L,B)	4-8(L,B)	3-6(L,B)	9-m	3	3-6(L)
14	3-6(b+)	1-3	4-7	-	-	-	?	?	?	?	?	?
15	4-7	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; b+: barbing variable; L: large sized; m: multiple (with more than ten branches); st: stout.
Specimens examined: 3 from Okinawa.

TABLE 141. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Malaya genurostris* Leicester, 1908

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	4-9	-	-	-	1	1	1	1	1	1	1
1	1	1-2	1-3	1-3	1-4	2-4	3-4	3-4	3-6	4-6	5-9	4-7
2	-	1-2	1-3	1-4	1-2	1	1	1-2	1-2	1-2	1-4	1-2
3	1	1-3	1-2	2-5	1-3	1-3	1	1	1	2-4	1(L,b)	1-6
4	1-3	5-10	1-2	1-3	2-4	2-3	2-3	2-3	1-3	2-4	1-2	1-3
5	1-2	m(B)	1(L,B)	2-4	3-6	2-6	3-7	3-6	3-7	4-6	3-5	2-3
6	1-2	m(L,B)	1(L,b)	1-4	6-9(L,B)	6-10(L,B)	1-2(L,b)	3-7(L,b)	1-3(L,b)	1(L,b)	3-5	1-S
7	2-4	1(L,B)	1(b)	4-6(b)	1-2(L,B)	2(L,B)	1-4	2-4	1-3	1-2	1	3-5(b)
8	1-3	6-10	3-5	1-2	-	1-3	1-3	1-3	2-4	3-6	4-7	1-X
9	3-5	1-3(L)	7-12(L,B)	9-15(L,B)	8-11(L)	7-10	2-4	1-2	1-2	1-3	3-5	2-3(L,B)
10	1-2	1-2(L,B)	1(L,b)	1-2(L)	3-6	2-4	2-3	1-3	2-4	2-4	2-4	2-X
11	6-8	1-2	1-2	1-2	3-5	2-3	2-4	2-3	2-4	2-4	2-3	3-5(L)
12	2-4	1(L,b)	1(L)	1	-	2-3	1-2	1-3	1-3	1	1	3-X
13	2-5	-	5-8	7-11	3	2-4	2-3	2-4	3-7	4-8	3-7	1-2(L)
14	1-4	1-2	2-4	-	-	-	1?	1	1	1	1?	1
15	1-3	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; L: large sized; m: multiple (with more than 10 branches).
Specimens examined: 9 from Okinawa Is., 1 from Ishigaki Is.

TABLE 142. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Toxorhynchites (Toxorhynchites) manicatus* (Edwards, 1921)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1-2	1-2	1-2	1-2	1-2	1-2	1-2
1	1	1	1	1	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	2-4	1(sf,B)	1-3
2	-	2-4	1-3	4-m	2-7	1-4	1-3	1	1-3	1	1	2-6
3	1	4-10	1-2	m	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	1(sf,B)	1-3	5-m
4	1	m	1-3	5-m	1-2(sf,B)	2(L,B)	1(L,B)	1(L,B)	1(sf,B)	3-10	1-2	1(sf,B)
5	m(d)	1(sf,B)	1(B)	4-m	3-9	2-6	2-5	2-5	3-7	2-8	3-7	1(sf,B)
6	1	2-8	1(sf,B)	1(sf,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	1(L,B)	7-m	1-S
7	1	1-2(sf,B)	1-6	1-2(sf,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	1(B)	1(sf,B)	4-7(B)
8	2-4	7-m	m(d)	m(d)	-	1-2	1	1-2	1	m	m	1-X
9	2-4	1(sf,B)	1(sf,B)	1(sf,B)	1-4	1	1	1-2	1	1	1	1(sf,B)
10	4-7	1(B)	1(B)	1(L,B)	1	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2	1-2	2-X
11	m(d)	1-3	1-2	1-2	2(sf,B)	2(B)	1-2(sf,B)	1(sf,B)	1(sf,B)	1(B)	1(B)	7-12(L)
12	5-10	1	1	1-2	m	1-3	1-4	1-5	1-5	1-4	1	3-X
13	8-m	-	1-2(sf,B)	1-2(sf,B)	1-3(B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	4-9(L)
14	1-2	1-2	m(d)	-	-	-	-	-	-	-	1-2	-
15	2-4	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 2 from Amami Oshima, 10 from Yaeyama Gunto.

TABLE 143. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Toxorhynchites (Toxorhynchites) towadensis* (Matsumura, 1916)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1-2	1	1	1(b)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	2-3	1(sf,B)	1-2
2	-	2-4	1	3-7	1-4	1-3	1-3	1-2	1-2	1-3	1	1-2
3	1	5-9	1-2	m	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	1(sf,B)	2-4	9-m
4	1	m	1-2	8-m	1-2(sf,B)	2(L,B)	1(L,B)	1(L,B)	1(sf,B)	8-10	1	1(sf,B)
5	m	1(sf,B)	1(B)	2-7	5-9	4-7	3-4	3-5	4-7	3-7	3-6	1(sf,B)
6	1	4-12	1(sf,B)	1(sf,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2(L,B)	1(L,B)	m	1-S
7	1	2(sf,B)	3-6	1(sf,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	1(L,B)	1(sf,B)	4-6(B)
8	1	m(d)	m(d)	m(d)	-	1-2	1	1	1-2	m	m	1-X
9	1-3	1(sf,B)	1(sf,B)	1(sf,B)	2-3	1-2	1	1	1	1	1	1(sf,B)
10	3-6	1(B)	1(B)	1(L,B)	1-2	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1	1	2-X
11	m(d)	1-2	1-3	1-3	2(sf,B)	1-2(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(B)	1(B)	4-8(L)
12	3-5	1	1	1	m(d)	2-6	2-4	2-5	2-5	1-3	1-4	3-X
13	4-9	-	2(sf,B)	1(sf,B)	1(B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	3-6(L)
14	1	1	m(d)	-	-	-	-	-	-	-	1-2	-
15	1-2	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 10 from Yaku-shima, Kyushu.

TABLE 144. CHAETOTAXY OF THE 4TH INSTAR LARVA OF *Toxorhynchites (Toxorhynchites) christophi* (Portschinsky, 1884)

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	1	1	1
1	1	1	1	1(b)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1-2	1(sf,B)	1-3
2	-	2-4	1	3-9	3-5	2-4	2-4	2-4	2-3	1-2	1	2-3
3	1	5-12	1-2	m	2(L,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(sf,B)	1-3	2-7
4	1	m	1	7-m	1-2(sf,B)	2(L,B)	1(L,B)	1(L,B)	1-2(sf,B)	9-m	1-2	1(sf,B)
5	m	1(sf,B)	1(B)	6-11	3-5	2-9	5-7	4-7	3-6	4-9	4-7	1(sf,B)
6	1	5-m	1(sf,B)	1(sf,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	1(L,B)	m	1-S
7	1	2	3-7	1(sf,B)	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1(L,B)	1(L,B)	1(sf,B)	3-6(B)
8	1-2	m(d)	m(d)	m(d)	-	1-2	1	1	1	m	m	1-X
9	2-6	1(sf,B)	1(sf,B)	1(sf,B)	1-4	1-2	1	1	1	1	1-2	1(sf,B)
10	3-6	1(B)	1(B)	1(L,B)	1	2(L,B)	2(L,B)	2(L,B)	2(L,B)	1-2	1	2-X
11	m(d)	2-4	1-3	1-3	2(sf,B)	2(B)	1(sf,B)	1(sf,B)	1(sf,B)	1(B)	1(B)	4-7(L)
12	3-4	1	1	1	m(d)	1-2	1-2	1-2	1-4	1	1	3-X
13	5-10	-	1-2(sf,B)	1(sf,B)	1(B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	3-4(L)
14	1	1	m(d)	-	-	-	-	-	-	-	1-2	-
15	1-2	-	-	-	-	-	-	-	-	-	-	-

B: barbed; b: weakly barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 6 from Kyongi do, Korea.

TABLE 145. CHAETOTAXY OF THE 3RD INSTAR LARVA OF *Toxorhynchites (Toxorhynchites)* sp.

SETA No.	HEAD	THORAX			ABDOMEN							
		PRO-	MESO-	META-	I	II	III	IV	V	VI	VII	VIII
0	1	m(d)	-	-	-	1	1	1	1	?	?	1
1	1	1	1	1	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1-3	1(sf,B)	1
2	1	1	1	3-4	1	1	1	1	1	1	1	1-3
3	1	3	1	m(d)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	1(sf,B)	1-2	4-10
4	1	m(d)	1	4	1(sf,B)	1(L,B)	1(L,B)	1(L,B)	1(sf,B)	6-7	1	1(sf,B)
5	7-8	1(sf,B)	1(B)	6	2	?	2	2	2	1-2	1	1(sf,B)
6	1	4	1(sf,B)	1(sf,B)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	m(d)	1-S
7	1	1-2(sf,B)	1-2	1(sf,B)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	1(L,B)	1(sf,B)	1(sf,B)	4(B)
8	1	m(d)	m(d)	m(d)	-	1	1	1	1	m	m(d)	1-X
9	2	1(sf,B)	1(sf,B)	1(sf,B)	1	1	1	1	1	1	1	1(sf,B)
10	1	1(sf,B)	1(B)	1(L,B)	1	1(B)	1(B)	1(B)	1(B)	1	1	2-X
11	m?(d)	1	1	1	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	4
12	3-4	1	1	1	m(d)	1	1?	2	2	1-2	1-2	3-X
13	1-2	-	2(sf,B)	1(sf,B)	1(B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	1(sf,B)	3
14	1	1	m(d)	-	-	-	-	-	-	-	?	-
15	1-2	-	-	-	-	-	-	-	-	-	-	-

B: barbed; d: dendritic; L: large sized; m: multiple (with more than ten branches); sf: stiff.
Specimens examined: 1 from Okinawa Is.

APPENDIX C. COLLECTION RECORDS*

Coll. No.	Locality	Habitat	Date	Collector(s)
D-0001	Odaru, Shizuoka Pref.	MC: Tire	19 VI 1969	A.Y. & M.S.
D-0002	"	RH	"	"
D-0003	"	MC	"	"
D-0004	"	RH	20 VI	"
D-0005	"	MC: Gravestone	22 VI	"
D-0006	Shimoda, Shizuoka Pref.	MC	23 VI	"
D-0007	"	MC	"	"
D-0008	"	TP	"	"
D-0009	"	MC: Vase	"	"
D-0010	"	MC: Concrete tank	"	"
D-0011	"	RH	"	"
D-0012	"	MC: Jar	"	"
D-0013	Yugashima, Shizuoka Pref.	MC: Wooden cask	24 VI	"
D-0014	"	MC	"	"
D-0015	Joren-no-taki, Shizuoka Pref.	RH	"	"
D-0016	"	RH	"	"
D-0017	"	RH	"	"
D-0018	"	RH	"	"
D-0019	"	RH	"	"
D-0020	Izu-kogen, Shizuoka Pref.	MC: Stone vase	25 VI	"
D-0021	"	MC: Gravestone	"	"
D-0022	"	MC: Tire	26 VI	"
D-0023	"	MC: Sink	"	"
F-0024	Yonago, Tottori Pref.	TH	?	S.Ss.
A-0025	Mt. Moiwa, Hokkaido	(Net)	24 VII 1969	K.M. & A.Y.
A-0026	"	TH	"	"
A-0027	"	MC: Cask	"	"
A-0028	Maruyama, Hokkaido	MC: Gravestone	"	"
A-0029	Tenninkyo, Hokkaido	(Net)	"	"
A-0030	"	"	25 VII	"
A-0031	"	GP	"	"
A-0032	Toyotomi, Hokkaido	GP	26 VII	"
A-0033	"	GP	"	"
A-0034	Shari, Hokkaido	MC: Tire	28 VII	"
A-0035	Mt. Rausu, Hokkaido	(Net)	"	"
A-0036	Hisagonuma, Hokkaido	(Net)	30 VII	"
A-0037	Yukomambetsu, Hokkaido	P	31 VII	"
A-0038	Tokotan, Hokkaido	(Net)	2 VIII	"
A-0039	Akkeshi, Hokkaido	GP	"	"
A-0040	Ayamegahara, Hokkaido	(Net)	"	"

*See p. 976-7 for abbreviations.

Coll. No.	Locality	Habitat	Date	Collector(s)
A-0041	Mt. Moiwa, Hokkaido	GP	4 VIII 1969	K.M. & A.Y.
A-0042	"	TH	"	"
A-0043	Onuma, Hokkaido	(Net)	5 VIII	"
A-0044	"	GP	"	"
A-0045	"	P	"	"
C-0046	Teganuma, Chiba Pref.	(LT)	16 VIII 1969	S.S. & K.M.
D-0047	Misakubo, Shizuoka Pref.	(Net)	14 VIII 1969	M.S. & A.Y.
D-0048	"	BbS	"	"
D-0049	"	MC: Gravestone	"	"
D-0050	"	MC: Can	"	"
D-0051	"	(Net)	15-16 VIII	"
D-0052	"	MC	15 VIII	"
D-0053	"	MC	"	"
D-0054	"	MC	16 VIII	"
D-0055	"	MC: Drum	"	"
D-0056	"	MC: Basin	17 VIII	"
D-0057	"	(Resting)	"	"
D-0058	"	MC: Gravestone	"	"
D-0059	"	BbS	"	"
D-0060	"	(Net)	18 VIII	"
D-0061	"	MC: Tire	"	"
D-0062	"	MC	"	"
D-0063	"	RF	"	"
D-0064	"	RF	"	"
D-0065	"	RF	"	"
D-0066	"	RF	"	"
B-0067	Nanairi, Fukushima Pref.	(Net)	22 VIII 1969	N.T.
C-0068	Asakawa, Tokyo	MC: Wooden tub	3 IX 1969	K.T. & M.S.
H-0069	Mt. Unzen, Nagasaki Pref.	MC: Vase	26 VIII 1969	K.M. & A.Y.
H-0070	"	MC	"	"
H-0071	"	MC	"	"
H-0072	"	?	"	"
H-0073	Tsuyoshi, Hirado Is.	(Net)	27 VIII	"
H-0074	"	MC: Gravestone	"	"
H-0075	Mt. Yasuman, Hirado Is.	RH	28 VIII	"
H-0076	"	(Net)	"	"
H-0077	"	MC	"	"
H-0078	Tosu, Saga Pref.	(Net)	29 VIII	"
H-0079	Cape Sata, Kagoshima Pref.	(Bait)	30 VIII	"
H-0080	"	TH	"	"
H-0081	"	MC: Cement tank	"	"
H-0082	Ambo, Yakushima	(Bait)	31 VIII	"
H-0083	"	MC: Gravestone	"	"
H-0084	"	MC: Can	"	"
H-0085	Kosugidani, Yakushima	TH	1 IX	"

Coll. No.	Locality	Habitat	Date	Collector(s)
H-0086	Kosugidani, Yakushima	TH	1 IX 1969	K.M. & A.Y.
H-0087	"	(Bait)	"	"
D-0088	Akaishi Spa, Shizuoka Pref.	MC: Can	11 IX 1969	K.M. & M.S.
D-0089	"	(Light)	"	"
D-0090	"	RH	12 IX	"
D-0091	"	(Net)	"	"
K-0092	Nakama Riv., Iriomote Is.	Str	3 IX 1969	T.K.
K-0093	Mt. Goza, Iriomote Is.	TH	"	"
K-0094	Omoto, Ishigaki Is.	(Net)	5 IX	"
D-0095	Oyama, Shizuoka Pref.	MC: Can	18 IX 1969	S.Ss. & H.S.
F-0096	Utoma, Okayama Pref.	(DT)	3 X 1969	K.T., K.I. & S.Su.
F-0097	"	GP	"	"
D-0098	Mt. Dando, Aichi Pref.	MC: Can	24 X 1969	K.T.
C-0099	Sato, Mikura Is.	TH	20 X 1969	K.S.
J-0100	Okinawa Is.	?	?	U.S.A.M.C.
D-0101	nr. Ippeki-ko, Shizuoka Pref.	BbS	27 IV 1970	A.Y.
L-0102	Munsan, Kyongki Do	(LT)	8 VII 1969	5th P.M.U.
L-0103	Uijong-bu, Kyongki Do	(LT)	VII 1969	H.S.Y.
L-0104	"	(LT)	12 VIII 1969	5th P.M.U.
M-0105	Mosul-po, Cheju Do	(LT)	19 IX	"
L-0106	Kwandaeri, Kangwon Do	(LT)	8 IX	"
L-0107	Sintanjin, Chungchongnam Do	(LT)	19 IX 1969	H.S.Y.
L-0108	Secret Garden, Seoul	TH	22 IX 1969	5th P.M.U.
C-0109	Zama, Kanagawa Pref.	(Biting)	?	406 M.L.
K-0110	Tonoshiro, Ishigaki Is.	TH	22 IV 1970	M.N.
K-0111	"	TH	23 IV	"
K-0112	foot of Mt. Banna, Ishigaki Is.	GP	24 IV	"
K-0113	"	BlS	"	"
K-0114	Mt. Banna, Ishigaki Is.	TH	25 IV	"
K-0115	"	TH	"	"
K-0116	"	TH	"	"
K-0117	Hirai, Ishigaki Is.	MC: Nightsoil tank	"	"
K-0118	"	GP	"	"
K-0119	Yarabu Pen., Ishigaki Is.	TH	26 IV	"
K-0120	"	TH	"	"
K-0121	"	BbS	"	"
K-0122	Fanan Riv., Ishigaki Is.	TH	27 IV	"
K-0123	"	MC: Can	"	"
K-0124	"	MC: Glass	"	"
K-0125	Tarama, Ishigaki Is.	Str	28 IV	"
K-0126	Mt. Nosoko, Ishigaki Is.	TH	"	"
K-0127	"	TH	"	"
K-0128	Mt. Omoto, Ishigaki Is.	TH	29 IV	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0129	Kabira, Ishigaki Is.	TH	30 IV 1970	M.N.
K-0130	"	TH	"	"
K-0131	"	Str	"	"
K-0132	"	RF	"	"
K-0133	"	Shell	"	"
K-0134	Mt. Banna, Ishigaki Is.	TH	1 V	"
K-0135	Mt. Omoto, Ishigaki Is.	TH	2 V	"
K-0136	"	TH	3 V	"
K-0137	Mt. Maeshi, Ishigaki Is.	TH	4 V	"
K-0138	"	RH	"	"
K-0139	"	FS	"	"
K-0140	Ishigaki, Ishigaki Is.	MC: Gravestone	5 V 1970	K.M. & M.N.
K-0141	"	TH	"	"
K-0142	"	D	"	"
K-0143	"	D	"	"
K-0144	"	F: Water buffalo	"	"
K-0145	Yoshiwara, Ishigaki Is.	GP	6 V	"
K-0146	Yonehara, Ishigaki Is.	TH	"	"
K-0147	"	TH	"	"
K-0148	"	TH	"	"
K-0149	Mt. Omoto, Ishigaki Is.	TH	7 V	"
K-0150	"	RH	"	"
K-0151	Itokawa-rindo, Iriomote Is.	TH	8 V	"
K-0152	"	TH	"	"
K-0153	"	BbS	"	"
K-0154	"	BbS	"	"
K-0155	foot of Mt. Goza, Iriomote Is.	TH	9 V	"
K-0156	"	TH	"	"
K-0157	"	TH	"	"
K-0158	Mt. Goza, Iriomote Is.	TH	"	"
K-0159	"	TH	10 V	"
K-0160	"	TH	"	"
K-0161	"	TH	"	"
K-0162	"	LA	"	"
K-0163	"	LA	"	"
K-0164	"	LA	10 V	"
K-0165	Mt. Banna, Ishigaki Is.	TH	12 V	"
K-0166	"	TH	"	"
K-0167	"	TH	"	"
K-0168	"	LA	"	"
K-0169	Mt. Goza, Iriomote Is.	TH	9 V	"
K-0170	Fanan Riv., Ishigaki Is.	FS	27 IV 1970	M.N.
C-0171	Tono, Kanagawa Pref.	BlS	27 V 1970	A.Y. & J.L.Y.
K-0172	Tonoshiro, Ishigaki Is.	(Net)	23 IV 1970	M.N.
K-0173	Yarabu Pen., Ishigaki Is.	(Net)	26 IV	"
K-0174	Fanan Riv., Ishigaki Is.	(Net)	27 IV	"
K-0175	Mt. Nosoko, Ishigaki Is.	(Net)	28 IV	"
K-0176	Tarama, Ishigaki Is.	(Net)	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0177	Kabira, Ishigaki Is.	(Net)	30 IV 1970	M.N.
K-0177a	Ishigaki, Ishigaki Is.	(Net)	5 V 1970	K.M. & M.N.
K-0178	Yoshiwara, Ishigaki Is.	(Net)	6 V	"
K-0179	Yonehara, Ishigaki Is.	(Net)	"	"
K-0180	Mt. Omoto, Ishigaki Is.	(Net)	7 V	"
K-0181	Itokawa-rindo, Iriomote Is.	(Net)	8 V	"
K-0181a	Ohara, Iriomote Is.	(Net)	"	"
K-0182	foot of Mt. Goza, Iriomote Is.	(Net)	9 V	"
K-0182a	nr. Mt. Goza, Iriomote Is.	(Net)	"	"
K-0183	Mt. Goza, Iriomote Is.	(Net)	10 V	"
K-0184	Mt. Banna, Ishigaki Is.	(Net)	12 V	"
A-0185	Zenibako, Hokkaido	GP	29 V	"
A-0186	"	GP	"	"
A-0187	"	(Biting)	"	"
A-0188	"	(Net)	"	"
A-0189	Mt. Moiwa, Hokkaido	RH	30 V	"
A-0190	Yukomambetsu, Hokkaido	GP	31 V	"
A-0191	"	GP	1 VI	"
A-0192	"	GP	"	"
A-0193	Sarobetsu, Hokkaido	GP	2 VI	"
A-0194	"	GP	"	"
A-0195	"	GP	"	"
A-0196	"	D	"	"
A-0197	"	F: Cow	"	"
A-0198	Toyotomi, Hokkaido	GP	"	"
A-0199	"	D	"	"
A-0200	Iwaobetsu, Hokkaido	GP	4 VI	"
A-0201	"	GP	"	"
A-0202	Iwaobetsu Spa, Hokkaido	TH	"	"
A-0203	Shiretoko-goko, Hokkaido	GP	"	"
A-0204	"	GP	"	"
A-0205	"	GP	5 VI	"
A-0206	"	GP	"	"
A-0207	"	GP	"	"
A-0208	"	GP	"	"
A-0209	"	GP	"	"
A-0210	"	(Net)	"	"
A-0211	Yukomambetsu, Hokkaido	GP	7 VI 1970	K.T., K.M. & M.N.
A-0212	"	GP	"	"
A-0213	Hisagonuma, Hokkaido	P	8 VI 1970	K.M. & M.N.
A-0214	Tokotan, Hokkaido	(Biting)	10 VI	"
A-0215	Ayamegahara, Hokkaido	GP	"	"
A-0216	"	(Net)	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
A-0217	Wakoto Pen., Hokkaido	(Biting)	12 VI 1970	K. M. & M. N.
A-0218	"	(Net)	"	"
A-0219	"	(Biting)	13 VI	"
A-0220	"	(Net)	"	"
A-0221	Zenibako, Hokkaido	(Biting)	15 VI	"
A-0222	"	(Net)	"	"
A-0223	Yukomambetsu, Hokkaido	(Net)	7 VI 1970	K. T., K. M. & M. N.
A-0224	"	(Bait)	"	"
A-0225	Toyotomi, Hokkaido	(Resting)	2 VI 1970	K. M. & M. N.
F-0226	Kurashiki, Okayama Pref.	(Resting)	14 VII 1970	K. T.
F-0227	Utoma, Okayama Pref.	(Biting)	14 VII 1970	K. T. & K. I.
F-0228	"	GP	"	"
F-0229	"	GP	"	"
F-0230	"	(Net)	15 VII 1970	K. T. & S. Su.
F-0231	"	(DT)	"	"
F-0232	"	D	"	"
F-0233	"	(DT)	V-VII 1970	S. Su.
I-0234	Akagina, Amami Oshima	Str	28 VI 1970	K. M. & M. N.
I-0235	"	Str	"	"
I-0236	Mt. Yuwan, Amami Oshima	RH	30 VI	"
I-0237	"	MC	"	"
I-0238	"	TH	"	"
I-0239	"	TH	"	"
I-0240	"	TH	"	"
I-0241	"	RH	"	"
I-0242	"	MC	"	"
I-0243	"	MC	"	"
I-0244	"	MC	"	"
I-0245	"	TH	1 VII	"
I-0246	"	TH	"	"
I-0247	"	TH	"	"
I-0248	"	TH	"	"
I-0249	"	TH	"	"
I-0250	"	RH	"	"
I-0251	"	RH	"	"
I-0252	"	MC	"	"
I-0253	"	TH	2 VII	"
I-0254	"	TH	"	"
I-0255	"	TH	"	"
I-0256	"	TH	"	"
I-0257	"	MC	3 VII	"
I-0258	"	D	"	"
I-0259	"	TH	"	"
I-0260	"	TH	"	"
I-0261	"	TH	"	"
I-0262	"	TH	"	"
I-0263	"	MC	4 VII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
I-0264	Yuwan, Amami Oshima	BbS	5 VII 1970	K. M. & M. N.
I-0265	"	MC: Gravestone	"	"
I-0266	Yuwan, Amami Oshima	MC: Vase	"	"
I-0267	Koniya, Amami Oshima	MC: Cement tank	6 VII	"
I-0268	Yuwan, Amami Oshima	TH	"	"
I-0269	"	BbS	"	"
I-0270	"	MC	"	"
I-0271	"	MC	"	"
I-0272	"	MC	"	"
I-0273	Nishinakama, Amami Oshima	RH	7 VII	"
I-0274	"	BbS	"	"
I-0275	"	MC	"	"
I-0276	"	MC: Gravestone	"	"
I-0277	"	TH	8 VII	"
I-0278	"	TH	"	"
I-0279	"	TH	"	"
I-0280	"	TH	"	"
I-0281	"	TH	"	
I-0282	"	BbS	"	"
I-0283	"	RH	"	"
I-0284	"	Str	9 VII	"
I-0285	"	Str	"	"
I-0286	"	TH	10 VII	"
I-0287	"	TH	"	"
I-0288	"	TH	"	"
I-0289	"	TH	"	"
I-0290	"	TH	"	"
I-0291	"	TH	"	"
I-0292	"	RF	"	"
I-0293	Yuwan, Amami Oshima	RH	12 VII	"
I-0294	"	RH	"	"
I-0295	"	RH	"	"
I-0296	Yuwan, Amami Oshima	RH	"	"
I-0297	"	RH	"	"
I-0298	"	RH	"	"
I-0299	"	TH	"	"
I-0300	"	TH	"	"
I-0301	Nase, Amami Oshima	MC: Gravestone	14 VII	"
I-0302	Mt. Yuwan, Amami Oshima	(Net)	30 VI	"
I-0303	"	(Net)	1 VII	"
I-0304	"	(Net)	2 VII	"
I-0305	"	(Net)	3 VII	"
I-0306	Shimmura, Amami Oshima	(Resting)	6 VII	"
I-0307	Yuwan, Amami Oshima	(Net)	"	"
I-0308	"	(Net)	7 VII	"
I-0309	Nishinakama, Amami Oshima	(Net)	8 VII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
I-0310	Nishinakama, Amami Oshima	(Net)	9 VII 1970	K.M. & M.N.
I-0311	"	(Net)	10 VII	"
I-0312	Yuwan, Amami Oshima	(Net)	11 VII	"
I-0313	"	(Net)	12 VII	"
I-0314	Hatsuno, Amami Oshima	(Net)	2 VII 1970	S.M.
H-0315	Shiroyama, Kagoshima Pref.	TH	15 VII 1970	K.M. & M.N.
H-0316	"	TH	"	"
H-0317	"	TH	"	"
H-0318	"	(Net)	"	"
B-0319	Sukayu, Aomori Pref.	TH	21 VII 1970	A.K. & M.N.
B-0320	"	TH	"	"
B-0321	"	TH	"	"
B-0322	Kimen Vall., Aomori Pref.	RH	22 VII	"
B-0323	"	RH	"	"
B-0324	"	RH	"	"
B-0325	"	RH	"	"
B-0326	Shinyu, Aomori Pref.	TH	23 VII	"
B-0327	"	TH	"	"
B-0328	"	TH	"	"
B-0329	"	TH	"	"
B-0330	"	TH	"	"
B-0331	"	TH	"	"
B-0332	"	TH	"	"
B-0333	"	TH	"	"
B-0334	"	TH	"	"
B-0335	"	TH	"	"
B-0336	Tsuta, Aomori Pref.	TH	24 VII	"
B-0337	"	TH	"	"
B-0338	"	TH	"	"
B-0339	"	TH	"	"
B-0340	"	TH	"	"
B-0341	"	TH	"	"
B-0342	"	TH	"	"
B-0343	"	TH	"	"
B-0344	"	TH	"	"
B-0345	"	TH	"	"
B-0346	"	TH	"	"
B-0347	"	TH	"	"
B-0348	"	TH	"	"
B-0349	"	TH	"	"
B-0350	"	TH	"	"
B-0351	"	TH	"	"
B-0352	"	GP	"	"
B-0353	Kenashi Highland, Aomori Pref.	GP	25 VII	"
B-0354	"	GP	"	"
B-0355	Sukayu, Aomori Pref.	GP	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
B-0356	Sukayu, Aomori Pref.	GP	25 VII 1970	A.K. & M.N.
B-0357	Nenokuchi, Aomori Pref.	TH	26 VII	"
B-0358	"	TH	"	"
B-0359	"	TH	"	"
B-0360	"	TH	"	"
B-0361	"	TH	"	"
B-0362	"	TH	"	"
B-0363	"	TH	"	"
B-0364	"	TH	"	"
B-0365	"	TH	"	"
B-0366	"	TH	"	"
B-0367	Tsuta, Aomori Pref.	TH	"	"
B-0368	"	TH	"	"
B-0369	"	GP	"	"
B-0370	nr. Jogakura, Aomori Pref.	RH	27 VII	"
B-0371	"	RH	"	"
B-0372	"	RH	"	"
B-0373	"	RH	"	"
B-0374	"	RH	"	"
B-0375	"	RH	"	"
B-0376	"	RH	"	"
B-0377	Shinyu, Aomori Pref.	TH	"	"
B-0378	Sukayu, Aomori Pref.	MC: Cement tank	28 VII	"
B-0379	Tsuta, Aomori Pref.	(Net)	24 VII	"
B-0380	"	(Biting)	"	"
B-0381	"	(Net)	26 VII	"
B-0382	nr. Jogakura, Aomori Pref.	(Resting)	27 VII	"
B-0383	Sukayu, Aomori Pref.	(Net)	28 VII	"
B-0384	"	?	"	"
B-0385	Tsuta, Aomori Pref.	TH	24 VII	"
D-0386	Kanayama, Yamanashi Pref.	MC	2 VIII 1970	J.L.Y & A.Y.
D-0387	Norikura-kogen, Nagano Pref.	MC: Basin	4 VIII	"
D-0388	"	MC: Can	"	"
D-0389	"	MC: Can	"	"
D-0390	"	BlS	"	"
D-0391	"	GP	"	"
D-0392	"	P	5 VIII	"
D-0393	"	P	"	"
D-0394	"	P	"	"
D-0395	Inagoki, Nagano Pref.	MC: Tire	"	"
D-0396	"	MC: Tire	"	"
D-0397	"	MC: Basin	"	"
D-0398	Kanayama, Yamanashi Pref.	MC: Can	6 VIII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
D-0399	Kanayama, Yamanashi Pref.	MC: Tire	6 VIII 1970	J.L.Y & A.Y.
D-0400	"	MC: Tire	"	"
D-0401	"	MC: Tire	"	"
D-0402	"	TH	"	"
D-0403	Norikura-kogen, Nagano Pref.	P	5 VIII	"
D-0404	Kanayama, Yamanashi Pref.	(Biting)	1 VIII	"
D-0405	"	(Biting)	2 VIII	"
D-0406	"	(Biting)	4 VIII	"
J-0407	Mt. Nago, Okinawa Is.	P	28 VIII 1970	K.T. & K.M.
J-0408	"	TH	"	"
J-0409	"	TH	"	"
J-0410	Taiho, Okinawa Is.	GP	29 VIII	"
J-0411	Shirahama, Okinawa Is.	TH	"	"
J-0412	Janagusuku, Okinawa Is.	LA	"	"
J-0413	Kijoka, Okinawa Is.	TH	"	"
J-0414	"	TH	"	"
J-0415	"	MC	"	"
J-0416	"	MC	"	"
J-0417	Kogachi, Okinawa Is.	GP	"	"
J-0418	Taira, Okinawa Is.	D	30 VIII	"
J-0419	"	MC	"	"
J-0420	Gajanokobanta, Okinawa Is.	RH	31 VIII	"
J-0421	"	RH	"	"
J-0422	"	RH	"	"
J-0423	"	RH	"	"
J-0424	"	RH	"	"
J-0425	"	RH	"	"
J-0426	"	RH	"	"
J-0427	"	RH	"	"
J-0428	"	RH	"	"
J-0429	Yona, Okinawa Is.	LA	1 IX	"
J-0430	"	RH	"	"
J-0431	"	TH	"	"
J-0432	"	TH	"	"
J-0433	"	LA	2 IX	"
J-0434	"	RH	"	"
J-0435	"	BbS	"	"
J-0436	"	BlS	"	"
J-0437	"	RH	"	"
J-0438	"	RH	"	"
J-0439	"	MC	"	"
J-0440	"	Str	3 IX	"
J-0441	"	TH	"	"
J-0442	"	TH	"	"
J-0443	"	TH	"	"
J-0444	"	RH	"	"
J-0445	"	RH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
J-0446	Yona, Okinawa Is.	RH	3 IX 1970	K. T. & K. M.
J-0447	"	RH	"	"
J-0448	"	RH	"	"
J-0449	"	RH	"	"
J-0450	"	RH	"	"
J-0451	"	BlS	"	"
J-0452	"	MC	"	"
J-0453	"	LA	"	"
J-0454	"	D	4 IX	"
J-0455	"	Str	"	"
J-0456	"	TH	5 IX	"
J-0457	"	TH	6 IX	"
J-0458	"	TH	"	"
J-0459	"	TH	"	"
J-0460	"	TH	"	"
J-0461	"	TH	"	"
J-0462	"	TH	"	"
J-0463	"	BbS	7 IX	"
J-0464	"	MC	"	"
J-0465	"	MC	"	"
J-0466	"	TH	"	"
J-0467	"	TH	"	"
J-0468	"	TH	"	"
J-0469	"	TH	"	"
J-0470	"	TH	"	"
J-0471	"	MC	"	"
J-0472	"	TH	"	"
J-0473	"	TH	"	"
J-0474	"	TH	"	"
J-0475	"	Str	"	"
J-0476	"	GP	8 IX	"
J-0477	"	GP	"	"
J-0478	"	RH	"	"
J-0479	"	RH	"	"
J-0480	"	TH	"	"
J-0481	"	TH	"	"
J-0482	"	TH	"	"
J-0483	"	TH	"	"
J-0484	"	TH	"	"
J-0485	"	TH	"	"
J-0486	"	TH	"	"
J-0487	"	TH	"	"
J-0488	"	TH	"	"
J-0489	"	TH	"	"
J-0490	"	GP	9 IX	"
J-0491	Mt. Yonaha, Okinawa Is.	TH	"	"
J-0492	"	TH	"	"
J-0493	"	TH	"	"
J-0494	"	TH	"	"
J-0495	"	TH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
J-0496	Mt. Yonaha, Okinawa Is.	TH	9 IX 1970	K. T. & K. M.
J-0497	"	MC	"	"
J-0498	"	MC	"	"
J-0499	Oku, Okinawa Is.	RF	"	"
J-0500	"	MC	"	"
J-0501	Yona, Okinawa Is.	BlS	10 IX	"
J-0502	"	GP	"	"
J-0503	Mt. Onishi, Okinawa Is.	Str	"	"
J-0504	"	TH	"	"
J-0505	"	TH	"	"
J-0506	"	TH	"	"
J-0507	"	TH	"	"
J-0508	"	TH	"	"
J-0509	"	TH	"	"
J-0510	"	TH	"	"
J-0511	"	TH	"	"
J-0512	"	RH	"	"
J-0513	"	RH	"	"
J-0514	Yona, Okinawa Is.	BlS	11 IX	"
J-0515	"	RH	"	"
J-0516	"	RH	"	"
J-0517	"	RH	"	"
J-0518	"	RH	12 IX	"
J-0519	"	RH	"	"
J-0520	"	RH	"	"
J-0521	"	TH	"	"
J-0522	Mt. Nago, Okinawa Is.	(Net)	28 VIII	"
J-0523	Kogachi, Okinawa Is.	(Biting)	29 VIII	"
J-0524	Nago, Okinawa Is.	(Biting)	30 VIII	"
J-0525	Izumi, Okinawa Is.	(Biting)	"	"
J-0526	Nago, Okinawa Is.	(Net)	31 VIII	"
J-0527	Gajanokobanta, Okinawa	(Net)	"	"
J-0528	Yona, Okinawa Is.	(Net)	1 IX	"
J-0529	"	(Net)	2 IX	"
J-0530	"	(Net)	5 IX	"
J-0531	"	(Net)	6 IX	"
J-0532	"	(LT)	"	"
J-0533	"	(Bait)	7 IX	"
J-0534	"	(Net)	"	"
J-0535	"	(Biting)	8 IX	"
J-0536	"	(LT)	"	"
J-0537	Oku, Okinawa Is.	(Net)	9 IX	"
J-0538	Onishi, Okinawa Is.	(Net)	10 IX	"
J-0539	"	(Biting)	"	"
J-0540	Yona, Okinawa Is.	(Net)	11 IX	"
J-0541	"	(Resting)	"	"
J-0542	"	?	IX	"
J-0543	Okinawa Is.	?	?	U. S. A. M. C.
J-0544	Miyagi Is.	?	"	"
K-0545	Ishigaki Is.	?	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0546	Iriomote Is.	?	?	U.S.A.M.C.
H-0547	Izuhara, Tsushima	BbS	7 X 1970	M.N.
H-0548	"	MC: Gravestone	8 X	"
H-0549	"	MC: Gravestone	"	"
L-0550	National Forest, Kyongki Do	?	5 VII 1967	5th P.M.U.
L-0551	"	?	11 VII	"
L-0552	Secret Garden, Seoul	TH	22 IX 1969	"
L-0553	National Forest, Kyongki Do	?	21 X 1969	"
L-0554	"	?	18 VIII 1970	"
L-0555	Namhan Castle, Kyongki Do	?	"	"
L-0556	"	?	20 VIII	"
L-0557	National Forest, Kyongki Do	TH	18 X 1965	"
L-0558	Yong San, Seoul	(LT)	15 III 1968	"
L-0559	Kang Hwa Do, Kyongki Do	(LT)	6 VIII 1968	"
L-0560	National Forest, Kyongki Do	D	12 IX 1969	"
K-0561	Yonehara, Ishigaki Is.	TH	18 XII 1970	K.M.
K-0562	"	TH	"	"
K-0563	"	TH	"	"
K-0564	"	TH	"	"
K-0565	"	TH	"	"
K-0566	"	LA	"	"
K-0567	Mt. Banna, Ishigaki Is.	LA	19 XII	"
K-0568	Arakawa, Ishigaki Is.	TH	25 XII	"
K-0569	"	TH	"	"
K-0570	"	TH	"	"
K-0571	Itokawa-rindo, Iriomote Is.	TH	21 XII	"
K-0572	foot of Mt. Goza, Iriomote Is.	TH	22 XII	"
K-0573	"	TH	"	"
K-0574	"	TH	"	"
K-0575	"	RH	"	"
K-0576	"	LA	"	"
K-0577	Itokawa-rindo, Iriomote Is.	TH	23 XII	"
K-0578	"	TH	"	"
K-0579	Yonehara, Ishigaki Is.	(Net)	18 XII	"
K-0580	Mt. Banna, Ishigaki Is.	(Net)	19 XII	"
K-0581	Ishigaki, Ishigaki Is.	(Net)	24 XII	"
K-0582	Itokawa-rindo, Iriomote Is.	(Net)	21 XII	"
K-0583	foot of Mt. Goza, Iriomote Is.	(Net)	22 XII	"
K-0584	Itokawa-rindo, Iriomote Is.	(Net)	23 XII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0585	Nago, Okinawa Is.	(Biting)	13 XII 1970	K. M.
K-0586	Okinawa Is.	?	?	U. S. A. M. C.
K-0587	Iriomote Is.	?	"	"
K-0588	foot of Mt. Maeshi, Ishigaki Is.	BlS	5 IV 1971	K. M. & M. N.
K-0589	"	Str	"	"
K-0590	"	D	"	"
K-0591	Nagura, Ishigaki Is.	GP	6 IV	"
K-0592	"	BlS	"	"
K-0593	"	RH	"	"
K-0594	"	RH	"	"
K-0595	"	GP	"	"
K-0596	"	GP	"	"
K-0597	"	RF	"	"
K-0598	"	GP	"	"
K-0599	"	Str	"	"
K-0600	"	GP	"	"
K-0601	Mt. Banna, Ishigaki Is.	BlS	7 IV	"
K-0602	"	BlS	"	"
K-0603	"	BlS	"	"
K-0604	"	TH	"	"
K-0605	"	TH	"	"
K-0606	"	TH	"	"
K-0607	Arakawa Riv., Ishigaki Is.	RH	11 IV	"
K-0608	"	RH	"	"
K-0609	"	RH	"	"
K-0610	"	RH	"	"
K-0611	"	RH	"	"
K-0612	"	RH	"	"
K-0613	"	RH	"	"
K-0614	Yonehara, Ishigaki Is.	TH	"	"
K-0615	Piutta Riv., Ishigaki Is.	Str	"	"
K-0616	foot of Mt. Maeshi, Ishigaki Is.	BlS	12 IV	"
K-0617	"	BlS	"	"
K-0618	"	BlS	"	"
K-0619	"	BlS	"	"
K-0620	"	BlS	"	"
K-0621	"	BlS	"	"
K-0622	"	BlS	"	"
K-0623	"	RH	"	"
K-0624	"	GP	"	"
K-0625	Hirano, Ishigaki Is.	Str	13 IV	"
K-0626	Inoda, Ishigaki Is.	RH	18 IV	"
K-0627	"	RH	"	"
K-0628	"	RH	"	"
K-0629	"	RH	"	"
K-0630	"	RH	"	"
K-0631	"	RH	"	"
K-0632	"	RH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0633	Inoda, Ishigaki Is.	RH	18 IV 1971	K.M. & M.N.
K-0634	"	TH	"	"
K-0635	"	TH	"	"
K-0636	"	BlS	"	"
K-0637	Mt. Banna, Ishigaki Is.	TH	22 IV	"
K-0638	"	TH	"	"
K-0639	"	TH	"	"
K-0640	"	RH	"	"
K-0641	"	BlS	"	"
K-0642	"	BlS	"	"
K-0643	"	BlS	"	"
K-0644	"	BlS	"	"
K-0645	"	BlS	"	"
K-0646	foot of Mt. Banna, Ishigaki Is.	MC: Can	23 IV	"
K-0647	"	GP	"	"
K-0648	"	GP	"	"
K-0649	"	D	"	"
K-0650	"	RF	"	"
K-0651	"	BlS	"	"
K-0652	"	BlS	"	"
K-0653	"	BlS	"	"
K-0654	"	GP	"	"
K-0655	Hoshino, Ishigaki Is.	BlS	24 IV	"
K-0656	"	GP	"	"
K-0657	"	GP	"	"
K-0658	nr. Fannan Riv., Ishigaki Is.	D	"	"
K-0659	"	D	"	"
K-0660	"	Str	"	"
K-0661	"	BlS	"	"
K-0662	"	BlS	"	"
K-0663	"	BlS	"	"
K-0664	Miyara Riv., Ishigaki Is.	Str	25 IV	"
K-0665	"	Str	"	"
K-0666	"	Str	"	"
K-0667	Itokawa-rindo, Iriomote Is.	Str	14 IV	"
K-0668	"	Str	"	"
K-0669	"	Str	"	"
K-0670	"	Str	"	"
K-0671	"	Str	"	"
K-0672	"	Str	"	"
K-0673	"	Str	"	"
K-0674	"	Str	"	"
K-0675	"	Str	"	"
K-0676	"	Str	"	"
K-9677	"	Str	"	"
K-0678	"	Str	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0679	Itokawa-rindo, Iriomote Is.	Str	14 IV 1971	K. M. & M. N.
K-0680	"	Str	"	"
K-0681	"	CH	"	"
K-0682	"	Str	"	"
K-0683	"	Str	"	"
K-0684	"	TH	"	"
K-0685	"	TH	"	"
K-0686	Ohara, Iriomote Is.	GP	"	"
K-0687	"	MC: Cement tank	"	"
K-0688	foot of Mt. Goza, Iriomote Is.	BlS	15 IV	"
K-0689	"	BlS	"	"
K-0690	Mt. Goza, Iriomote Is.	TH	"	"
K-0691	foot of Mt. Goza, Iriomote Is.	Str	"	"
K-0692	"	RH	"	"
K-0693	Itokawa-rindo, Iriomote Is.	TH	17 IV	"
K-0694	"	MC: Tire	"	"
K-0695	nr. Shirahama, Iriomote Is.	BlS	19 IV	"
K-0696	"	BlS	"	"
K-0697	"	GP	"	"
K-0698	nr. Sonai, Iriomote Is.	TH	20 IV	"
K-0699	"	TH	"	"
K-0700	"	RP	"	"
K-0701	"	RH	"	
K-0702	nr. Shirahama, Iriomote Is.	RH	21 IV	"
K-0703	"	BlS	"	"
K-0704	"	BlS	"	"
K-0705	Fuka, Hateruma Is.	D	8 IV	"
K-0706	Naishi, Hateruma Is.	F: Water buffalo	9 IV	"
K-0707	Kita, Hateruma Is.	MC: Well	"	"
J-0708	Gajanokobanta, Okinawa Is.	RH	3 IV	"
J-0709	"	RH	"	"
J-0710	"	RH	"	"
J-0711	Yona, Okinawa Is.	RH	4 IV	"
J-0712	"	RH	"	"
J-0713	"	GP	"	"
J-0714	"	BlS	"	"
J-0715	"	BlS	"	"
J-0716	"	TH	26 IV	"
J-0717	"	TH	"	"
J-0718	"	BlS	"	"
K-0719	foot of Mt. Maeshi, Ishigaki Is.	(Net)	5 IV	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0720	Mt. Banna, Ishigaki Is.	(Net)	7 IV 1971	K. M. & M. N.
K-0721	nr. Arakawa Riv., Ishigaki Is.	(Resting)	11 IV	"
K-0722	foot of Mt. Maeshi, Ishigaki Is.	(Net)	12 IV	"
K-0723	Inoda, Ishigaki Is.	(Net)	18 IV	"
K-0724	Mt. Banna, Ishigaki Is.	(Net)	22 IV	"
K-0725	Ishigaki, Ishigaki Is.	(Net)	24 IV	"
K-0726	Itokawa-rindo, Iriomote Is.	(Net)	14 IV	"
K-0727	foot of Mt. Goza, Iriomote Is.	(Net)	15 IV	"
K-0728	"	(Net)	16 IV	"
K-0729	Mt. Goza, Iriomote Is.	(Net)	"	"
K-0730	Itokawa-rindo, Iriomote Is.	(Net)	17 IV	"
K-0731	nr. Shirahama, Iriomote Is.	(Net)	19 IV	"
K-0732	nr. Sonai, Iriomote Is.	(Net)	20 IV	"
K-0733	nr. Shirahama, Iriomote Is.	(Net)	21 IV	"
K-0734	Fuka, Hateruma Is.	(Net)	8 IV	"
K-0735	Naishi, Hateruma Is.	(Net)	9 IV	"
K-0736	Kita, Hateruma Is.	(Net)	10 IV	"
J-0737	Gajanokobanta, Okinawa Is.	(Net)	3 IV	"
J-0738	Yona, Okinawa Is.	(Net)	4 IV	"
K-0739	Itokawa-rindo, Iriomote Is.	(LT)	14-15 IV	"
K-0740	foot of Mt. Goza, Iriomote Is.	(LT)	16-17 IV	"
D-0741	Masutomi, Yamanashi Pref.	MC	23 V	"
D-0742	"	RH	"	"
D-0743	"	RH	"	"
D-0744	"	TH	22 V	"
D-0745	"	TH	"	"
D-0746	Akaishi Spa, Shizuoka Pref.	TH	22 VI 1971	K. T. & K. M.
D-0747	"	MC	"	"
D-0748	"	MC	23 VI	"
D-0749	"	MC: Concrete tank	"	"
D-0750	"	MC	"	"
D-0751	"	BlS	"	"
D-0752	"	RH	"	"
D-0753	"	RH	"	"
D-0754	"	(Net)	22 VI	"
D-0755	"	(Net)	23 VI	"
D-0756	Nigorigo Spa, Gifu Pref.	MC: Canoe	6 VII 1971	K. T.

Coll. No.	Locality	Habitat	Date	Collector(s)
D-0757	Mt. Fuji, Shizuoka Pref.	RH	17 VII 1971	K.T.
K-0758	Mt. Maeshi, Ishigaki Is.	BlS	28 VII 1971	K.M.
K-0759	foot of Mt. Maeshi, Ishigaki Is.	Str	"	"
K-0760	"	BlS	"	"
K-0761	Yonehara, Ishigaki Is.	TH	29 VII	"
K-0762	"	TH	"	"
K-0763	"	TH	"	"
K-0764	"	TH	"	"
K-0765	"	TH	"	"
K-0766	"	TH	"	"
K-0767	"	TH	"	"
K-0768	"	TH	"	"
K-0769	"	TH	"	"
K-0770	"	TH	"	"
K-0771	"	TH	"	"
K-0772	"	TH	"	"
K-0773	"	(Net)	"	"
K-0774	foot of Mt. Banna, Ishigaki Is.	BlS	30 VII	"
K-0775	"	BlS	"	"
K-0776	"	RH	"	"
K-0777	"	(Net)	"	"
K-0778	Mt. Banna, Ishigaki Is.	TH	31 VII	"
K-0779	"	TH	"	"
K-0780	"	TH	"	"
K-0781	"	TH	"	"
K-0782	"	TH	"	"
K-0783	"	BlS	"	"
K-0784	"	RH	"	"
K-0785	"	RH	"	"
K-0786	"	(Net)	"	"
K-0787	Itokawa-rindo, Iriomote Is.	Str	1 VIII	"
K-0788	"	BlS	"	"
K-0789	"	BlS	"	"
K-0790	"	BlS	"	"
K-0791	"	TH	"	"
K-0792	"	TH	"	"
K-0793	"	TH	"	"
K-0794	"	TH	"	"
K-0795	"	(Net)	"	"
K-0796	Inoda, Ishigaki Is.	TH	2 VIII	"
K-0797	"	(Net)	"	"
K-0798	Yonehara, Ishigaki Is.	TH	3 VIII	"
K-0799	"	TH	"	"
K-0800	"	TH	"	"
K-0801	foot of Mt. Maeshi, Ishigaki Is.	BlS	4 VIII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0802	foot of Mt. Maeshi, Ishigaki Is.	BlS	4 VIII 1971	K. M.
K-0803	"	BlS	"	"
K-0804	"	RH	"	"
K-0805	"	(Net)	"	"
J-0806	Yona, Okinawa Is.	TH	7 VIII	"
J-0807	"	TH	"	"
J-0808	"	BlS	"	"
H-0809	Kusugawa, Yakushima	TH	12 VII 1971	K. W.
H-0810	Ambo, Yakushima	(Net)	"	"
D-0811	Mt. Fuji, Yamanashi Pref.	(Biting)	25 VIII 1971	K. T.
D-0812	Aokigahara, Yamanashi Pref.	MC: Can	18 IX	"
D-0813	"	MC	"	"
D-0814	"	MC	"	"
L-0815	National Forest, Kyongki Do	(Net)	26 VIII 1971	K. M. & C. S. C.
L-0816	"	GP	"	"
L-0817	"	RH	"	"
L-0818	"	TH	"	"
L-0819	"	TH	"	"
L-0820	"	TH	"	"
L-0821	"	TH	"	"
L-0822	"	TH	"	"
L-0823	Secret Garden, Seoul	MC: Cement tank	28 VIII	"
L-0824	"	MC: Cement tank	"	"
L-0825	"	TH	"	"
L-0826	"	TH	"	"
L-0827	"	TH	"	"
L-0828	"	TH	"	"
L-0829	"	(Net)	"	"
L-0830	National Forest, Kyongki Do	RH	29 VIII 1971	K. M.
L-0831	"	P	"	"
L-0832	"	D	"	"
L-0833	Bhopjusa, Chungchongpuk Do	TH	31 VIII 1971	K. M. & C. S. C.
L-0834	"	(Net)	"	"
L-0835	Sogrisan, Chungchongpuk Do	TH	1 IX	"
L-0836	"	TH		"
L-0837	"	RH	"	"
L-0838	"	RH	"	"
L-0839	"	RH	"	"
L-0840	Inchon, Kyongki Do	RF	2 IX	"
L-0841	"	P	"	"
M-0842	Mt. Halla, Cheju Do	RH	4 IX 1971	K. M., C. S. C. & C. A. C.

Coll. No.	Locality	Habitat	Date	Collector(s)
M-0843	Sogwipo, Cheju Do	(Biting)	5 IX 1971	K.M., C.S.C. & C.A.C.
M-0844	Mt. Halla, Cheju Do	BlS	"	"
M-0845	"	BlS	"	"
M-0846	"	RH	"	"
M-0847	"	RH	"	"
M-0848	"	TH	"	"
M-0849	Sogwipo, Cheju Do	(Net)	"	"
M-0850	"	D	"	"
M-0851	Mt. Halla, Cheju Do	(Net)	6 IX	"
M-0852	Chungmunni, Cheju Do	RH	"	"
M-0853	"	RH	"	"
M-0854	Mt. Halla, Cheju Do	MC	"	"
M-0855	"	MC	"	"
M-0856	"	BlS	"	"
M-0857	"	RH	"	"
M-0858	"	RH	"	"
M-0859	"	GP	7 IX	"
M-0860	"	TH	"	"
M-0861	"	RH	"	"
M-0862	"	RH	"	"
M-0863	Sogwipo, Cheju Do	MC	9 IX	"
M-0864	"	MC	10 IX	"
L-0865	Mt. Sorak, Kangwon Do	(Net)	14 IX 1971	K.M. & C.S.C.
L-0866	"	TH	"	"
L-0867	"	TH	"	"
L-0868	"	(Net)	15 IX	"
L-0869	"	RH	"	"
L-0870	"	RH	"	"
L-0871	"	TH	"	"
L-0872	"	(Net)	16 IX	"
L-0873	"	TH	"	"
L-0874	"	(Net)	17 IX	"
L-0875	"	TH	"	"
L-0876	"	TH	"	"
M-0877	Cheju Do	?	IX 1971	K.M, C.S.C. & C.A.C.
L-0878	Pusan, Kyongsangnam Do	TH	14 VIII 1971	C.S.C.
L-0879	Mt. Sorak, Kangwon Do	RH	17 IX 1971	K.M. & C.S.C.
L-0880	Inchon, Kyongki Do	RH	23 VIII 1971	C.S.C.
L-0881	Bu-pyong, Kyongki Do	(LT)	23 IX 1969	5th P.M.U.
L-0882	Uijong-bu, Kyongki Do	(LT)	7 VI 1968	"
L-0883	"	(LT)	19	"
L-0884	Kwangju, Kyongki Do	(LT)	14 VIII 1968	C.S.C.

Coll. No.	Locality	Habitat	Date	Collector(s)
L-0885	National Forest, Kyongki Do	?	21 X 1969	5th P.M.U.
L-0886	"	?	2 X 1969	H.J.C.
M-0887	Cheju, Cheju Do	RP	30 IX 1968	5th P.M.U.
M-0888	Aewol-myon, Cheju Do	RP	2 X 1968	"
L-0889	Kwang Nung, Kyongki Do	?	11 VII 1967	"
L-0890	National Forest, Kyongki Do	?	7 X 1962	H.J.C.
L-0891	Kwang Nung, Kyongki Do	D	11 IX 1962	5th P.M.U.
L-0892	National Forest, Kyongki Do	?	2 X 1969	H.J.C.
L-0893	"	?	12 IX 1969	"
L-0894	Munsan, Kyongki Do	(LT)	8 VII 1963	5th P.M.U.
L-0895	Mt. Sorak, Kangwon Do	TH	8 VIII 1971	"
L-0896	Mt. Sorak, Kangwon Do	TH	7 VIII 1971	5th P.M.U.
L-0897	Mojin Dong, Seoul	?	11 VIII 1965	H.S.Y.
J-0898	Yona, Okinawa Is.	(Net)	24 X 1971	K.M., S.S. & T.K.
J-0899	"	BlS	"	"
J-0900	"	BlS	"	"
J-0901	"	BlS	"	"
J-0902	"	TH	"	"
J-0903	"	RH	"	"
J-0904	"	(Biting)	25 X	"
J-0905	"	GP	"	"
K-0906	Funaura, Iriomote Is.	(Net)	27 X	"
K-0907	"	Str	"	"
K-0908	"	GP	"	"
K-0909	"	MC: Tin can	"	"
K-0910	"	TH	"	"
K-0911	"	TH	"	"
K-0912	"	TH	"	"
K-0913	Kambira-taki, Iriomote Is.	(Net)	28 X	"
K-0914	"	RH	"	"
K-0915	"	TH	"	"
K-0916	"	TH	"	"
K-0917	"	TH	"	"
K-0918	"	TH	"	"
K-0919	nr. Uehara, Iriomote Is.	(Net)	29 X	"
K-0920	"	GP	"	"
K-0921	"	BlS	"	"
K-0922	"	Str	"	"
K-0923	"	TH	"	"
K-0924	"	(Net)	30 X	"
K-0925	nr. Funaura, Iriomote Is.	(Net)	31 X	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0926	nr. Funaura, Iriomote Is.	MC: Tin can	31 X 1971	K.M., S.S. & T.K.
K-0927	Nakamuru, Hatoma Is.	(Net)	"	"
K-0928	"	MC: Cement tank	"	"
K-0929	Yonehara, Ishigaki Is.	(Net)	1 XI	"
K-0930	"	MC	"	"
K-0931	"	TH	"	"
K-0932	"	TH	"	"
K-0933	"	TH	"	"
K-0934	Mt. Banna, Ishigaki Is.	(Net)	2 XI	"
K-0935	"	TH	"	"
K-0936	"	TH	"	"
K-0937	"	TH	"	"
K-0938	"	RH	"	"
K-0939	"	BlS	"	"
K-0940	"	BlS	"	"
K-0941	Mt. Omoto, Ishigaki Is.	(Net)	3 XI 1971	K.M. & S.S.
K-0942	"	GP	"	"
K-0943	"	GP	"	"
K-0944	"	TH	"	"
K-0945	"	TH	"	"
K-0946	Itokawa-rindo, Iriomote Is.	(Net)	5 XI	"
K-0947	"	TH	"	"
K-0948	"	Str	"	"
K-0949	"	BlS	"	"
K-0950	"	BlS	"	"
K-0951	Mt. Maeshi, Ishigaki Is.	(Net)	6 XI	"
K-0952	"	GP	"	"
K-0953	"	BlS	"	"
K-0954	"	Str	"	"
K-0955	"	Str	"	"
K-0956	Mt. Banna, Ishigaki Is.	(Net)	8 XI 1971	K.T. & K.M.
K-0957	"	TH	"	"
K-0958	"	TH	"	"
K-0959	"	TH	"	"
K-0960	"	TH	"	"
K-0961	"	GP	"	"
K-0962	"	GP	"	"
K-0963	"	Str	"	"
K-0964	"	Str	"	"
K-0965	"	BlS	"	"
K-0966	"	BlS	"	"
K-0967	"	BlS	"	"
K-0968	"	BlS	"	"
K-0969	Yonehara, Ishigaki Is.	(Net)	9 XI	"
K-0970	"	TH	"	"
K-0971	"	TH	"	"
K-0972	"	TH	"	"
K-0973	"	TH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-0974	foot of Mt. Maeshi, Ishigaki Is.	(Net)	9 XI 1971	K. T. & K. M.
K-0975	"	Str	"	"
K-0976	Itokawa-rindo, Iriomote Is.	(Net)	10 XI	"
K-0977	"	CH	"	"
K-0978	"	CH	"	"
K-0979	"	BlS	"	"
K-0980	"	BlS	"	"
K-0981	"	Str	"	"
K-0982	"	BlS	"	"
K-0983	Ohara, Iriomote Is.	GP	"	"
K-0984	"	GP	"	"
K-0985	"	GP	11 XI	"
K-0986	"	GP	"	"
K-0987	"	GP	"	"
K-0988	"	GP	"	"
K-0989	"	MC	"	"
K-0990	nr. Ohara, Iriomote Is.	Rut pool	"	"
K-0991	"	Str	"	"
K-0992	"	GP	"	"
K-0993	"	GP	"	"
K-0994	"	GP	"	"
K-0995	nr. Kabira, Ishigaki Is.	TH	12 XI	"
K-0996	"	GP	"	"
K-0997	"	GP	"	"
K-0998	"	GP	"	"
K-0999	"	GP	"	"
K-1000	"	GP	"	"
K-1001	"	GP	"	"
K-1002	foot of Mt. Maeshi, Ishigaki Is.	(Net)	13 XI	"
K-1003	"	GP	"	"
K-1004	"	RH	"	"
K-1005	"	Str	"	"
K-1006	foot of Mt. Banna, Ishigaki Is.	GP	"	"
K-1007	Minarisukumuru, Ishigaki Is.	Str	15 XI	"
K-1008	"	BlS	"	"
K-1009	Hirai, Ishigaki Is.	MC	"	"
K-1010	nr. Funaura, Iriomote Is.	(Net)	16 XI 1971	K. M.
K-1011	"	CH	"	"
K-1012	"	TH	"	"
K-1013	"	CH	"	"
K-1014	"	CH	"	"
K-1015	Funaura, Iriomote Is.	(Net)	17 XI	"
K-1016	"	CH	"	"
K-1017	"	CH	"	"
K-1018	"	CH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1019	Funaura, Iriomote Is.	GP	17 XI 1971	K.M.
K-1020	"	MC	"	"
K-1021	Yashi-gawa, Iriomote Is.	(Net)	18 XI	"
K-1022	"	BlS	"	"
K-1023	"	GP	"	"
K-1024	"	TH	"	"
K-1025	"	TH	"	"
K-1026	"	CH	"	"
K-1027	"	CH	"	"
K-1028	"	CH	"	"
K-1029	"	CH	"	"
K-1030	"	CH	"	"
K-1031	"	CH	"	"
K-1032	Shirahama, Iriomote Is.	MC	19 XI	"
K-1033	"	MC	"	"
K-1034	Mt. Maeshi, Ishigaki Is.	(Net)	9 XI 1971	K.T.
K-1035	"	(Net)	12 XI	"
K-1036	Ohara, Iriomote Is.	(Net)	16 XI	"
K-1037	Itokawa-rindo, Iriomote Is.	(Net)	17 XI	"
K-1038	foot of Mt. Goza, Iriomote Is.	(Net)	18 XI	"
K-1039	Itokawa-rindo, Iriomote Is.	TH	17 XI	"
K-1040	"	TH	"	"
K-1041	"	TH	"	"
K-1042	"	TH	"	"
K-1043	"	TH	"	"
K-1044	"	TH	"	"
K-1045	"	BlS	"	"
K-1046	"	BlS	"	"
K-1047	"	Str	"	"
K-1048	"	RH	"	"
K-1049	foot of Mt. Goza, Iriomote Is.	TH	18 XI	"
K-1050	"	TH	"	"
K-1051	"	TH	"	"
K-1052	"	TH	"	"
K-1053	"	RH	"	"
K-1054	"	BlS	"	"
K-1055	Mt. Banna, Ishigaki Is.	Str	19 XI	"
K-1056	"	GP	"	"
K-1057	Yarabu Peninsula, Ishigaki Is.	(Net)	20 XI	"
K-1058	"	RP	"	"
K-1059	"	BlS	"	"
K-1060	"	CH	"	"
K-1061	"	TH	"	"
K-1062	"	TH	"	"
K-1063	"	TH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1064	Yarabu Peninsula, Ishigaki Is.	TH	20 XI 1971	K. T.
K-1065	Mt. Maeshi, Ishigaki Is.	(Net)	22 XI 1971	K. M.
K-1066	"	Str	"	"
K-1067	"	BlS	"	"
K-1068	nr. Sonai, Yonaguni Is.	(Biting)	23 XI	"
K-1069	"	(Net)	"	"
K-1070	"	Str	"	"
K-1071	"	P	"	"
K-1072	"	MC	"	"
K-1073	"	MC	"	"
K-1074	"	(Net)	24 XI	"
K-1075	Mt. Omoto, Ishigaki Is.	(Net)	26 XI	"
K-1076	"	TH	"	"
K-1077	"	GP	"	"
K-1078	nr. Uehara, Iriomote Is.	(Net)	27 XI	"
K-1079	"	GP	"	"
K-1080	"	GP	"	"
K-1081	"	GP	"	"
K-1082	"	CH	"	"
K-1083	"	CH	"	"
K-1084	"	CH	"	"
K-1085	"	CH	"	"
K-1086	"	CH	"	"
K-1087	"	CH	"	"
K-1088	"	CH	"	"
K-1089	nr. Funaura, Iriomote Is.	(Net)	28 XI	"
K-1090	"	GP	"	"
K-1091	"	TH	"	"
K-1092	"	CH	"	"
K-1093	"	CH	"	"
K-1094	"	CH	"	"
K-1095	"	CH	"	"
K-1096	"	CH	"	"
K-1097	"	CH	"	"
K-1098	"	CH	"	"
K-1099	"	CH	"	"
K-1100	"	CH	"	"
K-1101	"	CH	"	"
K-1102	Funaura, Iriomote Is.	(Biting)	30 XI	"
K-1103	"	TH	"	"
K-1104	"	GP	"	"
K-1105	"	GP	"	"
K-1106	"	GP	"	"
K-1107	"	GP	"	"
K-1108	"	GP	"	"
K-1109	"	GP	"	"
K-1110	"	GP	"	"
K-1111	"	(Net)	1 XII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1112	Funaura, Iriomote Is.	TH	1 XII 1971	K. M.
K-1113	"	GP	"	"
K-1114	"	CH	"	"
K-1115	"	GP	"	"
K-1116	"	GP	"	"
K-1117	"	CH	"	"
K-1118	"	CH	"	"
K-1119	"	CH	"	"
K-1120	"	CH	"	"
K-1121	"	CH	"	"
K-1122	nr. Kabira, Ishigaki Is.	(Net)	4 XII	"
K-1123	"	GP	"	"
K-1124	"	GP	"	"
K-1125	"	GP	"	"
K-1126	nr. Yoshiwara, Ishigaki Is.	(Net)	5 XII	"
K-1127	"	TH	"	"
K-1128	"	CH	"	"
K-1129	"	CH	"	"
K-1130	"	CH	"	"
J-1131	Gajanokobanta, Okinawa Is.	TH	7 XII	"
J-1132	"	RH	"	"
J-1133	"	RH	"	"
K-1134	Ishigaki Is.	GP	2 XII 1966	T. Ki.
A-1135	Toyotomi, Hokkaido	?	VII 1970	S. H.
K-1136	Otomi, Iriomote Is.	TH	24 IX	"
K-1137	Ohara, Iriomote Is.	BlS	"	"
K-1138	"	TH	"	"
K-1139	"	TH	"	"
K-1140	Ishigaki Is.	?	IV 1970	K. M. & M. N.
C-1141	Kawamata, Saitama Pref.	BlS	21 V 1972	K. M. & S. H.
C-1142	"	Str	"	"
C-1143	"	RH	"	"
C-1144	"	TH	"	"
C-1145	"	TH	"	"
C-1146	"	TH	"	"
C-1147	"	(Resting)	"	"
H-1148	Meoto-daki, Yakushima	TH	V 1972	S. S.
H-1149	Bozuiwa, Yakushima	TH	"	"
H-1150	Kodakazuka, Yakushima	TH	"	"
H-1151	Hananoego, Yakushima	TH	"	"
H-1152	"	TH	"	"
H-1153	"	TH	"	"
D-1154	Umegashima Spa, Shizuoka Pref.	TH	30 V 1972	K. M. & S. H.
D-1155	"	RH	"	"
D-1156	"	GP	"	"
D-1157	"	TH	31 V	"
D-1158	"	GP	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
C-1159	Mt. Kashozan, Gumma Pref.	BlS	15 VI 1972	K.M. & S.H.
C-1160	"	RH	"	"
C-1161	"	TH	16 VI	"
C-1162	"	TH	17 VI	"
C-1163	"	TH	"	"
C-1164	"	TH	"	"
C-1165	"	RH	"	"
C-1166	"	RH	18 VI	"
C-1167	"	RH	"	"
C-1168	"	RH	"	"
N-1169	Oogiura, Chichijima	GP	24 VI 1972	S.S.
N-1170	Mt. Chuozan, Chichijima	GP	25 VI	"
N-1171	Miyano-hama, Chichijima	RH	27 VI	"
N-1172	Mt. Chuozan, Chichijima	GP	28 VI	"
N-1173	Oogiura, Chichijima	GP	30 VI	"
N-1174	"	GP	"	"
N-1175	Miyano-hama, Chichijima	RH	27 VI	"
N-1176	Mt. Chuozan, Chichijima	TH	28 VI	"
N-1177	"	TH	"	"
N-1178	"	TH	"	"
N-1179	"	(Net)	25 VI	"
N-1180	Hokko, Hahajima	(Net)	13 V 1972	Y.K.
N-1181	Kopepe-kaigan, Chichijima	TP	30 VI 1972	S.S.
D-1182	Mt. Hakusan, Ishikawa Pref.	P	7 VII 1972	K.T.
D-1183	"	GP	8 VII	"
D-1184	"	GP	"	"
D-1185	Ichinose, Ishikawa Pref.	(Resting)	9 VII	"
D-1186	Bijodaira, Toyama Pref.	TH	8 VI 1972	K.K.
D-1187	Nanairi, Fukushima Pref.	GP	10 VII 1972	S.H. & Y.I.
B-1188	Hinoemata, Fukushima Pref.	RH	11 VII	"
B-1189	"	BlS	"	"
C-1190	Oze, Gumma Pref.	GP	12 VII	"
C-1191	"	GP	"	"
C-1192	"	GP	"	"
C-1193	"	GP	"	"
C-1194	Osawa, Gumma Pref.	MC	13 VII	"
B-1195	Hinoemata, Fukushima Pref.	?	11 VII	"
B-1196	Nanairi, Fukushima Pref.	(Net)	10 VII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
B-1197	Hinoemata, Fukushima Pref.	(Net)	11 VII 1972	S.H. & Y.I.
C-1198	Oze, Gumma Pref.	(Net)	12 VII	"
D-1199	Mt. Fuji, Yamanashi Pref.	(Biting)	27 VIII 1972	K.T.
D-1200	"	GP	"	"
D-1201	"	MC: Concrete tank	"	"
D-1202	"	MC: Wooden tank	"	"
D-1203	"	MC: Wooden tank	"	"
D-1204	"	MC: Wooden tank	"	"
J-1205	Nago, Okinawa Is.	(Net)	13 IX 1972	K.M.
J-1206	Gajanokobanta, Okinawa Is.	CH	14 IX	"
J-1207	"	CH	"	"
J-1208	"	RH	"	"
J-1209	"	RH	"	"
K-1210	nr. Yoshiwara, Ishigaki Is.	GP	16 IX	"
K-1211	Yoshiwara, Ishigaki Is.	CH	17 IX	"
K-1212	"	CH	"	"
K-1213	"	CH	"	"
K-1214	nr. Yonehara, Ishigaki Is.	TH	18 IX	"
K-1215	"	TH	"	"
K-1216	"	TH	"	"
K-1217	"	TH	"	"
K-1218	"	(Net)	"	"
K-1219	nr. Funaura, Iriomote Is.	Str	19 IX	"
K-1220	"	CH	"	"
K-1221	"	CH	"	"
K-1222	Uehara, Iriomote Is.	GP	20 IX	"
K-1223	"	CH	"	"
K-1224	"	CH	"	"
K-1225	"	CH	"	"
K-1226	"	CH	"	"
K-1227	"	CH	"	"
K-1228	"	CH	"	"
K-1229	Funaura, Iriomote Is.	GP	21 IX	"
K-1230	"	GP	"	"
K-1231	"	GP	"	"
K-1232	"	GP	"	"
K-1233	"	GP	"	"
K-1234	"	TH	"	"
K-1235	"	TH	"	"
K-1236	Ohara, Iriomote Is.	TH	22 IX	"
K-1237	Toyohara, Iriomote Is.	GP	23 IX	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1238	Itokawa-rindo, Iriomote Is.	TH	24 IX 1972	K. M.
K-1239	"	GP	"	"
K-1240	"	CH	"	"
K-1241	"	CH	"	"
K-1242	"	BlS	"	"
K-1243	"	(Net)	"	"
K-1244	Yonehara, Ishigaki Is.	TH	26 IX	"
K-1245	"	TH	"	"
K-1246	Yoshiwara, Ishigaki Is.	GP	27 IX	"
K-1247	"	CH	"	"
K-1248	"	CH	"	"
K-1249	"	CH	"	"
K-1250	"	CH	"	"
K-1251	"	CH	"	"
J-1252	Gajanokobanta, Okinawa Is.	(Net)	30 IX	"
J-1253	"	CH	"	"
J-1254	"	CH	"	"
J-1255	"	CH	"	"
J-1256	"	CH	"	"
J-1257	"	RH	"	"
J-1258	"	RH	"	"
J-1259	"	RH	"	"
J-1260	"	RH	"	"
J-1261	Yona, Okinawa Is.	RH	1 X	"
J-1262	"	RH	"	"
J-1263	"	RH	"	"
D-1264	Mt. Fuji, Yamanashi Pref.	MC: Wooden tank	2 X 1972	K. T. & V. A. R.
D-1265	"	MC: Wooden tank	18 X	"
D-1266	"	MC: Concrete tank	"	"
D-1267	"	MC: Concrete tank	"	"
G-1268	Ashizuri-misaki, Kochi Pref.	TH	25 X 1972	K. T.
G-1269	"	TH	26 X	"
G-1270	"	TH	"	"
G-1271	"	TH	"	"
G-1272	"	TH	"	"
G-1273	"	TH	"	"
G-1274	"	TH	"	"
G-1275	"	TH	"	"
G-1276	"	P	"	"
G-1277	"	(Net)	25-26 X	"
D-1278	Mt. Fuji, Yamanashi Pref.	MC: Wooden tank	1 XI 1972	K. T. & V. A. R.
D-1279	foot of Mt. Fuji, Shizuoka Pref.	MC: Tin can	3 XI 1972	K. M.

Coll. No.	Locality	Habitat	Date	Collector(s)
D-1280	Mt. Fuji, Yamanashi Pref.	MC	15 XI 1972	K.T. & V.A.R.
D-1281	"	MC	"	"
D-1282	"	MC: Concrete tank	30 V 1973	"
D-1283	"	MC: Wooden tank	"	"
B-1284	Aomori Pref.	D	IX 1954	406 M.L.
A-1285	Kotoni, Hokkaido	?	20 VIII 1954	"
J-1286	Gajanokobanta, Okinawa Is.	(Net)	28 XI 1972	K.M. & Y.I.
J-1287	"	BlS	"	"
J-1288	"	TH	"	"
J-1289	"	LA	"	"
J-1290	"	RH	"	"
J-1291	"	RH	"	"
J-1292	Mt. Nago, Okinawa Is.	(Net)	29 XI	"
J-1293	"	MC: Tin can	"	"
K-1294	Mt. Omoto, Ishigaki Is.	GP	2 XII	"
K-1295	"	RH	"	"
K-1296	"	TH	"	"
K-1297	"	TH	"	"
K-1298	"	TH	"	"
K-1299	"	TH	"	"
K-1300	"	GP	"	"
K-1301	"	GP	"	"
K-1302	"	(Net)	"	"
K-1303	Kabira, Ishigaki Is.	GP	3 XII	"
K-1304	"	TH	"	"
K-1305	Yonehara, Ishigaki Is.	LA	"	"
K-1306	"	TH	"	"
K-1307	nr. Yoshiwara, Ishigaki Is.	LA	4 XII	"
K-1308	"	GP	"	"
K-1309	"	GP	"	"
K-1310	"	GP	"	"
K-1311	"	GP	"	"
K-1312	"	GP	"	"
K-1313	"	TH	"	"
K-1314	"	TH	"	"
K-1315	"	TH	"	"
K-1316	"	TH	"	"
K-1317	"	CH	"	"
K-1318	"	CH	"	"
K-1319	"	CH	"	"
K-1320	"	CH	"	"
K-1321	"	CH	"	"
K-1322	"	CH	"	"
K-1323	"	CH	"	"
K-1324	"	(Net)	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1325	nr. Kabira, Ishigaki Is.	(Net)	5 XII 1972	K. M. & Y. I.
K-1326	"	CH	"	"
K-1327	"	GP	"	"
K-1328	Itokawa-rindo, Iriomote Is.	(Net)	6 XII 1972	E. S. S., K. M. & Y. I.
K-1329	"	GP	"	"
K-1330	"	TH	"	"
K-1331	"	TH	"	"
K-1332	"	TH	"	"
K-1333	"	TH	"	"
K-1334	"	TH	"	"
K-1335	"	MC: Tin can	"	"
K-1336	"	MC: Tin can	"	"
K-1337	foot of Mt. Goza, Iriomote Is.	(Net)	7 XII	"
K-1338	"	FS	"	"
K-1339	"	MC: Tin can	"	"
K-1340	"	TH	"	"
K-1341	"	TH	"	"
K-1342	"	TH	"	"
K-1343	"	TH	"	"
K-1344	"	TH	"	"
K-1345	"	TH	"	"
K-1346	Mt. Goza	TH	8 XII	"
K-1347	"	TH	"	"
K-1348	"	TH	"	"
K-1349	"	TH	"	"
K-1350	foot of Mt. Goza, Iriomote Is.	TH	"	"
K-1351	Mt. Banna, Ishigaki Is.	GP	10 XII	"
K-1352	"	CH	"	"
K-1353	"	TH	"	"
K-1354	"	TH	"	"
K-1355	"	TH	"	"
K-1356	"	TH	"	"
K-1357	"	TH	"	"
K-1358	"	TH	"	"
K-1359	"	TH	"	"
K-1360	"	TH	"	"
K-1361	"	TH	"	"
K-1362	"	TH	"	"
K-1363	"	(Net)	"	"
K-1364	Funaura, Iriomote Is.	(Net)	11 XII 1972	K. M. & Y. I.
K-1365	"	GP	"	"
K-1366	"	GP	"	"
K-1367	"	CH	"	"
K-1368	nr. Uehara, Iriomote Is.	(Net)	12 XII	"
K-1369	"	TH	"	"
K-1370	"	GP	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1371	nr. Uehara, Iriomote Is.	(Net)	12 XII 1972	K.M. & Y.I.
K-1372	"	CH	"	"
K-1373	"	CH	"	"
K-1374	"	CH	"	"
K-1375	"	CH	"	"
K-1376	"	CH	"	"
K-1377	"	CH	"	"
K-1378	"	CH	"	"
K-1379	"	CH	"	"
K-1380	"	CH	"	"
K-1381	"	CH	"	"
K-1382	Mt. Banna, Ishigaki Is.	(Net)	13 XII	"
K-1383	"	GP	"	"
K-1384	"	TH	"	"
K-1385	"	TH	"	"
K-1386	Omoto, Ishigaki Is.	GP	14 XII	"
K-1387	"	GP	"	"
K-1388	Mt. Omoto, Ishigaki Is.	GP	"	"
K-1389	Inoda, Ishigaki Is.	LA	"	"
K-1390	"	GP	"	"
K-1391	"	TH	"	"
K-1392	"	TH	"	"
K-1393	"	RH	"	"
K-1394	"	RH	"	"
K-1395	"	RH	"	"
K-1396	foot of Mt. Maeshi, Ishigaki Is.	GP	15 XII	"
K-1397	"	GP	"	"
K-1398	"	GP	"	"
K-1399	Mt. Maeshi, Ishigaki Is.	LA	"	"
K-1400	"	TH	"	"
K-1401	"	(Net)	"	"
K-1402	Nosoko, Ishigaki Is.	(Net)	16 XII	"
K-1403	"	GP	"	"
K-1404	"	TH	"	"
K-1405	"	TH	"	"
K-1406	nr. Yoshiwara, Ishigaki Is.	(Net)	17 XII	"
K-1407	"	CH	"	"
K-1408	"	CH	"	"
K-1409	"	CH	"	"
K-1410	"	CH	"	"
K-1411	nr. Yonehara, Ishigaki	LA	20 XII	"
K-1412	" Is.	TH	"	"
K-1413	"	TH	"	"
K-1414	"	TH	"	"
K-1415	"	TH	"	"
K-1416	"	TH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1417	Itokawa-rindo, Iriomote Is.	(Net)	21 XII 1972	K. M. & Y. I.
K-1418	"	MC: Tin can	"	"
K-1419	"	TH	"	"
K-1420	Ohara, Iriomote Is.	MC: Tin can	22 XII	"
K-1421	"	MC: Tin can	"	"
K-1422	Toyohara, Iriomote Is.	(Net)	23 XII	"
K-1423	"	TH	"	"
K-1424	"	TH	"	"
K-1425	nr. Kabira, Ishigaki Is.	(Net)	26 XII	"
K-1426	"	TH	"	"
K-1427	"	TH	"	"
K-1428	"	TH	"	"
K-1429	Omoto, Ishigaki Is.	GP	27 XII	"
K-1430	"	GP	"	"
K-1431	"	GP	"	"
K-1432	"	GP	"	"
K-1433	"	(Resting)	"	"
K-1434	"	(Net)	"	"
K-1435	Yarabu Peninsula, Ishigaki Is.	(Net)	28 XII	"
K-1436	"	GP	"	"
K-1437	"	GP	"	"
K-1438	"	GP	"	"
K-1439	"	GP	"	"
K-1440	"	GP	"	"
K-1441	"	GP	"	"
K-1442	"	GP	"	"
K-1443	"	GP	"	"
K-1444	foot of Mt. Banna, Ishigaki Is.	(Net)	30 XII	"
K-1445	"	LA	"	"
K-1446	"	GP	"	"
K-1447	Mt. Banna, Ishigaki Is.	(Net)	31 XII	"
K-1448	"	GP	"	"
K-1449	"	TH	"	"
K-1450	"	TH	"	"
K-1451	"	TH	"	"
K-1452	"	TH	"	"
K-1453	"	TH	"	"
K-1454	"	TH	"	"
K-1455	"	TH	"	"
K-1456	"	TH	"	"
K-1457	nr. Arakawa, Ishigaki Is.	(Net)	1 I 1973	"
K-1458	"	TH	"	"
K-1459	"	TH	"	"
K-1460	"	TH	"	"
K-1461	"	TH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1462	nr. Arakawa, Ishigaki Is.	TH	1 I 1973	K.M. & Y.I.
K-1463	"	CH	"	"
K-1464	"	CH	"	"
K-1465	"	CH	"	"
K-1466	"	CH	"	"
K-1467	"	CH	"	"
K-1468	"	CH	"	"
K-1469	"	CH	"	"
K-1470	"	CH	"	"
K-1471	"	CH	"	"
K-1472	Mt. Maeshi, Ishigaki Is.	(Net)	6 IV 1973	Y.I.
K-1473	Nakara Rev., Iriomote Is.	(Net)	11 IV	"
K-1474	Kambira-taki, Iriomote Is.	(Net)	14 IV	"
K-1475	Iriomote Is.	?	15 XII 1968	U.S.A.M.C.
K-1476	Inoda, Ishigaki Is.	?	18 XII	"
K-1477	Iriomote Is.	?	"	"
C-1478	Kawagoe, Saitama Pref.	?	14 VII 1953	406 M.L.
C-1479	Toya, Kanagawa Pref.	?	7 VII 1965	H.S.
C-1480	Mt. Tanzawa, Kanagawa Pref.	?	28 IV 1966	406 M.L.
J-1481	Ojana, Okinawa Is.	?	6 XI 1970	U.S.A.M.C.
J-1481a	Ginowan, Okinawa Is.	?	7 XI 1970	"
L-1482	Kongju, Chungchongnam Do	TH	16 IX 1972	K.W.L.
L-1483	Banpodong, Seoul	RF	18 IX 1972	"
L-1484	Kwangnung, Kyongki Do	Seepage	30 IV 1970	"
L-1485	Yechon, Kyongsangpuk Do	TH	19 IV 1972	"
L-1486	Jongmyo, Seoul	GP	24 X 1969	"
L-1487	Yongju, Kyongsangpuk Do	(Resting)	10 IX 1969	"
L-1488	Kwangnung, Kyongki Do	TH	13 VIII 1972	"
L-1489	"	TH	30 VIII 1970	"
L-1490	Haeinsa, Kyongsangnam Do	GP	2 VIII 1972	"
L-1491	Sockni, Chungchongnam Do	MC: Jar	1 X 1972	"
K-1492	Inoda, Ishigaki Is.	?	18 XII 1968	U.S.A.M.C.
J-1493	Yona, Okinawa Is.	?	23 XI 1964	"
J-1494	Toguchi, Okinawa Is.	?	5 VIII 1969	"
K-1495	Inoda, Ishigaki Is.	?	18 XII 1968	U.S.A.M.C.
C-1496	Toya, Kanagawa Pref.	?	7 VII 1965	406 M.L.
C-1497	Yamato, Kanagawa Pref.	?	12 VI 1969	A.K.
C-1498	Sagamihara, Kanagawa Pref.	?	5 VII 1963	406 M.L.
C-1499	Ayase, Kanagawa Pref.	?	16 VI 1964	"

Coll. No.	Locality	Habitat	Date	Collector(s)
C-1500	Atsugi, Kanagawa Pref.	?	20 I 1964	406 M.L.
C-1501	"	?	4 III 1964	"
C-1502	"	?	5 II 1964	"
C-1503	Hachioji, Tokyo Met.	?	15 VI 1965	"
N-1504	Mt. Chuozan, Chichijima	GP	19 V 1973	S.S.
N-1505	Fukiagedani, Chichijima	GP	25 V	"
N-1506	Kitafukurozawa, Chichijima	TH	26 V	"
N-1507	"	(Net)	19 V	"
N-1508	Mt. Kuwanokiyama, Hahajima	(Net)	20 V 1973	S.S. & Y.K.
N-1509	Fukiagedani, Chichijima	(Net)	25 V 1973	S.S.
N-1510	Kitafukurozawa, Chichijima	(Net)	26 V	"
N-1511	"	(Net)	26 V	Y.K.
N-1512	Fukurozawa, Chichijima	(Net)	"	"
N-1513	"	(Net)	16 V	"
N-1514	Higashi-ko, Hahajima	(Net)	2 I 1973	S.H.
N-1515	Hahajima	(Net)	20 III	"
N-1516	"	(Net)	1 IV	"
N-1517	"	(Net)	7 III	"
N-1518	Okimura, Hahajima	(Net)	7 I	"
N-1519	Kominato, Chichijima	GP	25 V 1973	S.S. & R.K.
C-1520	Hakone, Kanagawa Pref.	TH	26 V 1973	K.T.
C-1521	Zama, Kanagawa Pref.	MC: Pail	1 VI 1973	E.S.S.
C-1522	"	MC	4 VI	"
C-1523	Kawada, Mikura Is.	(Net)	7 VI 1973	K.M. & S.O.
C-1524	"	BbS	"	"
C-1525	"	BbS	"	"
C-1526	"	TH	"	"
C-1527	"	TH	"	"
C-1528	Sato, Mikura Is.	TH	8 VI	"
C-1529	"	TH	"	"
C-1530	"	(Net)	"	"
C-1531	Mt. Oyama, Mikura Is.	(Net)	9 VI	"
C-1532	"	TH	"	"
C-1533	"	TH	"	"
C-1534	"	BbS	"	"
C-1535	Sato, Mikura Is.	RH	10 VI	"
K-1536	Mt. Maeshi, Ishigaki Is.	(Net)	21 IV 1973	Y.I.
K-1537	Mt. Banna, Ishigaki Is.	(Net)	24 IV	"
K-1538	"	(Net)	25 V	"
K-1539	Mt. Maeshi, Ishigaki Is.	(Net)	29 V	"
D-1540	Kamikochi, Nagano Pref.	GP	13 VI 1973	V.A.R.
D-1541	"	GP	"	"
D-1542	"	GP	"	"
D-1543	"	GP	"	"
C-1544	Zama, Kanagawa Pref.	MC: Pail	16 VI 1973	E.S.S.
N-1545	Hahajima	GP	VI 1973	S.H.

Coll. No.	Locality	Habitat	Date	Collector(s)
N-1546	Hahajima	GP	VI 1973	S.H.
N-1547	"	GP	"	"
N-1548	"	GP	"	"
N-1549	"	GP	"	"
N-1550	"	GP	"	"
N-1551	Chichijima	GP	"	"
N-1552	"	TH	"	"
N-1553	"	TH	"	"
N-1554	"	TH	"	"
N-1555	"	TH	"	"
N-1556	"	(Net)	5 VI	"
N-1557	Kominato, Chichijima	(Net)	9 VI	"
N-1558	Chichijima	(Net)	11 VI	"
N-1559	"	(Net)	12 VI	"
N-1560	Hahajima	(Net)	23 V	"
N-1561	"	(Net)	29 V	"
N-1562	"	(Net)	31 V	"
N-1563	Mt. Kuwanokiyama, Hahajima	(Net)	1 VI	"
N-1564	Hahajima	(Net)	3 VI	"
N-1565	"	(Net)	4 VI	"
N-1566	"	(Net)	7 VI	"
N-1567	"	(Net)	13 VI	"
N-1568	"	?	29 V	"
N-1569	"	?	7 VI	"
N-1570	Chichijima	?	9 VI	"
N-1571	"	?	11 VI	"
N-1572	"	?	12 VI	"
N-1573	"	?	21 VI	"
C-1574	Zama, Kanagawa Pref.	MC	20 VI 1973	E.S.S.
E-1575	Mt. Ohdaigahara, Nara Pref.	BlS	26 VI 1973	K.T. & V.A.R.
E-1576	"	TH	"	"
E-1577	"	TH	"	"
D-1578	Mt. Fuji, Yamanashi Pref.	MC: Wooden tank	19 VII	"
D-1579	"	MC: Concrete tank	"	"
C-1580	Zama, Kanagawa Pref.	MC: Barrel	20 VII 1973	E.S.S.
C-1581	"	MC: Barrel	22 VII	"
D-1582	Mt. Fuji, Yamanashi Pref.	MC: Wooden tank	VII 1973	V.A.R.
D-1583	"	MC: Wooden tank	"	"
D-1584	"	MC: Concrete tank	"	"
D-1585	"	MC: Concrete tank	"	"
D-1586	Zama, Kanagawa Pref.	MC: Barrel	3 VIII 1973	E.S.S.
K-1587	Itokawa-rindo, Iriomote Is.	(Net)	27 VII 1973	K.M.

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1588	Itokawa-rindo, Iriomote Is.	TH	27 VII 1973	K. M.
K-1589	"	TH	"	"
K-1590	nr. Toyohara, Iriomote Is.	(Net)	28 VII	"
K-1591	"	TH	"	"
K-1592	"	BlS	"	"
K-1593	Komi, Iriomote Is.	(Net)	29 VII	"
K-1594	"	GP	"	"
K-1595	"	CH	"	"
K-1596	foot of Mt. Banna, Ishigaki Is.	(Net)	30 VII	"
K-1597	"	GP	"	"
K-1598	Mt. Maeshi, Ishigaki Is.	(Net)	31 VII	"
K-1599	"	LA	"	"
K-1600	"	BlS	"	"
K-1601	"	CH	"	"
K-1602	nr. Kabira, Ishigaki Is.	(Net)	1 VIII	"
K-1603	"	TH	"	"
K-1604	"	TH	"	"
K-1605	"	BlS	"	"
K-1606	"	GP	"	"
K-1607	"	GP	"	"
K-1608	"	GP	"	"
K-1609	Funaura	CH	2 VIII	"
K-1610	nr. Yonehara, Ishigaki Is.	TH	3 VIII	"
K-1611	"	TH	"	"
K-1612	"	LA	"	"
K-1613	nr. Yoshiwara, Ishigaki Is.	TH	4 VIII	"
K-1614	"	TH	"	"
K-1615	"	CH	"	"
K-1616	"	CH	"	"
K-1617	"	GP	"	"
K-1618	"	GP	"	"
K-1619	"	GP	"	"
K-1620	"	GP	"	"
K-1621	"	GP	"	"
K-1622	"	GP	"	"
J-1623	Nago, Okinawa Is.	(LT)	21 VI 1973	O. I. P. H.
J-1624	"	(LT)	23 VII	"
J-1625	"	(LT)	2 VIII	"
D-1626	Mt. Dando, Aichi Pref.	BlS	11 VIII 1973	K. T.
D-1627	"	(LT)	12 VIII	"
C-1628	Sagamihara, Kanagawa Pref.	MC: Concrete tank	14 VIII 1973	E. S. S.
C-1629	Zama, Kanagawa Pref.	MC: Can	15 VIII	"
K-1630	Komi, Iriomote Is.	CH	24 VIII 1973	T. K. & J. T.

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1631	Komi, Iriomote Is.	CH	24 VIII 1973	T.K. & J. T.
A-1632	Mt. Moiwa, Hokkaido	(Bait)	20 VIII 1973	E.S.S. & K.M.
A-1633	"	(Net)	"	"
A-1634	"	TH	"	"
A-1635	"	TH	"	"
A-1636	"	MC: Cement tank	"	"
A-1637	Engaru, Hokkaido	GP	21 VIII	"
A-1638	"	GP	"	"
A-1639	"	P	"	"
A-1640	"	(Net)	23 VIII	"
A-1641	"	TH	"	"
A-1642	"	GP	"	"
A-1643	"	MC: Barrel	"	"
A-1644	"	GP	"	"
A-1645	"	GP	"	"
A-1646	"	GP	"	"
A-1647	"	GP	"	"
A-1648	"	GP	24 VIII 1973	K.M.
A-1649	"	GP	"	"
A-1650	"	GP	"	"
A-1651	"	TH	25 VIII	"
A-1652	"	GP	"	"
A-1653	"	GP	"	"
A-1654	"	MC: Tin can	"	"
A-1655	"	P	"	"
A-1656	"	Str	"	"
A-1657	"	Str	"	"
A-1658	"	(Net)	"	"
A-1659	"	GP	26 VIII	"
A-1660	"	GP	"	"
A-1661	Shibecha, Hokkaido	MC	24 VIII 1973	E.S.S.
A-1662	"	GP	"	"
A-1663	"	GP	25 VIII	"
A-1664	"	MC	"	"
A-1665	"	GP	"	"
A-1666	"	D	"	"
A-1667	"	D	"	"
A-1668	"	P	"	"
A-1669	"	P	"	"
A-1670	Engaru, Hokkaido	(Net)	27 VIII 1973	E.S.S. & K.M.
A-1671	"	TH	"	"
A-1672	"	GP	"	"
A-1673	Tenninkyo, Hokkaido	(Biting)	29 VIII	"
A-1674	"	MC	"	"
A-1675	"	MC	"	"
A-1676	Mt. Moiwa, Hokkaido	MC	31 VIII 1973	K.M.
A-1677	Sapporo, Hokkaido	MC	2 IX	"
A-1678	"	MC	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
A-1679	Shakotan, Hokkaido	TH	VIII 1973	S. Sa.
A-1680	"	GP	V 1973	"
A-1681	Sarufutsu, Hokkaido	GP	VII 1973	"
A-1682	"	GP	"	"
A-1683	Rubeshibe, Hokkaido	GP	12 V 1966	"
A-1684	"	GP	29 V	"
E-1685	Mt. Ohdaigahara, Nara Pref.	TH	11 IX 1973	K. T. & V. A. R.
E-1686	"	TH	"	"
E-1687	"	RH	"	"
E-1688	"	RH	"	"
E-1689	"	RH	"	"
E-1690	"	RH	"	"
E-1691	"	RH	"	"
E-1692	"	RH	"	"
E-1693	"	TH	12 IX	"
E-1694	"	TH	"	"
E-1695	"	TH	"	"
E-1696	"	TH	"	"
E-1697	"	TH	"	"
E-1698	"	BlS	"	"
E-1699	Mt. Sanzukochi, Mie Pref.	MC: Boots	13 IX	"
E-1700	"	TH	"	"
E-1701	"	MC: Plastic cup	"	"
E-1702	Mt. Ohdaigahara, Nara Pref.	(Net)	11 IX	"
E-1703	"	(Biting)	12 IX	"
E-1704	"	(LT)	"	"
E-1705	"	(LT)	13 IX	"
K-1706	Toyotomi, Iriomote Is.	(Net)	23 VIII 1973	T. K.
K-1707	Komi, Iriomote Is.	(Net)	24 VIII	"
A-1708	Mt. Muine, Hokkaido	?	23 VII 1957	K. H.
A-1709	"	?	27 VII	"
A-1710	Usubetsu, Hokkaido	?	"	"
A-1711	Kitami, Hokkaido	?	23 VII 1958	"
A-1712	Engaru, Hokkaido	?	VIII 1973	E. S. S. & K. M.
A-1713	Shibecha, Hokkaido	?	VIII 1973	E. S. S.
N-1714	nr. Mt. Chuozan, Chichijima	(Net)	28 IX 1973	K. M.
N-1715	"	TH	"	"
N-1716	"	TH	"	"
N-1717	"	TH	"	"
N-1718	"	TH	"	"
N-1719	"	TH	"	"
N-1720	"	GP	"	"
N-1721	"	GP	"	"
N-1722	Oogiura, Chichijima	Str	"	"
N-1723	Mt. Chuozan, Chichijima	RH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
N-1724	Okumura, Chichijima	GP	29 IX 1973	K. M.
N-1725	"	GP	"	"
N-1726	"	MC	"	"
N-1727	Ohmura, Chichijima	GP	"	"
N-1728	"	MC	"	"
N-1729	"	MC	"	"
N-1730	"	MC	"	"
K-1731	Itokawa-rindo, Iriomote Is.	TH	6 XII 1973	K. M. & J. T.
K-1732	"	GP	"	"
K-1733	Maira Riv., Iriomote Is.	(Net)	7 XII	"
K-1734	"	CH	"	"
K-1735	"	CH	"	"
K-1736	Yonehara, Ishigaki Is.	TH	8 XII 1973	K. M. & K. Ku.
K-1737	"	TH	"	"
K-1738	"	TH	"	"
K-1739	"	TH	"	"
K-1740	"	TH	"	"
K-1741	"	CH	9 XII	"
K-1742	"	CH	"	"
K-1743	"	CH	"	"
K-1744	"	TH	"	"
K-1745	nr. Kabira, Ishigaki Is.	GP	10 XII 1973	K. M.
K-1746	"	GP	"	"
K-1747	"	GP	"	"
K-1748	"	P	"	"
K-1749	Mt. Banna, Ishigaki Is.	LA	11 XII	"
K-1750	"	TH	"	"
K-1751	"	TH	"	"
K-1752	nr. Yonehara, Ishigaki Is.	LA	13 XII 1973	K. M. & K. W.
K-1753	"	TH	"	"
K-1754	"	TH	"	"
K-1755	"	TH	"	"
K-1756	"	TH	"	"
K-1757	"	TH	"	"
K-1758	"	TH	"	"
K-1759	Kabira, Ishigaki Is.	GP	"	"
K-1760	Itokawa-rindo, Iriomote Is.	(Net)	14 XII 1973	K. M.
K-1761	"	TH	"	"
K-1762	"	TH	"	"
K-1763	"	TH	"	"
K-1764	nr. Ibaruma, Ishigaki Is.	GP	15 XII 1973	K. M. & K. W.
C-1765	Zama, Kanagawa Pref.	BbS	20 III 1974	K. M.
K-1766	Ohama, Ishigaki Is.	TP	1 V 1974	K. M. & K. W.
K-1767	"	TP	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-1768	Kannonzaki, Ishigaki Is.	RH	2 V 1974	K.M. & K.W.
K-1769	"	RH	"	"
K-1770	"	RH	"	"
K-1771	nr. Yonehara, Ishigaki Is.	TH	3 V	"
K-1772	"	TH	"	"
K-1773	nr. Yoshiwara, Ishigaki Is.	TH	"	"
K-1774	"	TH	"	"
K-1775	"	TH	"	"
K-1776	nr. Agarisuji, Kuroshima	TH	4 V 1974	K.M.
K-1777	"	RH	"	"
K-1778	"	RH	"	"
J-1779	Nago, Okinawa Is.	(LT)	19 II 1974	O.I.P.H.
A-1780	Zenibako, Hokkaido	(Net)	17 V 1974	K.M.
A-1781	"	GP	"	"
A-1782	"	GP	"	"
A-1783	"	GP	"	"
A-1784	"	GP	19 V	"
A-1785	Mt. Moiwa, Hokkaido	(Net)	21 V 1974	K.M. & V.A.R.
A-1786	"	TH	"	"
A-1787	Toyotomi, Hokkaido	MC: Cement tank	25 V	"
A-1788	Engaru, Hokkaido	TH	1 VI 1974	K.M.
A-1789	"	GP	2 VI	"
A-1790	"	GP	"	"
A-1791	"	GP	"	"
A-1792	"	GP	"	"
A-1793	Akan-kohan, Hokkaido	GP	29 V	Y.H.
A-1794	"	GP	"	"
A-1795	"	GP	"	"
A-1796	"	GP	"	"
A-1797	"	GP	"	"
A-1798	"	GP	"	"
A-1799	"	GP	"	"
A-1800	"	GP	30 V	"
A-1801	"	GP	"	"
A-1802	"	GP	"	"
A-1803	Zenibako, Hokkaido	GP	1 V 1974	E.K.
A-1804	"	GP	"	"
A-1805	Kunitomi, Hokkaido	TH	15 VIII 1972	H.T.
A-1806	"	TH	19 VIII	"
C-1807	Sagamihara, Kanagawa Pref.	BlS	7 VI 1974	K.M. & B.D.H.
A-1808	Onuma-koen, Hokkaido	GP	30 IV 1959	K.H.
A-1809	Zenibako, Hokkaido	GP	IV-V 1966	Y.T.

Coll. No.	Locality	Habitat	Date	Collector(s)
C-1810	Sagamihara, Kanagawa Pref.	BlS	19 VI 1974	V.A.R.
C-1811	"	BlS	25 VI	"
C-1812	nr. Toya, Kanagawa Pref.	GP	9 VII 1974	V.A.R. & B.D.H.
C-1813	"	GP	"	"
C-1814	"	GP	"	"
C-1815	"	GP	"	"
C-1816	"	GP	"	"
C-1817	"	MC: Cement tank	"	"
C-1818	"	MC: Cement tank	"	"
C-1819	Zama, Kanagawa Pref.	GP	10 VII 1974	E.S.S.
C-1820	"	MC	"	"
C-1821	"	MC	"	"
C-1822	"	MC	30 VII	"
C-1823	"	MC	"	"
H-1824	Hananoego, Yakushima	MC: Tin can	26 VII 1974	S.S.
H-1825	Kanosawa, Yakushima	TH	30 VII	S.S.
C-1826	Sagamihara, Kanagawa Pref.	MC: Concrete basin	7 VIII 1974	E.S.S.
C-1827	"	?	"	"
I-1828	Mt. Yuwan, Amami Oshima	TH	23 VII 1974	E.S.S. & K.M.
I-1829	"	TH	"	"
I-1830	"	TH	24 VII	"
I-1831	"	TH	"	"
I-1832	"	TH	"	"
I-1833	"	TH	"	"
I-1834	"	TH	"	"
I-1835	"	TH	"	"
I-1836	"	MC: Tin can	"	"
I-1837	"	(Net)	25 VII	"
I-1838	"	Str	"	"
I-1839	"	RH	"	"
I-1840	"	TH	25 VII	"
I-1841	"	TH	"	"
I-1842	"	TH	"	"
I-1843	"	TH	"	"
I-1844	"	TH	"	"
I-1845	"	TH	"	"
I-1846	"	TH	25 VII	"
I-1847	"	TH	"	"
I-1848	"	(Net)	26 VII	"
I-1849	"	TH	"	"
I-1850	"	TH	"	"
I-1851	"	TH	"	"
I-1852	"	TH	"	"
I-1853	"	TH	"	"
I-1854	"	TH	"	"
I-1855	Yuwan, Amami Oshima	GP	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
I-1856	Yuwan, Amami Oshima	GP	26 VII 1974	E.S.S.
I-1857	"	GP	"	"
I-1858	"	TH	"	"
I-1859	"	MC	"	"
I-1860	Mt. Yuwan, Amami Oshima	TH	27 VII 1974	K.M.
I-1861	"	TH	"	"
I-1862	"	MC: Tin can	"	"
I-1863	Taken, Amami Oshima	GP	28 VII	"
I-1864	"	GP	"	"
I-1865	Yuwan, Amami Oshima	RH	29 VII	"
I-1866	"	RH	"	"
I-1867	"	RH	"	"
I-1868	"	RH	"	"
I-1869	"	RH	"	"
I-1870	Suko, Amami Oshima	Str	30 VII	"
I-1871	"	Str	"	"
I-1872	nr. Ishara, Amami Oshima	Str	31 VII	"
I-1873	"	GP	"	"
I-1874	"	GP	"	"
I-1875	"	GP	"	"
I-1876	"	GP	"	"
I-1877	Taken, Amami Oshima	RF	1 VIII	"
I-1878	"	RF	"	"
I-1879	"	RF	"	"
I-1880	Yuwan, Amami Oshima	GP	2 VIII	"
I-1881	"	GP	"	"
I-1882	"	GP	"	"
I-1883	"	GP	3 VIII	"
I-1884	Mt. Yuwan, Amami Oshima	(Net)	4 VIII	"
I-1885	"	GP	"	"
I-1886	"	TH	"	"
I-1887	"	TH	"	"
I-1888	"	TH	"	"
I-1889	"	TH	"	"
I-1890	"	TH	"	"
I-1891	"	TH	"	"
I-1892	Ashiken, Amami Oshima	RF	5 VIII	"
I-1893	"	Str	"	"
I-1894	"	RH	"	"
H-1895	Shiroyama, Kagoshima Pref.	P	7 VIII	"
C-1896	Zama, Kanagawa Pref.	MC	29 VII 1974	E.S.S.
C-1897	"	MC	9 VIII	"
C-1898	Sagamihara, Kanagawa Pref.	MC: Catch basin	13 VIII	"
C-1899	"	MC: Catch basin	15 VIII	"

Coll. No.	Locality	Habitat	Date	Collector(s)
C-1900	Sagamihara, Kanagawa Pref.	MC	15 VIII 1974	B. D. H.
C-1901	Tachikawa, Tokyo Met.	MC	17 VIII 1974	E. S. S.
C-1902	Nakatsu Valley, Kanagawa Pref.	RP	17 VIII 1974	B. D. H.
C-1903	Zama, Kanagawa Pref.	MC	19 VIII 1974	E. S. S.
C-1904	Sagamihara, Kanagawa Pref.	MC	20 VIII 1974	B. D. H.
C-1905	"	Str	"	"
C-1906	"	MC	23 VIII 1974	E. S. S.
C-1907	"	MC	"	"
C-1908	Nakatsu Valley, Kanagawa Pref.	MC	17 VIII 1974	B. D. H.
A-1909	Engaru, Hokkaido	MC	27 VIII 1974	K. M. & B. D. H.
A-1910	"	GP	"	"
A-1911	"	P	"	"
A-1912	"	RF	28 VIII	"
A-1913	"	RF	"	"
A-1914	"	RF	"	"
A-1915	"	GP	"	"
A-1916	"	GP	"	"
A-1917	"	GP	"	"
A-1918	"	GP	"	"
A-1919	"	GP	"	"
A-1920	"	GP	"	"
A-1921	"	GP	"	"
A-1922	"	MC	"	"
A-1923	"	MC	"	"
A-1924	"	GP	"	"
A-1925	"	GP	"	"
A-1926	"	GP	"	"
A-1927	"	GP	"	"
A-1928	"	GP	29 VIII	"
A-1929	"	RF	"	"
A-1930	"	GP	"	"
A-1931	"	GP	"	"
A-1932	"	GP	"	"
A-1933	"	GP	"	"
A-1934	"	GP	"	"
A-1935	"	MC	"	"
A-1936	"	GP	30 VIII 1974	K. M.
A-1937	"	GP	"	"
A-1938	"	GP	"	"
A-1939	"	GP	31 VIII	"
A-1940	"	GP	"	"
A-1941	Rubeshibe, Hokkaido	GP	30 VIII 1974	B. D. H.
A-1942	"	GP	"	"
A-1943	"	GP	"	"
A-1944	"	GP	31 VIII	"
A-1945	"	GP	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
A-1946	Rubeshibe, Hokkaido	GP	31 VIII 1974	B.D.H.
A-1947	Engaru, Hokkaido	GP	1 IX 1974	K.M.
A-1948	"	GP	"	"
A-1949	"	GP	"	"
A-1950	Sapporo, Hokkaido	P	3 IX 1974	K.M. & T.O.
A-1951	Mt. Moiwa, Hokkaido	TH	4 IX	"
A-1952	Aizankei, Hokkaido	GP	24 VI 1974	E.K.
C-1953	Sagamihara, Kanagawa Pref.	MC	9 IX 1974	E.S.S.
C-1954	Zama, Kanagawa Pref.	MC	13 IX	"
C-1955	"	MC	"	"
C-1956	"	GP	"	"
L-1957	Secret Garden, Seoul	MC	24 IX	"
L-1958	"	?	"	"
L-1959	"	MC	"	"
L-1960	"	P	"	"
L-1961	"	MC	"	"
L-1962	"	P	"	"
L-1963	Korean Nat. Mus. Park, Seoul	P	"	"
L-1964	"	MC	"	"
L-1965	National Forest, Kyongki Do	TH	25 IX	"
L-1966	"	MC	"	"
L-1967	"	?	"	"
L-1968	"	GP	"	"
L-1969	Mt. Nam-han, Kyongki Do	GP	26 IX	"
L-1970	Seoul	GP	"	"
L-1971	"	?	"	"
L-1972	"	P	"	"
L-1973	Munsan, Kyongki Do	D	27 IX	"
L-1974	"	RF	"	"
L-1975	"	RF	"	"
L-1976	"	GP	"	"
H-1977	Uto, Kumamoto Pref.	P	21 IX 1974	K.M. & A.Y.
H-1978	"	P	"	"
H-1979	Yatsushiro, Kumamoto Pref.	BlS	"	"
H-1980	"	BlS	"	"
H-1981	"	BlS	"	"
H-1982	"	RF	"	"
H-1983	"	RF	"	"
H-1984	"	RF	"	"
H-1985	"	GP	22 IX	"
H-1986	"	Str	"	"
H-1987	"	RF	"	"
H-1988	"	BlS	"	"
H-1989	"	BlS	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
H-1990	Yatsushiro, Kumamoto Pref.	RF	22 IX 1974	K. M. & A. Y.
H-1991	"	RF	"	"
H-1992	"	RP	"	"
H-1993	"	RP	"	"
H-1994	"	RP	"	"
H-1995	"	RP	"	"
H-1996	"	(Net)	23 IX	"
H-1997	Tamana, Kumamoto Pref.	P	"	"
H-1998	"	RF	"	"
H-1999	Aino, Nagasaki Pref.	BlS	"	"
H-2000	"	BlS	"	"
H-2001	"	BlS	"	"
H-2002	"	BlS	"	"
H-2003	Isuhara, Tsushima	(Net)	25 IX 1974	K. M.
H-2004	Mt. Ariake, Tsushima	(Net)	26 IX	"
H-2005	"	BbS	"	"
H-2006	"	RH	"	"
H-2007	"	RH	"	"
H-2008	"	MC: Cement tank	"	"
H-2009	Kuwa, Tsushima	RF	27 IX	"
H-2010	Naiin, Tsushima	RF	"	"
H-2011	"	RF	"	"
H-2012	Asamo, Tsushima	RF	"	"
H-2013	Mt. Ariake, Tsushima	RH	"	"
H-2014	"	(Net)	27 IX	"
H-2015	Isahaya, Nagasaki Pref.	BlS	29 IX	"
H-2016	"	BlS	"	"
H-2017	"	RF	"	"
H-2018	"	RF	"	"
H-2019	"	RF	"	"
H-2020	"	RF	"	"
C-2021	Zama, Kanagawa Pref.	MC	2 X 1974	E. S. S.
L-2022	Andong, Kyongsangpuk Do	?	?	K. W. L.
L-2023	"	?	"	"
L-2024	Jongmyo, Seoul	?	"	"
L-2025	?	?	"	"
L-2026	Kongju, Chungchongnam Do	?	"	"
L-2027	Wido, Chon Nam	?	"	"
L-2028	Jongmyo, Seoul	?	"	"
L-2029	Paju, Kyongki Do	?	"	"
K-2030	Toyotomi, Iriomote Is.	(Net)	29 XI 1974	K. M.
K-2031	Itokawa-rindo, Iriomote Is.	(Net)	30 XI 1974	K. M. & J. T.
K-2032	"	TH	"	"
K-2033	"	TH	"	"
K-2034	"	TH	"	"

Coll. No.	Locality	Habitat	Date	Collector(s)
K-2035	Itokawa-rindo, Iriomote Is.	TH	30 XI 1974	K. M. & J. T.
K-2036	"	TH	"	"
K-2037	"	TH	"	"
K-2038	"	GP	"	"
K-2039	"	GP	"	"
K-2040	"	GP	"	"
K-2041	Toyotomi, Iriomote Is.	(Net)	1 XII 1974	K. M.
K-2042	"	GP	"	"
K-2043	"	GP	"	"
K-2044	nr. Agarisuji, Kuroshima	MC: Tin can	2 XII	"
K-2045	"	RH	3 XII	"
K-2046	"	RH	"	"
K-2047	Kannonzaki, Ishigaki Is.	TP	4 XII 1974	K. M. & K. W.
K-2048	"	TP	"	"
K-2049	nr. Yoshiwara, Ishigaki Is.	GP	"	"
K-2050	"	GP	"	"
K-2051	"	(Net)	"	"
K-2052	"	TH	"	"
K-2053	"	TH	"	"
K-2054	"	TH	"	"
K-2055	Yonehara, Ishigaki Is.	(Net)	5 XII	"
K-2056	"	TH	"	"
K-2057	"	TH	"	"
K-2058	"	TH	"	"
K-2059	"	TH	"	"
K-2060	Mt. Maeshi, Ishigaki Is.	(Net)	6 XII 1974	K. M.
K-2061	"	TH	"	"
K-2062	Mt. Banna, Ishigaki Is.	(Net)	"	"
K-2063	"	GP	"	"
K-2064	"	GP	"	"
K-2065	Inoda, Ishigaki Is.	?	18 XII 1968	U. S. A. M. C.
I-2066	Shimmura, Amami Oshima	(Net)	30 VII 1974	S. O.
L-2067	Banpodong, Seoul	?	27 IX 1972	K. W. L.
L-2068	Sosa, Kyongki Do	?	?	"
B-2069	Sakata, Yamagata Pref.	?	9 VII 1974	K. Sh.
K-2070	Taira, Miyako Is.	(Net)	1 VII 1965	K. M.
E-2071	Mt. Kurama, Kyoto Pref.	TH	29 III 1975	K. M. & S. O.
E-2072	"	TH	"	"
E-2073	"	TH	"	"
A-2074	Onuma-koen, Hokkaido	GP	21 V 1958	K. H.
D-2075	Mt. Amagi, Shizuoka Pref.	TH	13 VI 1975	S. H. & K. Sa.
J-2076	Geya-taki, Okinawa Is.	Str	25 IV 1975	I. M.

Coll. No.	Locality	Habitat	Date	Collector(s)
A-2077	Kitami, Hokkaido	GP	23 VIII 1958	K.H.
A-2078	Sapporo, Hokkaido	GP	30 VII 1958	"
A-2079	Zenibako, Hokkaido	GP	1 V 1963	"
C-2080	Zama, Kanagawa Pref.	MC	5 VI 1975	E.S.S.
C-2081	Sagamihara, Kanagawa Pref.	(Resting)	17 VI 1975	K.M.
C-2082	Zama, Kanagawa Pref.	MC	18 VI 1975	E.S.S.
E-2083	Mt. Kurama, Kyoto Pref.	(Net)	19 VI 1975	K.M.
E-2084	"	TH	"	"
E-2085	"	TH	"	"
E-2086	"	TH	"	"
C-2087	Sagamihara, Kanagawa Pref.	?	10 IV 1963	"
E-2088	Mt. Kurama, Kyoto Pref.	MC: Tin can	18 VII 1975	K.M. & S.O.
E-2089	"	TH	"	"
E-2090	"	TH	"	"
E-2091	"	TH	"	"
L-2092	Yechon, Kyongsangpuk Do	?	?	K.W.L.
L-2093	Kwangnung, Kyongki Do	?	29 IV 1973	"
L-2094	Jong Myo, Seoul	?	?	"
L-2095	Kwangnung, Kyongki Do	TH	29 IV 1973	K.W.L.
L-2096	"	TH	"	"
L-2097	"	TH	"	"
L-2098	"	?	?	"
E-2099	Mt. Kurama, Kyoto Pref.	TH	31 VII 1975	K.M.
E-2100	"	TH	"	"
E-2101	"	TH	"	"
C-2102	Akigase, Saitama Pref.	?	10 VII 1953	J.E.S.
C-2103	Atsugi, Kanagawa Pref.	GP	26 IX 1975	S.R.C.
C-2104	Mt. Takatori, Kanagawa Pref.	RH	4 X 1974	K.M. & S.O.
C-2105	"	MC: Cement tank	"	"
K-2106	Kawarayama, Ishigaki Is.	(Net)	1 IV 1971	Y.U.
C-2107	Okutama, Tokyo Met.	BbS	3 VI 1966	K.T.
J-2108	Ada, Okinawa Is.	BlS	11 X 1975	I.M.
L-2109	Kwangnung, Kyongki Do	?	13 VIII 1972	K.W.L.
L-2110	Kwangnung, Kyongki Do	?	20 VIII 1972	K.W.L.
L-2111	"	?	1 X 1973	"
L-2112	"	?	?	"
L-2113	"	?	30 VIII 1970	"
L-2114	Kongju, Chungchongnam Do	?	?	"
L-2115	"	?	"	"
B-2116	Tamagawa, Yamagata Pref.	?	11 VI 1975	K.Sh.

Coll. No.	Locality	Habitat	Date	Collector(s)
J-2117	Makibaru, Okinawa Is.	(LT)	15 X 1969	U.S.A.M.C.
J-2118	Chibana, Okinawa Is.	(LT)	10 XI 1969	"
K-2119	Inoda, Ishigaki Is.	?	18 XII 1968	"
J-2120	Miyagi Is.	?	13 II 1963	"
J-2121	Kuba, Okinawa Is.	?	8 X 1968	"
J-2122	Yaka, Okinawa Is.	?	29 III 1969	T.H.
H-2123	Kagoshima, Kagoshima Pref.	(LT)	12 VIII 1969	S.Y.
B-2124	Sendai, Miyagi Pref.	?	27 V 1949	207 M.S.D.
A-2125	Hokkaido	?	?	406 M.L.
A-2126	Chitose, Hokkaido	?	14 V 1963	"
A-2127	"	?	15 V 1963	"
E-2128	Kyoto, Kyoto Pref.	BbS	20 XII 1953	Y.S. & J.MC.
C-2129	Yamato, Kanagawa Pref.	?	3 III 1964	406 M.L.
C-2130	Ayase, Kanagawa Pref.	?	30 IV 1964	"
C-2131	Yamato, Kanagawa Pref.	?	8 V 1964	"
M-2132	Ronkokyo, Cheju Do	?	18 IX 1969	K.W.L.
L-2133	Pusan, Kyongsangnam Do	?	17 VIII 1971	"
L-2134	?	?	?	"
L-2135	"	?	"	"
L-2136	Yongju, Kyongsangpuk Do	?	"	"
L-2137	Paju, Kyongki Do	?	"	"
L-2138	Bomosa, Pusan, Kyongsangpuk Do	?	"	"
L-2139	Biwon, Seoul	?	"	"
M-2140	Namcheju-kun, Cheju Do	?	7 VIII 1973	"
L-2141	Chinhae, Kyongsangnam Do	?	23 IX 1950	207 M.S.D.
2142	(Not used)			
L-2143	Yung ju, Kyongsangpuk Do	?	?	K.W.L.
L-2144	Bulkuksa, Kyungju, Kyongsangpuk Do	P	23 IX 1973	"
L-2145	Hapchon, Kyongsangnam Do	RC	20 X 1973	"
L-2146	Kwrodong, Seoul	?	21 X 1969	"
J-2147	C. Okinawa, Okinawa Is.	?	VIII 1970	U.S.A.M.C.
J-2148	Kishaba, Okinawa Is.	D	1 V 1971	T.H.
J-2149	"	D	16 III 1971	B.H.
J-2150	Yonabaru, Okinawa Is.	?	11 VII 1958	R.P.
J-2151	Chibana, Okinawa Is.	(LT)	14 X 1969	U.S.A.M.C.
J-2152	"	(LT)	7 XI 1959	"
K-2153	Ishigaki, Ishigaki Is.	(Net)	10 VI 1965	K.Ta.

Coll. No.	Locality	Habitat	Date	Collector(s)
J-2154	Chibana, Okinawa Is.	?	IX 1965	U.S.A.M.C.
J-2155	"	?	"	"
J-2156	Shimabuku, Okinawa Is.	(LT)	14 X 1969	"
J-2157	Makibaru, Okinawa Is.	(LT)	22 X	"
C-2158	Tokyo	?	12 VIII 1949	406 M.L.
E-2159	Hikone, Shiga Pref.	?	20 VIII 1950	207 M.S.D.
J-2160	Awase, Okinawa Is.	?	27 VIII 1956	R.P.
E-2161	Yodo, Osaka Pref.	?	16 VIII 1949	207 M.S.D.
E-2162	Hikone, Shiga Pref.	?	17 VIII 1950	"
E-2163	"	?	28 VIII	"
J-2164	Chibana, Okinawa Is.	?	VIII 1965	U.S.A.M.C.
J-2165	"	(LT)	14 X 1969	"
J-2166	Kuba, Okinawa Is.	(LT)	13 XI	"
J-2167	Awase, Okinawa Is.	?	17 VII 1956	R.P.
J-2168	Chibana, Okinawa Is.	(LT)	29 VII 1950	U.S.A.M.C.
J-2169	Okinawa Is.	?	1970	"
C-2170	Mt. Sengen, Kanagawa Pref.	?	11 VI 1966	K.T.
C-2171	Okutama, Tokyo Met.	MC: Stone basin	18 VI	"
D-2172	Mt. Amagi, Shizuoka Pref.	RC	24 VI	"
D-2173	Mt. Hongu, Aichi Pref.	RC	22 VI 1972	"
C-2174	Manazuru, Kanagawa Pref.	?	20 XI 1969	A.K.
C-2175	Sagiyama, Saitama Pref.	?	24 V 1957	406 M.L.
C-2176	"	?	11 VI	"
C-2177	Fuchinobe, Kanagawa Pref.	?	26 VIII 1965	"
C-2178	Machida, Tokyo Met.	?	10 VI 1963	"
C-2179	Sagamihara, Kanagawa Pref.	?	5 VII	"
C-2180	"	?	15 X	"
C-2181	Atsugi, Kanagawa	?	10 I 1964	"
C-2182	Yamato, Kanagawa Pref.	?	21 I	"
C-2183	Atsugi, Kanagawa Pref.	?	28 I	"
C-2184	Ayase, Kanagawa Pref.	?	29 I	"
C-2185	Sagamihara, Kanagawa Pref.	?	29 I	"
E-2186	Kyoto, Kyoto Pref.	?	22 VI 1948	207 M.S.D.
K-2187	Iriomote Is.	?	15 XII 1968	U.S.A.M.C.
K-2188	Inoda, Ishigaki Is.	?	18 XII	"
I-2189	Aragusuku, Okinoerabu Is.	RF	23 IV 1964	K.K.
E-2190	Kyoto, Kyoto Pref.	MC: Cement tank	26 VI 1953	Y.S. & J.MC.
E-2191	"	MC: Cement tank	15 VII	"
E-2192	"	?	27 V 1948	207 M.S.D.
J-2193	Tancha, Okinawa Is.	(LT)	13 X 1969	U.S.A.M.C.

Coll. No.	Locality	Habitat	Date	Collector(s)
J-2194	Haneji, Okinawa Is.	?	6 VIII 1969	U.S.A.M.C.
K-2195	Itokawa-rindo, Iriomote Is.	BbI	21 I 1976	K.M. & J.T.
K-2196	"	BbI	"	"
K-2197	"	BbI	"	"
K-2198	Hichi, Okinawa Is.	BbI	15 I 1976	I.M.
K-2199	"	BbI	"	"
J-2200	"	BbI	"	"
J-2201	Yona, Okinawa Is.	BbI	13 IX 1975	"
J-2202	"	BbI	"	"
J-2203	"	BbI	"	"
J-2204	"	BbI	"	"
J-2205	"	BbI	10 VII	"
J-2206	"	BbI	26 VIII	"
J-2207	Ada, Okinawa Is.	TH	21 VI	"
J-2208	Yona, Okinawa Is.	TH	?	"
J-2209	Genga, Okinawa Is.	BlS	15 I 1976	"
C-2210	Yokohama, Kanagawa Pref.	(Lab. Col.)		406 M.L.
C-2211	Kawasaki, Kanagawa Pref.	(Lab. Col.)		"
L-2212	Chinhae, Kyongsangnam Do	(Biting)	27 IX 1950	207 M.S.D.
L-2213	"	?	29 IX	"
C-2214	Tokyo Met.	?	24 VIII 1949	"
C-2215	"	?	10 IX	"
C-2216	Funabashi, Chiba Pref.	(Net)	22 VI 1952	K.T.
C-2217	"	(Net)	20 VII 1954	"
C-2218	Hatagaya, Tokyo Met.	(LT)	2 VI 1956	"
C-2219	Chitosefunabashi, Tokyo Met.	(Net)	17 VI 1958	"
C-2220	Tajimagahara, Saitama Pref.	(Net)	13 VI 1959	"
C-2221	Tama Hills, Tokyo Met.	(Net)	16 VI	"
C-2222	Sagamihara, Kanagawa Pref.	(Net)	6 VII 1970	K. & T.T.
C-2223	Tachikawa, Tokyo Met.	?	VII 1965	406 M.L.
E-2224	Toyonaka, Osaka Pref.	(Lab. Col.)		N.I.H.J.
I-2225	Mt. Yuwan, Amami Oshima	?	VII 1970	K.M. & M.N.
C-2226	Zama, Kanagawa Pref.	?	10 IX 1963	406 M.L.
J-2227	Okinawa Is.	?	V 1966	M.L.P.
C-2228	Funabashi, Chiba Pref.	(Net)	3 IV 1952	K.T.
C-2229	Chitosefunabashi, Tokyo Met.	(Net)	8 VI 1965	"
C-2230	"	(Net)	19 VI	"
C-2231	"	(Net)	17 XI	"
C-2232	Sagamihara, Kanagawa Pref.	(Net)	6 V 1969	K. & T.T.
C-2233	"	(Net)	16 VII 1970	K.T.

Coll. No.	Locality	Habitat	Date	Collector(s)
C-2234	Sagamihara, Kanagawa Pref.	(Net)	15 II 1972	K. & T. T.
C-2235	"	(Net)	22 IV	"
C-2236	Funabashi, Chiba Pref.	(Net)	13 VII 1953	K. T.
C-2237	"	(Net)	15 VII	"
C-2238	"	(Light)	28 VI 1954	"
C-2239	"	(Net)	21 VIII	"
C-2240	"	(Light)	1 IX	"
C-2241	Zama, Kanagawa Pref.	?	26 IV 1963	406 M. L.
C-2242	Sagamihara, Kanagawa Pref.	?	1 V	"
C-2243	Tokyo Met.	?	17 V 1949	207 M. S. D.
C-2244	"	?	1 VI	"
E-2245	Hikone, Shiga Pref.	?	13 II 1950	"
L-2246	Chinhae, Kyongsangnam Do	?	25 IX 1950	"
E-2247	Kyoto, Kyoto Pref.	MC: Cement tank	26 VI 1953	T. S. B. & J. MC.
2248-62	(Not used)			
K-2263	Kuroshima	GP	25 VIII 1967	K. N.
2264-5	(Not used)			
C-2266	Okutama, Tokyo Met.	(Net)	11 VI 1956	K. T.
D-2267	Kawai-mura, Gifu Pref.	(Net)	18 VI 1972	"
C-2268	Kurasawa, Tokyo Met.	(Net)	9 V 1969	R. I.
2269	(Blank)			
K-2270	Sakieda, Ishigaki Is.	(Net)	23 VII 1962	T. M.
I-2271	Mt. Yuwan, Amami Oshima	(Net)	18 VI 1963	S. S.
A-2272	Nopporo, Hokkaido	GP	4 V 1962	K. H.
A-2273	Sapporo, Hokkaido	BlS	19 VI 1958	"
A-2274	"	BlS	23 VI	"
A-2275	Mt. Moiwa, Hokkaido	?	1 VII	"
C-2276	Sagamihara, Kanagawa Pref.	?	13 VIII 1959	406 M. L.
A-2277	Sapporo, Hokkaido	?	13 VI 1959	K. H.
E-2278	Kyoto, Kyoto Pref.	BbS	17 II 1950	207 M. S. D.
C-2279	Tokyo	MC	12 VII 1949	406 M. L.
A-2280	Aizankei, Hokkaido	?	1 VII 1963	K. H.
A-2281	Zenibako, Hokkaido	?	7 V ?	"
J-2282	Shioya, Okinawa Is.	RF	18 VII 1969	D. DF.
J-2283	Kudasaki, Okinawa Is.	?	10 IV 1967	U. S. A. M. C.
K-2284	Shirahama, Iriomote Is.	RP	23 V 1968	A. B. S.
C-2285	Yokohama, Kanagawa Pref.	?	?	406 M. L.
C-2286	Hachioji, Tokyo Met.	?	1965	"
J-2287	Mt. Oh-take, Kume Is.	(Net)	30 VIII 1967	K. M.
L-2288	National Forest, Kyongki Do	?	19 VII 1972	C. S. C.
C-2289	Tokyo	?	11 VIII 1949	406 M. L.
C-2290	Chiba, Chiba Pref.	?	18 VIII 1949	207 M. S. D.

Coll. No.	Locality	Habitat	Date	Collector(s)
C-2291	Machida, Tokyo Met.	?	3 X 1963	406 M.L.
C-2292	Yamato, Kanagawa Pref.	?	3 III 1964	"
C-2293	"	?	8 V	"
K-2294	Inoda, Ishigaki Is.	BlS	17 V 1968	R.W.I.
J-2295	Kayo, Okinawa Is.	Str	30 X 1969	T.S.B.
C-2296	Tana, Kanagawa Pref.	?	11 VII 1965	H.S.
H-2297	Taniyama, Kagoshima Pref.	(LT)	21 VIII 1969	S.Y.
H-2298	"	(LT)	20 VIII	"
H-2299	Kagoshima, Kagoshima Pref.	(LT)	12 VIII	"
C-2300	Mt. Takatori, Kanagawa Pref.	MC: Stone basin	22 V 1976	K.M. & S.O.
C-2301	"	RH	"	"
C-2302	Jimmuji, Kanagawa Pref.	TH	"	"
C-2303	"	MC: Tin can	"	"
C-2304	Zushi, Kanagawa Pref.	?	10 IX 1963	406 M.L.
C-2305	Fuchinobe, Kanagawa Pref.	?	30 VIII 1966	"
C-2306	Sagamihara, Kanagawa Pref.	?	24 V 1963	"
J-2307	Yonabaru, Okinawa Is.	GP	5 VIII 1958	M.S.V.
J-2308	Yomitan, Okinawa Is.	(LT)	23 X 1965	U.S.A.M.C.
J-2309	Oroku, Okinawa Is.	(LT)	6 X 1969	"
K-2310	Arakawa, Ishigaki Is.	RF	9 II 1968	A.B.S.
K-2311	Inoda, Ishigaki Is.	?	18 XII 1968	U.S.A.M.C.
J-2312	Kubasaki, Okinawa Is.	GP	13 XI 1968	C.K.
F-2313	Okayama, Okayama	?	10 VIII 1949	207 M.S.D.
F-2314	" Pref.	?	24 VIII	"
L-2315	Chinhae, Kyongsangnam Do	?	23 IX 1950	"
C-2316	Zama, Kanagawa Pref.	?	21 IV 1958	406 M.L.
C-2317	Mt. Kashozan, Gumma Pref.	TH	13 VI 1976	S.H.
C-2318	Tachikawa, Tokyo Met.	?	VIII 1965	406 M.L.
C-2319	Machida, Tokyo Met.	?	19 VII	"
C-2320	Sagamihara, Kanagawa Pref.	?	30 VI 1963	"
C-2321	Toya, Kanagawa Pref.	?	7 VII 1965	"
C-2322	Zama, Kanagawa Pref.	?	29 X 1963	"
C-2323	Yamato, Kanagawa Pref.	?	12 VI 1969	A.K.
C-2324	Zama, Kanagawa Pref.	?	24 X 1963	406 M.L.
C-2325	Enoshima, Kanagawa Pref.	?	30 XII	"
C-2326	Sagamihara, Kanagawa Pref.	?	29 I 1964	"
C-2327	"	(LT)	14 VIII 1970	"

Coll. No.	Locality	Habitat	Date	Collector(s)
J-2328	Yomitan, Okinawa Is.	?	4 III 1969	U.S.A.M.C.
J-2329	Nago, Okinawa Is.	?	14 VIII	"
K-2330	Iriomote Is.	?	15 XII 1968	"
K-2331	Inoda, Ishigaki Is.	?	18 XII	"
J-2332	Tancha, Okinawa Is.	(LT)	13 X 1969	"
J-2333	"	(LT)	20 X	"
C-2334	Oze, Gumma Pref.	GP	28 VII 1976	S.H.
C-2335	"	(Net)	"	"
2336	(Not used)			
C-2337	Sagamihara, Kanagawa Pref.	(LT)	2 VIII 1976	S.R.C.
C-2338	Zama, Kanagawa Pref.	(LT)	3 VIII	"
K-2339	Mt. Omoto, Ishagaki Is.	(Net)	7 V 1963	Y.A.

Abbreviations for Collection Records

Collection Number Prefixes

A	Hokkaido District		H	Kyushu District
B	Tokoku District		I	Amami Guntô
C	Kanto District	—Honshu	J	Okinawa Guntô
D	Chubu District		K	Miyako and Yaeyama Guntô
E	Kinki District		L	Korean Peninsula
F	Chugoku District		M	Cheju Do
G	Shikoku District		N	Ogasawara and Volcano islands

Habitats

BbI	Bamboo internode	RC	Rock cavity
BbS	Bamboo stump	RF	Rice field
BlS	Blocked stream	RH	Rock hole
CH	Crab hole	RP	Rock pool
D	Ditch	Str	Stream
F	Foot print	TH	Tree hole
FS	Fern stump	TP	Tide pool
GP	Ground pool	(DT)	Dry ice trap
LA	Leaf axil	(Lab. Col.)	Laboratory colony
MC	Man-made container	(LT)	Light trap
P	Pond		

Collectors' Names

A.B.S.	A. B. Silagan	K.W.	K. Watanabe
A.K.	A. Kato	K.W.L.	K. W. Lee
A.Y.	A. Yoshii	M.N.	M. Nishikawa
B.D.H.	B. D. Hall	M.S.	M. Sawada
B.H.	B. Higa	M.S.V.	M. S. Viray
C.A.C.	C. A. Cho	N.T.	N. Tamiya
C.K.	C. Kijoka	R.I.	R. Ishikawa
C.S.C.	C. S. Chong	R.K.	R. Kano
D.DF.	D. DeForest	R.P.	R. Pangaldan
E.K.	E. Kanda	R.W.I.	R. W. Intermill
E.S.S.	E. S. Saugstad	S.H.	S. Hayashida
H.J.C.	H. J. Cho	S.M.	S. Miyake
H.S.	H. Suzuki	S.O.	S. Okajima
H.S.Y.	H. S. Yu	S.R.C.	S. R. Crutchfield
H.T.	H. Takahashi	S.S.	S. Shinonaga
I.M.	I. Miyagi	S.Sa.	S. Sato
J.E.S.	J. E. Scanlon	S.Ss.	S. Sasagawa
J.L.Y.	J. L. Young	S.Su.	S. Suguri
J.MC.	J. McClendon	S.Y.	S. Yamamoto
J.T.	J. Tamamori	T.H.	T. Higa
K.H.	K. Hattori	T.K.	T. Kikuchi
K.I.	K. Itano	T.Ki.	T. Kishimoto
K.K.	K. Kamimura	T.M.	T. Matsui
K.Ku.	K. Kuroshima	T.O.	T. Otani
K.M.	K. Mizusawa	T.S.B.	T. S. Bolinquit
K.N.	K. Nagano	V.A.R.	V. A. Robinson
K.S.	K. Soma	Y.A.	Y. Arita
K.Sa.	K. Sakai	Y.H.	Y. Hattori
K.Sh.	K. Shirahata	Y.I.	Y. Imamura
K.T.	K. Tanaka	Y.K.	Y. Kusui
K.Ta.	K. Takahashi	Y.S.	Y. Shogaki
K.&T.T.	K. & T. Tanaka	Y.T.	Y. Tomidokoro
		Y.U.	Y. Uemura

5th P.M.U.	U. S. Army 5th Preventive Medicine Unit, Korea
207 M.S.D.	U. S. Army 207th Malaria Survey Detachment, Kyoto, Japan
406 M.L.	406th Medical Laboratory, U. S. Army Medical Command, Japan
M.L.P.	U. S. Army Medical Laboratory, Pacific
N.I.H.J.	National Institute of Health, Japan
O.I.P.H.	Okinawa Institute of Pollution Health
U.S.A.M.C.	U. S. Army Medical Center, Ryukyu Islands

POSTSCRIPTUM

Work on this project commenced in July 1969. At that time, however, there was no suitable mosquito reference collection maintained in the laboratory. Initially, numerous field collection trips were conducted, and through the rigorous effort made by members of this project, a large quantity of specimens were accumulated. Approximately 90% of the species studied were collected during this project.

In total, 6 members of the Department of Entomology participated in this project. Three of them have since departed the laboratory, however, their contribution to the project was invaluable. The names and times of participation of these individuals are:

Kazuo Tanaka	July 1969 - Present
Kiyoyuki Mizusawa	July 1969 - Present
Edward S. Saugstad	July 1972 - June 1975
Masaru Nishikawa	March 1970 - June 1971
Masaaki Sawada	July 1969 - May 1970
Akimasa Yoshii	July 1969 - December 1969

Sagamihara, Japan
6 December 1976

K.T.

INDEX

Names of valid taxa are set in Roman type; *italic type* is used for invalid names of taxa (synonyms, misidentifications, spelling errors, incorrect generic assignment, etc.). *Italicized* numerals refer to the primary text references; roman numerals refer to secondary text references, the suffix k indicates mention in a key. Roman numerals enclosed in parentheses refer to the figures.