# CONTRIBUTIONS TO THE MOSQUITO FAUNA OF SOUTHEAST ASIA. III.

# THE GENUS *AEDES*, SUBGENUS *NEOMACLEAYA* THEOBALD IN SOUTHEAST ASIA.[1]

By

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## INTRODUCTION

This is the second of two papers dealing with a revision of the *Aedes* subgenus *Neomacleaya* of Southeast Asia. The previous paper (Delfinado 1967) described the species represented in Thailand, the present one treats all of the remaining species known to occur in Southeast Asia and an additional new species from Thailand. The name *Neomacleaya* Theobald was resurrected from synonymy with subgenera *Aedes* s. str. and *Verrallina* by Delfinado (1967). It was recognized as a distinct subgenus for the primarily Oriental species formerly placed in *Aedes* or *Verrallina* because it has little in common with the type species of subgenus *Aedes* (*cinereus* Meigen, described from Europe) but resembles *butleri* Theobald, the type species of *Verrallina*. The *Neomacleaya* are distinguished from *Verrallina* by the remarkable development of the female and male terminalia, and by certain characters of the immature stages. The subgenus is restricted in distribution to the Oriental region except *A. panayensis* and *A. neomacrodixoa*, which also occur in the Australasian region.

The material used in this study is from the collections of the U. S. National Museum, Washington, D. C. (USNM); B. P. Bishop Museum, Honolulu (Bishop); British Museum (Natural History), London (BM); California Academy of Sciences, San Francisco (CAS); Academy of Natural Sciences, Philadelphia (ANS); Chicago Natural History Museum (CNHM); Johns Hopkins School of Tropical Medicine and Hygiene, Baltimore (JHS), and the Instituut voor Tropische Hygiene, Amsterdam (AM). The type specimens of the new species will be deposited in the respective institutions as indicated in the type data.

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Of the 55 species in *Neomacleaya*, 42 are presently known in Southeast Asia. It seems that in this subgenus there are several widely distribute dominant species and a number of specialized endemics. It is probable that there are still several unrecognized species within its geographical range. Very little information on adult bionomics is available though some species are known to take blood; little is also known of the specific larval habitats, and in many species one or more stages are unknown. Much collecting and individual rearings of several species remain to be done.

Four new species from the Philippines, Malaya, North Borneo and Thailand respectively are added here. *Aedes malayi* (Leicester) is here placed as a synonym of *A. fragilis* (Leicester) and *Aioretomyia perdita* Leicester is treated as a *species inquirenda*.

The terminology, larval and pupal chaetotaxy and format used are as given in the previous paper. Nothing is added to the subgeneric account which I have already discussed (Delfinado 1967).

During the present study the diagnostic value of the structure of the tarsal claws was revealed and hence this aspect receives more than usual prominence here.

The pupae as presently known show few reliable specific characters hence a key for their identification is not given.

## SPECIES OF THE SUBGENUS *NEOMACLEAYA* KNOWN FROM SOUTHEAST ASIA.

In this list species marked with a single asterisk (*) are dealt with here in detail, those which are unmarked have received formal treatment in Delfinado (1967). A double asterisk (**) following a country indicates a new record.

1. *andamanensis* Edwards - Andaman Islands, Philippines, Thailand, India, Malaya, Sumatra, Java, North Borneo, Vietnam
2. *atrius* Barraud - India (Assam), Thailand
3. *campylostylus* Laffoon* - Philippines
4. *cautus* Barraud - India, Thailand, North Borneo, Malaya
5. *clavatus* Barraud - India, Thailand, Vietnam
6. *cretatus* Delfinado - Thailand
7. *cyrtolabis* Edwards - Singapore, Thailand
8. *dermajoensis* Brug - Sumatra, Thailand
9. *dux* Dyar and Shannon - Philippines, Andaman Islands, Thailand, Java, Hainan Island, Vietnam
10. *fragilis* (Leicester)* - Malaya
11. *gibbosus* Delfinado - Thailand, Java, Malaya
12. *hamistylus* Laffoon* - Philippines, North Borneo**
13. *hispidus* Delfinado - Thailand

14. *incertus* Edwards - Thailand, Java, Malaya, North Borneo
15. *indecorabilis* (Leicester) - Malaya, Thailand, North Borneo
16. *indicus* (Theobald) - India, Thailand, Ceylon
17. *ishigakiensis* Bohart* - Ryukyu Islands
18. *johnsoni* Laffoon* - Philippines
19. *latipennis* Delfinado - Thailand
20. *leicesteri* Edwards* - Malaya, North Borneo**
21. *lugubris* Barraud* - Malaya**, Burma, Andaman Islands
22. *macrodixoa* Dyar and Shannon* - Philippines
23. *margarsen* Dyar and Shannon* - Philippines
24. *neomacrodixoa* King and Hoogstraal* - Celebes, New Guinea
25. *nigrotarsis* (Ludlow)* - Philippines
26. *notabilis* Delfinado - Thailand
27. *nubicola* Laffoon* - Philippines
28. *pahangi* n. sp.* - Malaya
29. *panayensis* Ludlow* - Philippines, New Guinea, Schouten Island, Morotai, Moluccas
30. *philippinensis* n. sp.* - Philippines
31. *prioekanensis* Brug* - Sumatra
32. *protuberans* Delfinado - Thailand
33. *pseudodiurnus* (Theobald) - India, Thailand
34. *rarus* n. sp.* - North Borneo
35. *robertsi* Laffoon* - Philippines
36. *siamensis* n. sp.* - Thailand
37. *singularis* (Leicester)* - Malaya, Sarawak
38. *torosus* Delfinado - Thailand
39. *uncus* (Theobald) - Philippines, Thailand, Java, North Borneo, Malaya, Sarawak, India (Assam)
40. *vallistris* Barraud - India (Assam), Burma, Thailand, Cambodia**
41. *varietas* (Leicester)* - Sumatra, Java,** Malaya
42. *virilis* (Leicester)* - Malaya

## KEYS TO THE SPECIES IN SOUTHEAST ASIA
## FEMALES[1]

1. Hind tarsal claws toothed (Figure 26). . . . . 2
   Hind tarsal claws simple (Figure 17). . . . . 8

2(1). Abdominal terga dark, without pale markings. . . . . 3
   Abdominal terga with pale markings (Figures 1, 2, 4, 5). . . . . 6

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[1]Females of the following unknown: *cyrtolabis, dermajoensis, indecorabilis, leicesteri, nubicola, prioekanensis, protuberans, pseudodiurnus, rarus, torosus* and *virilis*.

3(2). Postatrial plate with a pair of hairy lobed structures; preatrial plate consisting of 2 small, hairy separate parts; spermathecae each with a small neck. . . . . *notabilis*
Postatrial plate not as above, without hairs; preatrial plate entire; spermathecae without distinct necks. . . . . 4

4(3). Spermathecae reticulate; terminalia as in figure 23. . . . . *pahangi* (p. 31)
Spermathecae smooth. . . . . 5

5(4). Postatrial plate ovate with a rather large opening (Figure 25). . . . *robertsi* (p. 35)
Postatrial plate quadrate with a small opening (Figure 9). . . . . *hamistylus* (p. 16)

6(2). Vertex with a patch of white scales in front extending downwards to frons; terminalia as in figure 26. . . . . *siamensis* (p. 36)
Vertex not as above. . . . . 7

7(6). Terminalia with a markedly large preatrial plate expanded laterally (Figure 12) . . . . . *ishigakiensis* (p. 18)
Terminalia with a rather small preatrial plate without lateral expansions (Figure 8). . . . . *fragilis* (p. 15)

8(1). Abdominal terga dark brown or with light brown lateral patches, sometimes a small lateral spot of almost whitish scales is present on tergum I (Figure 3); terminalia fairly simple, postatrial plate with a pair of hairy finger-like processes. . . . . *dux*
Abdominal terga with distinct pale markings; terminalia not as above. . . . . 9

9(8). At least one of the terga with a complete pale band. . . . . 10
Terga with pale lateral patches, sometimes produced on to dorsum, rarely complete in *margarsen* (Figures 1, 4, 5). . . . . 14

10(9). Only tergum II with a complete pale band; terminalia with postatrial and preatrial plates fairly simple (Figure 13). . . . . *lugubris* (p. 22)
Terga II-VIII with complete pale bands (Figure 2); terminalia not as above. . . . . 11

11(10). All spermathecae with narrow necks. . . . . 12
Either 1 or 3 spermathecae with swollen necks . . . . . 13

12(11). Postatrial plate with broad wing-like structures laterally; preatrial plate consisting of widely separated, long, narrow parts. . . . *cretatus*
Postatrial plate not as above; preatrial plate narrowly separated, consisting of very large, ovate parts. . . . . *hispidus*

13(11). Only the largest spermatheca with a bent, swollen neck; preatrial plate partially sclerotized. . . . . *indicus*
Three spermathecae each with a large, bulbous neck; preatrial plate heavily sclerotized (Figure 21). . . . *nigrotarsis* (p. 28)

14(9). Lower mesepimeron with fine hairs (Figures 2, 4, 5). . . . . 15
Lower mesepimeron bare (Figures 1, 3). . . . . 20

15(14). Sternopleuron with about 20 strong bristles behind pale scale patch; spermathecae without necks; terminalia as in figure 22. . . . . *singularis* (p. 38)
Sternopleuron with 10 or less bristles. . . . . 16

16(15). Metameron with fine hairs; postatrial sclerite convex medianly with strongly lobed lateral corners; postatrial plate with scalloped distal margin of opening. . . . . *gibbosus*
Metameron bare. . . . . 17

17(16). At least one spermatheca with a large, swollen neck. . . . . 18
All spermathecae with small necks. . . . . 19

18(17). Usually only the largest spermatheca with a large, swollen neck; terminalia as in figure 15. . . . . *neomacrodixoa* (p. 27)
Three spermathecae each with a swollen neck; terminalia as in figure 14. . . . . *macrodixoa* (p. 23)

19(17). Postatrial plate simple without hairs; preatrial plate consisting of 2 small poorly sclerotized parts weakly connected medianly (Figure 23). . . . . *panayensis* (p. 32)
Postatrial plate with a large cordate opening, many long hairs; preatrial plate large, weakly divided, narrow basally. . . . . *uncus*

20(14). Metameron with fine hairs (Figure 1); postatrial plate with bluntly pointed distal arms (Figures 17, 19) (see figures for structural differences). . . . . *andamanensis*
*margarsen* (p. 25)
*johnsoni* (p. 20)
Metameron bare. . . . . 21

21(20). Postatrial plate pocket-shaped, without hairs; preatrial plate poorly sclerotized, consisting of 2 small lobes narrowly connected distally. . . . . *incertus*
Not as above. . . . . 22

22(21). Terminalia with preatrial plate consisting of 2 widely separated, long, narrow, parallel-sided parts (Figure 24). . . . . *philippinensis* (p. 33)
Not as above. . . . . 23

23(22). Postatrial sclerite with lobed lateral corners. . . . . 24
Postatrial sclerite rounded. . . . . 25

24(23). Preatrial plate large, subquadrate, weakly divided, hairy (Figure 10). . . . . *varietas* (p. 40)
Preatrial plate consisting of 2 narrow, long parts with hairy rounded ends and connected at this portion. . . . *cautus*

25(23). Postatrial plate with distal arms. . . . . 26
Postatrial plate without arms. . . . . 27

26(25). Distal arms short and straight; preatrial plate consisting of 2 small separate parts. . . . . *vallistris*
Distal arms incurved, fairly broad; preatrial plate consisting of 2 large separate parts (Figure 7). . . . *campylostylus* (p. 13)

27(25). Postatrial plate lightly sclerotized, covered mostly with short, branched hairs. . . . . *latipennis*
Postatrial plate with many coarse, long hairs only around margin of opening. . . . . 28

28(27). Preatrial plate weakly sclerotized at middle, with a pair of sclerotized transverse ridges and a pair of additional crescentic platelets on each side. . . . . *clavatus*
Preatrial plate consisting of 2 large, subquadrate parts narrowly connected distally. . . . . *atrius*

## MALES[1]

1. Abdominal terga wholly dark, or with pale brown lateral patches or a small lateral spot of almost whitish scales may be present on tergum I (Figure 3). . . . . 2
Abdominal terga with pale markings. . . . . 8

2(1). Hind tarsal claws simple (Figures 13, 15, 23, 24) . . . . . 3
Hind tarsal claws toothed (Figures 8, 10, 11, 13, 26). . . . . 4

3(2). Basimere projecting laterally towards inner margin, with a subapical process and a short curved spine. . . . . *dux*
Basimere without subapical or apical projections but with a patch of strong spines and setae on inner margin (Figure 24). . . . . *philippinensis* (p. 33)

4(2). Basimeres separated, with a short blunt apical projection and 2 large spines on inner margin near base (Figure 8). . . . . *prioekanensis* (p. 34)
Basimeres joined subapically. . . . . 5

5(4). Vertex with a patch of white scales in front extending downwards to frons; terminalia as in figure 26. . . . . *siamensis* (p. 37)
Vertex not as above. . . . . 6

6(5). Fore tarsal claws unequal, toothed, the smaller minutely so; mid claws unequal; only the smaller claw toothed (Figure 10); terminalia as in figure 10. . . . . *hamistylus* (p. 17)
Fore and mid claws unequal, only the larger claw toothed (Figure 13). . . . . 7

7(6). Terminalia as in figure 13, basimere rounded apically bearing a small, blunt, curved process. . . . . *robertsi* (p. 36)
Basimere bluntly produced distally, without such process; distimere markedly swollen at middle, abruptly narrowed and curved distally, with many setae at the swollen portion. . . . . *indecorabilis*

8(2). Fore and mid claws equal or unequal, each claw toothed (Figure 11). . . . . 9
Fore and mid claws unequal, only the larger claw toothed. . . . . 13

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[1]Males of the following unknown: *hispidus, notabilis, pahangi; incertus* and *indicus* uncertain.

9(8). Hind claws toothed; basimeres joined subapically, with an apical projection bearing a large, hooked spine (Figure 11). . . . . *ishigakiensis* (p. 18)

Hind claws simple; basimeres separated. . . . . 10

10(9). Fore and mid tarsal claws equal; basimere with a narrow, flattened apical projection with serrated tip (Figure 23). . . . . *panayensis* (p. 32)

Fore and mid claws unequal. . . . . 11

11(10). Basimere without apical projection but with 2 large spines near base and a median flattened projection with serrated tip; paraproct very small (Figure 24). . . . . *rarus* (p. 35)

Basimere with short differentiated apical projections; with long, slender paraproct. . . . . 12

12(11). Basimere projected apically into a short pointed process with 1-2 subapical spines and 2 long basal spines. . . . . *dermajoensis*

Basimere with 2 differentiated apical projections, one of which is long and slender, the other short and hairy, a large peg-like process and 1-2 large spines near base. . . . *cretatus*

13(8). At least one of the terga with a complete pale band. . . . . 14

Terga with pale lateral patches only sometimes produced on to dorsum. . . . . 15

14(13). Only tergum II with a complete pale band; terminalia as in figure 13. . . . . *lugubris* (p. 22)

Terga II-VIII with complete pale bands; terminalia as in figure 20. . . . . *nigrotarsis* (p. 28)

15(13). Lower mesepimeron with fine hairs. . . . . 16

Lower mesepimeron bare. . . . . 25

16(15). Tergum IX with a markedly large median Y-shaped structure. . . 17

Not as above. . . . . 18

17(16). Each hairy branch of the Y-shaped structure expanded and with a lateral lobe (Figure 15). . . . . *neomacrodixoa* (p. 27)

These branches wider and more abruptly tapered distally and without a lateral lobe (Figure 15). . . . . *macrodixoa* (p. 24)

18(16). Paraproct long and tapered. . . . . 19

Paraproct very short. . . . . 22

19(18). Tergum IX projecting medianly into a wedge-shaped structure; paraproct unusually long and wavy. . . . . *cyrtolabis*
Not as above. . . . . 20

20(19). Distimere bifurcate at distal half; sternum IX projecting distally, with a deep median concavity (Figure 22). . *singularis* (p. 39)
Not as above. . . . . 21

21(20). Distimere short and broad for most of its length and with a pointed lateral projection at apex; apical projection of basimere with 5 large spines and a small inner process (Figure 22). . . . . *nubicola* (p. 30)
Distimere very long, tapered distally, with a small pointed process at the middle; apical projection of basimere without spines (Figure 22). . . . . *virilis* (p. 41)

22(18). Sternum IX with 3 or 4 large marginal spines; basimere with 2 long slender projections, one of which bears 2 or 3 spines at apex while the other is split at tip, also with a short process armed with 6-8 strong spines and a shorter blunt projection. *uncus*
Not as above. . . . . 23

23(22). Distimere much enlarged and broadened distally; basimere with a large, curved spine and a short subapical projection armed with 2 large and 3 small spines (Figure 8). . . . . *leicesteri* (p. 21)
Distimere swollen at the middle, tapered distally. . . . . 24

24(23). Basimere with a long, pointed apical projection and 2 short processes, one of which bears 3 or 4 sharp spines, the other simple and pointed. . . . . *protuberans*
Basimere with a large, hairy lobe, a long slender projection and large hooked spine at inner margin. . . . . *torosus*

25(15). Metameron with fine hairs. . . . . 26
Metameron bare. . . . . 29

26(25). Basimere projecting distally then abruptly narrowed and bent before tip, with a short process on inner margin bearing a large spine, a subapical lobe with 3 or 4 spines; distimere stout and expanded distally. . . . . *gibbosus*
Basimere with forked apical projections; distimere slender. . . 27

27(26). Basimere with the apicodorsal projection slender, split distally and not much differentiated from other 3 processes, a group of 5-6 strong spines on inner margin (Figure 16). . . . . *margarsen* (p. 25)

This apicodorsal projection broader than any other processes and with a deep rounded notch apically. . . . . 28

28(27). Basimere with a long, well developed third subapical projection as in *margarsen* (Figure 18). . . . . *johnsoni* (p. 20)

This third subapical projection poorly developed or absent. . . . . *andamanensis*

29(25). Basimeres joined subapically, pointed distally and with a small lobed process on inner margin; distimere expanded at middle abruptly narrowed and curved distally (Figure 8). . . . . *fragilis* (p. 15)

Basimeres separated; distimere varied. . . . . 30

30(29). Paraproct bifurcate or divided. . . . . 31

Not as above. . . . . 33

31(30). Paraproct bifurcate distally with 1 prong much shorter than the other; basimere with a long slender apical projection, a ventral hairy lobe and 2-pronged dorsal process at base (Figure 6). . . . . *campylostylus* (p. 13)

Paraproct divided into 2 large, unequal parts. . . . . 32

32(31). Basimere broadly produced distally, terminating into a small, knob-like process and with a short, pointed subapical inner projection. . . . . *clavatus*

Basimere produced distally into 4 or 5 tooth-like processes, with many strong bristles and 4 large spines on inner margin. . . . *cautus*

33(30). Paraproct unusually broad, flattened. . . . . 34

Paraproct slender, tapered distally. . . . . 35

34(33). Distimere with a crescentic process at base and a row of strong bristles at the middle curved portion; basimere with a group of strong bristles apically, a 3-pronged process on inner margin, a long slender process arising from base and a small basal hairy lobe. . . . . *latipennis*

Distimere short and markedly swollen distally, with 4 or 5 small projections and short setae; basimere rather small, simple, with only a small subapical projection on inner margin. . . . . *pseudodiurnus*

35(33). Basimere with 3 short, differentiated apical and subapical projections and a small lobe bearing a group of strong spines; distimere short and broad, abruptly narrowing to a pointed tip, with 3-4 long setae at the middle . . . . *vallistris*
Basimere varied, with 3-4 strong, large, curved spines on inner margin. . . . . 36

36(35). Basimere with forked subapical and apical projections, 3 long curved spines at base; distimere roughly wedge-shaped in which one point is narrowly prolonged and bent (Figure 10). . . *varietas*(p. 40)
Basimere with 2 short projections, one bearing a group of strong setae, the other toothed, also with a row of 4-6 long, curved spines on inner margin; distimere curved at middle, narrowed distally and with scattered long setae. . . . . *atrius*

## LARVAE[1]

1. Anal gills short, as long as saddle; hairs 9, 10, 12-P single; 6-I-II double; 6-III-VI single; 7-I single, branched on other segments. . . . . *dux*
Anal gills longer than saddle. . . . . 2

2(1). Antennal hair 1-A single. . . . . 3
Antennal hair 1-A branched. . . . . 5

3(2). Siphon large and stout, about twice as long as basal width; anal gills about 2 1/2 times as long as saddle; hair 1-VIII with 3-4 short branches; 3-VIII with 5-8 branches (Figure 26); hairs 9, 10-P single; hair 1-M branched. . . . . *siamensis*(p. 37)
Siphon small, slender, about 3 times as long as basal width; anal gills very long, more than 5 times length of saddle; hair 1-VIII single; 3-VIII with at most 4 branches; 9, 10-P branched; 1-M single. . . . . 4

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[1]Larvae of the following unknown: *clavatus, cautus, dermajoensis, fragilis, gibbosus, hispidus, indecorabilis, leicesteri, lugubris, notabilis, neomacrodixoa, nubicola, pahangi, panayensis, philippinensis, prioekanensis, protuberans, pseudodiurnus, rarus, singularis, torosus, uncus, vallistris, varietas* and *virilis*. *cyrtolabis* and *indicus* are not included in the key because there are no specimens available and published descriptions lack definitive characters.

4(3). Thoracic hair 2-M small, single; 9, 10, 12-P barbed; 3-VIII with 3-4 branches (Figure 25). . . . . *robertsi* (p. 36)
Thoracic hair 2-M branched; 9, 10, 12-P smooth; 3-VIII at most 2-branched (Figure 9). . . . . *hamistylus* (p. 17)

5(2). Thoracic hair 3-M of 2 weak branches. . . . . 6
Thoracic hair 3-M long, always single. . . . . 7

6(5). Abdominal hair 6-II double; 1-P double; 1-A with 4-5 branches; 5, 6-C with 2-4 branches. . . . . *latipennis*
Abdominal hair 6-II single; 1-P single; 1-A, 5, 6-C at most 2-branched (Figure 12). . . . . *ishigakiensis* (p. 18)

7(5). Thoracic hair 8-P double. . . . . 8
Thoracic hair 8-P single. . . . . 11

8(7). Thoracic hair 6-T single; 2-P single (Figure 7). . . . . *campylostylus* (p. 14)
Thoracic hair 6-T with 2-4 branches; 2-P branched. . . . . 9

9(8). Head hair 5, or 6-C with not more than 3 branches, one branch usually stout and long; abdominal hair 7-I double (Figure 21). . *nigrotarsis* (p. 28)
Head hair 5, or 6-C with not less than 6 branches; abdominal hair 7-I single. . . . . 10

10(9). Head hair 8-C double (Figure 18). . . . . *johnsoni* (p. 20)
This hair long and single. . . . . *atrius*

11(7). Head hair 5-C with not more than 3 branches; 1-P single; 2, 3-P branched (Figure 14). . . . . *macrodixoa* (p. 24)
Head hair 5-C with more than 3 branches. . . . . 12

12(11). Thoracic hairs 9, 12-P single. . . . . 13
Thoracic hair 12-P branched; 9-P single. . . . . 14

13(12). Antennal hair 3-A minute; 6-C with not more than 3 branches; 1-T with 5-6 branches. . . . . *cretatus*
Antennal hair 3-A as long as 6-A; 6-C with more than 3 branches; 1-T with 2-3 weak branches. . . . . *andamanensis*

14(12). Head hair 6-C with at most 3 branches; 1-M weak, single. . . . . *incertus*
Head hair 6-C with more than 3 branches; 1-M branched, well developed (Figure 17). . . . . *margarsen* (p. 26)

## *AEDES (NEOMACLEAYA) CAMPYLOSTYLUS* LAFFOON
(Figures 6, 7)

*Aedes (Aedes) campylostylus* Laffoon 1946, J. Wash. Acad. Sci. 36:240 (♂*, ♀*, L*);[1] Knight and Hull 1953, Pacif. Sci. 7:476 (dist.).

Species with pale lateral patches on the abdominal terga and bare lower mesepimeron. *A. campylostylus* can be readily differentiated by the bifurcate paraproct of the male terminalia and by the characteristic distal arms of the postatrial plate of the female terminalia. The larva has hairs 1,2-P, 6-T single, 8-P double and abdominal hair 6-I-II double. The pupa has abdominal hair 2 small but fairly long. It is further characterized by the following:

FEMALE. *Head.* Vertex dark brown with light brown narrow scales around eye margin, patches of pale broad scales laterally and a few upright ones mixed with narrow golden scales on occiput; torus with fine hairs and small flat scales; palpus about 1/8 length of proboscis; proboscis longer than fore femur by 3 times length of labella, dark brown. *Thorax.* Scutal scales dark or reddish brown mixed with golden ones above wing base and front margin; anterior pronotum with 8-9 bristles and a few narrow scales; posterior pronotum with 4 bristles, no scales; postspiracular area with 4 bristles, without scales; small patches of pale scales on upper and lower sternopleuron, 5 bristles behind upper scale patch, without hairs on anterior portion; upper mesepimeron with a few hairs behind pale scale patch; lower mesepimeron bare; metameron bare; propleuron with pale scales and 5 bristles. *Wing.* Alula fringed with brown narrow scales. *Legs.* Forecoxal scale patch largely brown with a small pale spot on top; mid and hind coxae each with pale scales; fore and mid tarsal claws equal, each claw toothed; hind claws equal, simple. *Abdomen.* Terga with pale lateral patches; sterna largely pale scaled, with narrow brown apices. *Terminalia.* (Figure 7). Cercus short; postgenital plate broader than long, with a deep median emargination; postatrial sclerite rounded or nearly so; postatrial plate with fairly broad, incurved distal arms, hairs confined to median area; preatrial plate consisting of 2 separated, large, ovate, elongate parts. Three unequal spermathecae each with a short neck.

MALE. Similar to female in general habitus. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, simple. *Terminalia.* (Figure 6). Basimere with a long, slender apical projection, a ventral hairy lobe and 2-pronged dorsal process at base; distimere curved, evenly tapered; aedeagus small, rather simple; paraproct expanded at base, bifurcate distally with 1 prong much shorter than the other.

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[1] An asterisk (*) following the abbreviations ♂, ♀, P, L indicates that at least some portion of that sex or stage is figured.

LARVA. (Figure 7). *Head.* Hair 1-C slender; 3-C small, short; 4-C with 4-5 very short branches; 5-C with 6-8 strong branches; 6-C with 6-7 branches; 7-C with 12-16 branches; 8, 10-C with 2-3 branches; 9-C with 4-5 branches; antenna spinose; 1-A inserted at about middle, with 4-5 branches; 2-A longest of the apical hairs; mental plate with 40-42 lateral teeth. *Thorax.* Hairs 1, 2-P single; 3-P double; 8-P of 2 long branches; 9, 10-P single; 12-P double; 1-M 3-branched; 2-M with 2-3 short branches; 3-M single, long; 1-T very small, with 3-4 branches; 2-T with 3-4 fairly long branches; 3-T small, dendritic tuft; 5-T small, single; 6-T single, long. *Abdomen.* Hair 6-I-II double; 6-III-VI single; 7-I single, as long as hair 6, of 4 short branches on II-VI; segment VIII with 12-14 comb scales arranged in an irregular row, each scale pointed and finely fringed laterally; hair 1-VIII with 4-5 barbed branches; 2-VIII single or double; 3-VIII with 5-8 barbed branches; 4-VIII double; 5-VIII with 10-12 barbed branches; siphon spiculate, with 14-16 long, slender pecten teeth, each tooth with a lateral denticle except last tooth which is simple; siphonal tuft 1-S 2 or 3-branched, inserted about 2/3 from base; saddle spiculate; 1-X single; 2-X with 8-10 branches; 3-X single, very long; anal gills from 2-3 1/2 times length of saddle, slender and tapered distally; 1-2 precratal tufts.

PUPA. (Figure 6). *Cephalothorax.* Hairs 1, 2, 3-C 3-branched; 6-C small, single; 10-C with 6-8 branches; 11-C single, long; 12-C with 3-4 branches. *Abdomen.* Hair 2-I-VII small, hair-like but a bit longer on I-II; 3-I double; 3-II-III single; 3-IV with 4-5 branches; 3-V-VII 2-branched; 5-IV-VI of 2 long branches; 5-VII with 2-4 branches; 1-VII of 2 long branches; 6-I-II single, long; 6-III double; 6-IV-VI single, fairly long; 6-VII 2 or 3-branched; 10-III-IV with 2-3 branches; 10-V-VII single, long; 7-VI-VII single; 9-VIII with 2-3 branches, single and poorly developed on other segments; 4-VIII single or double. *Paddle.* Outer margin finely serrated, with strong midrib; hair 1-P simple.

TYPE DATA. Holotype male with associated cast skins, from about 4 mi. inland along Balsahan River (near Iwahig), Palawan, PHILIPPINES, in the U.S. National Museum.

DISTRIBUTION. So far only known from the PHILIPPINES. Specimens examined: Mindoro; San Jose; Balabac I.; Leyte; Mindanao, San Ramon, 32 males, 27 females, 12 larvae, 6 pupal skins (USNM, ANS).

TAXONOMIC DISCUSSION. *A. campylostylus* is strikingly different in the male terminalia but the female terminalia are in general similar to those of *andamanensis* in the development of the postatrial plate; the larva and pupa are of the same type as *andamanensis.*

BIOLOGY. Laffoon (1946:242) records that this species prefers jungle habitats. The larvae have been taken in rock holes, tin cans, gravel-bottomed residual pools, in a shaded rocky overflow pool and in temporary road rut pools. Nothing is known of the biting habits.

## *AEDES (NEOMACLEAYA) FRAGILIS* (LEICESTER)
(Figure 8)

*Verrallina fragilis* Leicester 1908, Cul. Malaya 3:199 (♂).
*Aedes fragilis* (Leicester), Edwards 1917, Bull. ent. Res. 7:222 (♂*).
*Verrallina malayi* Leicester 1908, Cul. Malaya 3:198 (♀); Laffoon 1946, J. Wash. Acad. Sci. 36:238 (taxonomy). NEW SYNONYMY.

Species with pale lateral patches on abdominal terga, toothed hind tarsal claws, pale scales on the anterior pronotum and bare mesepimeron; the male and female terminalia are characteristic. The larva and pupa are not known.

FEMALE. The following description is based on a single female *A. malayi* labeled type in the British Museum. *Head.* Vertex reddish brown with pale lateral patches, upright scales on occiput not visible; torus without scales or hairs; palpus about 1/6 length of proboscis; proboscis about as long as fore femur, brown. *Thorax.* Scutal scales uniformly brown; anterior pronotum with some pale broad scales; posterior pronotum with 4 bristles, without scales; postspiracular area with 4 bristles, without scales; small patches of pale scales on upper and lower sternopleuron, without hairs on anterior portion; a large pale scale patch on upper mesepimeron, without hairs behind this scale patch; lower mesepimeron bare; metameron bare; propleuron with pale scales. *Wing.* Alula fringed with lanceolate brown scales. *Legs.* Forecoxal scale patch pale above, brown below; mid coxa with a small patch of pale scales; a few pale scales on hind coxa; fore and mid claws equal, each claw toothed; hind claws missing but Leicester (1908:199) describes "ungues on all the legs equal each with a small tooth". *Abdomen.* Terga dark brown with pale lateral patches; sterna with pale scales. *Terminalia.* (Figure 8). Cercus long and tapered distally, more than twice as long as basal width; postgenital plate long and narrow, slightly emarginate; postatrial sclerite nearly flat at top; postatrial plate fairly simple, more or less horseshoe-shaped; preatrial plate rather small, rounded distally. Spermathecae missing.

MALE. Based on the lectotype male *A. fragilis* in the British Museum. Externally very similar to the female type specimen labeled *malayi*. *Legs.* Fore legs missing but Leicester (1908:199) describes "fore and mid ungues unequal, the larger ungues uni-serrate"; mid claws unequal, only the larger claw toothed; hind claws equal, each claw toothed. *Terminalia.* (Figure 8, after Edwards 1917:222, figure 8i). Basimeres joined subapically, pointed distally and with a small lobed process on inner margin; distimere expanded at middle, narrowed and curved distally, with long hairs; aedeagus appears similar to *indecorabilis;* paraproct slender, tapered and curved distally.

LARVA and PUPA. Unknown.

TYPE DATA. *Verrallina fragilis*, 1 male and 1 female labeled cotype in the British Museum. I selected here the male as lectotype with the following data: "5th mile Gombak Rd, Kuala Lumpur/28/2/04, FED.

MALAY STATES/G. F. Leicester/1912-350." Terminalia and hind claws in celluloid mount on pin. The female cotype has no abdomen. *Verrallina malayi*, a unique female labeled type in the British Museum; terminalia in celluloid mount on pin; type locality: "Jungle/Gombak Rd 6 mi fr. Kuala Lumpur, MALAYA."

DISTRIBUTION. Known only from type locality. Specimens examined: Kuala Lumpur, 1 male, 2 females (BM).

TAXONOMIC DISCUSSION. Concerning the synonymy of *A. malayi* with *A. fragilis*, Leicester (1908:199, 200) has suggested that *malayi* is possibly the female of *fragilis* or *imitator (indecorabilis)*. *A. malayi* was described from a unique female and from Leicester's descriptions and after examination of the type specimens I have no doubt that the 2 species are conspecific.

BIOLOGY. Leicester (1908:199, 200) records that the adults have been caught in the jungle. Larval habitats unknown.

## *AEDES (NEOMACLEAYA) HAMISTYLUS* LAFFOON
(Figures 9, 10)

*Aedes (Aedes) hamistylus* Laffoon 1946, J. Wash. Acad. Sci. 36:232 (♂*, ♀*, L*).

Species with wholly dark abdominal terga and a few pale scales on anterior pronotum. It is particularly distinctive in having the male fore tarsal claws, which are toothed, unequal; the mid claws unequal, only the smaller claw toothed and by the structure of the female postatrial and preatrial plates. The larva can be recognized by the very long anal gills, single abdominal hair 6-I-VI and single antennal hair 1-A.

FEMALE. *Head.* Vertex blackish brown with small pale lateral patches, a few dark upright scales confined to occiput; torus with small, flat dark scales and hairs; palpus about 1/6 length of proboscis; proboscis about as long as fore femur, dark brown. *Thorax.* Scutal scales uniformly dark reddish brown; anterior pronotum with 6 bristles and a few pale scales which may be rubbed off in some specimens; posterior pronotum with 4-5 bristles, without scales; postspiracular area with 3-4 bristles, without scales; small loose patches of pale scales on upper and lower sternopleuron, 4 bristles behind upper scale patch, without hairs on anterior portion; upper mesepimeron with a few hairs behind scale patch; lower mesepimeron bare; metameron bare; propleuron with pale scales, 2-3 bristles. *Wing.* Alula fringed with small flat scales. *Legs.* Forecoxal scale patch dark brown with a small pale spot at top; mid and hind coxae each with pale scales; all tarsal claws equal, each claw toothed. *Abdomen.* Terga wholly dark brown; sterna light brown. *Terminalia.* (Figure 9). Cercus long, tapered distally, more than twice as long as basal width; postgenital plate rather narrow, truncate, with a slight median emargination in some specimens; postatrial sclerite nearly flat at top; postatrial plate quadrate with a small opening, without hairs; preatrial plate rounded, small and hairy. Three unequal spermathecae, without necks.

MALE. Similar to female in general habitus. *Legs*. Fore tarsal claws unequal, toothed, the smaller minutely so; mid claws unequal, only the smaller claw toothed, larger claw simple;hind claws equal, each claw toothed. *Terminalia*. (Figure 10). Basimeres joined subapically, roundly produced distally,bearing a short, blunt process on inner margin; distimere rather slender, curved distally to a bent, blunt tip; aedeagus long and tapered; paraproct slender, evenly tapered.

LARVA. (Figure 9). *Head*. Hair 1-C slender; 3-C very small; 4-C with 3-4 short, weak branches; 5-C usually with 2 strong branches; 6-C with 2-3 branches; 7-C with 3-4 branches; 8-C with 3-4 fairly long branches; 9-C with 5-6 short branches; 10-C with 2 fairly long branches; antenna spinose; 1-A inserted at about middle of antenna, single; 2-A longest of the apical hairs; mental plate with 34-36 lateral teeth. *Thorax*. Hairs 1, 2-P single; 3-P with 5-6 short branches; 8-P single; 10-P with 2 long branches; 9, 12-P with 4 shorter, smooth branches; 1-M single, long; 2-M with 2-3 short branches; 3-M with 3 long branches; 4-M with 5-6 long branches; 1-T single, fairly long; 2-T with 3 long branches; 3-T with 6-7 rather long branches; 4-T with 4 short branches; 5-T small, single; 6-T long, double. *Abdomen*. Hair 6-I-VI single; 7-I single, as long as hair 6; 7-II-VI with 3-5 short branches; segment VIII with 10-12 comb scales, each scale pointed and fringed laterally; 1, 4-VIII single; 2-VIII double, barbed; 3-VIII of 2 long, barbed branches; 5-VIII with 4 barbed branches; siphon small, slender, about 3 times as long as basal width, spiculate, with 6-7 pecten teeth, each tooth widely spaced and with 3-5 fine lateral denticles, the last tooth smooth, inserted from 2/3 to near apex of siphon; siphonal tuft 1-S with 1-3 branches, subapical; saddle spiculate; 1-X usually single; 2-X with 3-5 branches; 3-X very long, single; anal gills very long, about 6 times length of saddle; 1-2 precratal tufts.

PUPA. Unknown.

TYPE DATA. Holotype male, Cape Melville, Balabac I., PHILIPPINES, in the U. S. National Museum. Paratypes: 41 males, 63 females, 8 larvae, in the U. S. National Museum and British Museum (Natural History), London.

DISTRIBUTION. Specimens examined: PHILIPPINES: Balabac I., Cape Melville, 14 males, 35 females, 4 larvae (USNM); Mindoro, San Jose, 3 males, 2 females (CAS); NORTH BORNEO*: Tawau, 3 males (BM).

TAXONOMIC DISCUSSION. The larva of *A. hamistylus* is very similar to *robertsi* from which it can be differentiated only by minor characters as mentioned in the key. The adults, however, show distinct differences in the structure of the tarsal claws and terminalia.

BIOLOGY. Laffoon (1946:233) records the larvae were collected in a gravel-bottomed residual pool in a stream bed; also in a pandanus swamp by dredging the leaves from the bottom (E. S. Ross).

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* New record.

## *AEDES (NEOMACLEAYA) ISHIGAKIENSIS* BOHART
(Figures 11, 12)

*Aedes (Aedes) ishigakiensis* Bohart 1956, Bull. Brooklyn ent. Soc. 51:32 (♂*, ♀*, P, L*).

Species with pale lateral patches on abdominal terga, broad pale scales on anterior pronotum and toothed hind tarsal claws. The male and female terminalia are particularly distinctive as shown in the figures. The larva can be distinguished by the single abdominal hair 6-II and thoracic hair 1-P and branched antennal hair 1-A; the pupa by the long, single abdominal hairs 7, 10-VI-VII and branched 6-III-V.

FEMALE. *Head.* Vertex dark brown with pale lateral patches and pale scales along eye margin; torus without scales; palpus about 1/6 length of proboscis; proboscis about as long as fore femur. *Thorax.* Scutal scales uniformly brown; anterior pronotum with pale, broad scales; posterior pronotum with 3-4 pale scales and 4 bristles; small patches of loose pale scales on upper and lower sternopleuron, without hairs on anterior portion; postspiracular area with bristles; upper mesepimeron with a small patch of pale scales, reduced or without hairs; lower mesepimeron bare; metameron bare; propleuron with pale scales. *Wing.* Alula fringed with brown lanceolate scales. *Legs.* Forecoxal scale patch largely brown with pale spot above; mid and hind coxae with pale scales; tarsal claws of all legs equal, each claw toothed. *Abdomen.* Terga with pale lateral patches, that on VII extending dorsally; sterna with pale basal bands. *Terminalia.* (Figure 12). Cercus long, tapered distally, more than twice as long as basal width; postgenital plate rather narrow, with a shallow median emargination; postatrial sclerite flat at top; postatrial plate relatively simple, with a pair of sclerotized bars laterally, large opening and without hairs; preatrial plate markedly large and expanded laterally, hairy. Three unequal spermathecae without distinct necks.

MALE. General habitus as in female. *Legs.* Fore and mid tarsal claws unequal, both toothed, the smaller minutely so; hind claws equal, each claw toothed. *Terminalia.* (Figure 11). Basimeres connected subapically, with an apical projection bearing a large hooked spine; distimere expanded at middle, curved distally to a narrow bent tip; aedeagus simple, long and tapered; paraproct slender, outwardly curved. Tergum IX with a long, tapered median projection as long as aedeagus.

LARVA. (Figure 12). Based on skins of paratype specimens. *Head.* Hair 1-C slender; 3-C very small, single; 4-C with 4-5 short branches; 5, 6-C of 2 fairly strong branches; 7-C with 5-7 branches; 8, 10-C with 3-4 branches; 9-C with 4-6 branches; antenna spinose; 1-A inserted at about middle of antenna, 2-branched; 2-A longest of the apical hairs; mental plate with 28-32 lateral teeth. *Thorax.* 1-P single; 2, 3-P with 2-3 branches; 8, 10, 12-P single; 9-P double, shorter than 10, 12-P; 1-M with 3 branches; 2-M very small, branched; 3-M with 2 weak branches; 4-M with at most 6 branches; 1-T with 4 short branches; 3-T with 8-10 branches; 4-T with 3-5

short branches; 5-T small, single; 6-T double, fairly long. *Abdomen.* Hair 6-I 2-3 branched; 6-II-VI single; 7-I single; 7-II-VI with 3-4 short branches; segment VIII with 10-12 comb scales, each scale pointed and with lateral fringe; hair 1-VIII with 4-5 barbed branches; 2-VIII with 2-3 weak branches; 3-VIII with 5-7 long barbed branches; 4-VIII single; 5-VIII with 6-8 barbed branches; siphon rugose, about 2 1/2 times as long as basal width, with 11-13 pecten teeth, each tooth with a lateral denticle, sometimes last distal tooth simple and inserted at about middle of siphon; siphonal tuft 1-S with 3-4 branches, inserted beyond middle of siphon; saddle rugose; 1-X double; 2-X with 3-4 branches; 3-X long, single; anal gills about twice as long as saddle; 2 precratal tufts.

PUPA. (Figure 11). Description based on paratype specimens. *Cephalothorax.* Hairs 1, 2-C bifid; 3-C single; 6-C small, double; 10-C with 5 branches; 11-C single; 12-C with 4 branches. *Abdomen.* Hair 2-II-VI strong, almost spine-like; 3-I with 3 branches; 3-II-III long, single; 3-IV-VI with 3-5 short branches; 5-IV short, double; 5-V-VI very long, single; 4, 5-VII with 3-4 branches, subequal in length; 6-I bifid or trifid; 6-II very long, single; 6-III-VII with 2-4 branches; 7, 10-VI-VII single, long; 10-III-IV with 3 short branches; 9-VIII with 2 short branches, very short and single on other segments; 4-VIII with 2-3 weak branches. *Paddle.* Outer margin serrated; hair 1-P simple.

TYPE DATA. Holotype male with associated cast skins, Mt. Banna, Ishigaki, RYUKYU I., in the U. S. National Museum.

DISTRIBUTION. Known only from type locality. Specimens examined: RYUKYU I.: Mt. Banna, Ishigaki, 1 male, 14 females (USNM).

TAXONOMIC DISCUSSION. *A. ishigakiensis* shows close relationship with *fragilis, hamistylus, indecorabilis* and *siamensis* on the basis of male and female terminalia. The presence of pale lateral markings on abdominal terga differentiates it from the above mentioned species, and from all other species by the presence of a long, tapered median projection of male tergum IX.

BIOLOGY. Bohart (1956:33) records the larvae have been taken from a foxhole in pine woods. Nothing is known of the biting habits.

## *AEDES (NEOMACLEAYA) JOHNSONI* LAFFOON
(Figures 18, 19)

*Aedes (Aedes) johnsoni* Laffoon 1946, J. Wash. Acad. Sci. 36:235 (♂*, ♀*, L).

The adults of this species are very similar to *A. margarsen* and *A. andamanensis* by having fine hairs on metameron, forked apical projections on male basimere and by the characteristic distal arms of the female postatrial plate. The male, however, can be recognized by the much broader apicodorsal projection of the basimere, also it has a long, well developed third subapical projection; the female by the widely open distal arms of the

postatrial plate. The larva has thoracic hair 8-P double, and hair 6-I-V long and double in the pupa.

FEMALE. *Head.* Vertex dark brown with pale lateral patches, some narrow golden scales around eye margin and upright forked scales on occiput; torus with small narrow dark scales. *Thorax.* Scutal scales golden brown, paler on anterior margin and above wing base; anterior pronotum with about 12 bristles, without scales; posterior pronotum with some pale brown narrow scales and bristles; postspiracular area with bristles and scales; a large patch of pale scales on upper sternopleuron, without hairs on anterior portion; upper mesepimeron with hairs behind pale scale patch extending downwards to middle of sclerite; lower mesepimeron bare; metameron with fine hairs; propleuron with pale scales. *Wing.* Alula fringed with narrow brown scales. *Legs.* Fore and mid tarsal claws equal, toothed; hind claws equal, simple. *Abdomen.* Terga with pale lateral patches produced on to dorsum; sterna pale basally, brown apically except VIII which appears mostly brown. *Terminalia.* (Figure 19). Very similar to *margarsen.* Distal arms of postatrial plate widely open and gently curved while in *margarsen* they are straight and directed inwards. One large and 2 small, subequal spermathecae each with a short neck.

MALE. General habitus as in female. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, simple. *Terminalia.* (Figure 18). Very similar to *margarsen* or *andamanensis* except as noted: the apicodorsal projection of the basimere is much broader than any other processes and it has a deep notch apically; this projection narrower and split distally in *margarsen;* also it has a long, well developed third subapical projection as in *margarsen* but absent or poorly developed in *andamanensis.*

LARVA. (Figure 18). *Head.* 1-C slender; 3-C very small, single; 4-C with 8 very short branches; 5, 6-C with 6-8 barbed branches; 7-C with 12-14 barbed branches; 8-C usually double; 9, 10-C with 2-5 shorter branches; antenna spinose; 1-A inserted a little below middle, with 4-5 branches; 2-A longest of the apical hairs; mental plate with 28-32 lateral teeth. *Thorax.* 1-P single; 2, 3-P with 2-3 branches; 8-P 2-branched, long; 9, 10-P single; 12-P double; 1-M with 3-4 short branches; 2-M very small, with 5 branches; 3-M single, very long; 1-T with 4-5 short branches; 2-T with 4-5 long branches; 3-T with many short branches; 5-T small, double; 6-T double, long. *Abdomen.* Hair 6-I-II double; 6-III-VI single; 7-I single, rarely double, branched on other segments; segment VIII with 10-14 comb scales, each scale pointed and with fine lateral fringe; hair 1-VIII with 4-7 barbed branches; 2, 4-VIII double; 3-VIII with 3-6 barbed branches; 5-VIII with 6-9 barbed branches; siphon with 14-20 pecten teeth, last tooth inserted beyond middle, basal teeth with small lateral denticles, distal 2-5 teeth simple or with a small denticle, more widely spaced than those nearer the base; siphonal tuft 1-S inserted about 2/3 from base, with 2-5 branches; saddle spiculate; 1-X single; 2-X with 5-7 branches; 3-X single; anal gills 2-3 times length of saddle; 2 precratal tufts.

PUPA. Chaetotaxy as in figure 19. *Cephalothorax.* Hairs 1, 2, 3-C 2-3 branched; 6-C single; 10-C with 6-8 branches; 11-C single or bifid; 12-C with 3-5 branches. *Abdomen.* Hair 2-I-VII small, hair-like but slightly longer on I-II; 3-I with 3-4 branches; 3-II-III single, long; 5-IV-VI double; 5-VII usually single; 6-I-V double, long; 6-VI single; 6-VII with 4-6 branches; 7, 10-VI-VII single; 9-VIII with 2-3 branches; 9-VII single, long but poorly developed on other segments. *Paddle.* Outer margin finely serrated, with fairly strong midrib; hair 1-P simple.

TYPE DATA. Holotype male with associated cast skins, San Ramon, Pasonanca, Zamboanga, Mindanao, PHILIPPINES, in the U. S. National Museum.

DISTRIBUTION. Apparently restricted to Mindanao, PHILIPPINES. Specimens examined: Kabakan, 35 females, 4 males; Zamboanga, Pasonanca and San Ramon, 31 females, 24 males, 30 pupal and larval cast skins; Basilan I., Isabela, 4 males, 5 females (USNM).

BIOLOGY. Laffoon (1946:236) records that the larvae have been collected in muddy pools and road ruts. Adults have been taken in the jungle during the daytime.

## *AEDES (NEOMACLEAYA) LEICESTERI* EDWARDS
(Figure 8)

*Aedes leicesteri* Edwards 1917, Bull. ent. Res. 7:222 (♂*); Barraud 1934, Fauna Brit. India, Dipt. 5:291.

Species with fine hairs on the lower mesepimeron and pale lateral patches on the abdominal terga. The male aedeagus is very similar to those of *uncus*, *protuberans* or *torosus* in being very large but differs by having a much enlarged distimere; also the basimere has a large, curved spine on the inner margin and a short subapical projection armed with 2 large and 3 small spines. The female, larva and pupa are not known.

MALE. Based on a single poor specimen from North Borneo and a unique type in the British Museum. *Head.* Vertex mostly brown with some pale scales laterally, a few upright scales on occiput; palpus about 1/8 length of proboscis; proboscis longer than fore femur. *Thorax.* Scutal scales brown; most of the pleural scales rubbed off but there is a patch of pale scales on upper mesepimeron, and fine hairs behind these scales extend downwards to lower portion; metameron bare. *Wing.* Alula fringed with narrow scales. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws gone in both specimens. *Abdomen.* Terga with pale lateral patches; sterna brown with scattered pale scales. *Terminalia.* (Figure 8). Basimere slightly projected apically with a large curved spine on inner margin and a short subapical projection armed with 2 large and 3 small spines; distimere much enlarged and broadened distally, with a few long setae; aedeagus very large, of *uncus* type; paraproct very short, pointed distally.

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. A unique male labeled type in the British Museum (Natural History), terminalia in celluloid mount on pin, Ampang Jungle, Kuala Lumpur, MALAYA.

DISTRIBUTION. Specimens examined: MALAYA: Kuala Lumpur, 1 male (BM); NORTH BORNEO: N. of Kalabakan, 1 male (Bishop).

BIOLOGY. Unknown.

## *AEDES (NEOMACLEAYA) LUGUBRIS* BARRAUD
(Figure 13)

*Aedes (Aedes) lugubris* Barraud 1928, Indian J. med. Res. 16:372 (♀); Barraud 1934, Fauna Brit. India, Dipt. 5:294 (♀*).

*A. lugubris* is strikingly different from other species by having only one complete pale band on abdominal terga, by the fairly simple female terminalia and by the horn-like apical projection of the male basimere as shown in the figure. The larva and pupa are not known.

FEMALE. *Head.* Vertex blackish brown with a line of pale scales at middle, patches of pale scales laterally and a few upright ones confined to occiput which are rather difficult to see; torus with a few fine hairs; palpus about 1/6 length of proboscis; proboscis longer than fore femur by length of labella, dark brown. *Thorax.* Scutal scales uniformly brown to reddish brown; anterior pronotum with 8 bristles, a few flat scales and fine hairs; posterior pronotum with some narrow brown scales and 5 bristles; postspiracular area with 5 bristles and a few scales; upper sternopleuron with a large patch of pale scales, a smaller patch below, without hairs on anterior portion; upper mesepimeron with a patch of pale scales, hairs confined to area behind this patch; lower mesepimeron bare; metameron bare; propleuron with a fairly large patch of pale scales. *Wing.* Alula fringed with lanceolate scales, a few appearing broad. *Legs.* Forecoxal scale patch largely brown with a small pale spot above; mid and hind coxae each with a row of pale scales; fore and mid claws unequal, each claw toothed; hind claws equal, simple. *Abdomen.* Terga with a complete pale band only on tergum II, pale lateral patches on other segments; sterna largely pale with brown apices. *Terminalia.* (Figure 13). Cercus rather short, about twice as long as basal width; postgenital plate large, with a shallow median emargination; postatrial sclerite convex; postatrial plate fairly simple, hairy below the opening; preatrial plate poorly sclerotized, joined at one end, hairy. Three unequal spermathecae each with a neck.

MALE. General habitus as in female. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws unequal, simple. *Terminalia.* (Figure 13). Basimere with a horn-like apical projection, 2 shorter, simple subapical processes and a bifurcate median process; distimere curved and pointed distally, with a small subapical process; aedeagus small, very simple; paraproct poorly developed.

LARVA and PUPA. Unknown.

TYPE DATA. I have seen the type female in the British Museum labeled: "type/Rangoon, BURMA/20/v/26, Capt. R. W. Hamilton-Miller." Also another female on a slide labeled cotype with same locality and date as type.

DISTRIBUTION. Specimens examined: MALAYA: Selangor, 8 females, 2 males (USNM), 3 females (Bishop); BURMA: Rangoon, 2 females (BM). This species has also been reported from the ANDAMAN I., but I have not seen specimens from this locality.

BIOLOGY. Unknown.

## *AEDES (NEOMACLEAYA) MACRODIXOA* DYAR AND SHANNON
(Figures 14, 15)

*Aedes (Aedes) macrodixoa* Dyar and Shannon 1925, Insec. Inscit. menst. 13:79 (♂); Laffoon 1946, J. Wash. Acad. Sci. 36:233 (♂*, ♀*).

Species with fine hairs on the lower mesepimeron and pale lateral patches on the abdomen which are slightly produced on to dorsum. The male is particularly distinctive by the markedly developed Y-shaped structure on tergum IX, and the female by the shape of the spermathecae. The larva has head hairs 5, 6-C with not more than 3 branches; thoracic hairs 8-P, 3-M single and abdominal hair 6-I-II double. The pupa is not known.

FEMALE. *Head.* Vertex dark brown with a line of narrow golden scales at middle, pale patches of broad scales laterally, a few upright scales confined to occiput; torus with a few hairs and flat scales; palpus about 1/8 length of proboscis; proboscis longer than fore femur by twice length of labella, dark brown. *Thorax.* Scutal scales dark brown with some golden ones on front margin, prescutellar area, scutellum and above wing base; anterior pronotum with about 10 bristles, without scales; posterior pronotum with 6 bristles and a few narrow scales; postspiracular area with 5-6 bristles, without scales; sternopleuron with a large pale scale patch on upper portion and 7 bristles behind this patch, a smaller patch of pale scales mixed with fine hairs below, anterior portion with many fine hairs; upper mesepimeron with a patch of pale scales, hairs behind this patch extend downwards to lower portion of sclerite; metameron bare; propleuron with a small patch of pale scales. *Wing.* Alula fringed with broad scales. *Legs.* Forecoxal scale patch dark brown with a pale spot above; mid and hind coxae each with patches of pale scales; fore and mid claws equal, each claw toothed; hind claws equal, simple. *Abdomen.* Terga with pale lateral patches slightly produced on to dorsum; sterna pale-scaled at basal 2/3, brown apically. *Terminalia.* (Figure 14). Cercus rather short, about twice as long as basal width; postgenital plate broader than long, with a shallow median emargination; postatrial sclerite rounded or nearly so; postatrial plate with lateral expansions, a few short hairs around opening; preatrial plate large, faintly joined at both ends, with wrinkled margin. Three unequal spermathecae each with a swollen neck.

MALE. Similar to female in general habitus. *Legs*. Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, simple. *Terminalia*. (Figure 15). Basimere with a long, slender projection between 2 short ones and a large, pointed median projection on inner margin; distimere fairly slender for most of its length, then curved distally; aedeagus large, simple, of the *uncus* type; paraproct very small, poorly developed. Tergum IX with a markedly large median Y-shaped structure similar to *neomacrodixoa* but the branches of the Y-shaped structure are wider and more abruptly tapered and without lateral lobe.

LARVA. (Figure 14). Based on cast skins. *Head*. 1-C slender; 3-C short; 4-C with 4-5 short branches; 5-C with 2-3 strong branches; 6-C with 1-3 strong branches, usually single in most specimens; 7-C with 6-8 strong branches; 8, 9, 10-C with 3-4 short branches; antenna spinose; 1-A inserted near middle, with 4-6 branches; 2-A longest of the apical hairs; mental plate with about 34 lateral teeth. *Thorax*. 1-P single; 2, 3-P either 2 or 3-branched; 8-P single; 9, 10-P single; 12-P double; 1-M with 3-4 short branches; 2-M very small, branched; 3-M single, fairly long; 1-T with 4 short branches; 2-T with 5-6 long branches; 3, 4-T very small, branched; 5-T small, single; 6-T 2 or 3-branched. *Abdomen*. 6-I-II double; 6-III-VI single; 7-I single; 7-II-VI with 3-5 short branches; segment VIII with 12 pointed comb scales, each scale with fine lateral fringe; 1-VIII with 4-5 barbed branches; 2-VIII with 2-3 weak branches; 3, 5-VIII with 6-10 strong, barbed branches; 4-VIII usually 2-branched; siphon rugose, with 16-18 pecten teeth, each with 1-4 denticles, distal 3-4 teeth more widely spaced than those nearer the base; siphonal tuft 1-S inserted 2/3 from base, with 2-4 branches; saddle rugose; 1-X single; 2-X with 7-9 branches; 3-X single, long; anal gills about 3 times length of saddle; 2-3 precratal tufts.

PUPA. Unknown.

TYPE DATA. Holotype male, Infanta, (Tayabas), Quezon, Luzon, PHILIPPINES, in the U. S. National Museum.

DISTRIBUTION. Specimens examined: PHILIPPINES: Mindoro, San Jose, 26 males, 17 females; Leyte, Tacloban, 2 males, 1 female; Mindanao, Kabakan, 8 males, 16 females (USNM).

TAXONOMIC DISCUSSION. This species is indistinguishable externally from *uncus*, *nubicola* or *neomacrodixoa*. The male terminalia closely resemble those of *neomacrodixoa* but the hairy branch of the Y-shaped structure of tergum IX of *neomacrodixoa* is expanded and with a lateral lobe, whereas it is tapered and without such a lobe in *macrodixoa*.

BIOLOGY. Laffoon (1946:239) records that the adults were bred from larvae taken in temporary leaf-filled pools; others were captured in dense jungle during the daytime. Larvae have also been collected in shaded temporary puddles and hoof prints (E. S. Ross). Nothing is known of the biting habits.

## *AEDES (NEOMACLEAYA) MARGARSEN* DYAR AND SHANNON
(Figures 16, 17)

*Aedes (Aedes) margarsen* Dyar and Shannon 1925, Insec. Inscit. menst. 13:80 (♂, ♀); Bohart 1945, U. S. Navmed 580, figs. 51, 57 (♂*, ♀*); Laffoon 1946, J. Wash. Acad. Sci. 36:237 (♂*, L).

Species with fine hairs on metameron, pale lateral patches on abdominal terga, forked apical projections on male basimere and characteristic distal arms of female postatrial plate. The male is recognized by the slender apicodorsal projection split distally and not much differentiated from other processes, also by the presence of a long, well developed third subapical projection on the basimere. The larva has hairs 1, 8-P single, 3-M long and single and 1-M branched and well developed. The pupa is most difficult to separate from *campylostylus*; it has hair 6-I-II single; 6-III-V with 2-3 branches and 7, 10-VI-VII single.

FEMALE. Vertex dark brown with narrow pale scales around eye margin, middle and occiput, patches of pale scales laterally, a few upright ones confined to occiput; torus with fine hairs and small flat scales; palpus about 1/6 length of proboscis; proboscis about as long as fore femur, brown. *Thorax*. Scutal scales brown with golden ones around front margin and prescutellar area; anterior pronotum with about 10 bristles, a few pale scales; posterior pronotum with narrow golden scales, 6 bristles; postspiracular area with 3-4 bristles, a few scales; upper sternopleuron with a large patch of pale scales, a row of 7 bristles behind this patch, without hairs on anterior portion; upper mesepimeron with hairs behind pale scale patch extending downwards to middle of sclerite; lower mesepimeron bare; metameron with many fine hairs; propleuron with a large patch of pale scales. *Wing*. Alula fringed with narrow brown scales. *Legs*. Forecoxal scale patch largely brown; mid and hind coxae each with patches of pale scales; fore and mid claws unequal, each claw toothed; hind claws equal, simple. *Abdomen*. Terga with pale lateral patches produced on to dorsum, occasionally forming complete bands in some specimens; sterna pale-scaled with brown apices. *Terminalia*. (Figure 17). Very similar to *johnsoni* except that the distal arms of postatrial plate are straight and directed inwards, the postgenital plate has narrower emargination and the preatrial plate consists of 2 rectangular parts slightly joined at middle. One large and 2 small subequal spermathecae each with a short neck.

MALE. General habitus as in female. *Legs*. Fore and mid claws unequal, only the larger claw toothed; hind claws equal, simple. *Terminalia*. (Figure 16). Similar to those of *johnsoni* or *andamanensis* but basimere with slender apicodorsal projection, split distally and not much differentiated from other 3 processes, a third long subapical projection as in *johnsoni*, and a group of 5-6 stronger spines on inner margin; distimere slender for most of its length and curved beyond middle; paraproct long, swollen at base, evenly tapered as in the above mentioned species.

LARVA. (Figure 17). *Head.* 1-C slender; 3-C short; 4-C with 6-8 very short branches; 5, 6-C with 6-9 branches; 7-C with at most 14 branches; 8-C usually with 2 short branches; 9, 10-C with 3 branches; antenna spiculate; 1-A inserted before middle, with 5 branches; 2-A longest of the apical hairs; mental plate with 28-34 lateral teeth. *Thorax.* 1, 8-P single, long; 2-P normally 2-branched; 3-P with 3-4 branches; 9, 10-P single; 12-P 2 or 3-branched; 1-M with 4-5 long branches; 2-M with 3 short weak branches; 3-M long, single; 4-M with 4 long branches; 1-T small, with 5 short weak branches; 2-T with 4-5 long branches; 3-T small tuft with many branches; 4-T very small branched tuft; 5-T small, single; 6-T with 3 long branches. *Abdomen.* 6-I-II double; 6-III-VI single; 7-I single; 7-II-VI branched, decreasing in length posteriorly; segment VIII with 9-11 comb scales, each scale pointed and with fine lateral fringe; 1-VIII with 4-5 branches; 2, 4-VIII 2-branched; 3-VIII with 5-6 longer branches; 5-VIII with 7-9 branches; siphon rather smooth, with 14-16 pecten teeth, distal 3-4 teeth widely spaced and simple, basal teeth each with a lateral denticle; siphonal tuft 1-S inserted about 2/3 from base, with 2-3 branches; saddle finely rugose; 1-X single; 2-X with 5-7 branches; 3-X long, single; anal gills about twice length of saddle; 1-2 precratal tufts.

PUPA. (Figure 16). *Cephalothorax.* Hairs 1, 2, 3-C with 2-3 branches; 6-C 2-branched; 10-C with 9-12 branches; 11-C single; 12-C with 3-5 branches. *Abdomen.* 2-I-VII small, hair-like but slightly longer on I-II; 3-I, IV-VII with 3-5 branches; 3-II-III single, long; 5-II-IV with 3-5 branches; 5-V-VI with 2 long branches; 6-I-II, VI single, long; 6-III-V, VII with 2-4 branches; 7, 10-VI-VII single; 9-VIII with 2-3 branches, occasionally 4-branched in some specimens; 9-VII with 1-2 branches; single and poorly developed on other segments. *Paddle.* With finely serrated margin, strong midrib; 1-P simple.

TYPE DATA. Lectotype male (selected by Laffoon 1946:237), Camp Eldridge, Laguna, Luzon, PHILIPPINES, in the U. S. National Museum, terminalia on slide.

DISTRIBUTION. Specimens examined: PHILIPPINES: Mindoro, San Jose, 41 males, 45 females, 10 larvae, 2 pupal skins (CAS); Luzon, La Union, Anastacio, 10 males; Laguna, Camp Eldridge, 3 males, 4 females; Cagayan, 1 female; Zambales, Subic Bay, 1 male, 3 females (USNM, JHS).

TAXONOMIC DISCUSSION. *A. margarsen* is apparently closely related to *johnsoni* and *andamanensis* on the basis of external characters and terminalia as well as on certain chaetotaxy of the immature stages. However, differences in the terminalia of the 3 species are quite distinctive as discussed elsewhere.

BIOLOGY. Laffoon (1946:237) records the larvae have been taken in road rut pools. Nothing is known of the biting habits.

## *AEDES (NEOMACLEAYA) NEOMACRODIXOA* KING AND HOOGSTRAAL (Figure 15)

*Aedes (Aedes) neomacrodixoa* King and Hoogstraal 1947, J. Wash. Acad. Sci. 37:124 (♂*, ♀).

The adults of this species are indistinguishable from those of *uncus, nubicola* or *macrodixoa.* The line of pale scales on the occiput which King and Hoogstraal regarded as being diagnostic for this species also occurs in *macrodixoa.* The terminalia are very similar to those of *macrodixoa* but can be recognized by the Y-shaped structure of tergum IX and by the presence of 1-2 rod-like setae on outer apical projection of basimere. The larva and pupa are not known.

FEMALE. *Head.* Vertex dark with pale lateral patches, narrow golden ones mixed with upright scales on occiput extending forward to between the eyes. *Thorax.* Scutal scales largely brown, golden anteriorly, over wing base and prescutellar area; anterior pronotum without scales; posterior pronotum with scattered narrow brown scales and about 6 bristles; upper sternopleuron with a large patch of pale scales and fine hairs on anterior portion; mesepimeron with numerous fine hairs behind pale scale patch and lower part of sclerite; metameron bare. *Legs.* Fore and mid tarsal claws equal, each claw toothed; hind claws equal, simple. *Abdomen.* Terga with pale lateral patches well produced on to dorsum; sterna largely pale basally. *Terminalia.* (Figure 15). Essentially similar to those of *macrodixoa.* I find no characters for separating the females of these except that in *neomacrodixoa* the postgenital plate is deeply emarginate and usually only the largest spermatheca has a large, swollen neck.

MALE. General habitus as in female. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, simple. *Terminalia.* (Figure 15). Very similar to those of *macrodixoa* except as follows: basimere with 1-2 rod-like setae on outer apical projection, (these are weak in *macrodixoa,)* numerous strong setae dorsally and a more pronounced inner apical projection; the Y-shaped structure of tergum IX has a longer stem, more hairy apical branches, each branch expanded and with a lateral lobe.

LARVA and PUPA. Unknown.

TYPE DATA. Holotype male, Hollandia, NETHERLANDS NEW GUINEA, in the U. S. National Museum.

DISTRIBUTION. Specimens examined: NEW GUINEA: 19 males, 17 females (paratype series, USNM); CELEBES: Kuluwara, 1 male (Bishop).

BIOLOGY. Adults have been collected at light and Malaise traps. Nothing is known of the breeding habitats.

## *AEDES (NEOMACLEAYA) NIGROTARSIS* (LUDLOW)
(Figures 20, 21)

*Pseudoskusea nigrotarsis* Ludlow 1908, Canad. Ent. 40:52 (♀).
*Aedes (Aedes) nigrotarsis* (Ludlow), Laffoon 1946, J. Wash. Acad. Sci. 36:239 (♂*, ♀*, L).

Species with complete pale bands on abdominal terga. The male terminalia are particularly distinctive in having a large rectangular apical projection and a crescentic process near the base of basimere; the female by the darkly pigmented preatrial plate and by the spermathecae each with a large bulbous neck. The larva has 8-P double; 1-P, 3-M single and abdominal hair 7-I double; the pupa has hairs 1, 3, 5-IV-VII with 3 or more branches and 6-III-VI with 3-4 branches.

FEMALE. *Head.* Vertex blackish brown with some narrow golden scales on occiput, broad pale scales laterally and upright ones confined to occiput sometimes difficult to see; torus with small flat scales and a few hairs; palpus about 1/6 length of proboscis; proboscis longer than fore femur by length of labella. *Thorax.* Scutal scales deep brown with some golden ones on front margin, above wing base, prescutellar area and scutellum; anterior pronotum with about 9 bristles and short setae, a few scales present on some specimens; posterior pronotum with narrow brown scales and 4 bristles; postspiracular with 4 bristles and narrow curved golden scales; patches of loose scales on sternopleuron and upper mesepimeron; 5-6 bristles behind pale scales on upper sternopleuron, without hairs on anterior portion; a few hairs behind pale scales on upper mesepimeron; lower mesepimeron bare; metameron bare; a few loose scales on propleuron. *Wing.* Alula fringed with dark brown lanceolate scales. *Legs.* Forecoxal scale patch largely brown; mid and hind coxae each with pale scales; fore and mid tarsal claws equal, each claw toothed; hind claws equal, simple. *Abdomen.* Terga with complete pale subbasal bands which may be broken dorsally in some specimens; sterna largely dark with some scattered pale scales. *Terminalia.* (Figure 21). Cercus tapered distally, about twice as long as basal width; postgenital plate slightly longer than wide, with a fairly deep median emargination; postatrial sclerite rounded or nearly so; postatrial plate with a fairly large cordate opening and thick long hairs; preatrial plate entire, darkly pigmented. Three unequal spermathecae each with a large bulbous neck and punctate in this region.

MALE. Similar to female in general habitus. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, simple. *Terminalia.* (Figure 20). Basimere with a large rectangular apical projection and a crescentic process near base; distimere slender, with a small thumb-like process distally; aedeagus rather small, of the *andamanensis* type; paraproct expanded at base, tapered distally and curved inwards.

LARVA. (Figure 21). Based on cast skins. *Head.* 1-C fairly slender; 3-C rather long; 4-C with 5-6 very short branches; 5, 6-C with not more than 3 branches, one branch usually stout and long if 3-branched; 7-C

with 8-10 branches; 8-C with 3 long branches; 9, 10-C with 3-4 short branches; antenna spinose; 1-A inserted before middle, with 4-5 branches; 2-A longest of the apical hairs; mental plate with about 40 lateral teeth. *Thorax.* 1-P usually single; 2-P branched apically; 3-P with 3-4 branches; 8-P double; 10, 12-P single; 9-P with 3 short branches; 1-M with 4-5 fairly long branches; 2-M very small, branched; 3-M single, long; 1-T very small, branched; 2-T with 5-7 branches; 3-T many-branched short tuft; 4-T very small branched tuft; 6-T with 4-5 long branches. *Abdomen.* 6-I-II with 2-3 branches; 6-III-VI single; 7-I double; 7-II with 5 strong barbed branches; 7-III-VI with 6-8 weak short branches; segment VIII with 10 pointed comb scales, each scale with fine lateral fringe; 1-VIII with 3-5 barbed branches; 2-VIII with 3-4 branches; 3-VIII with 8-12 barbed branches; 4-VIII single; 5-VIII with 6-8 barbed branches; siphon rugose, rather stout, about twice as long as basal width; with 10-11 pecten teeth, each tooth with 1-2 lateral denticles, distal 2 teeth widely spaced, last tooth simple and inserted a little beyond middle; siphonal tuft 1-S with 3-5 weak branches, inserted 2/3 from base; saddle rugose, broader than long; 1-X single; 2-X with 10-12 branches; 3-X single; anal gills about 2 1/2 times length of saddle; 2 precratal tufts.

PUPA. (Figure 20). *Cephalothorax.* 1, 2, 3-C with 2-3 branches; 6-C short, single; 10-C with 5-7 branches; 11-C single; 12-C with 3-4 branches. *Abdomen.* Setae mostly short, branched. 2-I-VII small, hair-like except on I, II where it is stronger; 3-III long, single; 3-I-II, IV-VII with 2-6 branches, comparatively longer on V-VI; 5-IV-VII with 3-5 long branches; 6-I-II single, long; 6-III-VI with 3-4 long branches; 6-VII short, branched; 7-VI, 10-VI-VII double; 7-VII single; 9-VIII 2-branched, occasionally triple; 9-VII with 1-3 much shorter branches, single and inconspicuous on other segments. *Paddle.* With finely serrated outer margin; 1-P simple.

TYPE DATA. Holotype female, Infanta, (Tayabas) Quezon, Luzon, PHILIPPINES, in the U. S. National Museum.

DISTRIBUTION. Specimens examined: PHILIPPINES: Luzon, La Union, 7 females; Rizal, 16 females, 9 males (USNM); Cagayan, 11 females, 2 males (JHS); Leyte, 27 females, 5 males (USNM, Bishop); Calicoan I., 1 male; Samar, 5 males, 2 females with cast skins (ANS); Mindanao, 30 females, 2 males, 15 pupal and larval skins (JHS), 2 males (CNHM).

TAXONOMIC DISCUSSION. *A. nigrotarsis* is apparently closely related to *indicus*. The male terminalia, however, differ from *indicus* by the process near the base of the basimere which is crescentic, not long and slender as figured for *indicus* by Barraud (1934:284). Also, I have examined the female type of *indicus* at the British Museum and I found significant differences in the details of the terminalia and shape of spermathecae. The preatrial plate consists of 2 darkly pigmented separate parts in *indicus*, whereas it is entire in *nigrotarsis*.

BIOLOGY. Laffoon (1946:240) records that the larvae have been collected several times in temporary grassy pools, and the adults at light traps. Nothing is known of the biting habits.

## *AEDES (NEOMACLEAYA) NUBICOLA* LAFFOON
(Figure 22)

*Aedes (Aedes) nubicolus* Laffoon 1946, J. Wash. Acad. Sci. 36:237 (♂*);
Bohart 1945, U. S. Navmed 580, fig. 50 (as *uncus*).

Species with fine hairs on lower mesepimeron and pale lateral patches on abdominal terga. The adult male can be recognized by the characters of the terminalia, namely, the presence of 5 large distal spines on apical projection of basimere, the short and broad distimere and by the very long slender paraprocts which have a pair of elongate structures arising between them. The female, larva and pupa are not known. The following description is based on a single male paratype.

MALE. *Head.* Vertex dark brown with scattered pale scales laterally and around eye margin, many upright ones on occiput; torus bare; palpus about 1/8 length of proboscis; proboscis longer than fore femur by twice length of labella, dark brown. *Thorax.* Scutal scales dark brown, paler at front margin; anterior pronotum with 7 bristles, without scales; posterior pronotum with a few dark narrow scales, 3 bristles; spiracular area with 6 bristles, without scales; sternopleuron and upper mesepimeron with few pale scales; anterior portion of sternopleuron with fine hairs; many fine hairs behind pale scales on upper mesepimeron which extend downwards to lower portion of sclerite; metameron bare; propleuron with a few pale scales. *Wing.* Alula fringed with flat scales. *Legs.* Forecoxal scale patch dark brown with pale scales on top and bottom; mid coxa with a small patch of pale scales; none on hind coxa; fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, simple. *Abdomen.* Terga with pale lateral patches; sterna mostly with scattered pale scales. *Terminalia.* (Figure 22). Basimere with an apical projection bearing 5 large spines distally and a small inner process; distimere short and broad for most of its length and with a pointed lateral projection at apex; aedeagus large, of the *uncus* type; paraproct very long and tapered; a pair of elongate structures arising between the paraprocts (I cannot determine from what these structures arise).

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. Holotype male, Sibulan River, 7000-8000 ft., Mt. Apo, Davao, Mindanao, PHILIPPINES, in the Museum of Comparative Zoology, Harvard. Paratype male with same date and locality as holotype.

DISTRIBUTION. Known only from the type locality.

TAXONOMIC DISCUSSION. *A. nubicola* can be mistaken for *uncus* and was figured by Bohart (1945:fig. 50) as the latter species. The characters of the male terminalia, however, are distinctive as noted above and shown in the figure.

BIOLOGY. Unknown.

## *AEDES (NEOMACLEAYA) PAHANGI* N. SP.
(Figure 23)

Species with wholly brown abdominal terga and sterna; it is externally similar to *hamistylus, robertsi* or *indecorabilis* from which *pahangi* can be differentiated by the shape of the preatrial plate and by the reticulate spermathecae of the female as shown in the figure. The male, larva and pupa are not known.

FEMALE. *Head.* Vertex dark with few pale scales around eye margin and sides, a few upright scales confined to occiput; torus with some hairs and flat scales; palpus about 1/6 length of proboscis; proboscis about as long as fore femur, dark brown. *Thorax.* Scutal scales reddish brown; anterior pronotum with 6 bristles and 2 short setae, without scales or these possibly rubbed off; posterior pronotum with 4 bristles, 2-3 narrow curved scales; a few pale scales on sternopleuron and upper mesepimeron; 6 bristles on upper sternopleuron behind pale scales, without hairs on anterior portion; spiracular area with 2-3 bristles, without scales; only a few mesepimeral hairs; lower mesepimeron bare; metameron bare; without scales on propleuron. *Wing.* Alula fringed with broad dark scales. *Legs.* Forecoxal scales mostly rubbed off, the remaining ones pale brown; mid coxa with a few pale scales; none on hind coxa; tarsal claws of all legs equal, each claw toothed. *Abdomen.* Terga and sterna wholly brown with a few scattered pale brown scales laterally. *Terminalia.* (Figure 23). Cercus long and tapered, more than twice as long as basal width; postgenital plate longer than wide, truncate distally; postatrial sclerite rounded, weak; postatrial plate elongate ovate with a pair of sclerotized rods laterally; preatrial plate pointed distally, hairy, a pair of platelets laterally; preatrial sclerite folded over postatrial plate, with a deep median emargination. Three unequal spermathecae, reticulate, without necks.

MALE, LARVA and PUPA. Unknown.

TYPE DATA. Holotype female, Kuala Terengan, Pahang, MALAYA (J. L. Gressitt), 17.xii.1958, in the Bishop Museum, terminalia and tarsal claws on slides. Paratype 1 female (USNM), terminalia on slide, same date and locality as holotype.

DISTRIBUTION. Known only from type locality.

TAXONOMIC DISCUSSION. This species is apparently closely related to *hamistylus, robertsi* or *indecorabilis* by the structures of the female terminalia, by the toothed tarsal claws as well as other characters mentioned above.

BIOLOGY. Unknown.

## *AEDES (NEOMACLEAYA) PANAYENSIS* LUDLOW
(Figures 4, 23)

*Aedes panayensis* Ludlow 1914, Psyche, Camb., Mass. 21:159 (♂, ♀); Laffoon 1946, J. Wash. Acad. Sci. 36:242 (♂*, ♀*); King and Hoogstraal 1947, J. Wash. Acad. Sci. 37:119 (♂).

*A. panayensis* differs from all other species in the subgenus by having the fore and mid tarsal claws of both sexes equal, each claw toothed, the hind claws equal, simple. On the basis of the male terminalia it appears related to *prioekanensis* or *dermajoensis* as discussed under the latter species; to *incertus* in the female. Laffoon (1946:242) and King and Hoogstraal (1947:119) have given detailed descriptions of the species. The larva and pupa are not known.

FEMALE. *Head.* Vertex dark with a few pale scales on midline and eye margin, pale lateral patches, sometimes narrow pale scales mixed along midline; torus with few dark scales. *Thorax.* Scutal scales golden to dark brown, lighter on front margin, above wing base and prescutellar area; anterior pronotum with a few pale scales, 8 bristles; posterior pronotum with narrow brown scales; patches of pale scales on upper and lower sternopleuron, without hairs on anterior portion; hairs behind pale scale patch on mesepimeron extend downwards to lower part of sclerite; metameron bare. *Legs.* Fore and mid tarsal claws equal, each claw toothed; hind claws equal, simple. *Abdomen.* Terga with pale lateral patches extending slightly on to dorsum; sterna brown on apical half. *Terminalia.* (Figure 23). Cercus gently tapered distally, about twice as long as basal width; postgenital plate broad with a shallow emargination; postatrial sclerite flat at top; postatrial plate small, pocket-shaped with wrinkled edges; preatrial plate consisting of 2 small poorly sclerotized parts weakly connected medianly. Two large, 1 small spermathecae each with a small neck.

MALE. General habitus and legs as in female. *Terminalia.* (Figure 23). Basimere with a narrow flattened apical projection serrated at tip, 3 very strong setae close to inner dorsal margin, a long tapered projection arising from base; distimere curved distally, with 1-2 stout bristles and weak setae beyond middle; paraproct broad, pointed distally.

LARVA and PUPA. Unknown.

TYPE DATA. Male lectotype selected by Laffoon (1946:242), Iloilo, Panay, PHILIPPINES, in the U. S. National Museum.

DISTRIBUTION. Specimens examined: PHILIPPINES: Jolo, Jolo, 67 females, 18 males; Palawan, Puerto Princesa, 5 females; Leyte, 2 males, 2 females; NORTH BORNEO: Tarawakan, 1 female; NEW GUINEA: Schouten Is., 26 females (USNM). Also recorded from the MOLUCCAS but I have not seen specimens from this locality.

TAXONOMIC DISCUSSION. The female terminalia are remarkably similar to those of *incertus* except that the edges of the pocket-shaped postatrial plate are wrinkled in *panayensis*, smooth in *incertus*. The male is quite distinct as discussed above.

BIOLOGY. Laffoon (1946:243) records that this species is apparently confined to coastal areas. The adults have been collected biting man during the daytime and resting in a crab hole in mangrove swamps. The larvae have been taken in slightly brackish water in a beached canoe and in a shaded, leafy, slightly brackish puddle in a nipa palm swamp at the extreme upper limit of the tidal zone.

## *AEDES (NEOMACLEAYA) PHILIPPINENSIS* N. SP.
(Figure 24)

*A. philippinensis* is a very distinct species quite unlike any other species placed in *Neomacleaya*. The male basimere is short and simple, it lacks apical or subapical projections but with a patch of strong spines and setae on inner margin; the female postatrial plate has characteristic branched hairs and the preatrial plate consists of 2 widely separated, long, narrow parts. The larva and pupa are not known.

FEMALE. *Head.* Scales of vertex all blackish brown, no visible upright scales on occiput; torus with a few fine hairs and small flat scales; palpus about 1/8 length of proboscis; proboscis longer than fore femur by twice length of labella, dark brown. *Thorax.* Scutal scales uniformly dark reddish brown; anterior pronotum with 4-5 strong bristles and a few short setae, without scales; posterior pronotum with 4-5 bristles and a few scattered narrow curved scales; postspiracular area with 2-3 bristles, without scales; very few translucent scales on sternopleuron and upper mesepimeron; 4 bristles behind upper scales on sternopleuron, without hairs on anterior portion; a few mesepimeral hairs behind translucent scales; lower mesepimeron bare; metameron bare; propleuron without scales, only bristles. *Wing.* Alula with flat brown scales. *Legs.* Forecoxal scale patch mostly brown with a small whitish spot above; mid coxa with some whitish scales; no scales on hind coxa; fore and mid tarsal claws equal, each claw toothed; hind claws equal, simple. *Abdomen.* Terga dark brown with small pale lateral patches (these appear pale brown or translucent in holotype specimen); sterna wholly brown. *Terminalia.* (Figure 24). Cercus tapered distally, about twice as long as basal width; postgenital plate rounded distally; postatrial sclerite produced medianly; postatrial plate with characteristic branched hairs, wide opening and lateral projections; preatrial plate consisting of 2 widely separated, long, narrow, more or less parallel-sided parts. One large and 2 small spermathecae each with a fairly long neck.

MALE. The association of the sexes here is quite presumptive due to lack of individual rearings. Although similar to female in general habitus the male vertex has some pale scales laterally and a few upright scales on occiput; torus bare; abdominal terga dark brown with pale brown or translucent lateral patches. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, simple. *Terminalia.* (Figure 24). Basimere short and simple, lacking apical and subapical projections but with a patch of strong spines and setae on inner margin; distimere elbowed near base, narrowed distally with a short hook at apex; aedeagus well developed, of the *andamanensis* type; paraproct very short.

LARVA and PUPA. Unknown.

TYPE DATA. Holotype male, terminalia on slide, 10. viii. 1964, Mahaplag, Leyte, PHILIPPINES (M. D. Delfinado), in the Bishop Museum. Allotype female, terminalia and tarsal claws on slides, 25. ix. 1945, Tacloban, Leyte (H. R. Roberts), in the U. S. National Museum.

DISTRIBUTION. PHILIPPINES.

BIOLOGY. A female has been bred out from a larva collected in a rain pool; the male has been collected at light trap.

## *AEDES (NEOMACLEAYA) PRIOEKANENSIS* BRUG
(Figure 8)

*Aedes (Aedes) prioekanensis* Brug 1931, Tijdschr. Ent. 74:249 (♂*).

Species with wholly dark brown abdominal terga and toothed hind tarsal claws; the male can be recognized by having a short blunt apical projection and 2 large spines on inner margin near base of basimere. The female, larva and pupa are not known. The following description is based on the type male in the British Museum. The specimen is in a very poor condition.

MALE. *Head.* Lost. *Thorax.* Scutal scales brown; anterior pronotum and propleuron destroyed; sternopleuron badly damaged by the pin; posterior pronotum with 3 bristles, without scales; postspiracular area with bristles missing; some pale scales present on upper mesepimeron; a few hairs present behind this scale patch; lower mesepimeron and metameron bare. *Wing.* Scales on alula missing. *Legs.* Few brown scales on fore coxa; some pale scales on mid coxa; none on hind coxa; fore and mid tarsal claws unequal, only the larger claw toothed; hind claws slightly unequal, each claw toothed. *Abdomen.* Terga wholly dark brown; sterna appear to have pale scales basally. *Terminalia.* (Figure 8). Based on a slide mount from Sumatra. Basimere with a short blunt apical projection and 2 large spines on inner margin near base; distimere twice bent, swollen in basal 1/2, narrowed distally; aedeagus very simple as in *dermajoensis;* paraproct short and slender.

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. A male labeled type in the British Museum, terminalia and tarsal claws in celluloid mount on pin, Benkulen, SUMATRA.

DISTRIBUTION. Known only from type locality.

TAXONOMIC DISCUSSION. On the basis of the male terminalia *prioekanensis* appears to be closely related to *dermajoensis* and *panayensis*. But the hind tarsal claws of *prioekanensis* differ from the 2 species mentioned in being slightly unequal, each claw toothed (Figures 8, 23); the fore and mid claws unequal, only the larger claw toothed. In *panayensis*, the fore and mid claws equal, each claw toothed; unequal, both large and small claw toothed in *dermajoensis;* also *prioekanensis* has wholly dark brown abdominal terga.

BIOLOGY. Brug (1931:249) records that the type male was bred from a larva found in a swamp in a virgin forest.

## *AEDES (NEOMACLEAYA) RARUS* N. SP.
(Figure 24)

Although this species is based only on a unique male specimen from North Borneo, the terminalia and tarsal claws are particularly distinctive. Like *philippinensis*, the basimere is short and lacks apical or subapical projections and the aedeagus is of the *andamanensis* type. *A. rarus*, however, is distinguished by the following: Antenna strongly plumose; anterior part of sternopleuron with fine hairs; lower mesepimeron bare; metameron bare; fore and mid tarsal claws unequal, both large and small claw toothed; hind claws simple, equal; abdominal terga with pale lateral patches. *Terminalia*. (Figure 24). Basimere without apical projection but with 2 large spines near base and a median flattened projection with serrated tip; distimere expanded distally, with pointed apex; aedeagus of the *andamanensis* type; paraproct very small, poorly developed.

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. Holotype male (British Museum), terminalia, mid and hind claws on slide, B60/19, Tawau, NORTH BORNEO, ii. 1960 (D. H. Colless).

DISTRIBUTION. Known only from type locality.

BIOLOGY. Unknown.

## *AEDES (NEOMACLEAYA) ROBERTSI* LAFFOON
(Figures 13, 25)

*Aedes (Aedes) robertsi* Laffoon 1946, J. Wash. Acad. Sci. 36:230 (♂*, ♀*, L).

Adults of *A. robertsi* are very similar to *hamistylus* from which they can be separated by the details of the terminalia and male tarsal claws as noted below. The larva, like *hamistylus*, has antennal hair 1-A single, very long anal gills and a small slender siphon. The pupa is not known.

FEMALE. *Head*. Vertex dark brown with pale lateral patches, 2-3 pale scales between the eyes, dark upright scales on occiput; torus with a few flat dark scales. *Thorax*. Scutal scales golden to dark brown in some lights; anterior pronotum with some pale scales which may be rubbed off; posterior pronotum with bristles, without scales; postspiracular area with bristles, without scales; upper and lower sternopleuron with small patches of loose pale scales, anterior portion without hairs; upper mesepimeron without hairs behind pale scales; lower mesepimeron bare; metameron bare. *Legs*. Tarsal claws of all legs equal, each claw toothed. *Abdomen*. Terga wholly brown (occasionally a small pale or whitish lateral spot present on tergum I); sterna entirely brown. *Terminalia*. (Figure 25). Cercus long, tapered distally, more than twice as long as basal width; postgenital plate longer than wide, with a shallow median emargination; postatrial sclerite poorly sclerotized, flat at top; postatrial plate ovate with comparatively large opening; preatrial plate large, rounded and open laterally, hairy; preatrial sclerite folded over postatrial plate as a distinctive M-shaped

structure. One large and 2 small spermathecae each without a neck.

MALE. General habitus as in female. *Legs.* Fore and mid tarsal claws unequal, only the larger claw toothed; hind claws equal, toothed. *Terminalia.* (Figure 13). Basimeres joined subapically, rounded apically bearing a small, curved, blunt process; distimere much swollen at middle, abruptly narrowed and curved distally, bent at tip; aedeagus long and tapered; paraproct rather stout throughout its length.

LARVA. (Figure 25). Extremely similar to *hamistylus*. *Head.* 1-C slender; 3-C very small; 4-C with 3-5 short branches; 5, 6, 7-C with 2-3 branches; 8-C with 3 long branches; 9-C with 4-5 short branches; 10-C with 2-3 branches, longer than 9-C; antenna spiculate; hair 1-A inserted at about middle, single; 2-A longest of the apical hairs; mental plate with 32-38 lateral teeth. *Thorax.* 1, 2-P single; 3-P 3-4 branched; 8-P single; 9, 10, 12-P 2-branched, barbed; 1-M single, long; 2-M very small, single; 3, 4-M with 3-5 long branches; 1-T very small, single; 2-T with 3 long branches; 3-T with 4-5 branches; 4-T small branched tuft; 5-T very small, single; 6-T with 2-3 long branches. *Abdomen.* 6-I-VI single; 7-I single; 7-II-VI with 3-4 branches; segment VIII with 9-12 comb scales, each scale pointed and with a fine lateral fringe; 1, 4-VIII single; 2-VIII double; 3, 5-VIII with 3-4 barbed branches; siphon small and slender, about 3 times as long as basal width, with 5-8 pecten teeth, spacing between the teeth nearly regular, last tooth inserted about 2/3 from base; siphonal tuft 1-S with 1-3 branches; inserted near apex; saddle fairly smooth; 1-X-1-2 branched; 2-X with 2-3 branches; 3-X single; anal gills very long, about 6 times as long as saddle; 1-2 precratal tufts.

PUPA. Unknown.

TYPE DATA. Holotype male, Tacloban, Leyte, PHILIPPINES, in the Academy of Natural Sciences, Philadelphia. Paratypes 8 males, 11 females, 6 larvae, with same data as holotype in the U. S. National Museum and British Museum (Natural History).

DISTRIBUTION. Specimens examined: PHILIPPINES: Leyte, Tacloban, 6 males, 8 females (USNM), 14 larvae (ANS).

BIOLOGY. Larvae were collected in gravel-bottomed residual pools in a stream by H. R. Roberts. Nothing is known of the biting habits.

## *AEDES (NEOMACLEAYA) SIAMENSIS* N. SP.
(Figure 26)

This species is very distinct externally by the presence of numerous broad white scales on anterior pronotum, postspiracular area and in front of vertex extending downwards to frons. The male basimeres are joined subapically, rather short with small inner and outer apical projections; the female preatrial and postatrial plates resemble those of *pahangi*. The larva has antennal hair 1-A single and large siphon; the pupa has generally weak hairs but 2-I-VI heavy, almost spine-like.

FEMALE. *Head.* Front of vertex with a patch of broad white scales extending downwards to frons, a few pale scales laterally and on

occiput; torus with some small dark scales on inner side; palpus about 1/8 length of proboscis; proboscis about as long as fore femur, dark. *Thorax.* Scutal scales blackish; anterior pronotum covered with broad white scales, 5-6 bristles; posterior pronotum with 5-6 bristles posteriorly, 3-4 loose pale scales; postspiracular area covered with white broad scales, 3-4 short bristles; large patches of white scales on upper and lower sternopleuron and upper mesepimeron, anterior portion of sternopleuron without hairs; lower and posterior portion of mesepimeron bare; metameron bare; propleuron covered with white scales. *Wing.* Alula fringed with lanceolate scales. *Legs.* Forecoxal scale patch all white scaled; mid and hind coxae each with small patches of white scales; femora with extensive pale scaling on ventral and basal posterior surfaces; tarsal claws of all legs equal, each claw toothed. *Abdomen.* Terga usually with pale lateral patches produced on to dorsum but not forming complete bands; sterna pale scaled on basal 1/2. *Terminalia.* (Figure 26). Cercus long and slender, about 3 times as long as basal width; postgenital plate longer than wide, truncate or slightly emarginate distally; postatrial sclerite very weak (not shown in the figure); postatrial plate with a large opening and a brace-like process on top; preatrial plate similar to *pahangi,* pointed distally, hairy, but lacks lateral platelets; preatrial sclerite shown overlying the postatrial plate in the figure. Two large, 1 small spermathecae with very short, almost indistinct necks.

MALE. Externally similar to female except the abdominal terga which are wholly brown though sometimes with some pale brown or whitish scales scattered laterally; sterna mostly pale; posterior basal surface of femora dark. *Legs.* Fore and mid tarsal claws slightly unequal, the larger claw with a double tooth; hind claws toothed, subequal; this is apparently variable as shown in figure 26. *Terminalia.* (Figure 26). Basimeres joined subapically, rather short, with a short outer apical and 2 small inner projections; distimere expanded and hairy at middle, abruptly narrowed and curved distally, bent at tip; aedeagus simple, pointed apically; paraproct slender, tapered and pointed distally.

LARVA. Figure 26 and description based on cast skins of allotype and paratypes. *Head.* 1-C slender; 3-C very small; 4-C with 3-5 weak short branches which are difficult to see; 5, 6-C with 1-3 branches; 7-C with 3-5 branches; 8-C with 1-2 branches; 9, 10-C with 3-5 branches; 12, 14-C single, very small; mental plate with 32-34 lateral teeth; antenna spinose; 1-A inserted before middle, single; 2-A longest of the apical hairs. *Thorax.* 1, 3-P single; 2-P single or double; 8-P single; 9, 10-P single; 12-P double; 1-M with 2 fairly long branches; 2-M short, single; 3, 4-M with 3-4 long branches; 1-T single; 2, 3-T with 5-6 long branches; 5-T very small, single; 6-T long, single. *Abdomen.* 6-I double; 6-II-VI single; 7-I single; 7-II-VI with 3 or more short branches; segment VIII with 7-10 comb scales, each scale pointed and with lateral fringe; 1-VIII with 3-4 short branches; 2-VIII double; 3-VIII with 5-8 barbed branches; 4-VIII single; 5-VIII with 4-6 barbed branches; siphon large and stout, about twice as long as basal width, rugose, with 12-14 pecten teeth, each tooth with a basal denticle except last tooth which is usually simple; siphonal tuft 1-S with 2-5 branches, inserted 2/3 from base; saddle broader than long, distal margin smooth; 1-X single;

2-X with 3-4 branches; 3-X single; anal gills more than twice length of saddle; 2-3 precratal tufts.

PUPA. Body hairs generally weak and short. *Cephalothorax.* 1, 2, 3-C 2-branched; 10-C with 3-4 branches; 11-C single; 12-C with 2-3 branches distally. *Abdomen.* 2-I-VI fairly heavy, almost spine-like; 3-I with 3-4 branches; 3-II-III single; 1, 3, 5-IV-VII at most 2-branched; 6-I double; 6-II single, as long as 6-I; 6-III-VII single, short; 9-VII single, fairly long; 9-VIII single; 10-III-VII single, long; 7-VI-VII single, long; 7-III-V branched. *Paddle.* Outer margin serrated, with strong midrib; 1-P simple.

TYPE DATA. Holotype male with associated pupal skin (01998-103), allotype female with associated larval and pupal skins (01998-3), terminalia and tarsal claws on slides, Lampang, Ban Pong Tao, THAILAND, 21. iv. 1965; paratypes 11 males, 14 females with 11 pupal and 2 larval skin mounts, with same date and locality as holotype. Male holotype, female allotype, 6 male, 6 female paratypes in the U. S. National Museum; 3 male, 4 female paratypes in the British Museum (Natural History); 2 male, 4 female paratypes with associated skins in the Bishop Museum.

DISTRIBUTION. Known only from type locality.

TAXONOMIC DISCUSSION. There is a marked sexual dimorphism in *siamensis*. Individual rearings of adults from gravid females caught at Ban Pong Tao definitely associate the sexes through the immature stages. The development of teeth on the larger tarsal claw of the male fore and mid legs seems to be extremely variable.

BIOLOGY. Possibly a ground pool breeder; the females were collected biting man.

## *AEDES (NEOMACLEAYA) SINGULARIS* (LEICESTER)
(Figure 22)

*Aioretomyia singularis* Leicester 1908, Cul. Malaya 3:188 (♂).
*Aedes (Aedes) singularis* (Leicester), Edwards 1917, Bull. ent. Res. 7:222, fig. 8c (♂*); Edwards 1922, Indian J. med. Res. 10:265 (♂, key).

A dark reddish brown species with numerous hairs on lower mesepimeron and pale lateral patches on abdominal terga. It is particularly distinguished by the many strong bristles behind pale scale patch on sternopleuron which extend downwards to lower portion; by the bifurcate distimere of the male terminalia and by the unusual shape of the postatrial and preatrial plates of the female terminalia. The larva and pupa are not known.

FEMALE. *Head.* Vertex blackish brown with patches of pale scales laterally, numerous upright scales on occiput and some narrow curved golden ones at middle continuing to occiput; torus with a few small dark scales; palpus 1/6 - 1/8 length of proboscis; proboscis as long as or slightly longer than fore femur, dark brown. *Thorax.* Scutal scales reddish brown, golden along front margin; anterior pronotum with 6 bristles on top, 4 short ones below, without scales; posterior pronotum with 4 bristles,

some narrow curved scales; postspiracular area with 3-4 bristles, without scales; small patches of pale scales on upper and lower sternopleuron, with many strong bristles and short hairs behind upper scale patch which extend to lower portion; upper mesepimeron with numerous fine hairs behind pale scale patch which extend downwards to lower portion of sclerite; metameron almost bare, with some fine hairs very difficult to see; propleuron largely brown with a small pale spot above. *Wing.* Alula fringed with narrow dark scales. *Legs.* Forecoxal scale patch mostly brown; a row of pale scales each on mid and hind coxae; fore and mid tarsal claws equal, each claw toothed; hind claws simple, equal. *Abdomen.* Terga with large pale lateral patches, those on VI-VII with ends produced on to dorsum; sterna pale scaled on basal 2/3, brown apically. *Terminalia.* (Figure 22). Cercus tapered distally, more than twice as long as basal width; postgenital plate small, with a fairly deep emargination; postatrial sclerite indistinct; postatrial plate well sclerotized, with a large *uncus*-type opening and long hairs; preatrial plate entire, broader distally, hairy. One large and 2 small subequal spermathecae without necks.

MALE. Similar to female in general habitus. *Legs.* Fore and mid tarsal claws unequal , only the larger claw toothed; hind claws equal, simple. *Terminalia.* (Figure 22). Basimere produced sternally with an apical projection dentate at tip and a small basal process; distimere bifurcate at distal half, the shorter branch with a small lateral tooth; aedeagus large, of the *uncus* type; paraproct long and slender, evenly tapered, curved inwards. Sternum IX projecting distally, with a deep median concavity.

LARVA and PUPA. Unknown.

TYPE DATA. A male labeled type in the British Museum, terminalia supposedly in celluloid mount on pin, but missing, Kuala Lumpur, MALAYA.

DISTRIBUTION. Specimens examined: MALAYA: Kuala Lumpur, 1 male (type); SARAWAK: Kuching, 3 females, 2 males (BM).

TAXONOMIC DISCUSSION. This species superficially resembles *virilis* but the structure of the aedeagus and the postatrial plate of the female resemble those of *uncus; singularis*, however, is a very distinct species and can be readily separated by the characters mentioned in the key.

BIOLOGY. Unknown.

## *AEDES (NEOMACLEAYA) VARIETAS* (LEICESTER)
(Figure 10)

*Aioretomyia varietas* Leicester 1908, Cul. Malaya 3:185 (♂ only).
*Aedes (Aedes) varietas* (Leicester), Edwards 1917, Bull. ent. Res. 7:222, fig. 8h (♂*); Knight and Hull 1953, Pacif. Sci. 7:474 (type ♀ = *uncus).*

Species with pale lateral patches on the abdomen, bare lower mesepimeron and simple hind tarsal claws. The male is readily distinguished from that of other species by the characteristic shape of the

distimere as shown in the figure; the basimere has forked apical and subapical projections and 3 long curved spines at the base. The female is associated here with uncertainty but I have the terminalia illustrated as in figure 10; the larva and pupa are not known.

MALE. *Head.* Vertex dark brown with pale scales laterally, a few upright scales mixed with some pale ones on occiput; torus bare; palpus about 1/10 length of proboscis; proboscis about as long as fore femur, dark brown. *Thorax.* Scutal scales mostly reddish brown; anterior pronotum with 4 bristles, without scales; posterior pronotum with 3-4 bristles; postspiracular area with 3 bristles, without scales; upper and lower sternopleuron with small patches of pale scales, without hairs on anterior portion, 5 bristles behind upper scale patch; small patch of pale scales on upper mesepimeron, only a few hairs behind this scale patch; lower mesepimeron bare; metameron bare; propleuron with pale scales. *Wing.* Alula fringed with narrow dark scales. *Legs.* Forecoxal scale patch mostly brown; mid and hind coxae each with some pale scales; fore and mid tarsal claws unequal, only the larger claw toothed; hind claws small, equal, simple. *Abdomen.* Terga with patches of pale scales laterally; sterna light brown scaled. *Terminalia.* (Figure 10). Basimere with a divided inner subapical projection, a forked apical one with 3-4 prongs, 3 long slender curved spines at base; distimere distinctive by being roughly wedge-shaped in which one point is narrowly prolonged and bent; aedeagus fairly large, of *uncus* type; paraproct long and slender, evenly tapered.

FEMALE. Uncertain; 3 specimens from Malaya labeled *varietas* in the British Museum are provisionally placed here. It agrees well with the male except: anterior pronotum with 6-8 weak bristles; 4-6 bristles on postspiracular area; fore and mid tarsal claws equal, each claw toothed; hind claws equal, simple. *Terminalia.* (Figure 10). Cercus tapered distally, about twice as long as basal width; postgenital plate broader than long, with a fairly deep median emargination; postatrial sclerite with lobed lateral corners, convex medianly; postatrial plate with a large opening and long fine hairs; preatrial plate large, subquadrate, weakly divided, hairy. Two large and one small spermathecae each with a short neck.

LARVA and PUPA. Unknown.

TYPE DATA. A male, in the British Museum, labeled "cotype/ Jungle Pahang Rd 5th mile/midday/Kuala Lumpur/7/11/03"; terminalia supposedly in celluloid mount on pin, but missing. Since this is the only male I assume it is the male lectotype selected by Knight and Hull (1953: 474) but it is not so labeled; the females were assigned to *uncus*.

DISTRIBUTION. Specimens examined: SUMATRA: Kota Tjane, 1 male; MALAYA: Kuala Lumpur, Klang Jungle, 3 females (BM).

TAXONOMIC DISCUSSION. The association of the sexes here is only presumptive; it is likely that they are correctly associated since the general anatomy and coloration are similar. The structures of the male terminalia superficially resemble those of *cautus* and *atrius* by having long, curved inner spines on the basimeres; the large preatrial plate of the female resemble *atrius*, the postatrial plate and sclerite is like *cautus*. *varietas* is easily differentiated from both by the shape of the distimere and

by the forked projections of the basimere in the male, as well as by the details of the postatrial and preatrial plates in the female.

BIOLOGY. Unknown.

## *AEDES (NEOMACLEAYA) VIRILIS* (LEICESTER)
(Figure 22)

*Verrallina virilis* Leicester 1908, Cul. Malaya 3:197 (♂).
*Aedes (Aedes) virilis* (Leicester), Edwards 1917, Bull. ent. Res. 7:222, fig. 8b (♂*).

There is no specimen available for study except the type in the British Museum. The specimen is in very poor condition; the head is missing, the abdomen is broken off and glued to a card and there are no tarsal claws; its sex cannot be determined. On another pin bearing this name and labeled type is a mount on celluloid of a male terminalia similar to those figured by Edwards (1917:222, fig. 8b). I assume that these terminalia came from the type; the external characters, such as still remain, agree well with Leicester's description.

MALE. *Thorax.* Scutal scales brown to reddish brown; postspiracular area with 2 bristles; sternopleuron with a few hairs on anterior portion, 7 bristles behind upper scale patch, a small patch of scales on lower portion mixed with some hairs; upper mesepimeron with numerous hairs behind pale scale patch which extend downwards to lower mesepimeron; metameron bare; propleuron with some pale scales. *Wing.* Remaining fringed scales on alula narrow. *Legs.* Forecoxal scale patch mostly brown with a few pale ones scattered below; mid and hind coxae appear bare; Leicester (1908) describes "fore and mid ungues unequal the larger ungues uniserrate", but did not mention the hind claws. *Abdomen.* Terga with pale lateral patches; sternal scales mostly rubbed off with a few pale ones left. *Terminalia.* (Figure 22; after Edwards 1917). Due to its poor preparation it has not been possible to redraw the type specimen. Basimere with a short slender apical projection, a shorter inner projection divided at tip, a small process and a hairy lobe at base which are not evident in Edward's figure; distimere particularly distinctive by being very long, tapered distally, with a small pointed process at middle; paraproct long and slender; aedeagus difficult to follow but appears similar to *singularis*.

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. Type male (terminalia) in the British Museum, with the following locality data: "Jungle 5th mile/Gombak Rd/Kuala Lumpur/ FED. MALAY STATES."

DISTRIBUTION. Known only from type locality.

BIOLOGY. Unknown.

## SPECIES INQUIRENDA

*Aioretomyia perdita* Leicester 1908, Cul. Malaya 3:192 (♂). Gombak Road, Kuala Lumpur.

The identity of this species is doubtful. The type has been lost and the description of Leicester was made up from his recollection. The presence of 2 long sharp spines at the base of larger fore tarsal claws as well as a number of characters he mentioned certainly do not fit in this subgenus.

## CORRECTIONS TO *AEDES (NEOMACLEAYA)* IN THAILAND

Page 11, line 48: Change the larger claw toothed to both claws toothed as in figure 24.

Figure 12, *A. incertus*, larva. Prothoracic hair labeled 9-P should be 12-P.

## ACKNOWLEDGEMENTS

As in the past my sincere thanks are again due to Dr. Alan Stone and Dr. Botha de Meillon for their many helpful suggestions regarding this revision and for reviewing the manuscript. I am also particularly indebted to Dr. P. F. Mattingly and Dr. J. Bonne-Wepster for much kindness to me in London and Amsterdam and for their helpful information concerning the Oriental species. The illustrations were drawn by Mrs. Elaine R. Hodges and Mrs. Jung Lea Smith of Southeast Asia Mosquito Project and by the artists of the 406th Medical Laboratory, Tokyo. I am especially appreciative of their assistance. Miss Helle Starcke typed the manuscript.

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## APPENDIX

### PRESENT STATUS OF THE *AEDES (NEOMACLEAYA)* FAUNA OF SOUTHEAST ASIA [1]

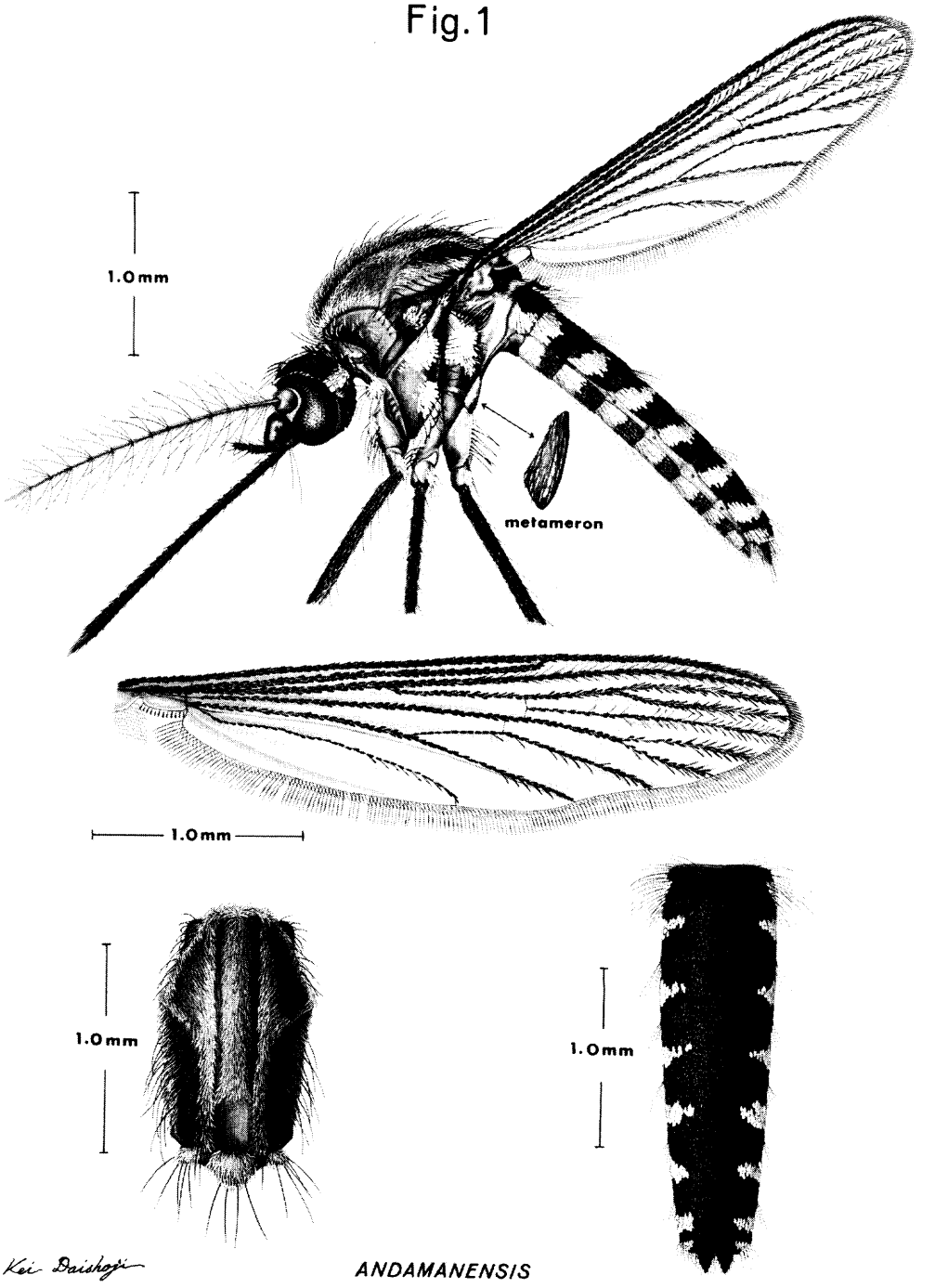
| SPECIES | ♂ | ♀ | L | P | BIOLOGY |
|---|---|---|---|---|---|
| *andamanensis* Edwards | * | * | * | * | Larval habitats known |
| *atrius* Barraud | * | * | * | * | Larval habitats known |
| *campylostylus* Laffoon | * | * | * | * | Larval habitats known |
| *cautus* Barraud | * | * | - | - | Adult biology and host preference known |
| *clavatus* Barraud | * | * | - | - | Unknown |
| *cretatus* Delfinado | * | * | * | * | Larval habitats known |
| *cyrtolabis* Edwards | * | - | * | * | Larval habitats known |
| *dermajoensis* Brug | * | - | - | * | Habitats known |
| *dux* Dyar and Shannon | * | * | * | * | Well known |
| *fragilis* (Leicester) | * | * | - | - | Unknown |
| *gibbosus* Delfinado | * | * | - | * | Larval habitats known |
| *hamistylus* Laffoon | * | * | * | - | Larval habitats known |
| *hispidus* Delfinado | - | * | - | - | Unknown |
| *incertus* Edwards | ? | * | * | * | Larval habitats known |
| *indicus* (Theobald) | ? | * | * | - | Larval habitats known |
| *indecorabilis* (Leicester) | * | * | - | - | Larval habitats known |

[1] * = stage or sex described and illustrated.
+ = stage or sex described but not illustrated.
- = unknown.
? = uncertain.

| SPECIES | ♂ | ♀ | L | P | BIOLOGY |
|---|---|---|---|---|---|
| *ishigakiensis* Bohart | * | * | * | * | Larval habitats known |
| *johnsoni* Laffoon | * | * | * | * | Larval habitats known |
| *latipennis* Delfinado | * | * | * | * | Larval habitats known |
| *leicesteri* Edwards | * | - | - | - | Unknown |
| *lugubris* Barraud | * | * | - | - | Unknown |
| *macrodixoa* Dyar and Shannon | * | * | * | - | Larval habitats known |
| *margarsen* Dyar and Shannon | * | * | * | * | Larval habitats known |
| *neomacrodixoa* King and Hoogstraal | * | * | - | - | Unknown |
| *nigrotarsis* (Ludlow) | * | * | * | * | Larval habitats known |
| *notabilis* Delfinado | - | * | - | - | Unknown |
| *nubicola* Laffoon | * | - | - | - | Unknown |
| *pahangi* n. sp. | - | * | - | - | Unknown |
| *panayensis* Ludlow | * | * | - | - | Well known |
| *philippinensis* n. sp. | * | * | - | - | Larval habitats known |
| *prioekanensis* Brug | * | - | - | - | Larval habitats known |
| *protuberans* Delfinado | * | - | - | - | Unknown |
| *pseudodiurnus* (Theobald) | * | - | - | - | Unknown |
| *rarus* n. sp. | * | - | - | - | Unknown |
| *robertsi* Laffoon | * | * | * | - | Larval habitats known |
| *siamensis* n. sp. | * | * | * | + | Host preference known; larval habitats unknown |
| *singularis* (Leicester) | * | * | - | - | Unknown |

| SPECIES | ♂ | ♀ | L | P | BIOLOGY |
|---|---|---|---|---|---|
| *torosus* Delfinado | * | - | - | - | Unknown |
| *uncus* (Theobald) | * | * | - | * | Host preference and larval habitats known |
| *vallistris* Barraud | * | * | - | - | Larval habitats known |
| *varietas* (Leicester) | * | ? | - | - | Unknown |
| *virilis* (Leicester) | * | - | - | - | Unknown |

Fig.1




Kei Daishoji

*ANDAMANENSIS*

Fig. 2

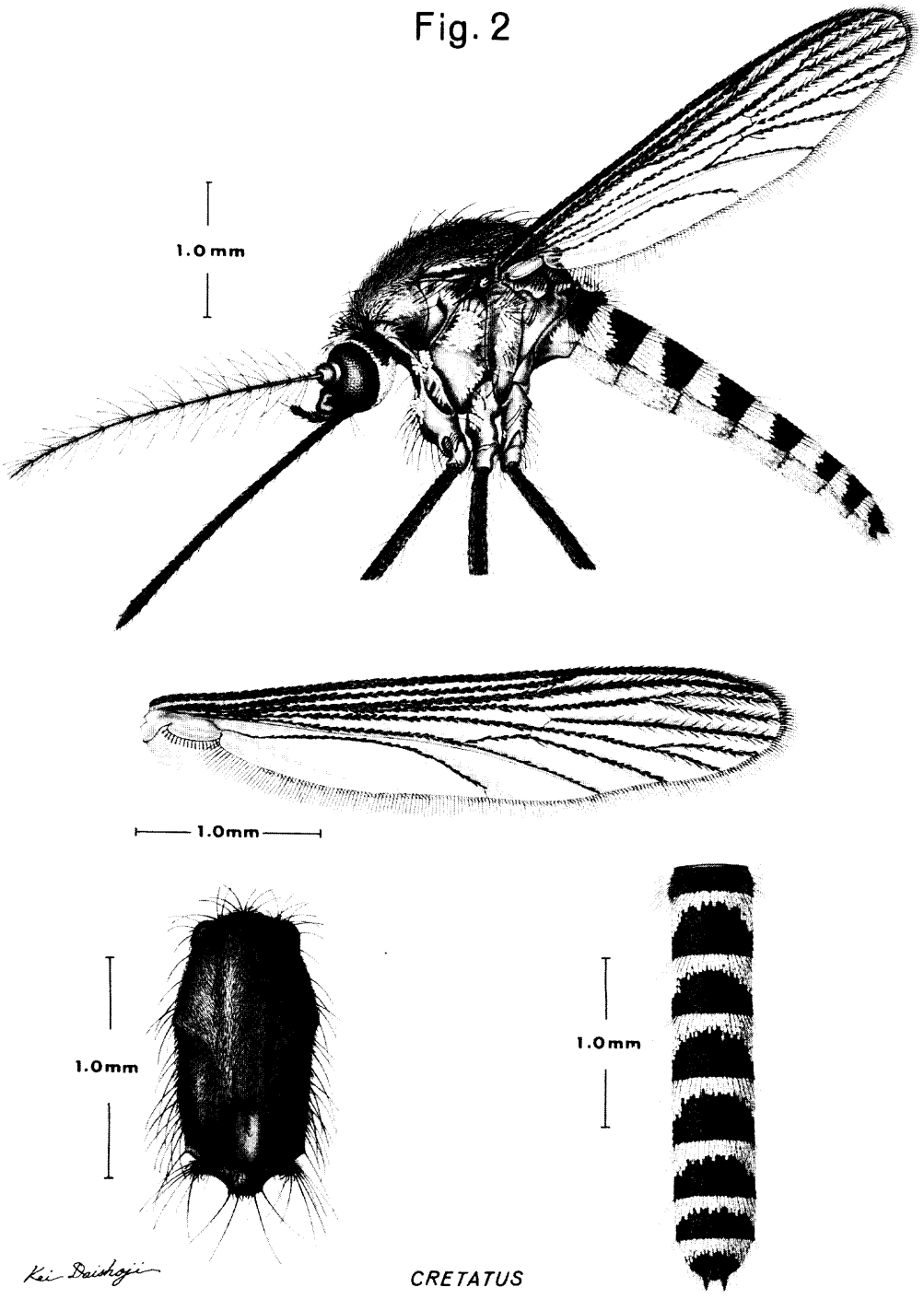


Fig. 3

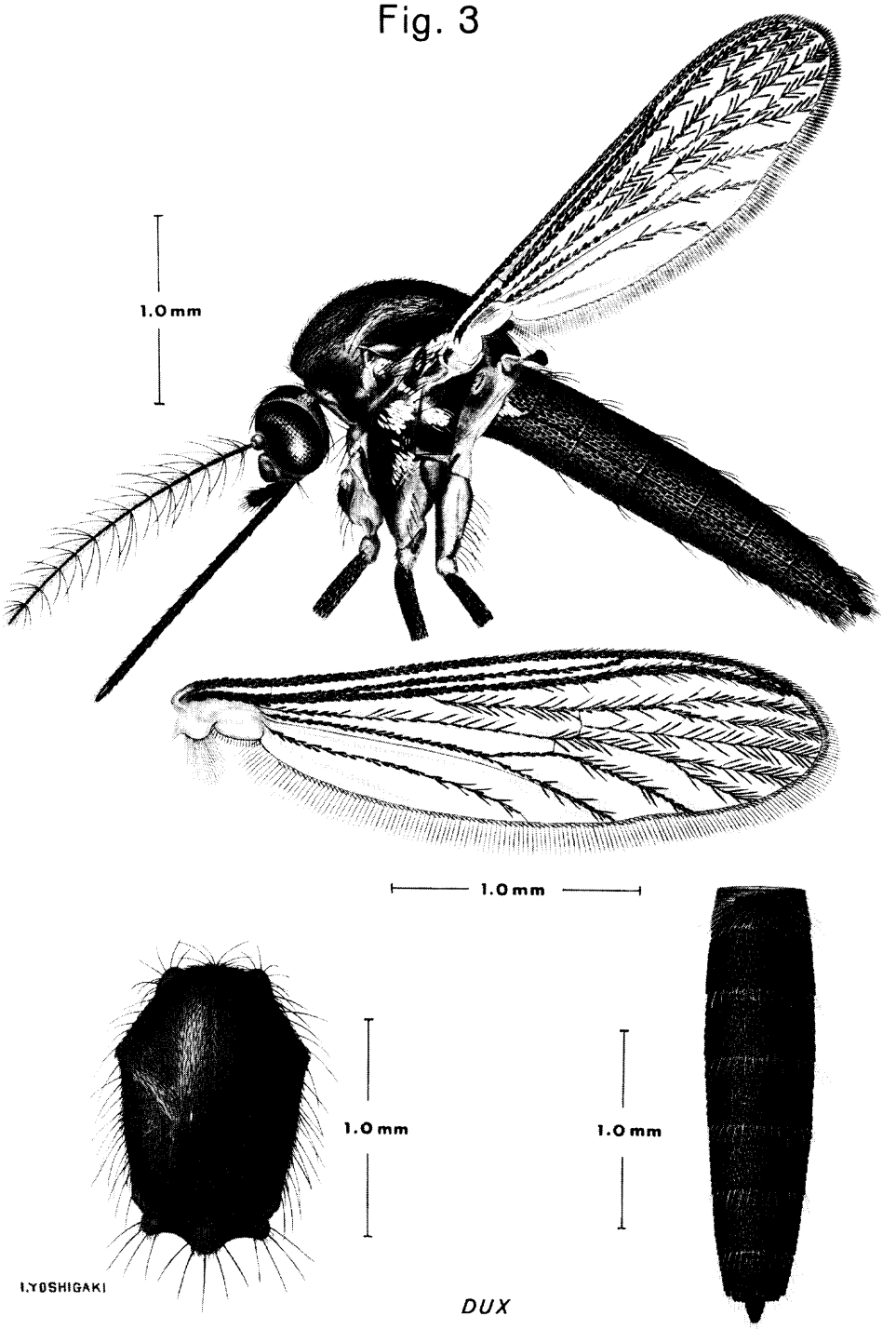
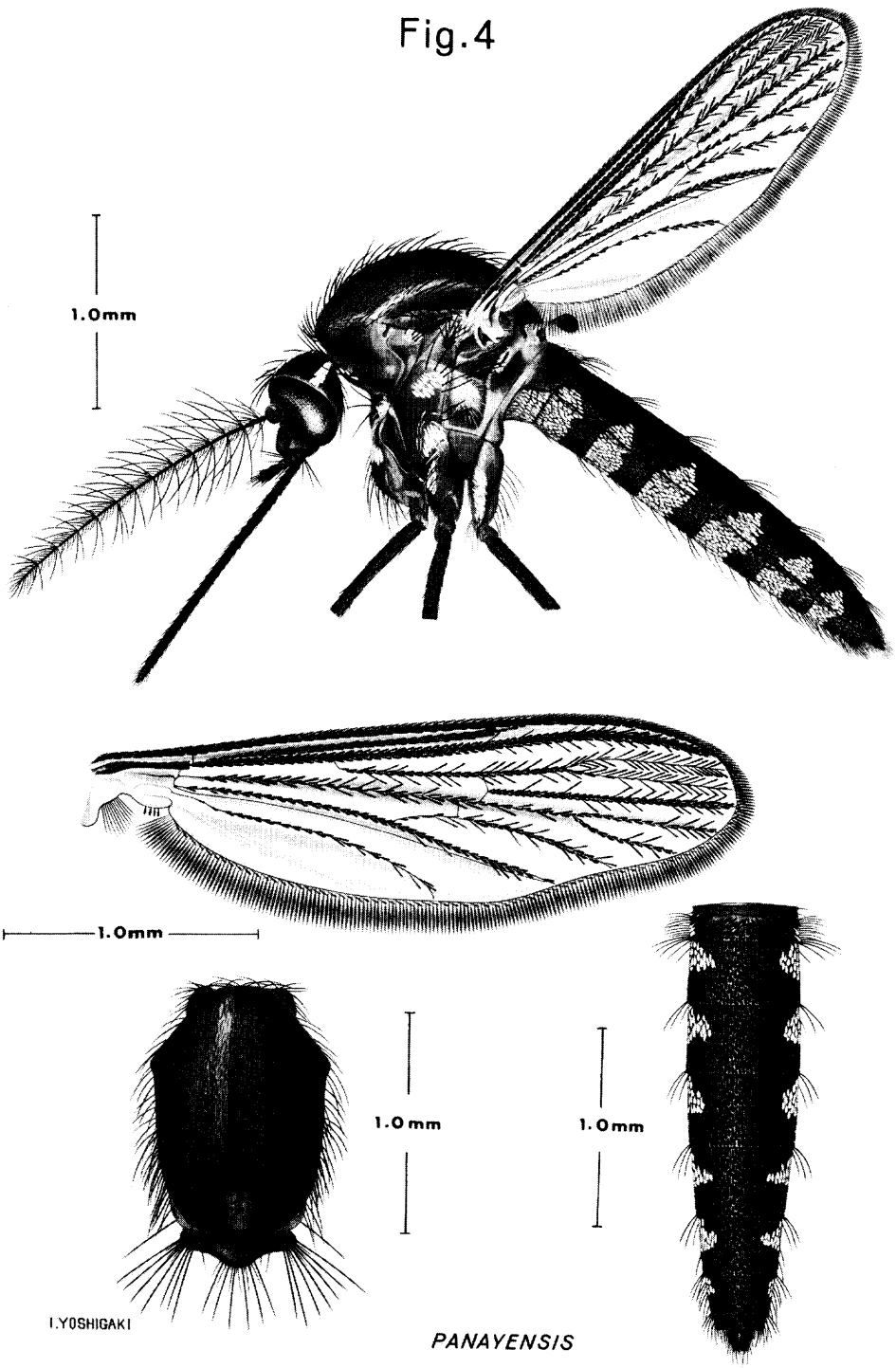
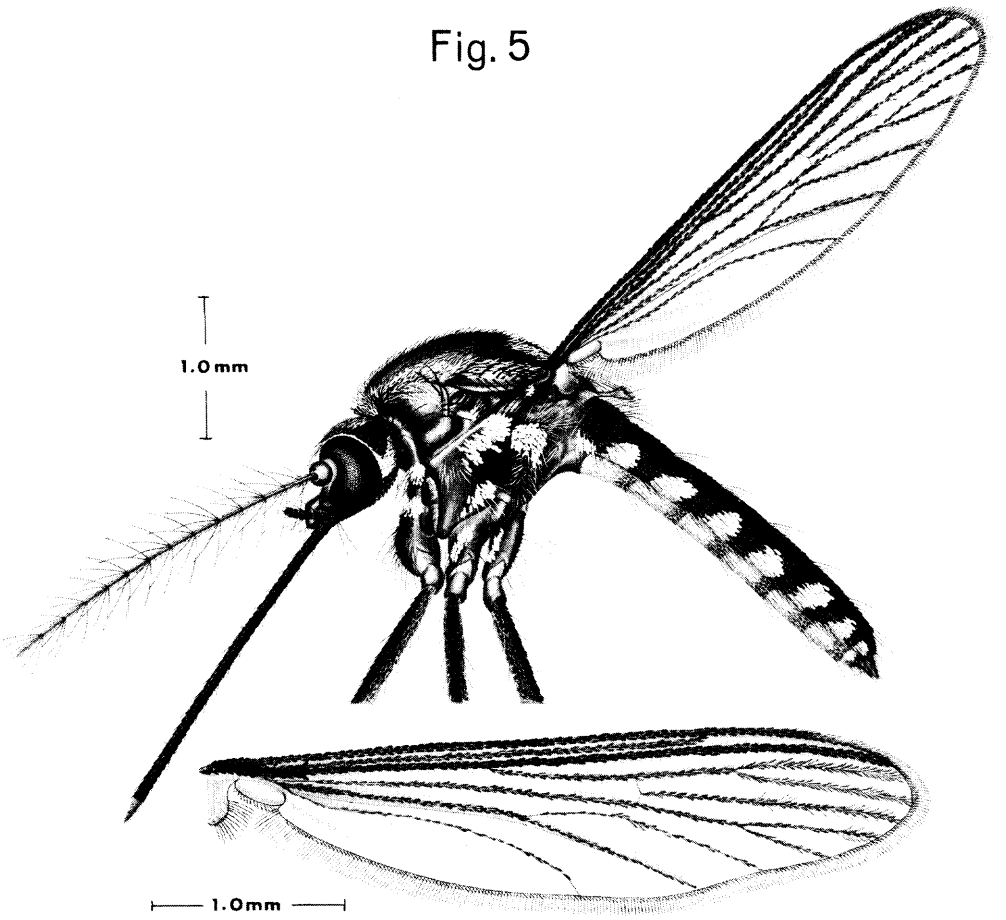


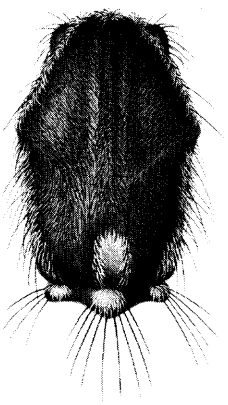
Fig.4




*PANAYENSIS*

Fig. 5



1.0mm

1.0mm

Kei Daishoji

UNCUS

Fig. 6

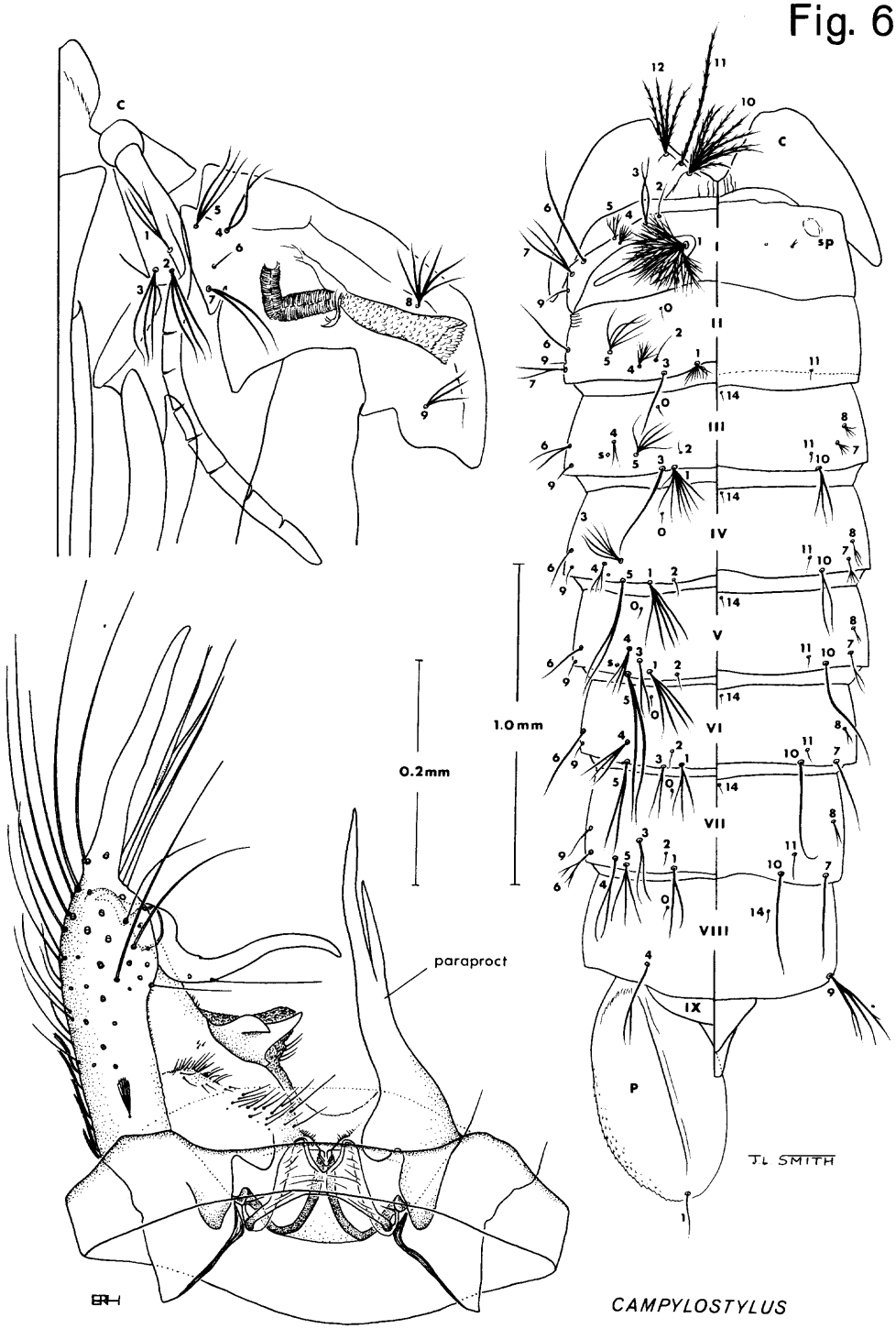
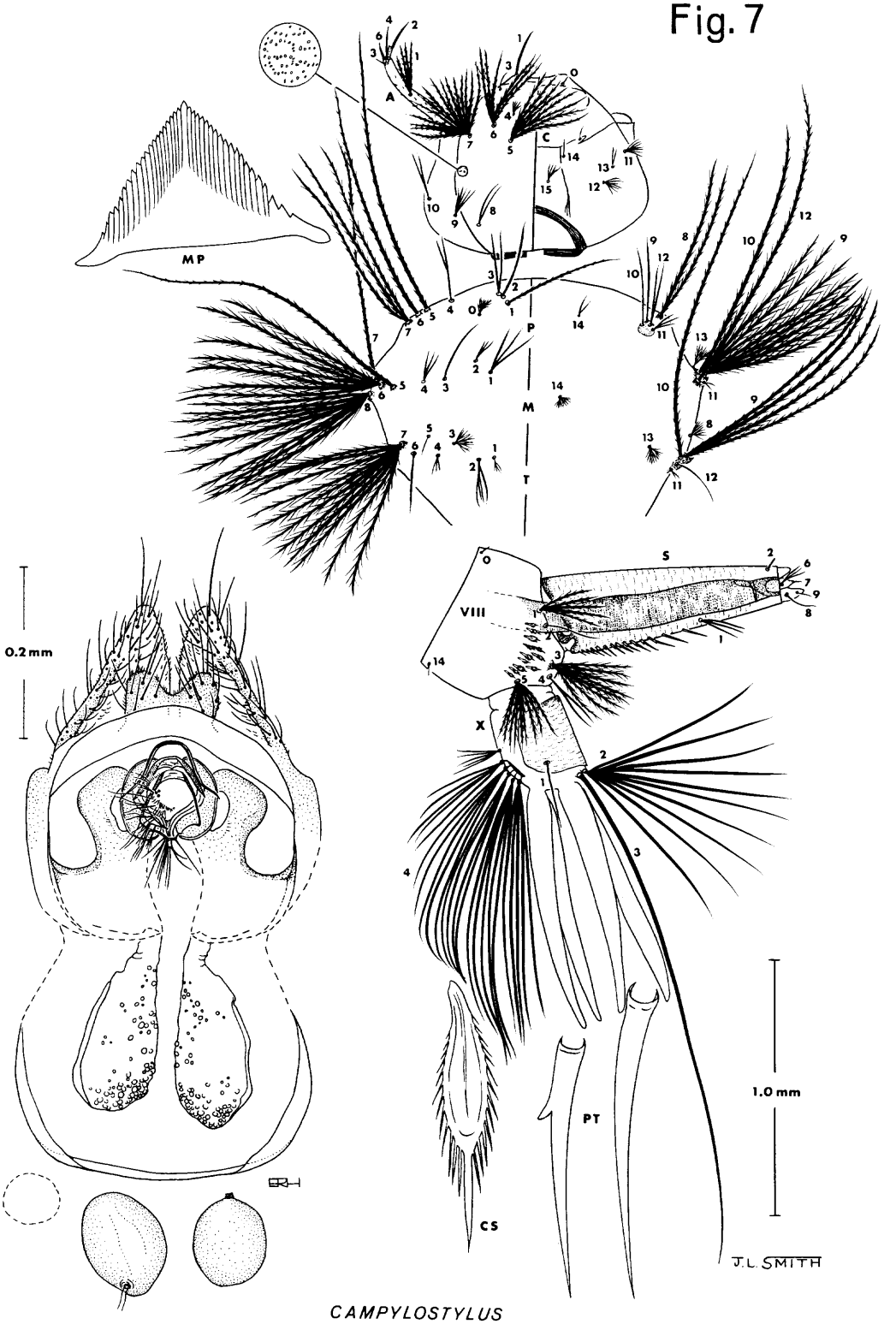

C
paraproct
0.2mm
1.0mm
I
II
III
IV
V
VI
VII
VIII
IX
P
sp
JL SMITH
CAMPYLOSTYLUS

Fig. 7




*CAMPYLOSTYLUS*

Fig. 8

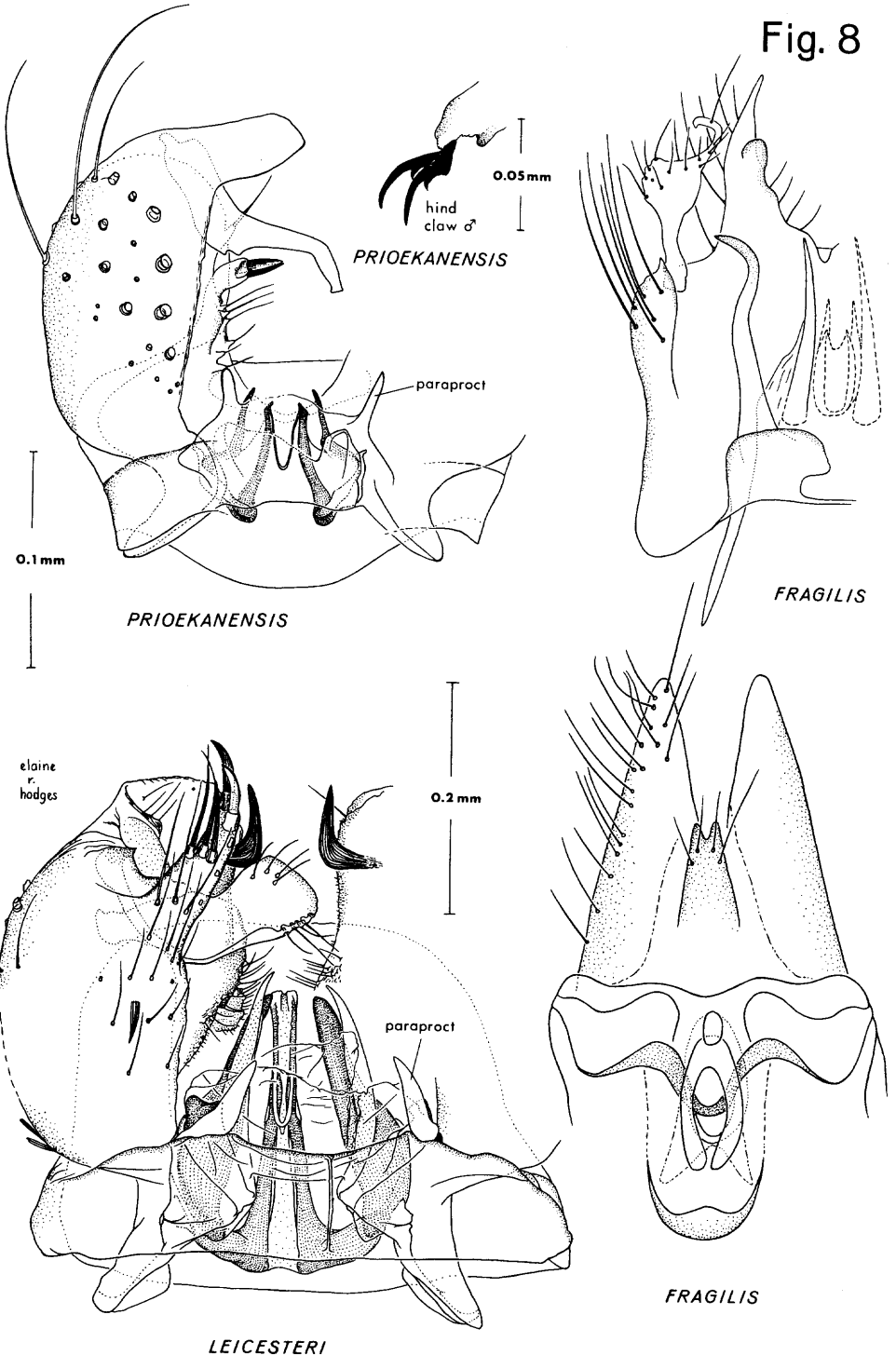
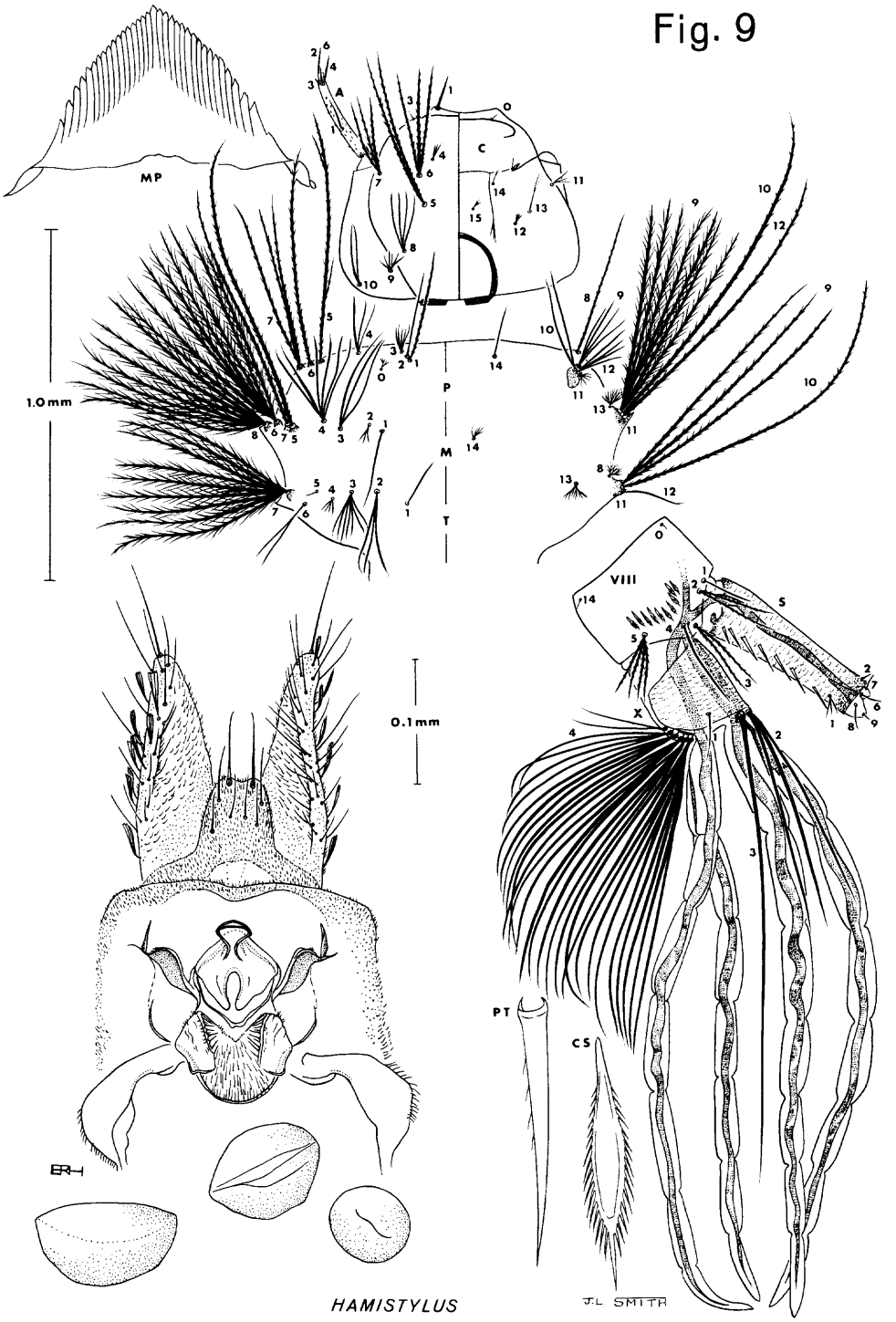

0.05mm
hind
claw ♂
PRIOEKANENSIS
paraproct
0.1mm
PRIOEKANENSIS
FRAGILIS
elaine
r.
hodges
0.2 mm
paraproct
LEICESTERI
FRAGILIS

Fig. 9




*HAMISTYLUS*

Fig. 10

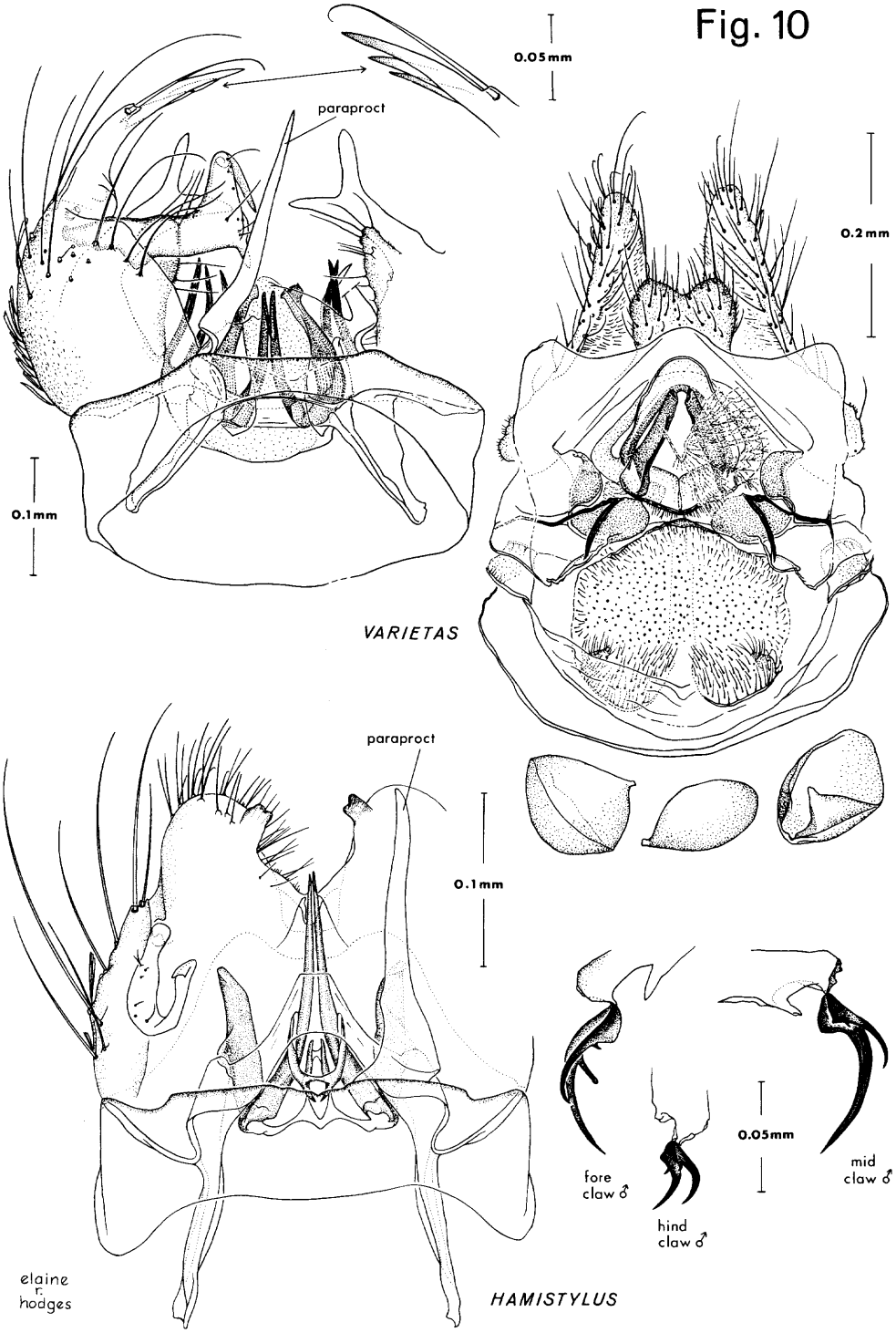
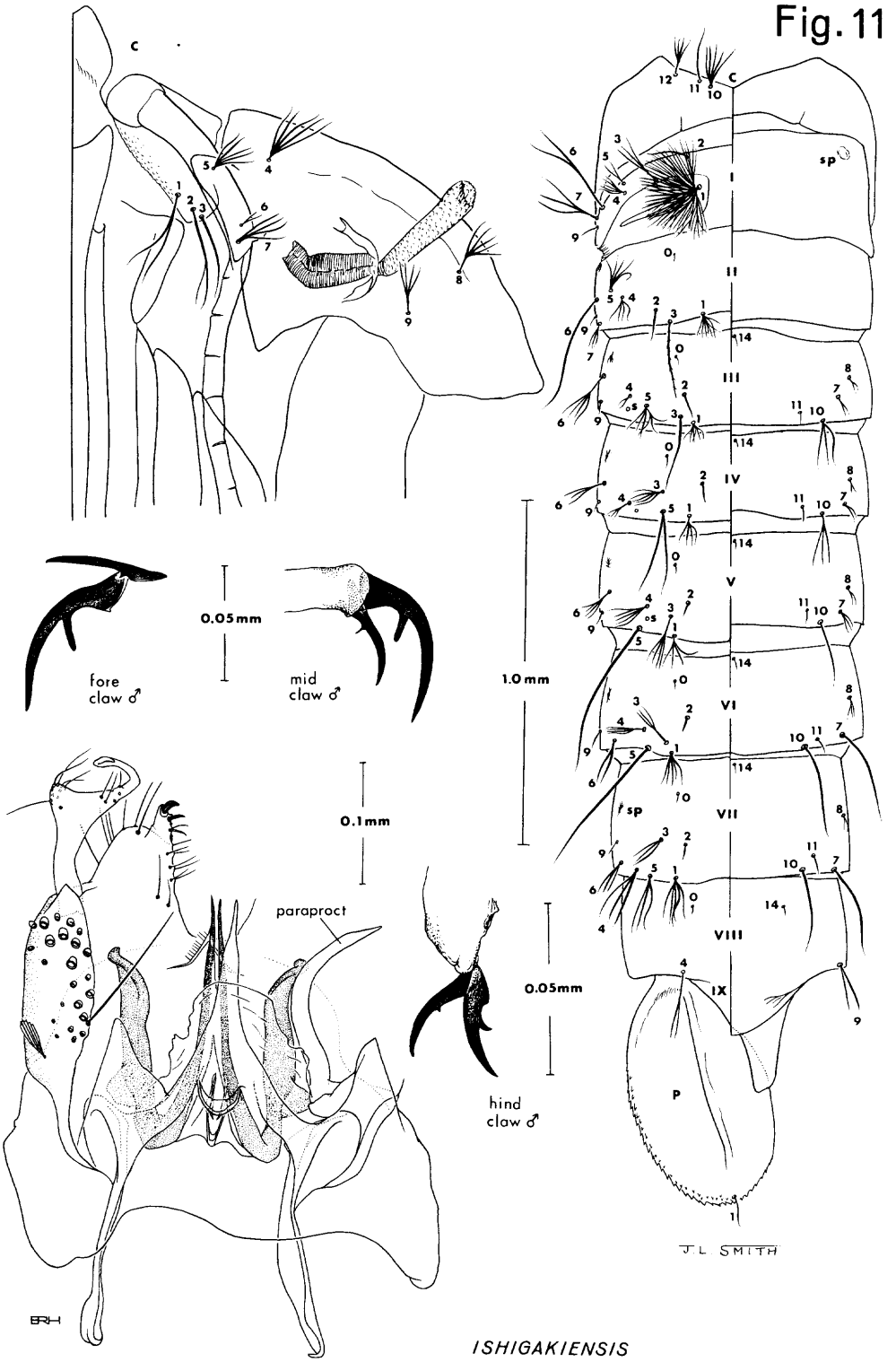
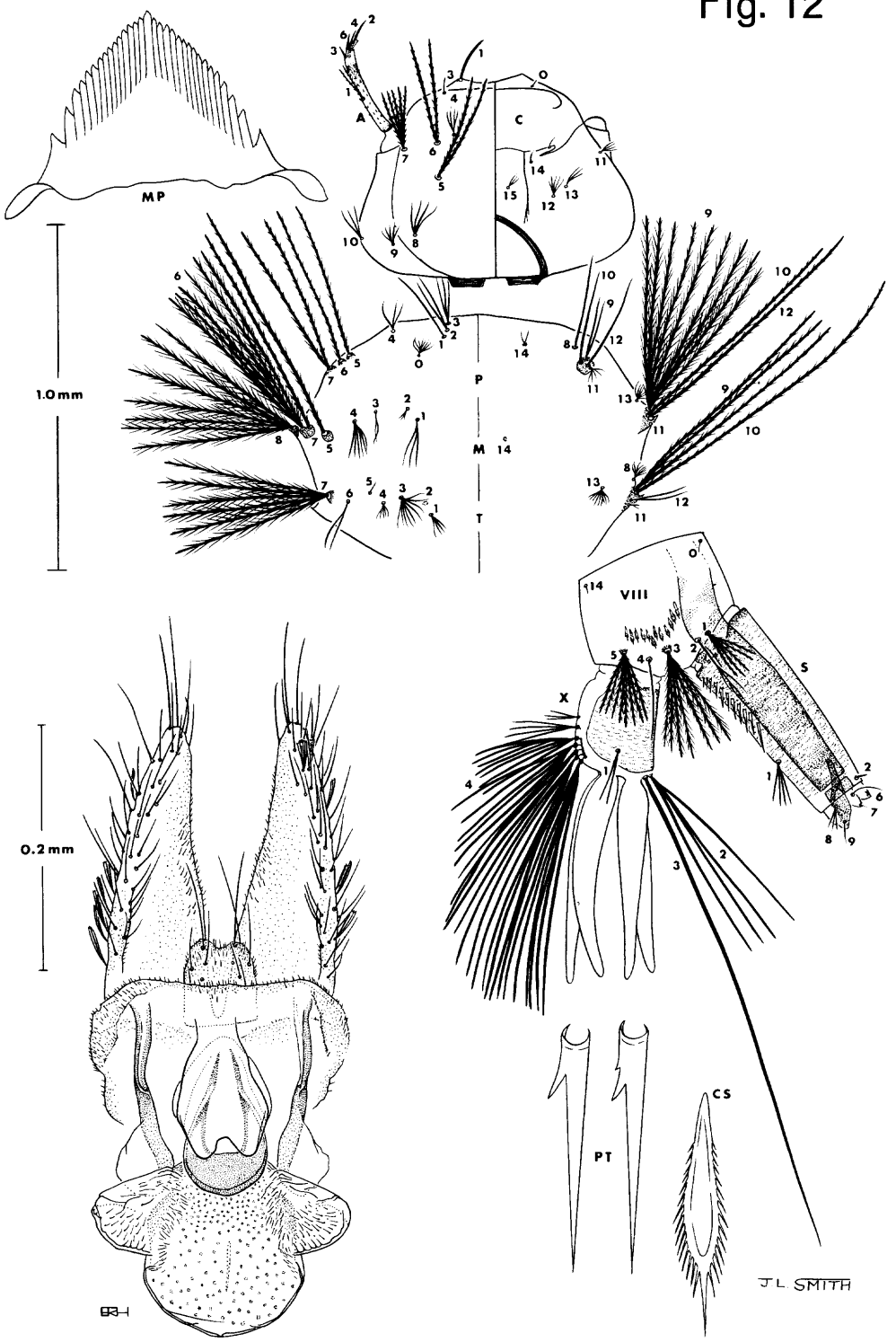

0.05mm
paraproct
0.2mm
0.1mm
VARIETAS
paraproct
0.1mm
0.05mm
fore claw ♂
hind claw ♂
mid claw ♂
elaine r. hodges
HAMISTYLUS

Fig. 11




*ISHIGAKIENSIS*

Fig. 12




*ISHIGAKIENSIS*

Fig. 13

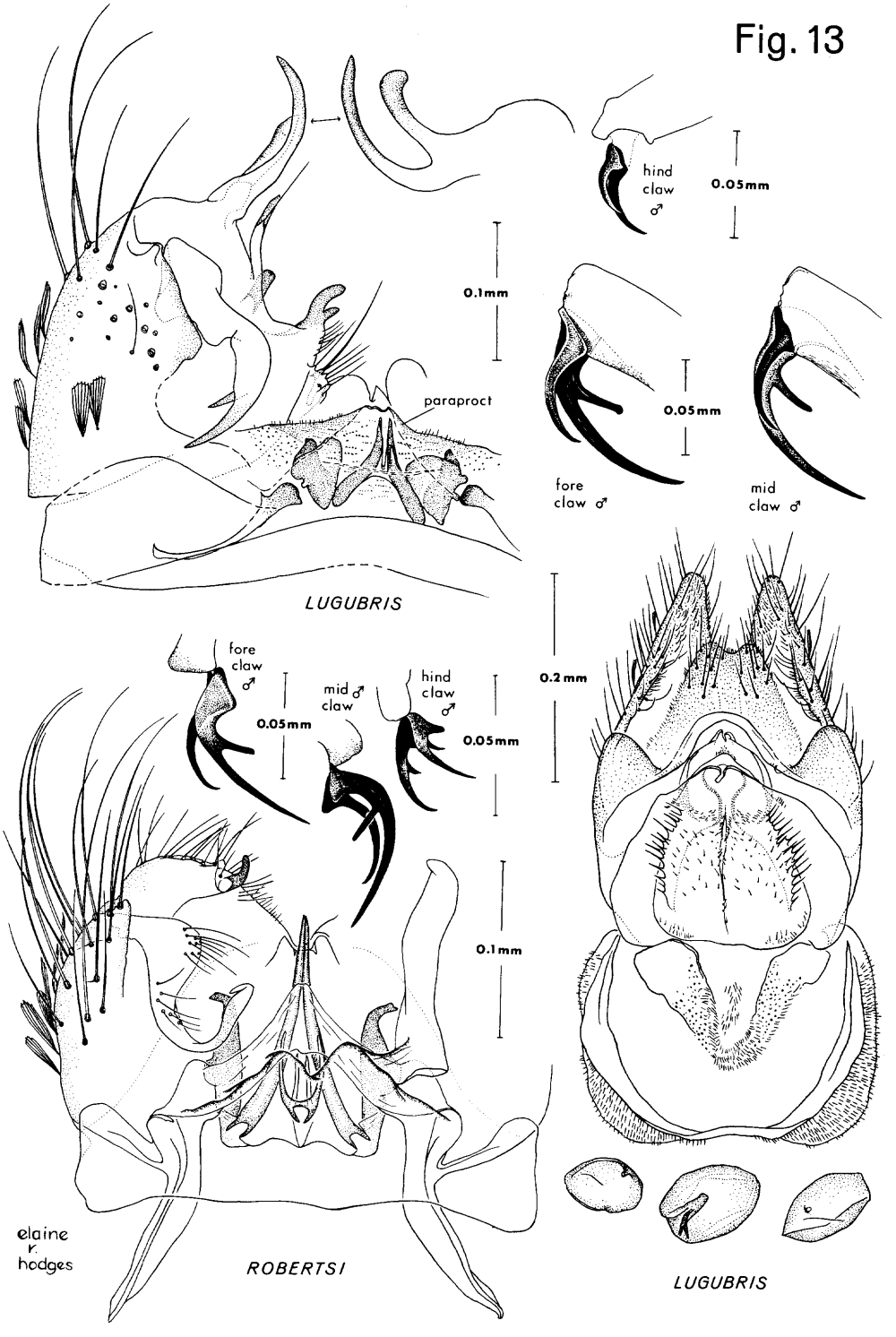

hind claw ♂
0.05mm
0.1mm
paraproct
0.05mm
fore claw ♂
mid claw ♂
LUGUBRIS
fore claw ♂
mid ♂ claw
hind claw ♂
0.05mm
0.05mm
0.2 mm
0.1mm
elaine r. hodges
ROBERTSI
LUGUBRIS

Fig. 14

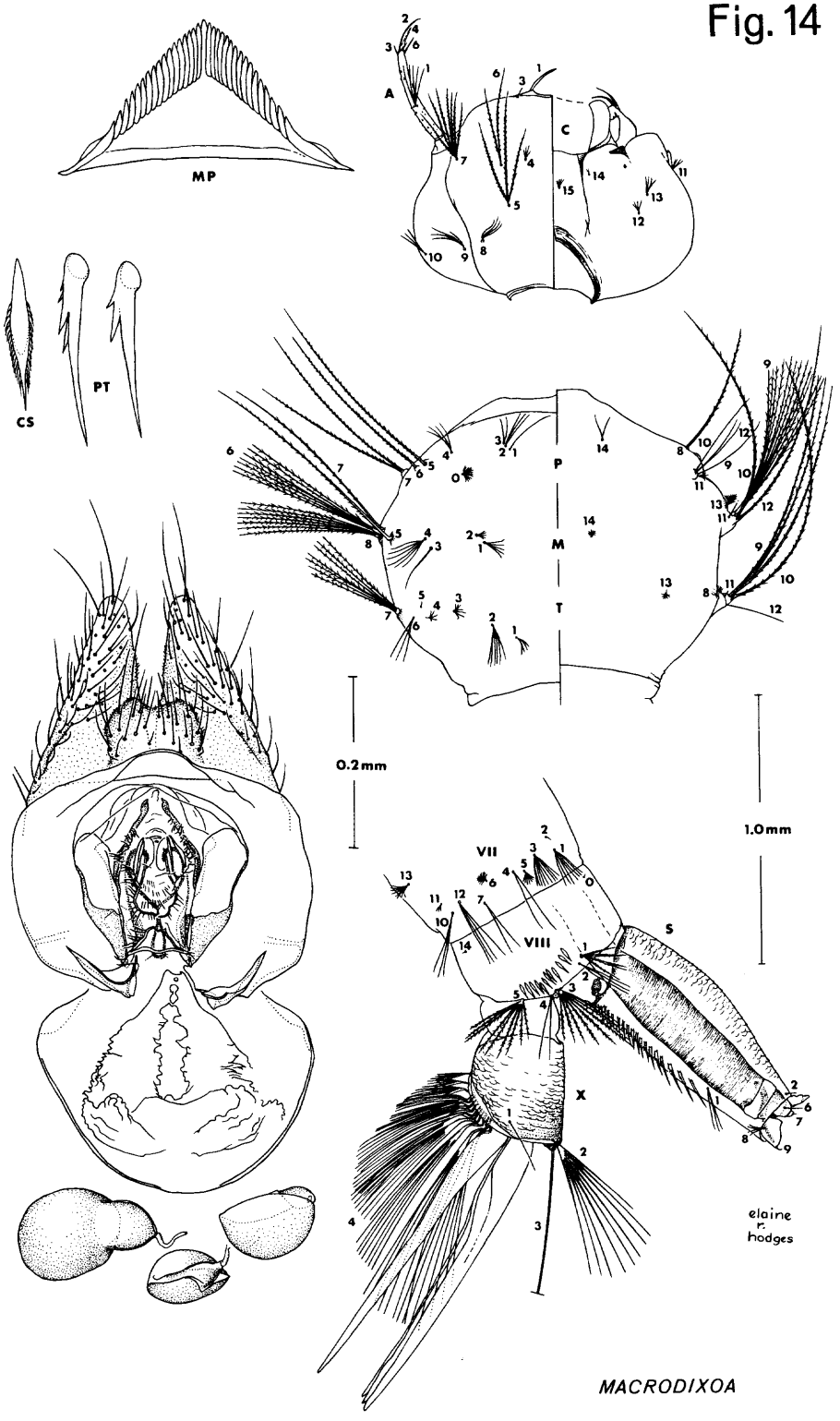

MP
A
C
CS
PT
P
M
T
0.2mm
1.0mm
VII
VIII
S
X
elaine
r.
hodges
MACRODIXOA

Fig. 15

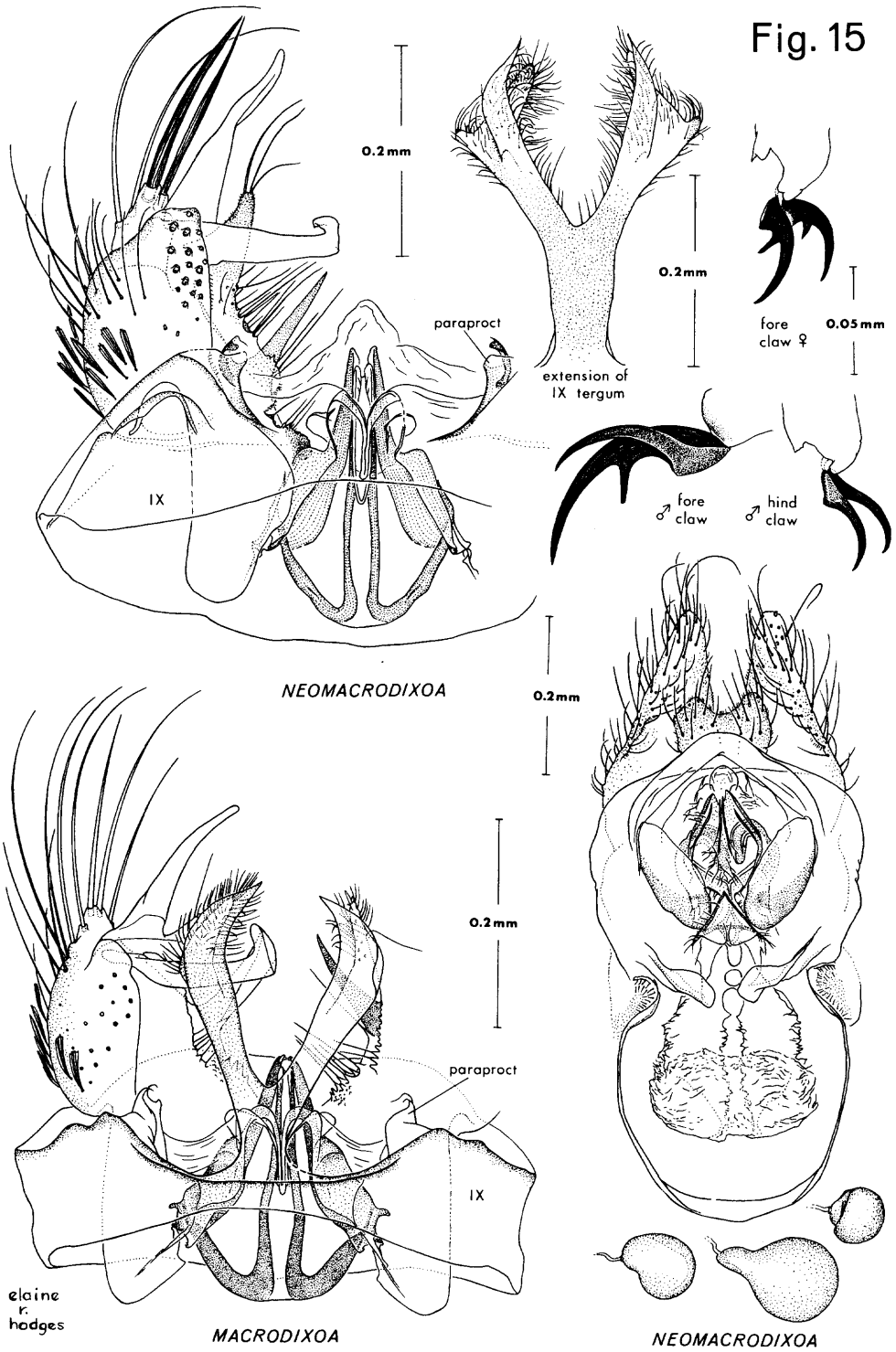
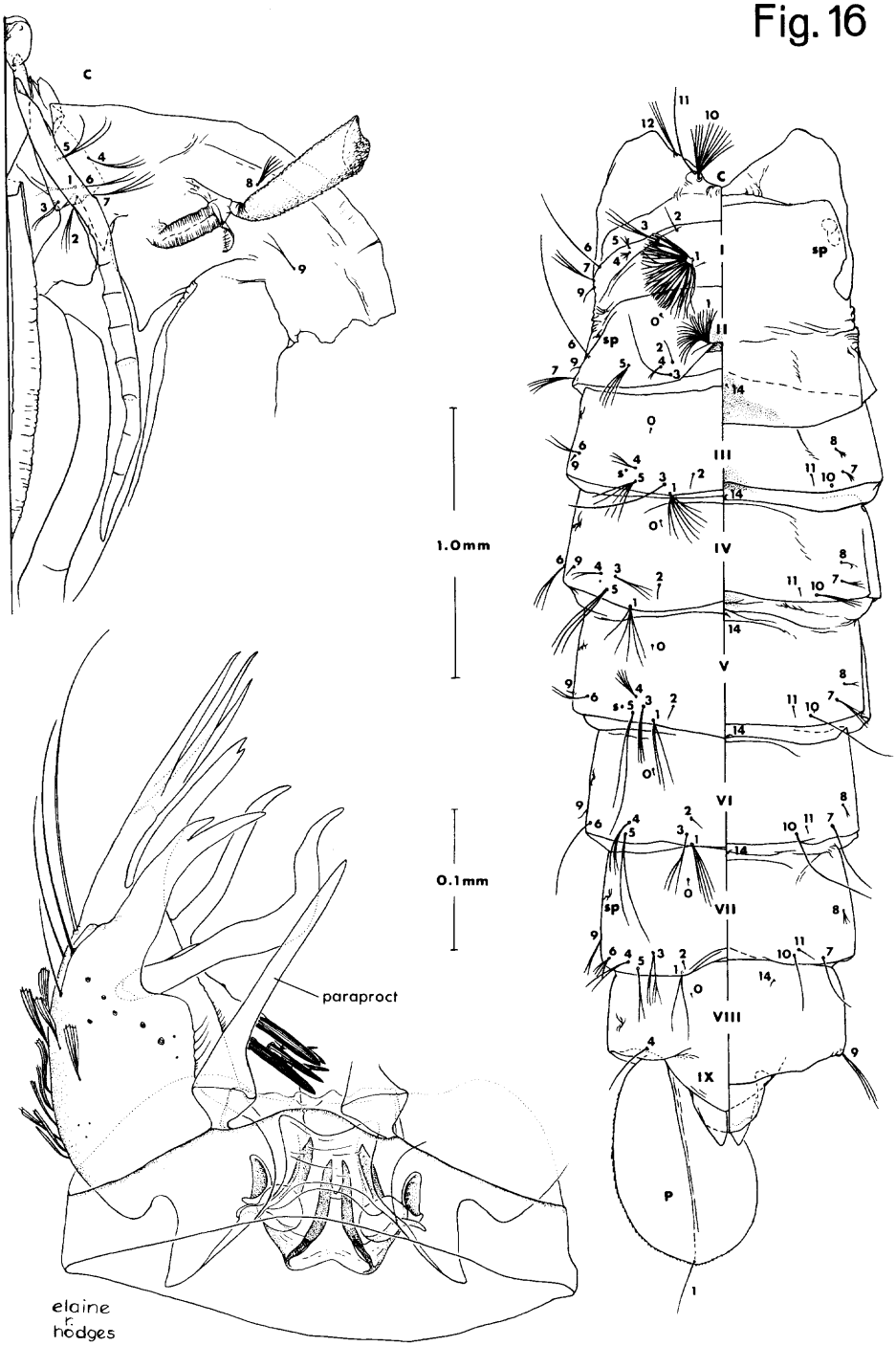

0.2mm
paraproct
IX
NEOMACRODIXOA
extension of IX tergum
0.2mm
fore claw ♀
0.05mm
♂ fore claw
♂ hind claw
0.2mm
0.2mm
paraproct
IX
elaine r. hodges
MACRODIXOA
NEOMACRODIXOA

Fig. 16




*MARGARSEN*

Fig. 17

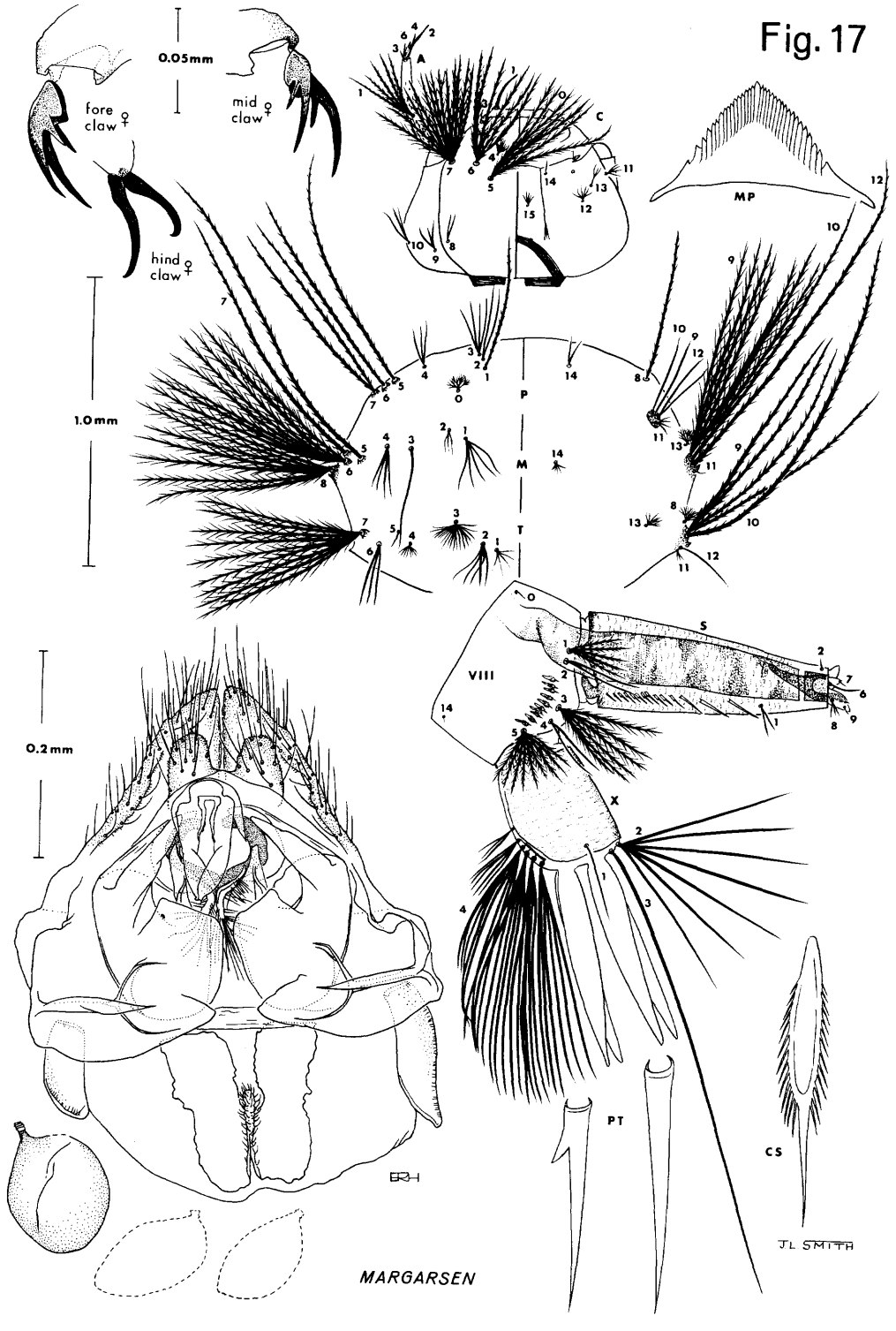
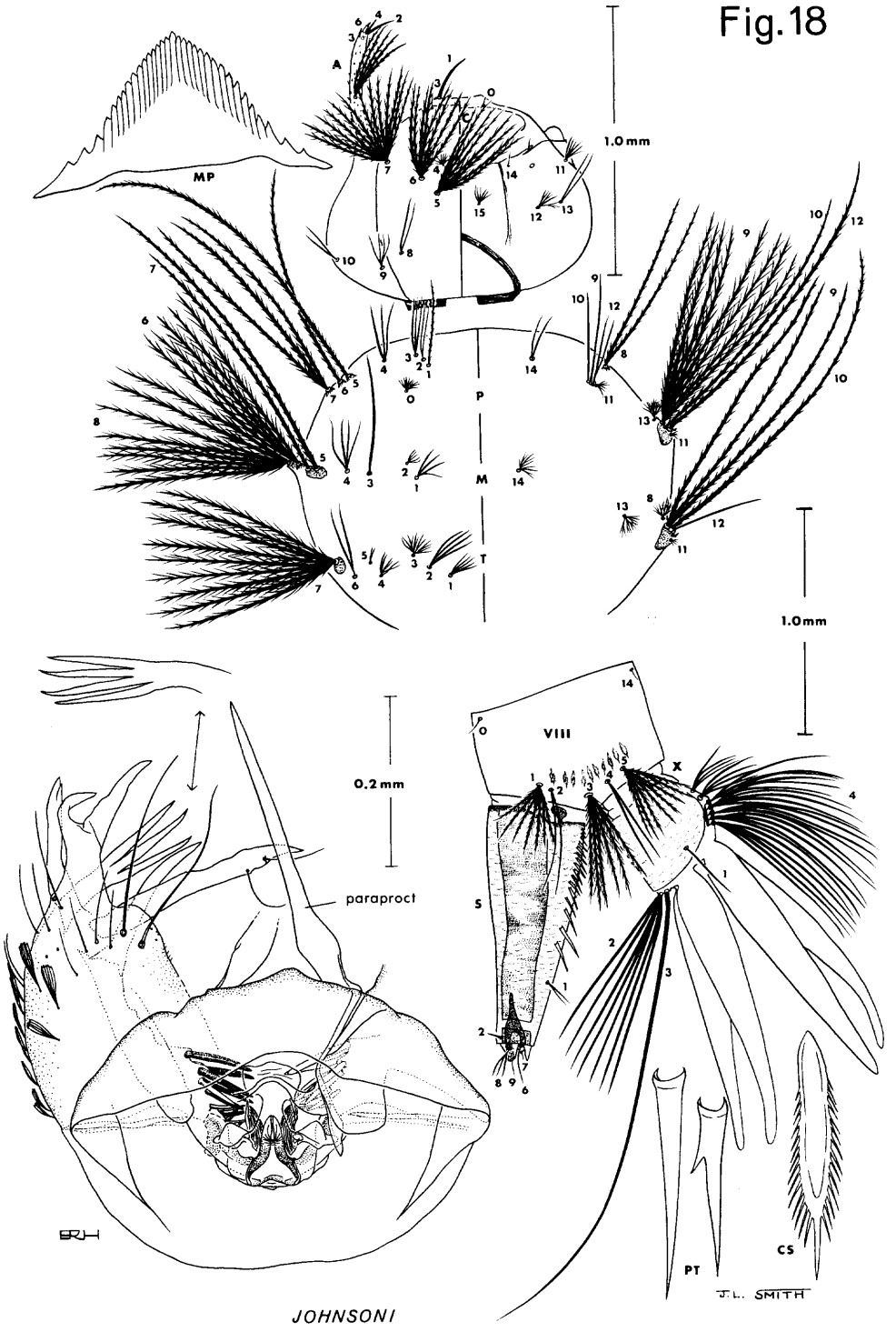
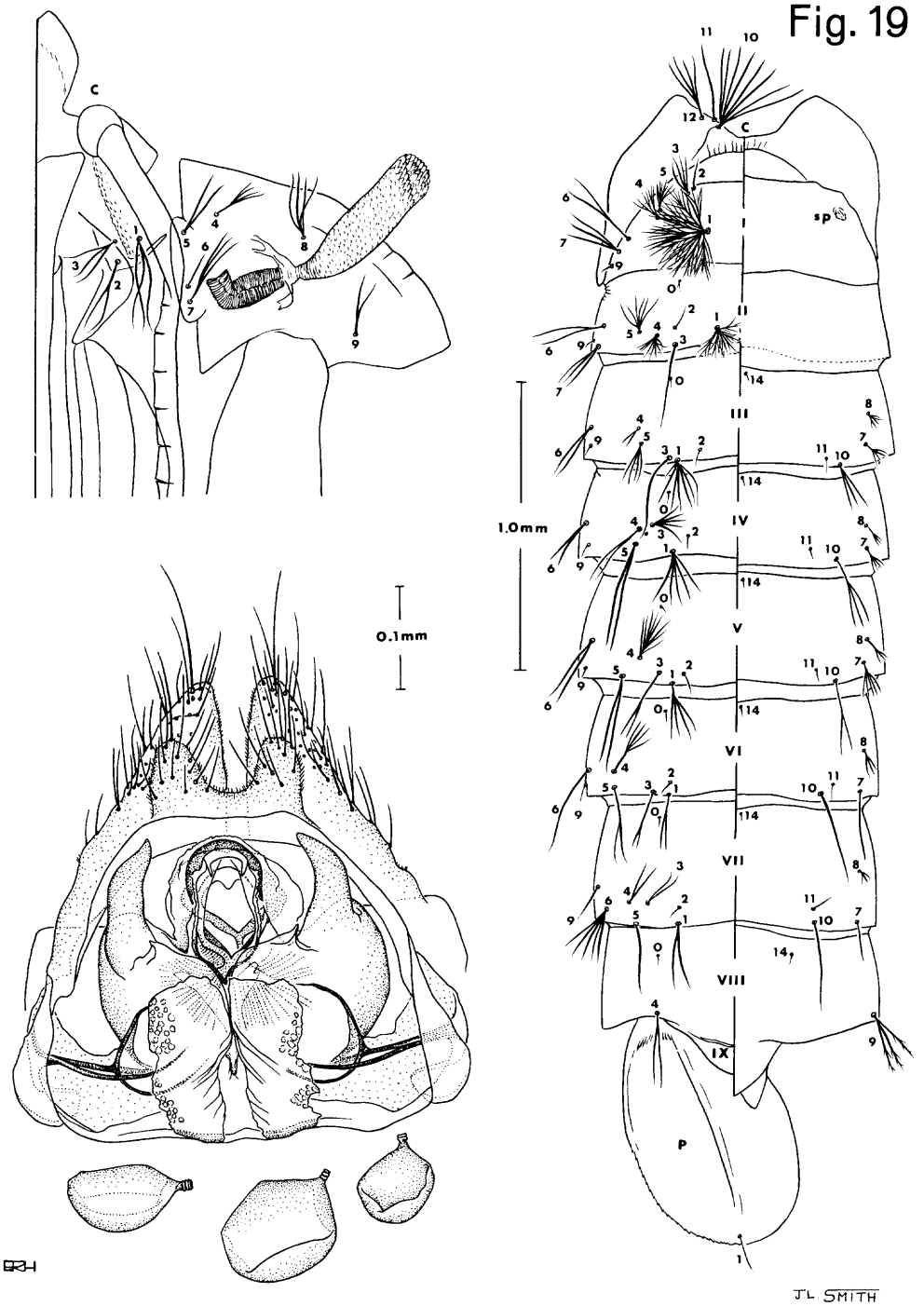

0.05mm
fore ♀ claw
mid ♀ claw
hind ♀ claw
1.0mm
A
C
MP
P
M
T
O
VIII
S
X
PT
CS
0.2mm
ERH
JL SMITH
MARGARSEN

Fig. 18



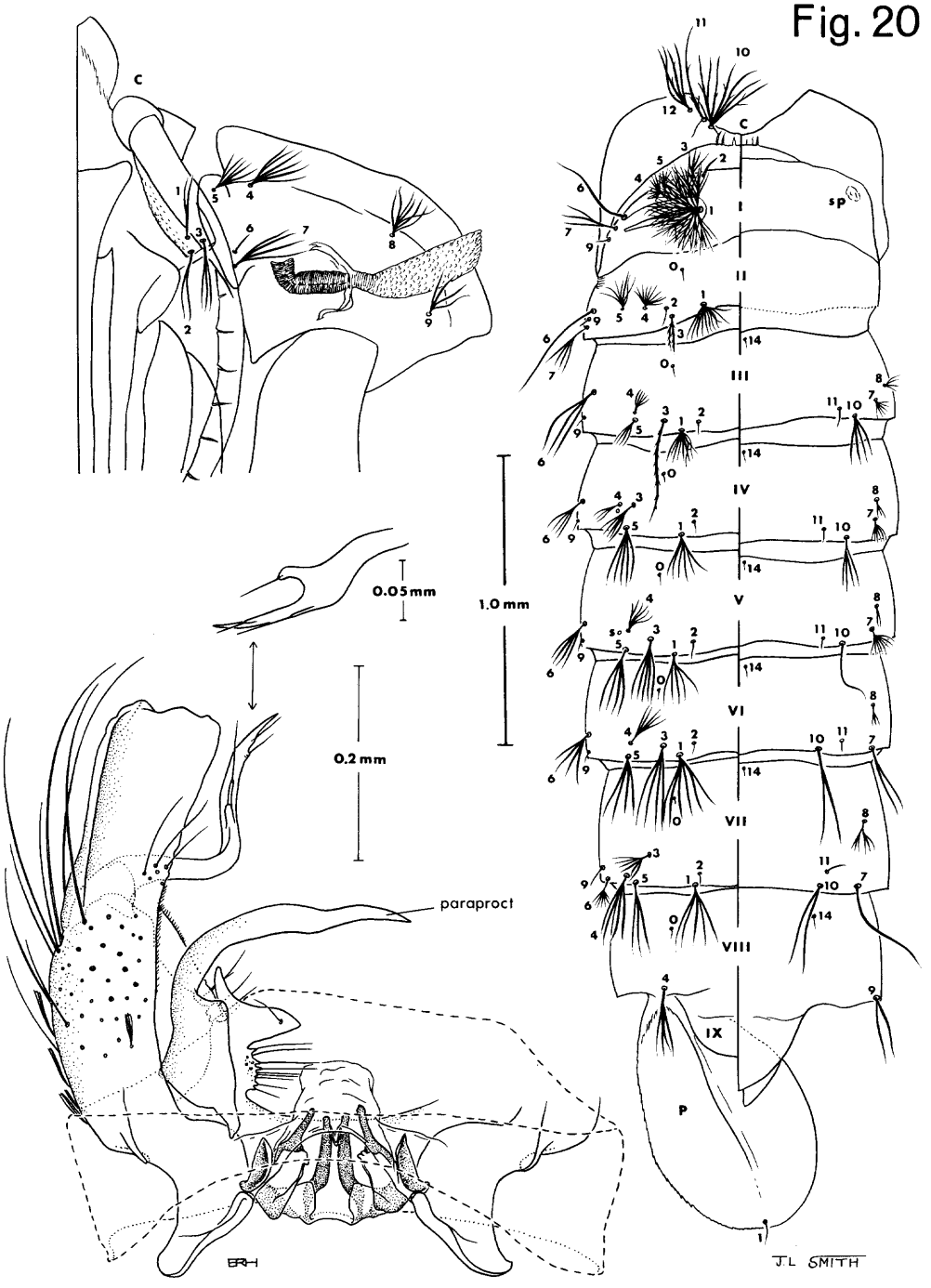

*JOHNSONI*

Fig. 19




*JOHNSONI*

Fig. 20




*NIGROTARSIS*

Fig. 21

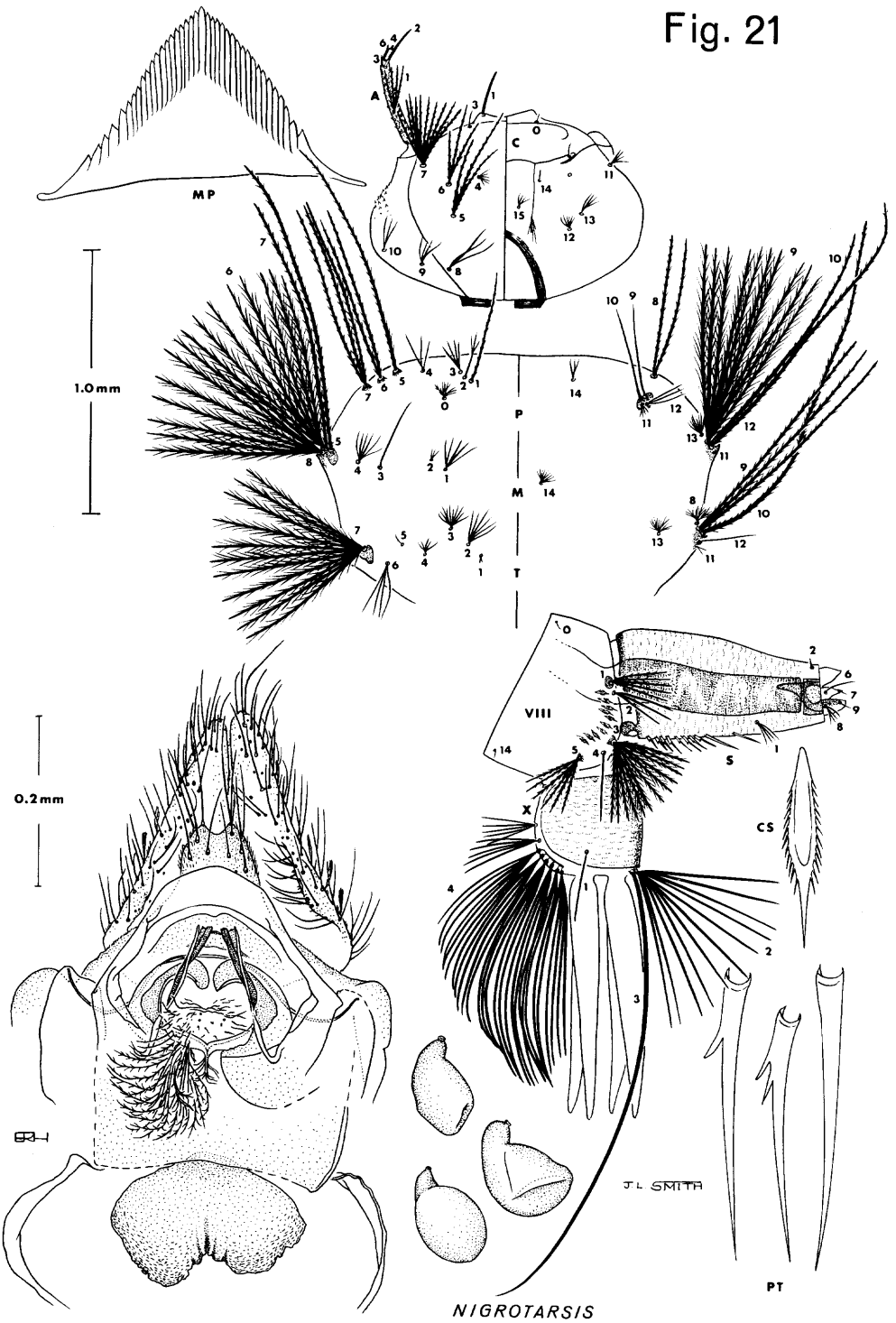
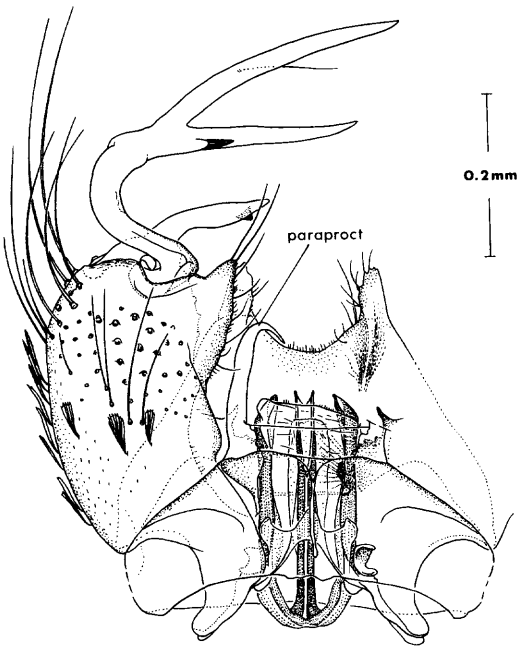
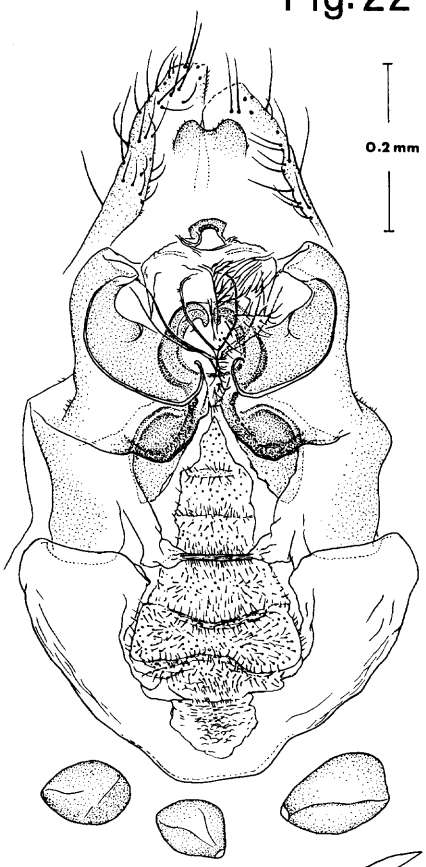
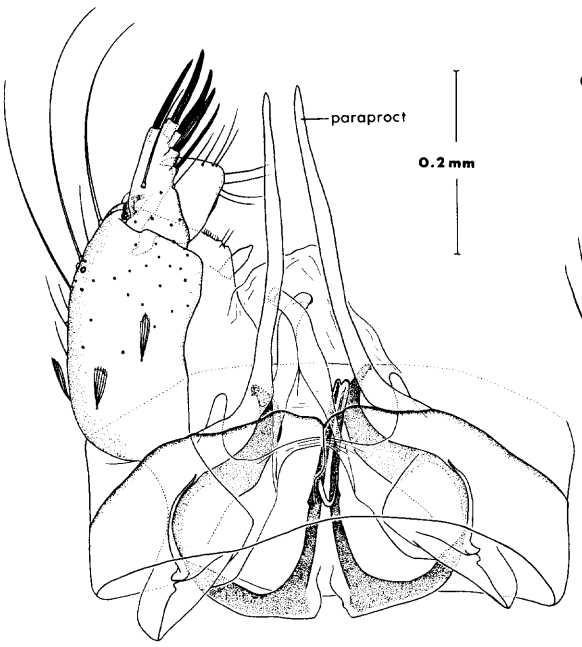


Fig. 22

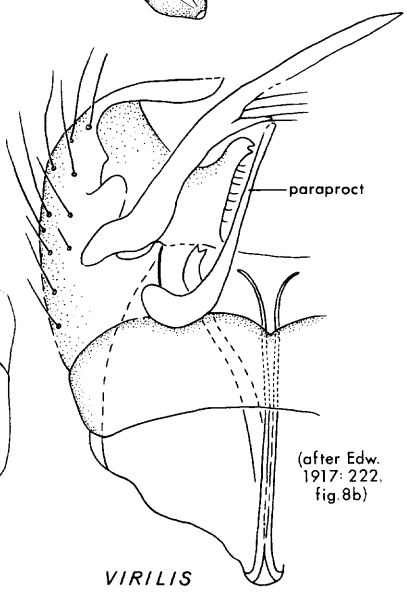



*SINGULARIS*




*NUBICOLA*




*VIRILIS*

elaine r. hodges

Fig. 23

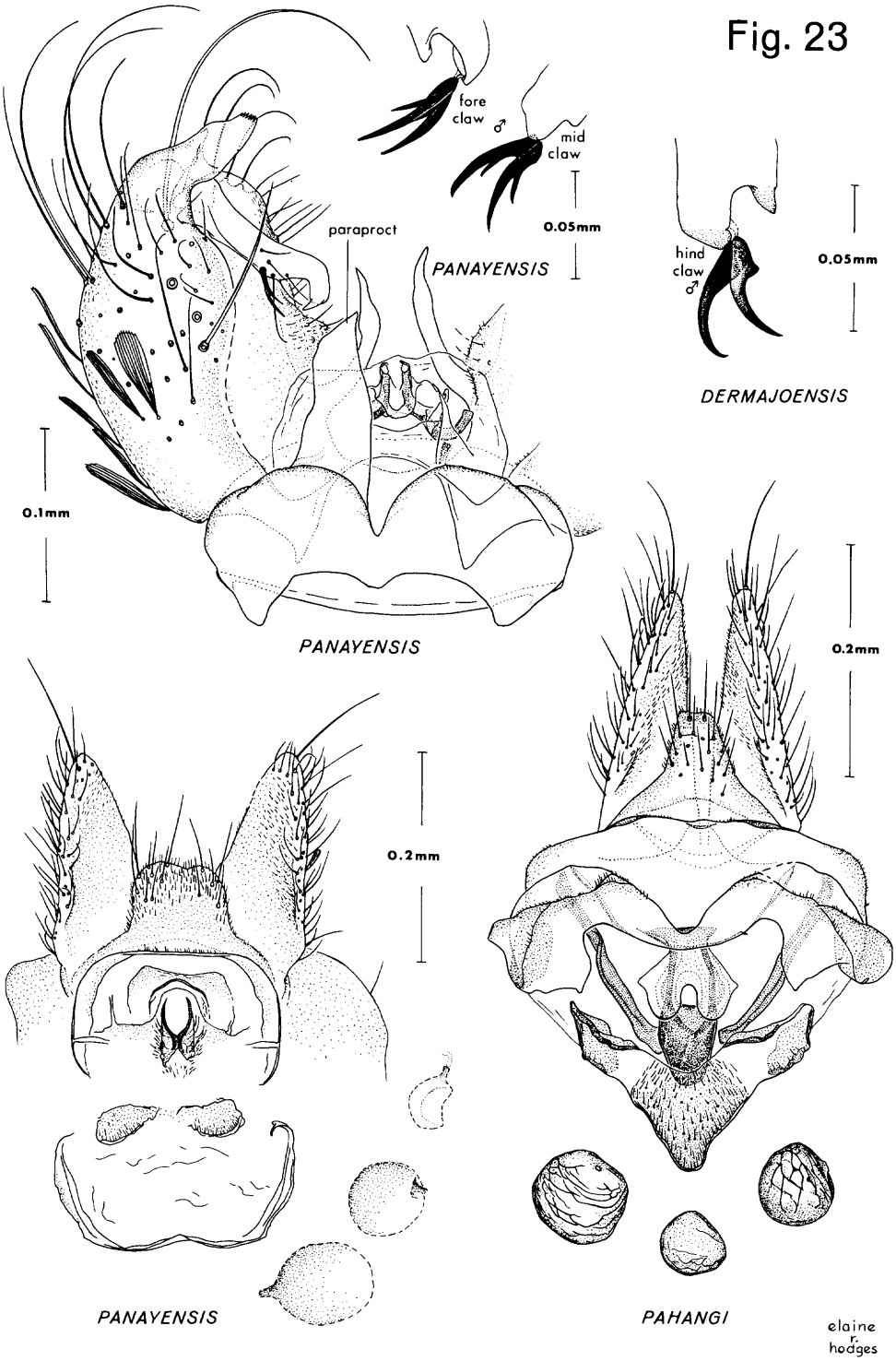

fore claw ♂
mid claw
0.05mm
paraproct
PANAYENSIS
hind claw ♂
0.05mm
DERMAJOENSIS
0.1mm
PANAYENSIS
0.2mm
0.2mm
PANAYENSIS
PAHANGI
elaine r. hodges

Fig.24

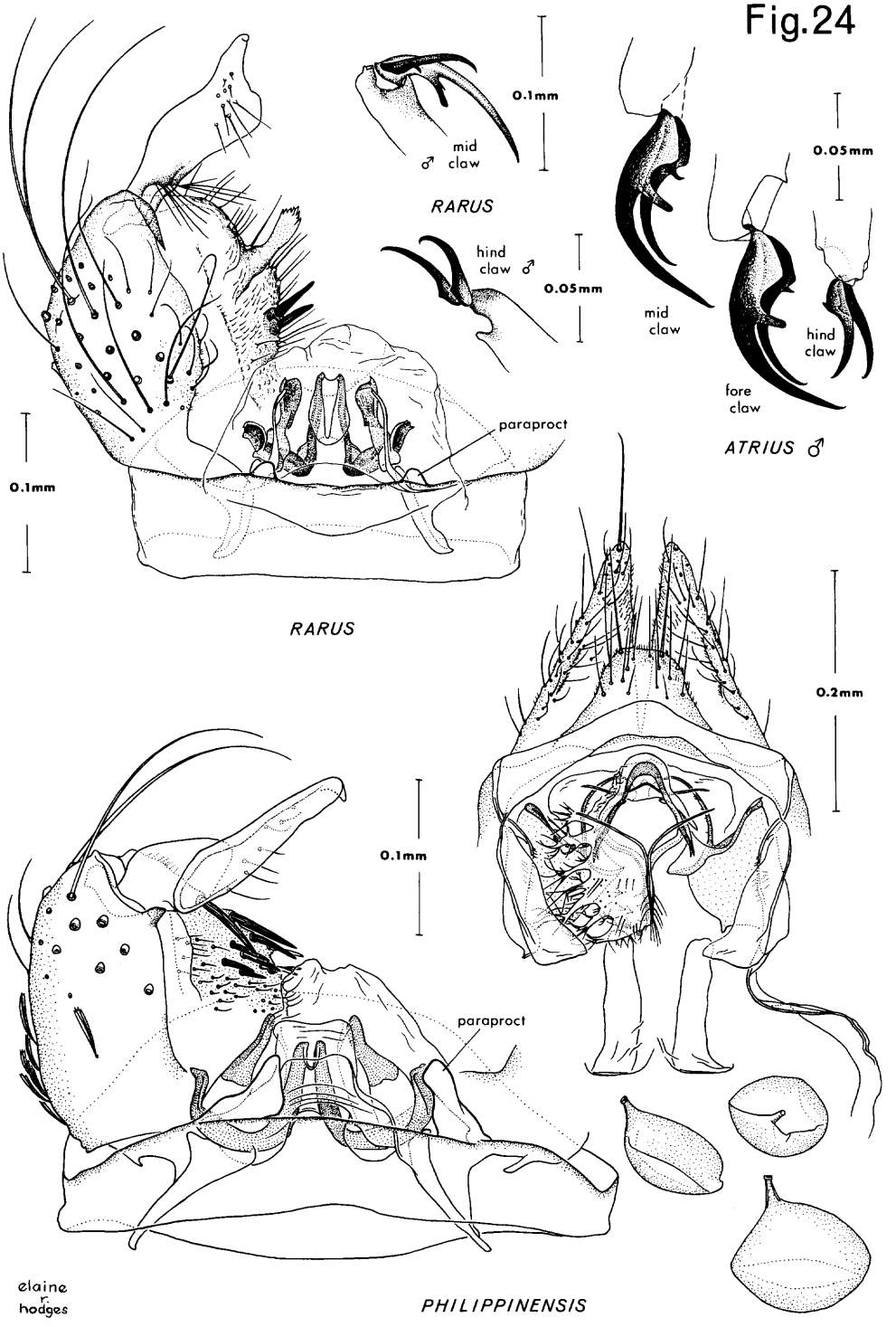

0.1mm
mid
♂ claw
RARUS
hind
claw ♂
0.05mm
0.05mm
mid
claw
hind
claw
fore
claw
ATRIUS ♂
paraproct
0.1mm
RARUS
0.2mm
0.1mm
paraproct
elaine
r.
hodges
PHILIPPINENSIS

Fig. 25

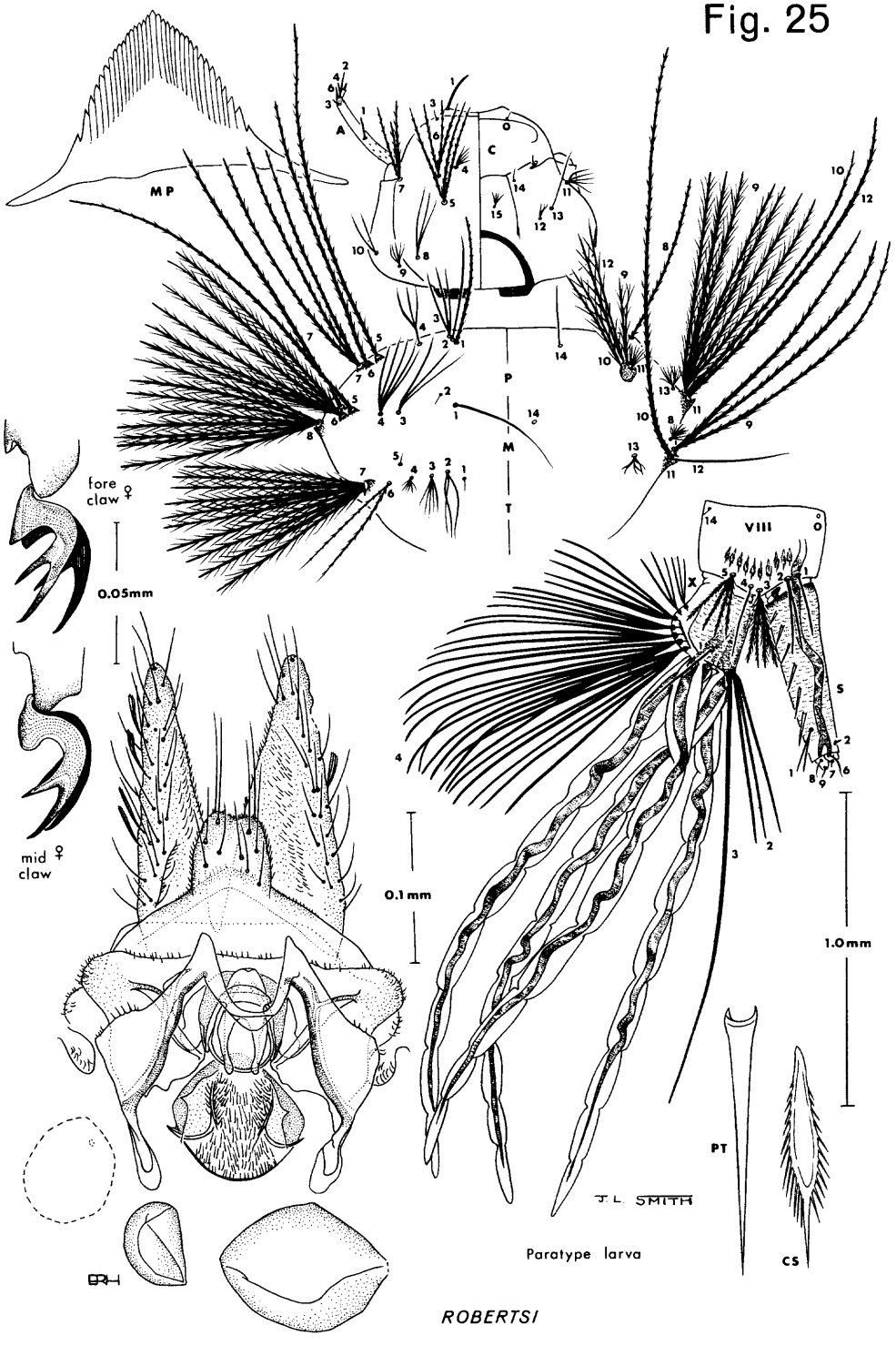
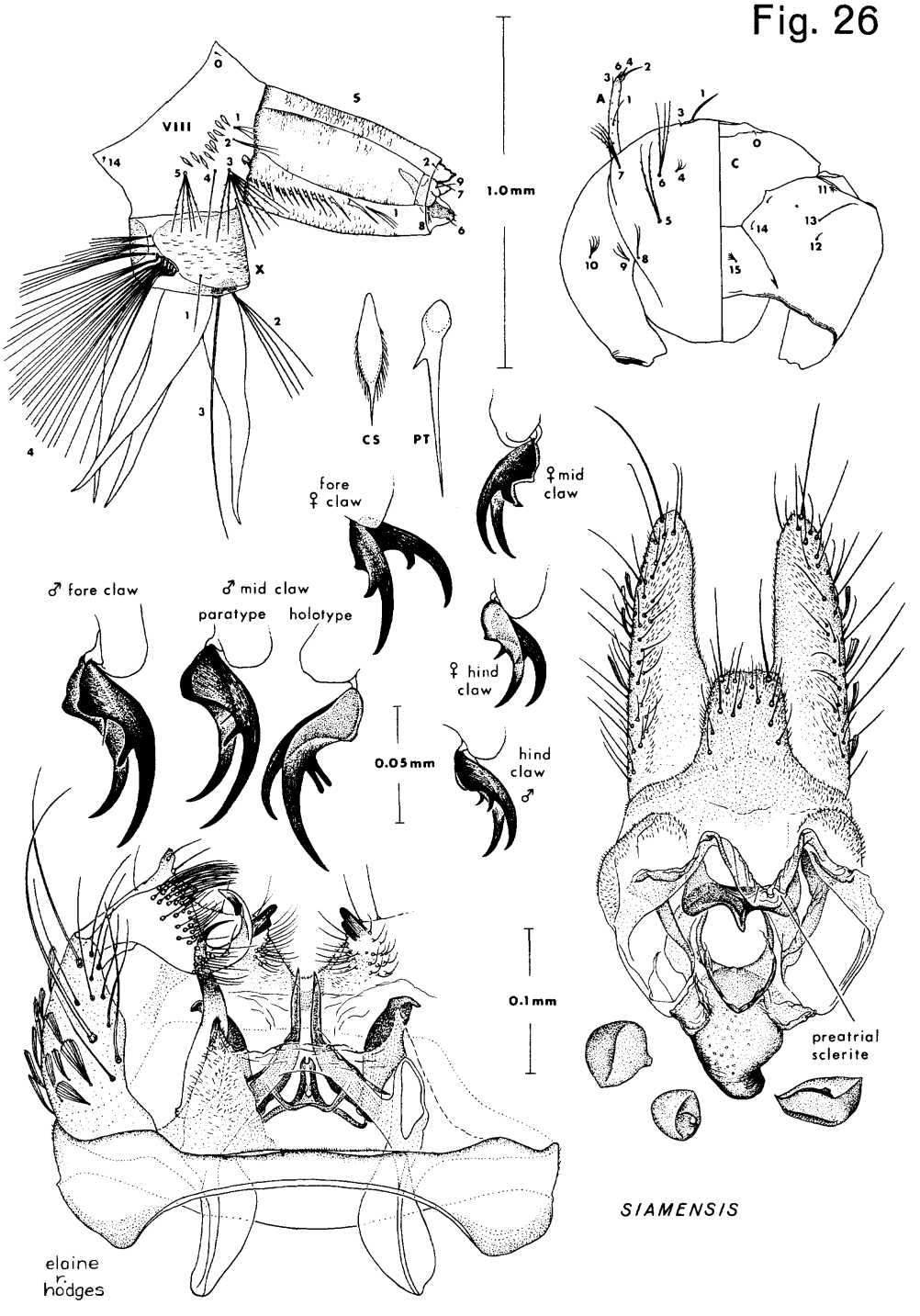

MP
A
C
P
M
T
fore claw ♀
0.05mm
mid ♀ claw
0.1 mm
VIII
X
S
1.0mm
PT
CS
J. L. SMITH
Paratype larva
ROBERTSI

Fig. 26


VIII
X
CS
PT
1.0mm
♀ fore claw
♀ mid claw
♂ fore claw
♂ mid claw
paratype
holotype
♀ hind claw
0.05mm
hind claw ♂
0.1mm
preatrial sclerite
SIAMENSIS
elaine r. hodges

## INDEX

Valid names are set in roman type, synonyms are italicized. The italicized pages are those which begin the primary treatment of the species. Numbers in parentheses refer to the figures illustrating the species in question. The first column refers to species mentioned in "Contributions to the Mosquito Fauna of Southeast Asia - I. The Genus *Aedes*, Subgenus *Neomacleaya* Theobald in Thailand" and the second column to "Contributions to the Mosquito Fauna of Southeast Asia - III. The Genus *Aedes*, Subgenus *Neomacleaya* Theobald in Southeast Asia."