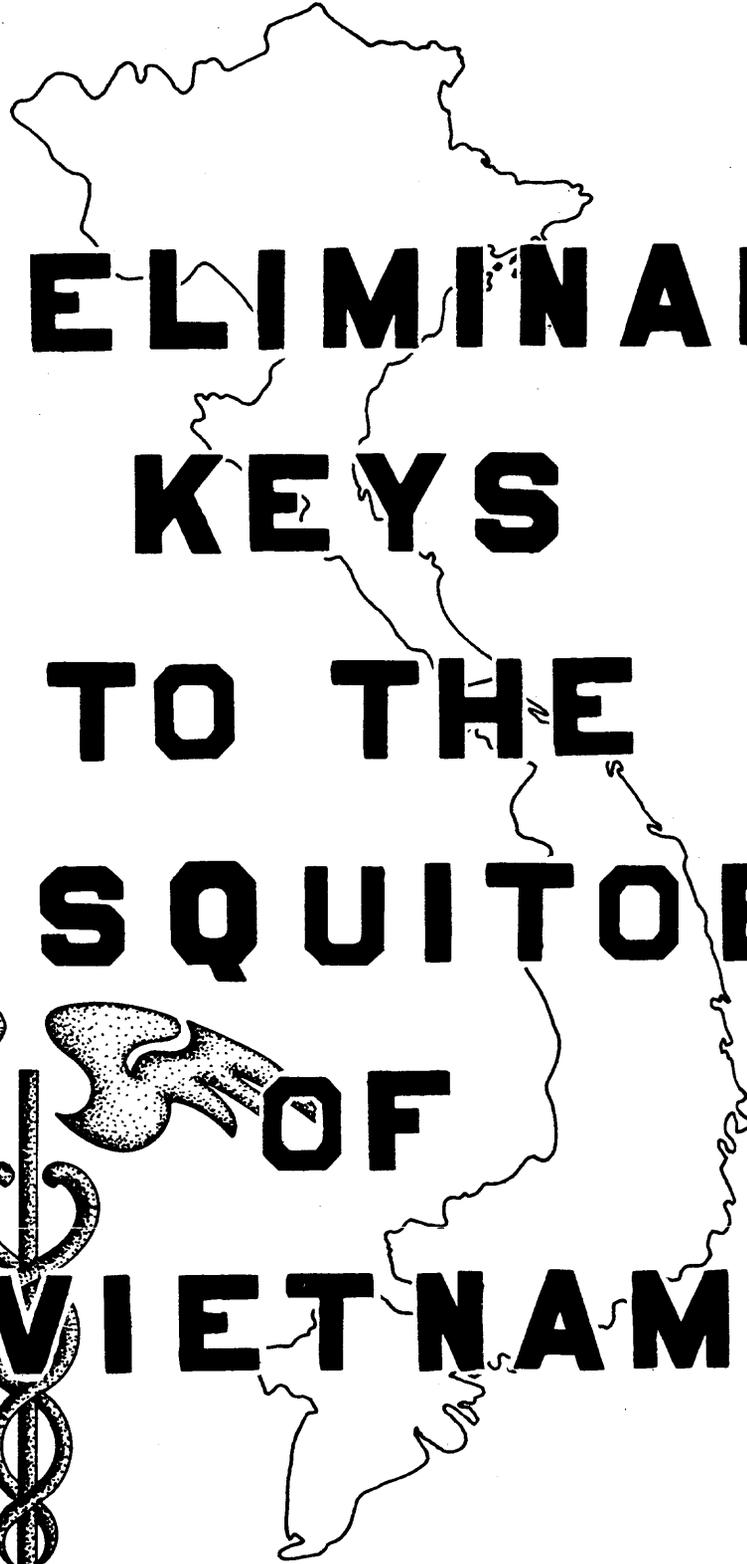


**PRELIMINARY  
KEYS**

**TO THE  
MOSQUITOES**

**OF  
VIETNAM**



FIRST REVISION  
May 1966

# Report Documentation Page

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**PRELIMINARY KEYS TO THE  
MOSQUITOES OF VIETNAM**

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First Revision, May, 1966

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## PREFACE TO FIRST PRINTING

These keys have been compiled primarily from existing literature, although as far as possible, they have been checked against specimens at the United States National Museum and in some instances characters have been supplied for differentiating closely related species and genera. Inasmuch as the entire mosquito fauna of Southeast Asia is currently undergoing intensive taxonomic investigation, these keys must be recognized as being of a preliminary nature and covering only the species known to occur in Vietnam or presumed to be there on the basis of overall zoogeography. It is hoped that specimens not running satisfactorily in the various keys or that raise any doubts will be submitted to the Army Mosquito Project for examination.

Terminology within the keys has been standardized to conform to that of Belkin (1962, Mosquitoes of the South Pacific (Diptera, Culicidae). Univ. Calif. Press, Berkeley). Figures 1, 2, 3, 4, 5, 16, 17, 18, 19, and 20 have been adapted from the above mentioned publication.

Due to the tentative nature of these keys, they have been reproduced in standard loose-leaf form. As taxonomic and zoogeographical data accumulate, revisions to the appropriate sections will be made and reproduced in the original format. Revised sections will then be automatically forwarded to individuals known to possess copies of the keys. To this end, it is requested that all individuals receiving copies of these keys forward their name and mailing address to:

Army Mosquito Project  
Department of Entomology  
Smithsonian Institution  
United States National Museum  
Washington, D. C. 20560

Attention: File K

October 1, 1965

## Preface to the First Revision

There has been a great demand for the keys and stocks have decreased so rapidly that a reissue came in for consideration. In view of the fact, however, that additional specimens and records have come to hand it was decided to bring the keys up to date and issue this Revision. As a result of demands from workers in the field, for whom the keys are primarily intended, a few extra illustrations have been added and also some notes on medical importance and biology. As before, the Revision is largely based on material in the USNM from Vietnam and adjoining countries plus species recorded in the literature as occurring and those which according to known distribution will probably be found to occur.

It is perhaps advisable to issue a word of warning about the conclusions to be drawn from the Keys. Keys can be good servants but bad masters and they have to be used intelligently and with caution. Like all keys the present one is not the ultimate court of appeal on the identity of a specimen but merely a guide giving a tentative diagnosis until such time as properly identified reference collections and detailed illustrated descriptions are available. SEAMP hopes in time to be able to fulfil both these requirements but it cannot do so until specimens, representative of the whole area, are available for study.

For administrative and other reasons the name of the project has been changed to the South East Asia Mosquito Project (SEAMP). The address remains the same, namely,

South East Asia Mosquito Project (SEAMP)  
Department of Entomology  
Smithsonian Institution  
United States National Museum  
Washington, D. C. 20560

The illustrations are by the Department of Entomology, Headquarters 406th Medical Laboratory, United States Army Medical Command, Japan, APO San Francisco 96343 and by Miss Thelma Ford and Miss J. L. Hwang of SEAMP.

Editor,  
(Botha de Meillon, SEAMP)

LIST OF THE MOSQUITOES OCCURRING, OR LIKELY TO OCCUR,  
IN THE REPUBLIC OF VIETNAM

Anopheles (Anopheles)

- alongensis Venhuis, 1940
- annandalei interruptus, Puri, 1929
- baezai Gater, 1933
- ✓ barbirostris Van der Wulp, 1884
- barbumbrosus Strickland and Choudhury, 1927
- bengalensis Puri, 1930
- ✓ campestris Reid, 1962
- gigas baileyi Edwards, 1929
- ✓ indiensis Theobald, 1901
- insulaeflorum (Swellengrebel and Swellengrebel de Graaf), 1920
- ✓ lesteri Baisas and Hu, 1936
- lindesayi Giles, 1900
- ✓ nigerrimus Giles, 1900
- ✓ peditaeniatus (Leicester), 1908
- ⇒ ✓ separatus (Leicester), 1908
- ✓ sinensis Wiedemann, 1828
- sintonoides Ho, 1938
- umbrosus (Theobald), 1903
- ✓ cravfordi 79 ♂ + ♀ *persati*
- ✓ argyropus *le thifan 177 spec. v. shini*

Anopheles (Cellia)

- ✓ <sup>P<sup>o</sup></sup> aconitus Dönitz, 1902
- annularis Van der Wulp, 1884
- ✓ balabacensis Baisas, 1936 24
- culicifacies Giles, 1901
- fluviatilis James, 1902
- jamesii Theobald, 1901
- ✓ jeyporiensis James, 1902 3f
- jeyporiensis candidiensis Koizumi, 1924
- ✓ karwari (James), 1903
- ✓ kochi Dönitz, 1901
- ✓ maculatus Theobald, 1901
- minimus Theobald, 1901

Anopheles (Cellia) (cont.)

- ✓ pallidus Theobald, 1901
- philippinensis Ludlow, 1902
- ✓ ramsayi Covell, 1927
- 2 ✓ splendidus Koizumi, 1920
- ✓ subpictus Grassi, 1899
- ✓ sundaicus (Rodenwaldt), 1925
- ✓ tessellatus Theobald, 1901
- ✓ vagus Dönitz, 1902
- kichii

Toxorhynchites (Toxorhynchites)

- albipes (Edwards), 1922
- 1 ea ✓ kempi (Edwards), 1921
- 1 ea ✓ splendens (Wiedemann), 1819

Tripteroides (Tripteroides)

- powelli (Ludlow), 1903
- proximus (Edwards), 1915
- similis (Leicester), 1908

Tripteroides (Rachionotomyia)

- ✓ aranoides (Theobald), 1901 6♀ 3♂ skin

Malaya

- ✓ genurostris Leicester, 1908
- ✓ jacobsoni (Edwards), 1930

Topomyia

- ✓ gracilis Leicester, 1908 1♀ w/skin

Ficalbia (Ficalbia)

✓ minima (Theobald), 1901 w/skinner wavy

Ficalbia (Mimomyia)

✓ chamberlaini (Ludlow), 1904 58 spec. 56 w/sk.  
 ✓ hybrida (Leicester), 1908

Ficalbia (Etorleptomyia)

✓ luzonensis (Ludlow), 1905

Coquillettia (Coquillettia)

✓ crassipes (Van der Wulp), 1881  
 ✓ ochracea (Theobald), 1903

Mansonia (Mansonioides)

✓ annulifera (Theobald), 1901 112 spec 11 w/skinner  
 ✓ dives (Schiner), 1868  
 low ✓ indiana Edwards, 1930 3♀  
 ✓ uniformis (Theobald), 1901 3 w/skinner

Uranotaenia

annandalei Barraud, 1926  
bicolor Leicester, 1908  
bimaculata Leicester, 1908  
campestris Leicester, 1908  
 ✓ edwardsi Barraud, 1926 32♀ 4♂  
hongayi Galliard and Ngu, 1947  
 ✓ lateralis Ludlow, 1905 46 w/skinner

Uranotaenia (cont.)

luteola Edwards, 1934  
lutescens Leicester, 1908  
macfarlanei Edwards, 1914  
maculipleura Leicester, 1908  
maxima Leicester, 1908  
obscura Edwards, 1915  
recondita Edwards, 1922

Hodgesia

malayi Leicester, 1908

Orthopodomyia

albipes Leicester, 1904  
 loc ✓ andamanensis Barraud, 1934  
 ✓ anopheloides (Giles), 1903

Aedeomyia

✓ catasticta Knab, 1909 <sup>187</sup>

Heizmannia

11th. 2 species  
 ✓ complex (Theobald), 1910  
reidi Mattingly, 1957

Aedes (Mucidus)

laniger (Wiedemann), 1820

Aedes (Ochlerotatus)

vigilax (Skuse), 1889

Aedes (Finlaya)

- Togai 5♀/10 ♂/1 skin*  
*Apthousentaria 40♀/18 ♂/1 skin*  
*subnervosa 2♀*  
*albolineatus 64 ♀*
- alongi Galliard and Ngu, 1947
  - ✓ assamensis (Theobald), 1908
  - ✓ chrysolineatus (Theobald), 1907
  - elsiae (Barraud), 1923
  - feegradei Barraud, 1934
  - ✓ formosensis Yamada, 1921
  - gubernatoris (Giles), 1901
  - ? ✓ khazani Edwards, 1922 1♀
  - ✓ macfarlanei (Edwards), 1914
  - niveoides Barraud, 1934
  - niveus (Ludlow), 1903 *lionsa 51♀*
  - poicilius (Theobald), 1903
  - prominens (Barraud), 1923
  - pseudotaeniatus (Giles), 1901
  - saxicola Edwards, 1922
  - tonkinensis Galliard and Ngu, 1947

*harveyi 1♀ w/sk.*  
*moskwa 4♀ 7♀*

Aedes (Skusea)

- ✓ amesii (Ludlow), 1903

Aedes (Christophersiomyia)

- brayi Knight, 1947

Aedes (Rhinoskusea)

- longirostris (Leicester), 1908

Aedes (Stegomyia)

- ✓ aegypti (Linnaeus), 1762
- ✓ albolineatus (Theobald), 1904
- albopictus (Skuse), 1895

Aedes (Stegomyia) (cont.)

- albocinctus* 149 2<sup>nd</sup> n/skns,  
annandalei (Theobald), 1910  
desmotes (Giles), 1904  
edwardsi (Barraud), 1923  
indosinensis (Borel), 1928  
mediopunctatus perplexus (Leicester), 1908  
pseudoalbopictus (Borel), 1928  
subalbopictus Barraud, 1931  
✓ vittatus (Bigot), 1861

Aedes (Aedimorphus)

- low* ✓ alboscuteclatus (Theobald), 1905  
 ✓ caecus (Theobald), 1901  
 ✓ mediolineatus (Theobald), 1901  
niveoscutellum (Theobald), 1905  
taeniorhynchoides (Christophers), 1911  
*low* ✓ vexans (Meigen), 1830  
*vigela* 219 2<sup>nd</sup>

Aedes (Paraedes)

- ostentatio (Leicester), 1908

Aedes (Neomelanicion)

- imprimens (Walker), 1861  
 ✓ lineatopennis (Ludlow), 1905

Aedes (Aedes)

- andamanensis Edwards, 1922  
 ✓ dux Dyar and Shannon, 1925

Aedes (Verrallina)

- butleri Theobald, 1901

Armigeres (Armigeres)

- aureolineatus (Leicester), 1908
- durhami Edwards, 1917
- ✓ kuchingensis Edwards, 1915
- moultoni Edwards, 1914
- ✓ subalbatus (Coquillett), 1898
- dicholicephalus 1♀*

Armigeres (Leicesteria)

- ✓ annulitarsis (Leicester), 1908
- cingulatus (Leicester), 1908
- ✓ dolichocephalus (Leicester), 1908 1♀
- ✓ flavus (Leicester), 1908
- longipalpis (Leicester), 1904
- ✓ magnus (Theobald), 1908
- pectinatus (Edwards), 1914
- Unk. 74♀ 51♂ w/ Shani*

Culex (Lutzia)

- ✓ fuscus Wiedemann, 1820
- x ✓ halifaxii Theobald, 1903
- x ✓ raptor 2♀

Culex (Neoculex)

- ✓ brevipalpis (Giles), 1902

Culex (Mochthogenes)

- foliatus Brug, 1932
- khazani Edwards, 1922
- ✓ malayi (Leicester), 1908

Culex (Lophoceraomyia)

- ✓ bernardi (Borel), 1926
- ✓ cinctellus Edwards, 1922
- ✓ curtipalpis (Edwards), 1914
- X ✓ infantulus Edwards, 1922
- X ✓ minor (Leicester), 1908
- X ✓ minutissimus (Theobald), 1907
- X ✓ quadripalpis (Edwards), 1914
- X ✓ rubithoracis (Leicester), 1908

Culex (Culiciomyia)

- fragilis Ludlow, 1903
- ✓ nigropunctatus Edwards, 1926
- X ✓ pallidothorax Theobald, 1905
- X ? ✓ viridiventer Giles, 1901 1915<sup>st</sup>

Culex (Culex) perplexus 29 w/skns,  
alienatus 29/107

- ✓ annulus Theobald, 1901
- ✓ bitaeniorhynchus Giles, 1901
- ✓ fuscocephala Theobald, 1907
- ✓ gelidus Theobald, 1901
- hutchinsoni Barraud, 1924
- mimeticus Noe, 1899
- X ✓ mimulus Edwards, 1915
- ✓ pipiens quinquefasciatus Say, 1823
- ✓ pseudosinensis Colless, 1955
- ✓ pseudovishnui Colless, 1957
- ✓ sinensis Theobald, 1903
- ✓ sitiens Wiedemann, 1828
- ✓ tritaeniorhynchus (sensu lat.) Giles, 1901
- vagans Wiedemann, 1828
- vishnui Theobald, 1901
- whitei Barraud, 1923
- ✓ whitmorei (Giles), 1904

*Anopheles*  
*Gulf* } *best*

*since 1965*  
*Mac*

KEY TO GENERA  
ADULT FEMALES

1. Posterior margin of scutellum evenly rounded, the  
marginal setae rather evenly spaced----- 2  
Posterior margin of scutellum trilobed, the marginal  
setae in three groups ----- 3
- 2(1). Abdominal terga heavily scaled; proboscis with apical half  
bent sharply downward and backward and conspicuously  
more slender than basal half ----- Toxorhynchites (p.69)  
Abdominal terga II-VI with few or no scales; proboscis  
not sharply bent downward and backward-----  
Anopheles (p.15)
- 3(1). Spiracular bristles or scales present----- 4  
Spiracular bristles or scales absent----- 6
- 4(3). Proboscis with long hairs; apical part swollen and bent  
upward (figure 7)-----Malaya (p.71)  
Proboscis without long hairs; apical part not swollen and  
bent upward----- 5
- 5(4). Upper calypter without hairs or scales; vein 1A reaching  
wing margin near level of junction of Cu<sub>1</sub> and Cu<sub>2</sub>-----  
Topomyia (one species, gracilis)  
Upper calypter with a fringe of hairs; vein 1A ending well  
beyond junction of Cu<sub>1</sub> and Cu<sub>2</sub>-----Tripteroides (p.70)
- 6(3). Vein 1A short, reaching wing margin before or at about  
level of junction of Cu<sub>1</sub> and Cu<sub>2</sub>----- 7  
Vein 1A longer, reaching wing margin beyond level of  
junction of Cu<sub>1</sub> and Cu<sub>2</sub>----- 8
- 7(6). Dorsal plume scales of wing narrow, forked apically  
(figure 10); microtrichia present-----  
Hodgesia (one species, malayi)

- Dorsal plume scales not forked; microtrichia absent-----  
Uranotaenia (p.77 )
- 8(6). Middle and hind femur with distinct tufts of scales at  
apices (figure 8); last two flagellomeres relatively  
short and thick (figure 9)-----  
Aedeomyia (one species, catasticta)  
Middle and hind femur without distinct tufts of scales at  
apices; flagellomeres not short nor thick----- 9
- 9(8). Postspiracular bristles absent----- 10  
Postspiracular bristles present----- 15
- 10(9). Postnotum with a median group of setae; anterior pronotal  
lobes enlarged and nearly touching behind head-----  
Heizmannia (p.83 )  
Postnotum rarely with a median group of setae; anterior  
pronotal lobes of normal size and widely separated---- 11
- 11(10). Proboscis more or less distinctly broadened distally,  
usually bent upward -----Ficalbia (p.72 )  
Proboscis not broadened distally although the apex may be  
laterally compressed, usually straight or downcurved-- 12
- 12(11). First fore tarsomere longer than the last four combined;  
fourth tarsomere about as long as wide-----  
Orthopodomyia (p.82 )  
First fore tarsomere shorter than last four combined;  
fourth tarsomere longer than wide----- 13
- 13(12). Claws of hind leg very small and inconspicuous; pulvilli  
present on all legs (figure 11) ----- Culex (p.33 )  
Claws of hind leg quite large and conspicuous; pulvilli  
absent ----- 14
- 14(13). Palpus long, nearly half the length of proboscis or more;  
postspiracular area covered with broad flat scales-----  
Armigeres (Leicesteria) (p.84 )  
Palpus shorter; postspiracular area bare-----  
Coquillettidia (p.74 )

- 15(9). Dorsal wing scales very numerous, all broad and strongly asymmetrical (figure 12) ----- Mansonia (p.75 )  
Wing scales not unusually broad or if broad not asymmetrical-----16
- 16(15). Proboscis somewhat laterally compressed and curved downward (figure 13)---- Armigeres (Armigeres) (p.84 )  
Proboscis not curved downward, or if slightly so not laterally compressed-----Aedes (p.50 )

KEY TO GENERA  
LARVAE

1. Siphon not developed-----Anopheles (p.20)  
Siphon distinct----- 2
- 2(1). Median dorsal valve of siphon very long, fixed, and with  
serrate dorsal margin (figure 21)----- 3  
Median dorsal valve of siphon short, movable, and never  
with serrated inner dorsal margin----- 4
- 3(2). Antenna about as long as width of head; anal segment with  
several multiple hairs midventrally ----Mansonia (p.75)  
Antenna very long, at least one and a half times width of  
head; anal segment with a single hair or none mid-  
ventrally----- Coquillettidia (p.74)
- 4(2). Siphon with more than one pair of ventrolateral hairs, and  
sometimes with additional dorsolateral hairs; if these  
are short and difficult to see, then siphon very long ----5  
Siphon with a single pair of subventral hairs; if indistinct  
the siphon only moderately long -----8
- 5(4). Siphon always with a distinct attached acus at base; pro-  
thoracic hair 13-P always absent ----- Culex (p.39)  
Siphon without acus; prothoracic hair 13-P always  
developed----- 6
- 6(5). Metathorax without a prominent spine arising from  
sclerotized base; prothoracic hairs 5-P and 6-P very  
large and multiple -----7  
Metathorax with a prominent spine arising from sclerotized  
base (figure 22); prothoracic hairs 5-P and 6-P single  
or 5-P with a few branches -----Tripteroides (p.70)
- 7(6). Sclerotized area at base of each thoracic pleural group of

- setae with spine as long as width of sclerotized area (figure 23) ----- Topomyia (one species, gracilis)  
 Base of each thoracic pleural hair group with spine very much smaller or absent ----- Malaya (p. 71)
- 8(4). Abdominal hairs in groups of 3 to 5 on large, common sclerotized plates; mouthbrushes reduced to about 10 broad, flat, simple filaments ---- Toxorhynchites (p. 69)  
 Abdominal hairs arising separately and without strong basal sclerotizations ----- 9
- 9(8). Abdominal segments VII and VIII each with a large sclerotized plate covering most of segments; comb of alternating large and small teeth-- Orthopodomyia (p. 82)  
 Abdominal segments VII and VIII not with large sclerotized plates; comb not of alternating large and small teeth-----10
- 10(9). Antenna greatly swollen to base of terminal hairs 2-4-----  
Aedeomyia (one species, catasticta)  
 Antenna never greatly swollen and never beyond antennal hair 1----- 11
- 11(10). Subventral hair of siphon in basal tenth -----  
Hodgesia (one species, malayi) \*  
 Subventral hair of siphon usually beyond basal third, never in basal tenth ----- 12
- 12(11). Maxillary suture of head capsule at most barely indicated on anterior margin, never reaching posterior tentorial pits -----13  
 Maxillary suture of head capsule always complete and reaching posterior tentorial pits (figure 17) ----- 14
- 13(12). Labial plate of head long; head more or less elongate, the antenna shorter than head capsule --- Uranotaenia (p. 79)  
 Labial plate of head very short; head wide, the antenna always longer than head capsule ----- Ficalbia (p. 72)

\* Ficalbia minima would also run down here but differs by having only two simple pecten teeth. Hodgesia malayi has twelve finely fringed pecten teeth.

- 14(12). Siphon without pecten teeth ----- Armigeres (p.86)  
Siphon with pecten teeth ----- 15
- 15(14). Head hair 5 with at least 3 branches, 4 very large and  
multibranched with swollen base, 6 usually bifid and  
with very unequal branches or long and stout, and / or  
comb often composed of mixed pointed and rounded  
scales ----- Heizmannia (p.83)  
Not with this combination of characters ----- Aedes (p.56)



- 8(6). Palpus all dark----- 9  
 Palpus with some white scales ----- 12
- 9(8). Abdomen with ventrolateral scale tufts on segment VII---- 10  
 Abdomen without ventrolateral scale tufts on segment VII--  
umbrosus
- 10(9). Fringe spot at vein R<sub>4+5</sub> wide, reaching to vein M<sub>1+2</sub>-----  
barbumbrosus  
 Fringe spot at vein R<sub>4+5</sub> narrow, not reaching to vein  
 M<sub>1+2</sub>-----11
- 11(10). More than half the scales between the basal dark spot on  
 vein Cu and the apical dark spot on vein Cu<sub>2</sub> black-- ---  
campestris  
 Fewer than half these scales black-----barbirostris
- 12(8). Basal quarter of vein C almost entirely pale --gigas baileyi  
 Basal quarter of vein C mainly dark, although scattered  
 pale scales may be present ----- 13
- 13(12). Abdomen without ventrolateral scale tuft on segment VII---  
separatus  
 Abdomen with ventrolateral scale tuft on segment VII-----14
- 14(13). Pale bands on hind tarsus narrow, fourth tarsomere without  
 basal pale band-----15  
 Pale bands on hind tarsus moderately broad to very broad,  
 fourth tarsomere with basal pale band----- 16
- 15(14). Apical fringe spot very short (from R<sub>1</sub> to R<sub>2</sub>), basal dark  
 mark on Cu fairly long, approaching to within its own  
 length or less than the upper mark on 1A ----- lesteri  
 Apical fringe spot longer (from R<sub>1</sub> to R<sub>4+5</sub> or longer),  
 basal dark mark on Cu shorter, separated by its own  
 length or more from upper dark mark on 1A--- sinensis
- 16(14). Wing pattern bright, basal half of costa with pale scales,  
 basal dark mark on Cu separated by its own length or  
 more from upper dark mark on 1A ----- indiensis

- Wing pattern blurred, darker. Basal dark mark on Cu  
 approaching to within its own length of upper mark on  
 1A -----17
- 17(16). Third hind tarsal pale band shorter than fifth tarsomere,  
 mid tarsal bands short (figure 15), no pale scales on  
 R<sub>1</sub> between subcostal and preapical pale spots-----  
nigerrimus  
 Third hind tarsal pale band longer than fifth tarsomere,  
 mid-tarsal bands wide; scattered pale scales usually  
 numerous on R<sub>1</sub> between subcostal and preapical pale  
 spots -----peditaeniatus
- 18(1). Femora and tibiae speckled with patches of pale scales----19  
 Femora and tibiae not speckled -----26
- 19(17). Hind tarsomeres 5, 4, 3, and apex of 2 all white ----- 20  
 Hind tarsomeres 5, 4, 3, and apex of 2 not all white ----- 22
- 20(19). Palpus with 2 broad apical white bands, palpal segments  
 2 and 3 speckled ----- splendidus  
 Palpus with 1 broad apical white band and 1 narrow band,  
 segments 2 and 3 not speckled ----- 21
- 21(20). Golden scales on abdominal terga VI-VIII ----- jamesii  
 No golden scales on abdominal terga VI-VIII ----- ramsayi
- 22(19). Palpus with three or less white bands ----- 23  
 Palpus with four or more white bands -----24
- 23(22). Palpus with apical and subapical white bands approximately  
 equal ----- maculatus  
 Palpus with apical white band at least twice the length of  
 the subapical white band ----- sundaicus
- 24(22). Tibio-tarsal joint of hind leg with large conspicuous white  
 band ----- balabacensis  
 Tibio-tarsal joint of hind leg without large conspicuous  
 white band ----- 25

- 25(24). Abdominal segments with a row of conspicuous ventro-lateral scale tufts. Palpus with four pale bands and additional indistinct yellowish bands ----- kochi  
 Abdominal segments without ventrolateral scale tufts.  
 Palpus with four pale bands----- tessellatus
- 26(18). Hind tarsus entirely dark; or with minute pale rings at joints, no longer than wide ----- 27  
 Hind tarsus with distinct white bands, much longer than wide ----- 32
- 27(26). Hind tarsus with minute apical bands of white scales ----- 28  
 Hind tarsus entirely dark, although the sutures may appear light ----- 29
- 28(27). Apical palpal pale band as long as or shorter than preapical dark band ----- jeyporiensis jeyporiensis  
 Apical pale palpal band much longer than preapical dark band ----- jeyporiensis candidiensis
- 29(27). Palpus with apical pale band as long as or longer than preapical dark band ----- 30  
 Palpus with apical pale band shorter than preapical dark band ----- 31
- 30(29). Apical half of proboscis flavescens dorsally; fringe spot at apex of vein 1A ----- aconitus  
 Apical half of proboscis dark dorsally; no fringe spot at apex of vein 1A ----- minimus
- 31(29). Vein R<sub>4+5</sub> dark for nearly entire length, small white spot near origin ----- culicifacies  
 Vein R<sub>4+5</sub> with long white area reaching from middle almost to apex ----- fluviatilis
- 32(26). Last hind tarsomere entirely white ----- 33  
 Last hind tarsomere not entirely white ----- 36
- 33(32). Hind tarsomere 4 entirely white ----- 34

- Hind tarsomere 4 with central dark band----- karwari
- 34(33). Vein Cu<sub>1</sub> with a dark area at base----- annularis  
 Vein Cu<sub>1</sub> with a pale area at base-----35
- 35(34). Abdomen without pale scales, or with a few pale scales on  
 apical segments ----- philippinensis  
 Abdomen with numerous scattered pale scales on most  
 segments -----pallidus
- 36(32). Apical pale band of palpus at best three times longer than  
 preapical dark band. Proboscis with pale spot toward  
 extremity. Presector dark spot on vein R<sub>1</sub> usually less  
 than half as long as that on C, sometimes absent--vagus  
 Apical pale band of palpus not more than two and one-half  
 times as long as preapical dark band. Proboscis  
 uniformly dark. Presector dark spot on vein R<sub>1</sub>  
 usually more than half the length of that on vein C-----  
subpictus

KEY TO ANOPHELES LARVAE

1. Distance between the bases of head hairs 2 not more, usually much less, than the distance between head hairs 2 and 3 on one side (A. alongensis is an exception, but head hairs 5, 6, and 7 are all very small, the tips well behind base of head hair 4) (Subgenus Anopheles)-----2
- Distance between the bases of head hairs 2 much more than the distance between the bases of head hairs 2 and 3 on one side; head hairs 5, 6, and 7 reaching almost to or beyond base of head hair 4 (Subgenus Cellia)-----19
- 2(1). Antennal hair 1 arising from the dorso-external surface of the antenna -----3
- Antennal hair 1 arising from the dorso-internal surface of the antenna -----5
- 3(2). Head hairs 5, 6, and 7 all short, poorly developed, and sparsely branched ----- 4
- Head hair 5 fairly long, simple, or split at outer 2/3-----  
annandalei interruptus
- 4(3). Integument covered dorsally with numerous spicules and setae ----- sintonoides
- Integument smooth, without conspicuous spicules-----  
alongensis
- 5(2). Antennal hair 1 arising from dorsal surface on basal 1/3 of antenna ----- 6
- Antennal hair 1 arising from inner surface on middle 1/3 of antenna ----- 9
- 6(5). Distance between bases of head hairs 2 about the same as between head hairs 2 and 3 on one side ----- bengalensis
- Bases of head hairs 2 close together, nearly touching----- 7
- 7(6). Abdominal hair 1-I palmate----- insulaeflorum

- Abdominal hair 1-I not palmate -----8
- 8(7). Abdominal hair 1-II palmate-----lindesayi  
 Abdominal hair 1-II not palmate -----gigas baileyi
- 9(5). Abdominal hair 1 palmate on five or more segments-----10  
 Abdominal hair 1 palmate on three or fewer segments-----17
- 10(9). Thoracic hair 1-P with branches arising from near base---11  
 Thoracic hair 1-P simple or with a few short branches near  
 tip----- 13
- 11(10). Head hair 3 with branches stiff, crowded, and forming a  
 broom-like tuft-----12  
 Head hair 3 with branches lax, not crowded, and spread-  
 ing----- barbumbrosus
- 12(11). Difference between the sum of the branches on both abdomi-  
 nal hairs 13-III and the sum of the branches on both  
 hairs 5-VII is ten or less ----- barbirostris  
 Difference between the sum of the branches on both abdomi-  
 nal hairs 13-III and the sum of the branches on both  
 hairs 5-VII is more than ten ----- campestris
- 13(10). Thoracic hair 4-M small, with horizontally spreading  
 branches ----- peditaeniatus  
 Thoracic hair 4-M not small, the branches straight, stiff,  
 and erect-----14
- 14(13). Palmate hairs large, leaflets pale basally and at tips;  
 spiracles large ----- 15  
 Palmate hairs small, pigment uniform; spiracles small--- 16
- 15(14). Head hair 8 with thirteen or fewer branches; abdominal  
 hairs 5-VI and 9-VI with six to eleven branches-sinensis  
 Head hair 8 with more than thirteen branches; abdominal  
 hairs 5-VI and 9-VI with two to five branches-----  
nigerrimus
- 16(14). Head hair 8 with eleven or more branches; pecten with six

- or fewer long teeth----- indiensis  
 Head hair 8 with less than eleven branches; pecten with  
 seven or more long teeth----- lesteri
- 17(9). Abdominal hair 1 palmate on at least segments IV and  
 V----- umbrosus  
 Abdomen without palmate hairs -----18
- 18(17). Tips of head hair 3 frayed into fine branches. Antennal  
 hair 1 with 13-21 branches----- baezai  
 Head hair 3 simple, antennal hair 1 with 25-36 branches---  
separatus
- 19(1). Anterior tergal plates on abdominal segments III-VII  
 large, enclosing small posterior plate-----20  
 Anterior tergal plates on abdominal segments III-VII small,  
 not enclosing small posterior plate----- 22
- 20(19). Head hairs 2 and 3 pectinate----- aconitus  
 Head hairs 2 and 3 simple----- 21
- 21(20). Abdominal hairs 0 on IV-VII very small, few or no  
 branches----- minimus  
 Abdominal hair 0 on IV-VII moderate in size, many  
 branches----- fluviatilis
- 22(19). Head hair 3 with long brush-like branches, often as long as  
 hair itself----- 23  
 Head hair 3 simple or with short side hairs never more than  
 1/4 the length of hair----- 26
- 23(22). Head hair 8 simple or bifurcate near tip----- 24  
 Head hair 8 split near base into two to eight branches-----25
- 24(23). Abdominal hair 1-I distinctly palmate----- annularis  
 Abdominal hair 1-I not distinctly palmate----- jamesii
- 25(23). Head hair 4 with two to five branches; palmate hairs with

- filaments 1/2 or more the length of blade ----- pallidus  
 Head hair 4 with seven to ten branches; palmate hairs with  
 filaments about 1/4 the length of blade-----philippinensis
- 26(22). Head hair 3 simple or only inconspicuously frayed----- 27  
 Head hair 3 pectinate----- 34
- 27(26). Abdominal hair 1-I with distinct sharp, flattened leaflets---  
 28  
 Abdominal hair 1-I with branches filamentous or blunt ---- 31
- 28(27). Both thoracic hairs 9-T and 10-T pectinate ----- 29  
 Thoracic hairs 9-T and 10-T with one pectinate, the other  
 simple----- culicifacies
- 29(28). Head hair 3 about 1/3 length of head hair 2; base of head  
 hair 4 distinctly internal to base of hair 3----- vagus  
 Head hair 3 1/2 or more the length of head hair 2; base of  
 head hair 4 not internal to base of hair 3----- 30
- 30(29). Spiracular lobe hair 1 with four to six branches; thoracic  
 hair 4-M simple or bifurcate in distal 1/2 ---- subpictus  
 Spiracular lobe hair 1 with seven to eight branches;  
 thoracic hair 4-M split in basal 1/2 into two to four  
 branches ----- sundaicus
- 31(27). Abdominal hair 1-II palmate ----- 32  
 Abdominal hair 1-II not palmate ----- 33
- 32(31). Some of the pro- and mesothoracic hairs 9 and 10  
 feathered----- maculatus  
 All of the pro- and mesothoracic hairs 9 and 10 simple----  
kochi
- 33(31). Thoracic hair 1-P with more than four branches; arising  
 from a large conspicuous base with an apical tooth-  
 like process ----- balabacensis  
 Thoracic hair 1-P with two to four branches; arising from  
 an inconspicuous base ----- tessellatus

- 34(26). Both thoracic hairs 9-T and 10-T feathered-----35  
 Neither thoracic hair 9-T nor 10-T feathered----- 37
- 35(34). The shortest of thoracic hairs 9-P, 10-P, 11-P, and 12-P  
 stout, truncate, with a number of lateral spine-like  
 branches -----ramsayi  
 The shortest of thoracic hairs 9-P, 10-P, 11-P, and 12-P  
 not stout nor truncate, splits distally into two to four  
 branches----- 36
- 36(35). Head hair 8 with two to four branches from near base-----  
splendidus  
 Head hair 8 simple or bifurcate apically----- karwari
- 37(34). Head hair 2 with a large number of branches along the  
 whole length -----jeyporiensis jeyporiensis  
 Head hair 2 with a few stout branches-----  
jeyporiensis candidiensis

Larval Habitats of Anopheles Species

	Rice Paddy	Streams, Irrigation Ditches	Surface Pools, Ponds	Mountain Streams, Waterfalls	Rock Hole	Tree Hole	Marshes, Swamps	Brackish Water Ponds	Springs, Seepages	Wells, Barrow Pits	Footprint, Hoofprint	Nipah Swamp on Coast	Artificial Containers
<i>anopheles (Anopheles)</i>					(+)								
<i>alongensis</i>													
<i>annandalei</i>													
<i>interruptus</i>						(+)							
<i>baezai</i>								+					
<i>barbirostris</i>	#	+	+				+			+			+
<i>barbumbrosus</i>	+	+	#	+	+								
<i>bengalensis</i>		+		+	+				+				
<i>campestris</i>	#	+	+										



Larval Habitats of Anopheles Species

	Rice Paddy	Streams, Irrigation Ditches	Surface Pools, Ponds	Mountain Streams, Waterfalls	Rock Hole	Tree Hole	Marshes, Swamps	Brackish Water Ponds	Springs, Seepages	Wells, Barrow Pits	Footprint	Hoofprint	Nipah Swamp on Coast	Artificial Containers
<i>sinensis</i>	#	+	+				+							
<i>sintonoides</i>						(+)								
<i>umbrosus</i>			+	+										
<i>Anopheles (Cellia)</i>														
<i>aconitus</i>	#	+	+				+			+	+	+	+	
<i>annularis</i>	+	+	+			+				+				
<i>balabacensis</i>				+			+					+		
<i>culicifacies</i>	+	#	+							+				+
<i>fluviatilis</i>	+	#	+							+				+



Larval Habitats of Anopheles Species

	Rice Paddy	Streams, Irrigation Ditches	Surface Pools, Ponds	Mountain Streams, Waterfalls	Rock Hole	Tree Hole	Marshes, Swamps	Brackish Water Ponds	Springs, Seepages	Wells, Barrow Pits	Footprint, Hoofprint	Nipah Swamp on Coast	Artificial Containers
ramsayi		+					+			+			
splendidus		+							+	+			
subpictus	+	+	#				+	+	+	+	+	+	+
sundaicus								+		+	+	+	
tessellatus	#	+	+				+		+	+	+		
vagus	+	#	+		+		+			+	+		+

+ Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.

# Particularly favored larval habitat.

(+) Only larval habitat known.

### Anopheles Vectors of Malaria

A number of species of Anopheles have been implicated in the transmission of malaria in Vietnam, but much remains to be learned on this subject. Many of the older records refer only to Tonkin, now in North Vietnam. Also, many of the older records are difficult to evaluate because of the failure of the earlier workers to recognize the existence of species groups among the Anopheles they examined for malaria parasites. It is essential that the vector status of the Anopheles species now recognized in the Republic of Vietnam be determined as rapidly as possible, in as many types of habitat and terrain as possible. This can be accomplished best by dissection of female mosquitoes biting man and examination of their mid-guts and salivary glands for malaria parasites. The possible presence of non-human malaria in Vietnam and its transmission by anophelines must be remembered.

Three species are generally recognized as malaria vectors in Vietnam: Anopheles sundaicus, minimus and jeyporiensis. A number of other species have been found infected from time to time, but their importance is open to question, since almost any Anopheles species may occasionally be found infected in an endemic area if enough individuals are examined. Several species, however, are vectors in neighboring areas and may prove to be quite important in Vietnam when additional data become available. Chief among these is Anopheles balabacensis, a potent jungle vector of malaria elsewhere in South East Asia. Of somewhat less probable importance are Anopheles maculatus and A. sinensis. Some notes on the habits and distribution of these species are given below:

Anopheles minimus - This strongly anthropophilic species is an important vector of malaria in foothill agricultural areas in many countries in South East Asia. The larvae are generally found in irrigation ditches and similar habitats partially open to the sun. In unsprayed areas the females feed primarily indoors and rest in houses. In sprayed areas they may bite more freely outdoors and

also tend to rest in the vegetation. Man is the preferred host, but domestic animals are also attacked, especially in sprayed areas.

Anopheles jeyporiensis candidiensis - The larvae of this foothill and mountain species are found in similar habitats to those of An. minimus. The adults also attack man indoors, or out of doors in sprayed areas.

Anopheles sundaicus - Strictly a coastal species. The larvae are found in pools of brackish water with emergent vegetation, often in association with the larvae of An. subpictus, which they resemble very closely. The transitory nature of the larval habitats and the strong flight habits of the adults combine to make population levels of this species fluctuate markedly. This is also true of the level of malaria in the populations in coastal areas where this species is the vector. They are extremely voracious feeders on man chiefly indoors, and on domestic animals.

Anopheles balabacensis - The importance of this species as a malaria vector in South East Asia has become increasingly clear in recent years. It is characteristic of the primary forest, or marginal recently cleared areas. The larvae are found in footprints or small pools in the jungle and similar habitats. The adults feed preferentially on man and other primates, usually outdoors, but they will also enter houses to feed. The species may occur in coastal areas where forest covered hills approach the shore, but it is more typical of upland hill forest.

Anopheles sinensis - Has been implicated as a malaria vector in delta or lowland rice growing areas of South East Asia. Most malaria transmission in South East Asia is either associated with foothill or mountainous areas, or with the coastal strip. However, a small number of cases, with sporadic epidemics, are found in the rice-growing regions. An. sinensis is suspected in such areas

and positive dissections have been reported in Vietnam. However, several other species have been confused under this name in the past (nigerrimus, peditaeniatus, lesteri and others) and it is impossible to evaluate the situation at present. Members of the species complex feed primarily on domestic animals, but may attack man heavily at times. The larvae are found most abundantly in rice fields, particularly after the ripening of the grain when water surfaces and vegetation are at their maxima.

KEY TO CULEX ADULT FEMALES

1. Proboscis completely dark scaled----- 2  
 Proboscis ringed with a median band of pale scales----- 3
- 2(1). Acrostichal bristles well developed on the mesonotum  
 (figure 4)----- 3  
 Acrostichal bristles not developed except at extreme  
 anterior end and rarely weakly near prescutellar  
 space ----- 24
- 3(1, 2). From one to several lower mesepimeral bristles present  
 (figure 2)----- 4  
 No differentiated lower mesepimeral bristles; at most  
 a few to numerous short hairs at the middle  
 mesepimeron ----- 12
- 4(3). Four or more lower mesepimeral bristles present;  
 proboscis with a broad band of white scales (Lutzia)----5  
 Three or less lower mesepimeral bristles present;  
 proboscis unbanded -----6
- 5(4). Abdominal terga V through VIII entirely yellow scaled, or  
 with very broad apical bands; terga II through IV  
 entirely dark, or with very narrow apical bands-----  
 (Lutzia) fuscanus  
 Abdominal terga entirely dark, or all with pale apical  
 bands of approximately the same width----- halifaxii
- 6(4). Pleuron with distinct scale patches at least on upper and  
 lower sternopleuron and middle mesepimeron (figure  
 3) (Culex in part)----- 7  
 Pleuron without distinct scale patches -----10
- 7(6). Abdominal terga unbanded----- (Culex) fuscocephala  
 Abdominal terga with narrow, basal white bands-----8

- 8(7). Anterior surface of mid and hind femora with a distinct longitudinal stripe of white scales (in the mid-femur this stripe is central and bounded on either side by dark scales; in the hind-femur this stripe completely covers the lower half) ----- vagans  
 Anterior surface of mid and hind femora usually unicolorous, without a narrow longitudinal stripe of white scales ----- 9
- 9(8). Integument of pleuron with bare, blackish-brown areas present ----- hutchinsoni  
 Integument of pleuron generally uniformly colored ----- pipiens quinquefasciatus
- 10(6). Integument of pleuron with a dark spot occupying the larger part of the mesepimeron (figure 2) ----- (Mochthogenes) khazani  
 Integument of pleuron with a dark spot only across upper part of mesepimeron ----- 11
- 11(10). Decumbent scales of the occiput usually uniformly dark; anterior surface of hind femur pale; abdominal sterna dark ----- foliatus  
 Decumbent scales of the occiput usually light; anterior surface of hind femur dark; abdominal sterna pale ----- malayi
- 12(3). Proboscis entirely dark scaled ----- (Neoculex) brevipalpis  
 Proboscis with a distinct median pale band (Culex in part) ----- 13
- 13(12). Wing with two or more distinct patches of light scales on the costa and subcosta ----- 14  
 Wing without distinct patches of light scales on the costa and subcosta; white scales may, however, be interspersed with dark scales on many veins, but not in distinct patches ----- 15
- 14(13). First pale costal spot (at middle of wing) extending only on to subcosta ----- (Culex) mimeticus

First pale costal spot extending over vein R-----mimulus

- 15(13). Abdominal terga with white apical bands, with apical, lateral triangular patches and basal bands, or with several segments completely covered with pale scales----- 16  
 Abdominal terga with white basal bands; apical bands or patches not present, or at least not visible from above----- 18
- 16(15). Wing generally with numerous scattered pale scales; mesonotum without a distinct pattern of silvery scales----- bitaeniorhynchus  
 Wing with few or no pale scales; mesonotum with a distinct pattern of silvery scales----- 17
- 17(16). Apical pale abdominal bands with a straight anterior border; basal abdominal bands very narrow---- sinensis  
 Apical pale abdominal bands represented on the proximal terga by triangular lateral patches which may merge in the center; basal abdominal bands rather broad----- pseudosinensis
- 18(15). Mesonotum covered with a distinct, dense pattern of silver scales-----19  
 Mesonotum uniformly brown or with a pattern of golden scales----- 20
- 19(18). Mesonotum entirely silver scaled from front to the supra-alar area, the prescutellar area and scutellar lobes dark; basal abdominal bands reaching to the lateral edges of the terga-----gelidus  
 Mesonotal silver scaling continued posteriorly through the prescutellar space and onto the scutellum; basal abdominal bands not reaching to the lateral edges of the terga and with a prominent median expansion----- whitmorei



- Mesonotal scaling sparse, rough in appearance; proboscis fairly thin ----- (Lophoceraomyia)\*
- 25(24). Abdominal terga entirely dark; pleuron uniform in color ----- (Culiciomyia) fragilis  
Abdominal terga with pale bands; integument of pleuron with dark markings ----- 26
- 26(25). Pleuron pale, with a distinct black spot on upper part of mesepimeron ----- nigropunctatus  
Pleuron with a brown stripe across upper part ----- pallidothorax

Culex (Culex) vishnui, Culex (Lophoceraomyia) bernardi, Culex (Lophoceraomyia) minutissimus, and Culex (Culiciomyia) viridiventer are not included in the key because of lack of suitable material.

\*Separation of species based on females of the subgenus Lophoceraomyia is not reliable at the present time. The following diagnostic adult characters for species in the subgenus apply only to the male.

1. Phallosome with both an inner division and a spinose or toothed outer division (figure 30); torus of antenna with a distinct prominence or protuberance on the inner surface ----- 2
- Phallosome with a pointed, toothless outer division only; torus of antenna without a distinct prominence or protuberance ----- 3

- 2(1). Apex of distimere noticeably expanded; basimere without long prominent submarginal setae----- curtipalpis  
 Apex of distimere evenly tapered; basimere with long prominent submarginal setae ----- minor
- 3(1). Abdominal terga with well marked basal white bands; basimere with the prominent submarginal setae in a patch ----- cinctellus  
 Abdominal terga without white bands; basimere with the prominent submarginal setae in a line ----- 4
- 4(3). Outer division of the phallosome with reticular markings on the entire surface; submarginal setae fine; flagellomeres 6 and 7 without tufts of scales or specialized setae ----- infantulus  
 Outer division of phallosome smooth; submarginal setae prominent; flagellomeres 6 and 7 with tufts of scales or specialized setae ----- 5
- 5(4). Mesonotal integument often with a reddish tint; lower mesepimeral bristle absent; flagellomere 6 with a rather inconspicuous tuft of narrow, tapering, pointed scales ----- rubithoracis  
 Mesonotal integument not as above; lower mesepimeral bristle present; flagellomere 6 with a conspicuous tuft of broad scales ----- quadripalpis

KEY TO CULEX LARVAE

1. Labrum produced in front; mouthbrushes thickened,  
 inserted in a compact group (figure 24); pecten  
 extending nearly the length of the siphon -----  
(Lutzia) fuscanus  
halifaxii
- Labrum not usually produced in front; mouthbrushes  
 normal; pecten restricted to the basal half of the  
 siphon or less-----2
- 2(1). Ventral brush consisting of eight hair tufts inserted on  
 the grid; head hair 1 fine and filamentous and thoracic  
 hair 3-P much thinner than 1-P and usually about half  
 its length or if head hair 1 stout, thoracic hairs 1-P  
 bifid and 3-P with two or more branches  
(Culiciomyia)----- 3
- Ventral brush consisting of ten or more hair tufts inserted  
 on the grid; head hair 1 generally robust and tapering  
 gradually to a bluntly rounded point; if head hair 1 is  
 filamentous, then thoracic hairs 1-P and 3-P single  
 and of the same order of magnitude and thickness----- 6
- 3(2). Siphon with a "false joint" beyond the middle due to lack  
 of sclerotization in an irregular ring-----  
(Culiciomyia) nigropunctatus
- Siphon without a "false joint" beyond the middle----- 4
- 4(3). Head hair 5-C seven branched, 6-C eight branched-----  
fragilis
- Head hairs 5-C and 6-C three or four branched----- 5
- 5(4). Siphonal index approximately 4:1; siphon greatly enlarged  
 medially; less than ten pecten teeth-----pallidothorax
- Siphonal index 5:1 or greater; siphon moderately enlarged  
 medially; more than ten pecten teeth-----viridiventer



- Siphonal index approximately 5:1; individual siphon tufts long; head hair 5-C six-branched, 6-C four-branched---  
vagans
- 13(10). Siphon with a strong, distinct subapical spine-- hutchinsoni  
Siphon without a subapical spine -----14
- 14(13). Head hair 1-C lightly pigmented, long, cylindrical; pecten inconspicuous, restricted to the basal 1/5 of the siphon or less ----- 15  
Head hair 1-C generally darkly pigmented, shorter; pecten obvious, extending through approximately the basal 1/3 of the siphon-----17
- 15(14). Distance between head hairs 1-C greater than the length of one of the hairs; lateral teeth of the mentum robust, distinctly separated -----sinensis  
Distance between head hairs 1-C less than the length of one of the hairs; lateral teeth of mentum extremely narrow and compact-----16
- 16(15). Individual comb scales elongated (length approximately eight times greater than the basal width); pecten consisting of approximately five to ten teeth-----  
bitaeniorhynchus  
Individual comb scales relatively short (length approximately three times greater than the basal width); pecten consisting of approximately ten to twelve teeth-----  
pseudosinensis
- 17(14). Comb consisting of approximately fifteen or less scales--- 18  
Comb consisting of approximately twenty or more scales-- 19
- 18(17). Siphonal index not more than 4:1; all siphonal tufts two branched, some pectinate----- whitmorei  
Siphonal index not less than 5:1; siphonal tufts two to four branched, simple----- pseudovishnui
- 19(17). Siphonal tufts inserted in a line on the siphon -----gelidus

- One or more pairs of siphonal tufts inserted out of line  
on the siphon ----- 20
- 20(19). Head hair 1 flattened, broad, its apex rounded or irregular;  
anal gills bulbous, not as long as the anal saddle -----  
sitiens  
Head hair 1 slender or moderately thickened, its apex  
acuminate; anal gills elongate, at least as long as the  
anal saddle ----- 21
- 21(20). At least some of the individual comb scales with the  
median distal spine somewhat longer and broader than  
the lateral spicules ----- 22  
Individual comb scales fan-shaped, fringed with subequal  
spicules ----- 24
- 22(21). Thoracic hair 4-P single; subventral siphonal hairs in ir-  
regular pairs or in a zigzag row----- mimeticus  
Thoracic hair 4-P double; subventral siphonal hairs in  
regular pairs ----- 23
- 23(22). Individual siphonal tufts two to four branched; the length of  
the individual siphonal tufts less than the width of the  
siphon at the point of insertion; thorax glabrous--- whitei  
Individual siphonal tufts multiple; the length of the  
individual siphonal tufts greater than the width of the  
siphon at the point of insertion; thorax minutely spicu-  
lose ----- annulus
- 24(21). Thoracic hair 4-P double; thoracic hair 2-M dendritic;  
head hair 4-C usually single, simple-----  
tritaeniorhynchus (sensu lat.)  
Thoracic hair 4-P single; thoracic hair 2-M single, simple;  
head hair 4-C usually double, simple ----- mimulus
- 25(9). Head hairs 16-C and 17-C absent ----- 26  
Head hairs 16-C and 17-C developed as rather long,  
slender spicules (Lophoceraomyia in part) ----- 27

- 26(25). Siphon index ranging from 7:1 to 15:1; antennal tuft  
(hair 1) multiple, the antennal shaft constricted beyond  
the insertion of the tuft----- (Neoculex) brevipalpis  
Siphon very short, its length less than that of the saddle;  
antennal tuft small, consisting of 2 or 3 branches,  
the antennal shaft not constricted beyond the insertion  
of the tuft----- (Lophoceraomyia) curtipalpis
- 27(25). Head hairs 4-C very long, distinctly longer than the  
distance between their bases; hair 2 of abdominal seg-  
ment VIII single----- minor  
Head hairs 4-C relatively short, shorter than the distance  
between their bases; hair 2 of abdominal segment VIII  
bifid (except in C. infantulus)-----28
- 28(27). Head hairs 5, 6-C generally with four to eight branches---  
cinctellus  
Head hairs 5, 6-C generally with three or less branches-- 29
- 29(28). Thoracic integument spiculose; thoracic hair 3-P  
multiple-----rubithoracis  
Thoracic integument glabrous; thoracic hair 3-P single or  
double-----30
- 30(29). Thoracic hair 4-P single----- quadripalpis  
Thoracic hair 4-P branched-----31
- 31(30). Siphon generally with a well marked dark median band  
which is as dark as the basal ring----- minutissimus  
Siphon usually either without a band or with a faintly  
visible median band which is paler than the basal  
ring----- infantulus

Culex (Culex) vishnui and Culex (Lophoceraomyia) bernardi  
are not included in the key because of lack of suitable material.







Larval Habitats of Culex Species

	Rice Paddy	Stream Pools, Irrigation Ditches	Surface Pools, Ponds	Rock Holes, Pools	Tree Holes	Marshes, Swamps	Brackish Waterpools	Springs, Seepages	Wells, Barrow Pits	Artificial Containers	Footprint, Hoofprint	Bamboo Internodes, Stumps	Polluted Catchments
<i>fuscocephala</i>	+		#						+				+
<i>gelidus</i>	+	+	#							+			
<i>hutchinsoni</i>		+	#	+							+		
<i>mimeticus</i>		+	#										
<i>mimulus</i>		+	#	+		+					+		+
<i>pipiens</i>													
<i>quinquefasciatus</i>			+						+	+			#
<i>pseudosinensis</i>		(+)								+			
<i>pseudovishnui</i>	+	+	#						+				
<i>sinensis</i>	+	+	#										

Larval Habitats of Culex Species

	Rice Paddy	Stream Pools, Irrigation Ditches	Surface Pools, Ponds	Rock Holes, Pools	Tree Holes	Marshes, Swamps	Brackish Waterpools	Springs, Seepages	Wells, Barrow Pits	Artificial Containers	Footprint, Hoofprint	Bamboo Internodes, Stumps	Polluted Catchments
sitiens							#			+			
tritaeniorhynchus	+	+	#			+		+	+				
vagans		+	#						+				
vishnui	+	+	+						+				
whitei		+	#						+				
whitmorei	+	+	+										

. Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.

† Particularly favored larval habitat.

+ ) Only larval habitat known.

### Culex of Medical Importance

Within the genus Culex, only three species are presently recognized as established vectors of disease organisms in South East Asia. C. (Culex) tritaeniorhynchus (sensu lat.) and C. (Culex) gelidus are important vectors of Japanese B encephalitis, and C. pipiens quinquefasciatus is the most important vector of bancroftian filariasis wherever the disease occurs. Several other species of the genus have been incriminated as disease vectors, but their efficiency as natural vectors is either insignificant or has not been adequately studied to permit definite conclusions. Included among these are C. (Lutzia) fuscans from which Brugia malayi has been isolated; C. (Culiciomyia) spathifurca and C. (Culiciomyia) pallidothorax which have been experimentally infected with Wuchereria bancrofti; C. (Culex) bitaeniorhynchus, a suspected vector of the encephalitides and Wuchereria bancrofti; and C. (Culex) pipiens quinquefasciatus from which has been isolated chichungunya and eastern equine encephalitis viruses in Thailand. Bakau, Ketapang, and Bebaru viruses have been isolated from species of the subgenus Lophoceraomyia but little is known about the ecology of either the vectors or the viruses.

C. tritaeniorhynchus (sensu lat.), gelidus, and pipiens quinquefasciatus are all probably distributed throughout Vietnam and each is capable of maintaining high population densities. Larvae of tritaeniorhynchus (sensu lat.) are found in a variety of temporary and semipermanent ground water habitats and almost any sunlit permanent freshwater pond, containing some vegetation is particularly favorable. Adults feed primarily on cow and pig, but will feed on man in the absence of cattle; in the presence of cattle, man is apparently almost completely ignored. Larvae of gelidus may be found in habitats similar to those of tritaeniorhynchus (sensu lat.). Adults commonly feed on large domestic animals, but will also feed on man in the absence of a suitable host. Larvae of pipiens quinquefasciatus are generally found in highly polluted waters, particularly in urban environments. Adults feed on a variety of hosts but will readily attack man both in and out of doors.



- Paratergite usually with scales; lower mesepimeral bristles present or absent; legs speckled or banded; claws toothed or simple-----10
- 9(8). Pleuron bare except for a small patch of scales on lower sternopleuron; alula with fringe of narrow scales; first hind tarsomere as long as or longer than tibia-----  
 (Rhinoskusea) longirostris  
 Pleuron with patches of broad scales; alula with broad scales in addition to fringe scales; first hind tarsomere shorter than tibia -----(Skusea) amesii
- 10(8). Wing membrane darkened around cross veins and base of R<sub>2+3</sub>; scutellum with tufts of twisted, white sub-erect scales; 8-10 lower mesepimeral bristles present-----  
 (Mucidus) laniger  
 Wing membrane and scutellar scales not as above; no lower mesepimeral bristles except in (Stegomyia) vittatus and (Christophersiomyia) brayi ----- 11
- 11(10). At least one lower mesepimeral bristle present, and with broad white scale patch on most of upper 3/4 of mesepimeron -----(Christophersiomyia) brayi  
 No lower mesepimeral bristle (except in Stegomyia vittatus); often with well defined white or yellow markings on mesonotum ----- 12
- 12(11). All scales on vertex and scutellum broad and flat; mesonotum nearly always with marked pattern of dark and white scales; tarsi conspicuously banded; paratergite with scales (Stegomyia) ----- 13  
 Vertex and scutellum with either broad or narrow scales; mesonotum with golden scales, sometimes marked with pale or golden longitudinal lines -----(Finlaya), 21\*  
 (Aedimorphus), 33\*

\*The two subgenera may be separated on the basis of male characters as follows:

- Palpus always longer than proboscis, with numerous long hairs laterally and apically on distal portion of segment III and all along IV-V; genitalia with claspettes absent; aedeagus divided into 2 lateral plates, each bearing several teeth ----- (Aedimorphus)  
 Palpus from 3/4 the length of proboscis to exceeding it by the length of terminal segment, with only few hairs at apices of segments III-V; genitalia with claspettes present; aedeagus simple (figure 32)-----(Finlaya)

- 13(12). Mesonotum with lyre-shaped markings; clypeus with patches  
of white scales ----- (Stegomyia) aegypti  
Mesonotum marked otherwise; clypeus bare (except in  
vittatus)-----14
- 14(13). Tibiae with white bands near middle ----- 15  
Tibiae dark ----- 16
- 15(14). Mesonotum with 4-6 small, white spots; femur with pre-  
apical white bands; proboscis with scattered pale  
scales ----- vittatus  
Mesonotum with a pair of longitudinal white stripes on  
anterior half; femur with white bands; proboscis  
entirely dark ----- desmotes
- 16(14). Palp entirely dark; mesonotum with a short longitudinal  
white stripe in front; hind tarsomeres IV-V dark-----  
albolineatus  
Palp white tipped; mesonotal markings otherwise -----17
- 17(16). Mesonotum with a longitudinal white stripe for most of its  
length ----- 18  
Mesonotal markings not as above ----- 20
- 18(17). Abdominal terga with basal white bands and lateral white  
patches ----- 19  
Abdominal terga dark dorsally, with white basal lateral  
patches only ----- subalbopictus
- 19(18). Scutellum with white scales on midlobe, dark laterally;  
hind tarsomere III dark, IV-V white-----  
mediopunctatus perplexus  
Scutellar lobes all white scaled; hind tarsomeres III-IV  
white at basal 1/2, V all white ----- albopictus\*  
pseudoalbopictus\*

\*The males may be separated on the basis of genitalic characters  
as follows:

- Apical appendage of distimere subterminal-----  
pseudoalbopictus  
Apical appendage of distimere terminal ----- albopictus

- 20(17). Mesonotum with a large anterior white patch; scutellar  
scales dark on mid lobe, white laterally ----- annandalei  
Mesonotum with a small round spot; scutellar lobes all  
white scaled ----- edwardsi
- 21(12). Wing spotted with pale and dark scales; femur and tibia  
spotted and banded with pale scales---(Finlaya) poicilius  
Not this combination of characters----- 22
- 22(21). Hind tarsomere entirely dark----- niveus\*  
niveoides\*  
Hind tarsomere with pale markings----- 23
- 23(22). Mesonotal pattern usually consisting of narrow lines of  
white and yellow scales ----- 24  
Mesonotal pattern varied usually consisting of patches of  
white scales ----- 29
- 24(23). Femur with longitudinal white lines; also one or more of  
the tibiae lined anteriorly with pale scales ----- 25  
Femur and tibia otherwise ----- 28
- 25(24). Abdominal terga II-VI with a pair of pale spots; proboscis  
dark, middle half with pale scales beneath and sides,  
dark beneath for distal 1/4----- macfarlanei  
Abdominal terga II-VII with narrow pale basal bands,  
sometimes not visible dorsally ----- 26
- 26(25). Proboscis entirely dark----- saxicola  
Proboscis with pale scales ----- 27
- 27(26). Paratergite and sub-spiracular areas with broad white  
scales; prealar scale patch separated from upper  
sternopleural scale patch; proboscis with ventral and  
lateral pale scales but not dorsally----- formosensis

\*The males may be separated on the basis of characters of the  
genitalia as follows:

- Dorsal basal portion of basimere with a group of  
specialized scales ----- niveus  
Dorsal basal portion of basimere with a group of long  
setae ----- niveoides

- Paratergite and sub-spiracular areas bare; prealar scale patch continuous with upper sternopleural scale patch; proboscis with ventral pale area broadly produced onto dorsum ----- chrysolineatus
- 28(24). Mesonotal lines of white or creamy scales; proboscis dark, with some pale scales on upper surface on basal 1/4 ----- pseudotaeniatus  
 Mesonotal lines of yellowish scales; proboscis dark on upper surface, with pale scales at sides and middle ----- elsiae
- 29(23). Abdominal sterna with long, outstanding scale tufts----- 30  
 Abdominal sterna without outstanding scale tufts----- gubernatoris
- 30(29). Posterior pronotal area bare ----- khazani  
 Posterior pronotal area with white scale patch ----- 31
- 31(30). Scutellar scales mainly white ----- 32  
 Scutellar scales dark on all lobes ----- feegradei
- 32(31). Mesonotal white scales usually extending posteriorly to prescutellar area ----- assamensis  
 Mesonotal white scales confined to anterior half, or may extend to prescutellar area in male----- prominens
- 33(12). Hind tarsomere entirely dark; scutellar scales broad or narrow ----- 34  
 Hind tarsomere banded; scutellar scales mainly narrow--- 35
- 34(33). Wing with a white spot at base of costa; abdomen with lateral basal white patches on terga ----- (Aedimorphus)  
alboscutellatus  
 Wing dark; abdomen with yellowish stripes laterally; fore and mid tibiae almost all yellowish ----- niveoscutellum

- 35(33). Wing and femur speckled; mesonotum with numerous  
pale scales evenly distributed; scales on mid lobe of  
scutellum narrow-----taeniorhynchoides  
Wing not speckled; femur dark or with pale scales;  
scutellar scales narrow or lanceolate-----36
- 36(35). Femur speckled with pale scales anteriorly; scutellar  
scales golden, narrow and curved ----- vexans  
Femur dark anteriorly, pale beneath; scutellar scales  
whitish, mostly lanceolate and flat ----- caecus

The following four species are omitted because of lack of  
specimens:

Aedes (Aedimorphus) mediolineatus  
Aedes (Aedimorphus) alongi  
Aedes (Aedimorphus) tonkinensis  
Aedes (Stegomyia) indosinensis

KEY TO AEDES LARVAE

1. Abdominal segment VIII with a semicircular sclerotized plate on each side, from posterior margin of which the comb scales arise ----- 2  
 Abdominal segment VIII without lateral sclerotized plate ----- 4
- 2(1). Comb of three to five scales with strong basal lateral denticles; two to eight pecten teeth; ventral brush of eight single long hairs ----- (Stegomyia) desmotes  
 Comb of five scales without basal denticles ----- 3
- 3(2). Pecten teeth without denticles (Siphon hair tuft of two to three fine branches; anal hair 1 (lateral hair) of two subplumose branches — these characters are doubtful) ----- annandalei  
 Pecten teeth with lateral denticles (Siphonal hair tuft of three subplumose branches; anal hair 1 (lateral hair) of two simple branches — these characters doubtful and probably variable) ----- mediopunctatus
- 4(1). Thorax with two pairs of large, black spines on dorsum; comb scales in a patch ----- 5  
 Thorax without such spines ----- 6
- 5(4). Siphonal hair-tuft modified into a stout spinulose bristle which may be bifid ----- (Finlaya) elsiae  
 Siphonal hair-tuft of four subplumose branches ----- macfarlanei
- 6(4). Head hairs 4-6 placed well forward anterior to level of bases of antenna ----- pseudotaeniatus  
 Head hairs 4-6 mostly placed below level of bases of antenna ----- 7
- 7(6). Siphon with a ring of spines near apex and a median patch of similar spines on the anterior surface -----  
 (Aedimorphus) caecus

- Siphon without apical spines----- 8
- 8(7). Comb of five to nineteen large scales in a single, straight  
or irregular row, or more or less in two rows ----- 9  
Comb of twenty to seventy scales, usually small, arranged  
in several rows or more or less in a triangular  
patch ----- 21
- 9(8). Antennal shaft with fairly numerous spicules or spines;  
basal pecten teeth with lateral denticles-----10  
Antennal shaft smooth or with an occasional spicule-----15
- 10(9). The two or three distal pecten teeth more widely spaced  
than those near base, and usually larger than basal  
teeth -----11  
All pecten teeth evenly spaced and all about same size,  
those furthest from base being but little larger than  
remainder----- 14
- 11(10). Head hairs 6 and 5 both with several branches ----- 12  
Head hair 6 single, hair 5 single or double-----  
(Aedimorphus) vexans
- 12(11). All pecten teeth with lateral denticles, except most distal  
tooth in some individuals; head hair 7 with eight to  
thirteen branches, 6 with three to six, 5 with four to  
seven -----(Neomelaniconion) lineatopennis  
The most distal two or three pecten teeth without lateral  
denticles ----- 13
- 13(12). Anal hair 3 with three to five branches; mentum with  
twenty to twenty-four lateral teeth -----imprimens  
Anal hair 3 single; mentum with eleven to sixteen lateral  
teeth ----- (Aedimorphus) vexans
- 14(10). Comb of sixteen to nineteen scales, each with fringe from  
base to apex; siphonal index 2.5:1-----(Finlaya) niveus  
Comb of eight to twelve scales, each fringed not more  
than half-way from base to apex; siphonal index  
5:1 ----- niveoides

- 15(9). The most distal pecten tooth widely spaced from main rank and placed between hair tuft and apex of siphon ----- (Stegomyia) vittatus  
Pecten teeth all one rank, none widely separated, or if distal tooth somewhat separated, not so placed ----- 16
- 16(15). Ventral brush of ten tufts or less ----- 17  
Ventral brush of twelve to seventeen tufts ----- 20
- 17(16). Head hair 5 with four to twenty branches; head hair 12 with ten to twenty-five branches -----  
(Stegomyia) albolineatus  
Head hair 5 with one to two branches; head hair 12 with two to five branches ----- 18
- 18(17). Comb scales with prominent basal lateral spines; meso- and metathoracic pleural hair groups each with a strong curved basal spine ----- aegypti  
Comb scales without prominent basal lateral spines; spinulose at base; meso- and metathoracic pleural hair groups with weak basal spines ----- 19
- 19(18). Saddle minutely spinose along margin; about 8-16 pecten teeth with few strong denticles on one side at base only; 8-12 comb scales present ----- albopictus  
Saddle smooth; about 4-8 pecten teeth with small, fine lateral denticles; 6-8 comb scales ----- pseudalbopictus
- 20(16). Comb scales with complete apical fringe, no prominent terminal spine; abdominal hair 2-VIII with four to six branches ----- (Verrallina) butleri  
Comb scales with a distinct terminal spine; abdominal hair 2-VIII with one to three branches ----- (Aedes) dux
- 21(8). Head hairs 5, 6, and 7 simple, 4 minute, three to four branched, 5 moderately elongate; abdominal hair 3-VIII six to fourteen branched; siphonal tuft six to eight branched ----- (Finlaya) prominens  
Not as above ----- 22

- 22(21). Several of the distal pecten teeth simple, without lateral denticles or fringe, and usually larger than the basal teeth ----- 23  
 All pecten teeth with lateral denticles or fringed, and usually about same size (delicate ventral fringe difficult to see in amesii)----- 25
- 23(22). Thoracic hair 7-T with three to four strong almost spine-like and barbed branches; four to five single pecten teeth between hair tuft and apex of siphon -----saxicola  
 Thoracic hair 7-T not unusually developed; at most three single pecten teeth beyond tuft -----24
- 24(23). Pecten of sixteen to nineteen teeth, two simple ones beyond tuft; anal hair 1 (lateral hair) three to four branched -----chrysolineatus  
 Pecten of about ten teeth, one or two simple ones beyond tuft; anal hair 1 (lateral hair) single -----formosensis
- 25(22). Siphonal tuft near apical  $1/6$  of siphon and of three to four long branches; antennal tuft of four to seven branches -----(Rhinoskusea) longirostris  
 Siphonal tuft usually not more than  $2/3$  of length of siphon from base ----- 26
- 26(25). Pecten teeth about twelve or less, broad and fringed on one side (sometimes thirteen in (F.) poicilius), or long with very attenuate apex and toothed basally ----- 27  
 Pecten teeth nearly always more than twelve and not as above ----- 28
- 27(26). Comb scales about seventy, those in distal row much larger and with a pair of large lateral denticles near base, apical portion expanded, very pale and with a delicate fringe; abdominal hair 3-VIII with five subplumose branches -----(Finlaya) poicilius  
 Comb scales eighteen to twenty-eight in several rows, each with a delicate apical fringe without lateral denticles, apex attenuate; abdominal hair 3-VIII with twelve subplumose branches -----(Ochlerotatus) vigilax

- 28(26). Head hairs 4, 5, 6, and 7 all placed well forward; 7  
 anterior to base of antenna with eight to fourteen slightly  
 plumose branches, 6 about level of antennal base,  
 single, 5 double (rarely triple), 4 slightly posterior  
 to 5 and six to ten branched-----(Skusea) amesii  
 Head hairs not as above ----- 29
- 29(28). Head hairs 5 and 6 usually single and standing one in front  
 of the other -----30  
 Head hair 5 with three to four branches; 6 with two or four  
 branches, anterolaterad of 5; antennal tuft with seven  
 to nine plumose hairs---- (Aedimorphus) alboscuteUellatus
- 30(29). Head hair 1 comparatively stout and blunt apically----- 31  
 Head hair 1 inconspicuous, rather long and tapering to a  
 fine point; comb with thirty to forty scales, apically  
 blunt and ending in a number of teeth; pecten of fourteen  
 to seventeen teeth, each with two basal denticles, the  
 lower one may be quite small----(Finlaya) gubernatoris
- 31(30). Head hair 4 nearer to hair 5 than to hair 6 ----- 32  
 Head hairs 4, 5, and 6 nearly in a straight line and  
 separated by fairly even intervals; anal hair 2 of three  
 to six long fine branches----- feegradei
- 32(31). Anal hair 2 of about eight fairly long subequal branches----  
khazani  
 Anal hair 2 of two long branches ----- assamensis

Larvae of the following species are not known.

- A. (Mucidus) laniger  
A. (Christophersiomyia) brayi  
A. (Stegomyia) edwardsi  
A. (Stegomyia) indosinensis  
A. (Stegomyia) subalbopictus  
A. (Aedimorphus) niveoscutellum

- A. (Aedimorphus) taeniorhynchoides
- A. (Paraedes) ostentatio
- A. (Aedes) andamanensis

The following three species are omitted because of lack of detail in the original larval description and absence of specimens.

- A. (Finlaya) alongi
- A. (Finlaya) tonkinensis
- A. (Aedimorphus) mediolineatus



Larval Habitats of Aedes Species

Ground Pools,									
Puddles									
Leaf Axils									
Rock Pools	+								
Tree Holes,									
Stumps									
Bamboo Stumps									
Crab Holes									
Artificial Containers									
Marshy Ground Pools	+								
Brackish Pools,									
Mangrove Swamps	+								
Coconut Shells,									
Leaf Bases									+
Jungle Pools									

*Aedes (Ochlerotatus)*

*vigilax*

*Aedes (Rhinoskusea)*

*longirostris*

*Aedes (Skusea)*

*amesii*

*Aedes (Mucidus)*

*laniger*

(+)

Larval Habitats of Aedes Species

Ground Pools, Puddles	Leaf Axils	Rock Pools	Tree Holes, Stumps	Bamboo Stumps	Crab Holes	Artificial Containers	Marshy Ground Pools	Brackish Pools, Mangrove Swamps	Coconut Shells, Leaf Bases	Jungle Pools
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*Aedes* (*Christophersomyia*)

*brayi*

*Aedes* (*Stegomyia*)

*aegypti*

*vittatus*

*desmotes*

*albolineatus*

*subalbopictus*

*mediopunctatus*

*perplexus*

#

#

(+)

+

+

+

+

+

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+

Larval Habitats of Aedes Species

	Ground Pools, Puddles	Leaf Axils	Rock Pools	Tree Holes, Stumps	Bamboo Stumps	Crab Holes	Artificial Containers	Marshy Ground Pools	Brackish Pools, Mangrove Swamps	Coconut Shells, Leaf Bases	Jungle Pools
<i>albopictus</i>				+	+		+			+	
<i>pseudalbopictus</i>				+	+		+				
* <i>annandalei</i>											
* <i>edwardsi</i>											
<i>poicilius</i>		#									
<i>niveus</i>				+	+						
<i>niveoides</i>				+	#						
<i>gubernatoris</i>				#							
<i>assamensis</i>				(+)							



Larval Habitats of Aedes Species

	Ground Pools, Puddles	Leaf Axils	Rock Pools	Tree Holes, Stumps	Bamboo Stumps	Crab Holes	Artificial Containers	Marshy Ground Pools	Brackish Pools, Mangrove Swamps	Coconut Shells, Leaf Bases	Jungle Pools
albocutellum	#										
albocutellatus	+		+						+		#
taeniorhynchoides											#
vexans											
caecus											#

+ Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.

# Particularly favored larval habitat.

(+) Only larval habitat known.

\* Larval habitat unknown.

### Aedes of Medical Importance

The genus Aedes is of great importance because it includes vectors of yellow fever, dengue, the encephalitides and filariasis. Many species bite man readily, some during the day, others at night, and are among the worst pests of man. Strains of dengue and chikungunga viruses associated with epidemic hemorrhagic fevers of the Philippines and Thailand have been isolated from Aedes aegypti which is regarded as the natural vector in both countries. Aedes aegypti is found commonly breeding in a variety of artificial containers inside and outside houses in urban areas. Aedes albopictus is another proven vector of classical dengue. It is abundant in rural areas, often persistently biting man during the daytime, but occurs in comparatively low numbers in built-up areas. Aedes poicilius is the principal vector of bancroftian filariasis in the abaca growing areas of the Philippines. Adults bite severely at dusk and also during the daytime. They breed in water-filled axils of abaca, banana, aroid, taro, pandanus and pineapple plants. Aedes niveus is probably also a vector of bancroftian filariasis in the Philippines. It has been found naturally infected with mature third stage larvae of Wuchereria bancrofti. A. niveus is an out-of-door biter, and attacks man in the evening in banana groves, bamboo thickets and woods. Aedes vigilax in the Pacific is a potential vector of bancroftian filariasis, and potential vector in Fiji and neighboring islands. Also, the Murray valley encephalitis virus was isolated from this species in northern Queensland.

KEY TO TOXORHYNCHITES ADULT FEMALES

1. Tarsomeres 3 to 5 of all legs with white markings or  
entirely white ----- albipes  
One or more of tarsomeres 3-5 on fore or hind legs  
without white markings ----- 2
2. Abdominal segments VI-VIII with conspicuous lateral tufts  
of hairs ----- splendens  
Abdominal segments without conspicuous lateral tufts  
of hairs ----- kempi

KEY TO TOXORHYNCHITES LARVAE

1. Mesothoracic dorso-lateral plate divided ----- albipes  
Mesothoracic dorso-lateral plate not divided ----- 2
2. Dorsolateral plate on abdominal segment VII with two  
bristles and three hairs ----- splendens  
Dorsolateral plate on abdominal segment VII with one  
bristle and four hairs ----- kempi

Larval Habitats of Toxorhynchites Species

In containers, bamboo stumps, tree holes and similar situations.



KEY TO MALAYA ADULT FEMALES

Clypeus yellowish-white; a line of silvery scales between  
 eyes -----genurostris  
 Clypeus dark; without a line of silvery scales between  
 eyes -----jacobsoni

KEY TO MALAYA LARVAE

All head hairs single, stout; comb with sixteen to twenty  
 scales in 2 rows ----- jacobsoni  
 Some head hairs double or triple; comb scales numerous,  
 in 3 rows ----- genurostris

Larval Habitat of Malaya Species

Larvae only known to occur in the leaf axils of certain  
 plants.

KEY TO FICALBIA ADULT FEMALES

1. Cell R<sub>2</sub> only about half length of R<sub>2+3</sub>----- 2  
 Cell R<sub>2</sub> as long as or longer than R<sub>2+3</sub> ----- 3
- 2(1). Tarsi with yellow rings; hind tarsomere 5 entirely  
 yellow ----- (Mimomyia) chamberlaini  
 Tarsi not ringed; hind tarsomere 5 dark----- hybrida
- 3(1). Tarsi with extensive pale areas; wings heavily speckled---  
 (Etorleptiomyia) luzonensis  
 Tarsi dark except at joints; wings dark-- (Ficalbia) minima

KEY TO FICALBIA LARVAE

1. Pecten with one to three stout teeth; maxilla with a  
 strong, black apical spine ----- 2  
 Pecten absent; maxilla without apical spine-----  
 (Etorleptiomyia) luzonensis
- 2(1). Antennal hair 1 near middle; head hair 1 simple; siphonal  
 tuft near middle----- 3  
 Antennal hair 1 far beyond middle; head hair 1 barbed;  
 siphonal tuft near base ----- (Ficalbia) minima
- 3(2). Siphon very short, broad at base but very narrow at tip;  
 valves very small, without long hairs-----  
 (Mimomyia) hybrida  
 Siphon moderate in length, and with normal shape; valves  
 large, each with a long fine hair----- chamberlaini

Larval Habitats of Ficalbia Species

	Irrigation Ditches, Ponds, Water Tanks	Containers	Ground Pools with Pistia
<u>Ficalbia (Mimomyia)</u>			
chamberlainii	+		
hybrida			+
<u>Ficalbia (Etorleptomyia)</u>			
luzonensis	+	+	
<u>Ficalbia (Ficalbia)</u>			
minima			+

+ Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.

KEY TO COQUILLETTIDIA ADULT FEMALES

Wing scales mainly dark; purplish scales on first four  
 or five abdominal terga ----- crassipes  
 Wing scales all yellow; abdomen yellow scaled----ochracea

KEY TO COQUILLETTIDIA LARVAE

Comb scales long, slender, sharply pointed-----crassipes  
 Comb scales not so slender, pectinate apically--- ochracea

Larval Habitats of Coquillettidia Species

The larvae of crassipes have been found attached to aquatic  
 vegetation in open swamps and ochracea in Pandanus swamps.

KEY TO MANSONIA ADULT FEMALES

1. Mesonotum marked with distinct round spots of white  
scales ----- 2  
Mesonotum without distinct round white spots though there  
may be small indefinite white spots or patches-----3
- 2(1). Mesonotum marked with 4 or more distinct round white  
spots; broad white scales on mid lobe of scutellum-----  
annulifera  
Mesonotum marked with 2 or 3 round white spots; narrow  
scales on mid lobe of scutellum ----- dives
- 3(1). Mesonotum marked with a pair of sublateral greenish  
stripes on a brown background----- uniformis  
Mesonotum all brown with no greenish stripes; some  
white scales may form indistinct white patches-- indiana

KEY TO MANSONIA LARVAE.

1. Antenna with basal 1/3 brown----- annulifera  
Antenna with only distinct brown band at base and at  
insertion of antennal hair 1----- 2
- 2(1). Siphonal index at least 2:1-----indiana  
Siphonal index only about 1.6:1----- 3
- 3(2). Anal segment wider at apex than at base----- dives  
Anal segment about same width throughout----- uniformis

### Larval Habitats of Mansonia (Mansonioides) Species

With the exception of M. uniformis, which breeds in open swamps attached mainly to grasses, the rest are forest-swamp breeders and are to be found attached to rootlets.

### Mansonia (Mansonioides) of Medical Importance

The subgenus Mansonia (Mansonioides) includes some species which are well known as vectors of filariasis due to Brugia malayi in Malaya, India, Ceylon and the Philippines. These are Mansonia dives, M. bonneae, M. annulata and to a lesser degree, M. uniformis. The latter is also regarded as an important vector of periodic Wuchereria bancrofti in Indonesia.

These mosquitoes attack man readily shortly after dusk both indoors and out of doors.

KEY TO URANOTAENIA ADULT FEMALES

1. Hind tarsomeres 2-4 with white basal bands-----edwardsi  
Hind tarsi entirely dark----- 2
- 2(1). Some white, creamy, or blue, flat broad scales along  
lateral margin of mesonotum in front of wing base-----3  
No pale or blue, broad flat scales along margin of  
mesonotum, though there may be narrow pale  
scales----- 4
- 3(2). Median pale markings on abdominal terga I-IV----- 5  
No median pale markings on dorsum of abdomen-- lateralis
- 4(2). Mesonotum covered with a mixture of pale brown,  
ochreous, and dark brown scales----- macfarlanei  
Mesonotum covered with deep brown scales only-----  
campestris
- 5(3). A line of bluish-white scales across pleuron, and a  
patch of rather broad greyish-brown scales above  
wing base----- annandalei  
No line of bluish-white scales across pleuron, and no  
patch of greyish-brown scales above wing base----- 6
- 6(5). Abdomen with basal pale bands on one or more of the  
terga----- 7  
Abdomen without pale bands-----9
- 7(6). Bands well defined on all abdominal terga; no border of  
pale narrow scales around margin of mesonotum----- 8  
Bands faintly indicated, but definite, on one or more  
terminal terga; a border of pale narrow scales from  
wing base around front of mesonotum-----maxima
- 8(7). Pleuron uniformly pale----- luteola

- Pleuron with dark patches----- bicolor
- 9(6). Some narrow pale scales on front or lateral margins of  
mesonotum ----- 10  
No pale scales on front or lateral margins of meso-  
notum -----11
- 10(9). A large velvet black spot in front of each wing base-----  
bimaculata  
No large black spot in front of wing base ----- maxima
- 11(9). Pleuron with conspicuous dark markings on a pale back-  
ground-----maculipleura  
Pleuron uniformly pale ----- 12
- 12(11). Mesonotum light brown, often translucent----- recondita  
Mesonotum dark brown----- obscura

Uranotaenia hongayi and Uranotaenia lutescens not  
included in the key.

KEY TO URANOETAENIA LARVAE

1. Apex of comb scales rounded and fringed-----recondita  
 Comb scales with apical spine, lateral fringe may be  
 present----- 2
- 2(1). Pecten with twenty teeth or more ----- bimaculata  
 Pecten with less than twenty teeth----- 3
- 3(2). Numerous strong stellate hairs on thorax and abdomen----  
maxima  
 Hairs on thorax and abdomen not strong and stellate----- 4
- 4(3). Head hairs 5 and 6 very stout, resembling flattened leaf-  
 like bristles -----5  
 Head hairs 5 and 6 not flattened, resembling finely barbed  
 bristles -----lateralis
- 5(4). Plates of abdominal segment VIII connected dorsally----- 6  
 Plates of abdominal segment VIII not connected dorsally---7
- 6(5). Antenna with three large leaf-like appendages---annandalei  
 Antenna without large, leaf-like appendages-----obscura
- 7(5). Pecten with about fourteen teeth ----- macfarlanei  
 Pecten with about eleven teeth-----campestris

Larvae of the following species have not been described:  
Uranotaenia bicolor, U. edwardsi, U. luteola, U.  
maculipleura, U. hongayi, and U. lutescens.

Larval Habitats of Uranotaenia Species

Habitat	*edwardsi	lateralis	macfarlanei	campestris	annandalei	maxima	*luteola	*bicolor
Crab Holes	+							
Tree Holes								
Bamboo Stumps, Tree Fern Stumps								
Jungle Creeks, Shady Pools, Rock Pools, Puddles	+	+	+		+	+		
Forest Streams		+		+	+			
Nipah Swamps								+

Uranotaenia

\*edwardsi

lateralis

macfarlanei

campestris

annandalei

maxima

\*luteola

\*bicolor

Larval Habitats of Uranotaenia Species

	+	+	
Crab Holes			
Tree Holes			
Bamboo Stumps, Tree Fern Stumps			
Jungle Creeks, Shady Pools, Rock Pools, Puddles			
Forest Streams			
Nipah Swamps			

bimaculata

\*maculipleura

recondita

\*obscura

Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.  
Larval habitat unknown.

KEY TO ORTHOPODOMYIA ADULT FEMALES

1. Hind tarsomere 2 distinctly pale scaled at base on outer surface ----- albipes  
Hind tarsomere 2 dark at base on outer surface ----- 2
2. Hind tarsomeres 3 and 4 each with a subapical black band; 5 completely white ----- anopheloides  
Hind tarsomeres 3-5 all pale scaled, or at most only 3 with a subapical black band ----- andamanensis

KEY TO ORTHOPODOMYIA LARVAE

1. Larger comb scales each consisting of a stout elongated spine with a fringe of short hairs laterally along the proximal portion ----- albipes  
Larger comb scales each with a group of prominent elongate projections arising from an expanded apex ---- 2
2. The siphonal hair tuft inserted at 0.32 - 0.42 the length of siphon from base ----- andamanensis  
The siphonal hair tuft inserted at 0.42 - 0.5 the length of siphon from base ----- anopheloides

Larval Habitats of Orthopodomyia Species

Larvae have been found in coconut shells, bamboo and other stumps, holes in trees and similar situations.

KEY TO HEIZMANNIA ADULT FEMALES

Abdominal terga with prominent baso-lateral white or  
 silver spots ----- reidi  
 Abdominal terga with at most a few pale scales on  
 terminal segments ----- complex

KEY TO HEIZMANNIA LARVAE

Antennal hair 1 simple ----- complex  
 Antennal hair 1 branched ----- reidi

Larval Habitat of Heizmannia Species

Larvae are usually found in holes in trees and bamboo  
 stumps.



- 11(10). Mesonotum compressed laterally, produced over head-----  
cingulatus  
Mesonotum not very compressed laterally, not produced  
over head-----pectinatus

KEY TO ARMIGERES LARVAE

1. Comb scales fan-shaped, apically frayed----- 2  
 Comb scales with single apical point, either fringed or  
 smooth ----- 4
- 2(1). Comb with five to six scales-----(Leicesteria) magnus  
 Comb with ten or more scales -----3
- 3(2). Comb with ten to twelve scales -----flavus  
 Comb with sixteen to twenty-six scales----- annulitarsis
- 4(1). Comb with about seventy scales in a triangular patch-----  
longipalpis  
 Comb with less than fifty scales in an irregular row----- 5
- 5(4). Abdominal segments I-V with prominent, lightly  
 sclerotized tubercles at base of setae-----6  
 Abdominal segments I-V without prominent tubercles-----7
- 6(5). Abdominal hair 5-VIII finely branched----- dolichocephalus  
 Abdominal hair 5-VIII stout, single, or bifid----- pectinatus
- 7(5). Lateral hair of anal segment simple, stout, as long as  
 length of saddle, and inserted posteroventrally within  
 saddle ----- (Armigeres) kuchingensis  
 Lateral hair of anal segment multiple, minute, and  
 arising outside of saddle ----- 8
- 8(7). Head hairs 5 and 6 separated by twice the distance between  
 hairs 4 and 6 ----- durhami  
 Head hairs 5 and 6 about the same distance as between  
 hairs 4 and 6 ----- 9
- 9(8). Head hair 5 minute, double or triple ----- subalbatus  
 Head hair 5 prominent, with three to five branches-----  
aureolineatus

Armigeres moultoni and Armigeres cingulatus are not included in the key.

Larval Habitats of Armigeres Species

	Coconut Shells, Fallen Leaf Axils	Bamboo Stumps	Rock Holes	Artificial Containers	Flower Cups of Parasitic Vine	Grassy Puddles	Tree Holes, Stumps	Tree Fern Stumps
<i>Armigeres (Armigeres)</i>								
<i>kuchingensis</i>	+	+		+				
<i>durhami</i>						+	+	
<i>subalbatus</i>	+		+	+				
* <i>aureolineatus</i>								
<i>malayi</i>	+	+			+		+	
<i>Armigeres (Leicesteria)</i>								
<i>magnus</i>		+						+

Larval Habitats of Armigeres Species

Coconut Shells,  
 Fallen Leaf Axils  
 Bamboo Stumps  
 Rock Holes  
 Artificial Containers  
 Flower Cups of  
 Parasitic Vine  
 Grassy Puddles  
 Tree Holes, Stumps  
 Tree Fern Stumps

flavus

annulitarsis

\*longipalpis

\*dolichocephalus

\*pectinatus

Larvae recorded from this habitat in Vietnam or elsewhere in South East Asia.  
 Larval habitat unknown.

## LIST OF ILLUSTRATIONS

Plate I

1. Generalized adult female, lateral aspect.
2. Enlarged lateral aspect of the thorax showing bristles.
3. Enlarged lateral aspect of the thorax showing scales.
4. Enlarged dorsal aspect of the thorax showing bristles.

Plate II

5. Generalized wing showing dorsal wing venation.
6. Dorsal aspect of Anopheles wing illustrating the wing spots.
7. Lateral aspect of head and proboscis of Malaya jacobsoni.
8. Lateral aspect of the hind femur and tibia of Aedeomyia catasticta.
9. Apical flagellomeres of Aedeomyia catasticta.
10. Dorsal plume scales of Hodgesia malayi.
11. Tarsal claws and pulvilli of Culex sp.
12. Dorsal wing scales of Mansonia uniformis.
13. Lateral aspect of head and proboscis of Armigeres subalbatus.
14. Frontal aspect of the head of Anopheles bengalensis showing vertical head scales.
15. Hind tarsus of Anopheles nigerrimus.

Plate III

16. Generalized larva showing dorsal and ventral chaetotaxy.
17. Ventral aspect of a generalized larval head.
18. Dorsal aspect of a generalized mentum.
19. Terminal segments of a generalized larva.

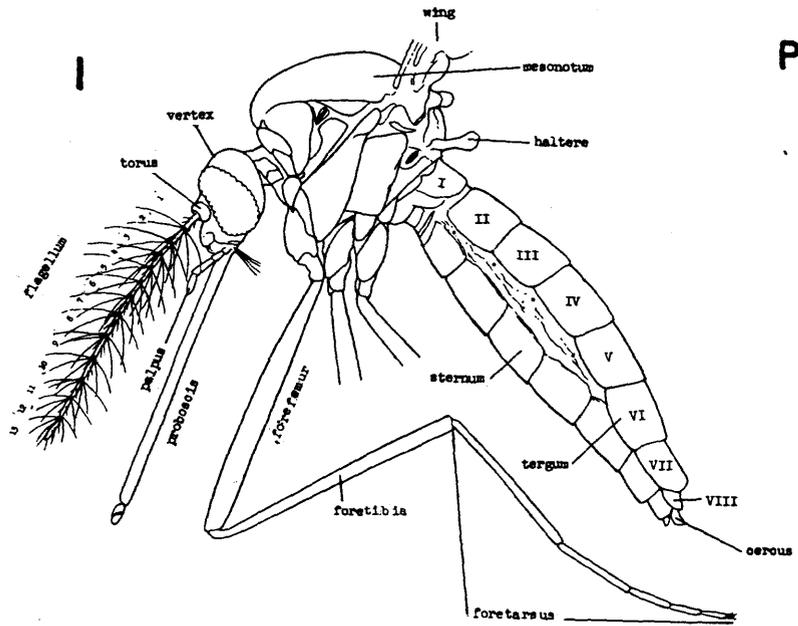
Plate IV

20. Hair types showing single and simple, single and barbed, stellate, plumose, pectinate, dendritic, and palmate.
21. Siphon of Mansonia uniformis.
22. Dorsal aspect of the thorax of Tripteroides aranoides showing prominent metathoracic spines arising from sclerotized bases.
23. Dorsal aspect of the thorax of Topomyia gracilis showing the sclerotized bases of the thoracic pleural groups.
24. Dorsal aspect of the buccal structures of Culex (Lutzia) fuscus.

Plate V

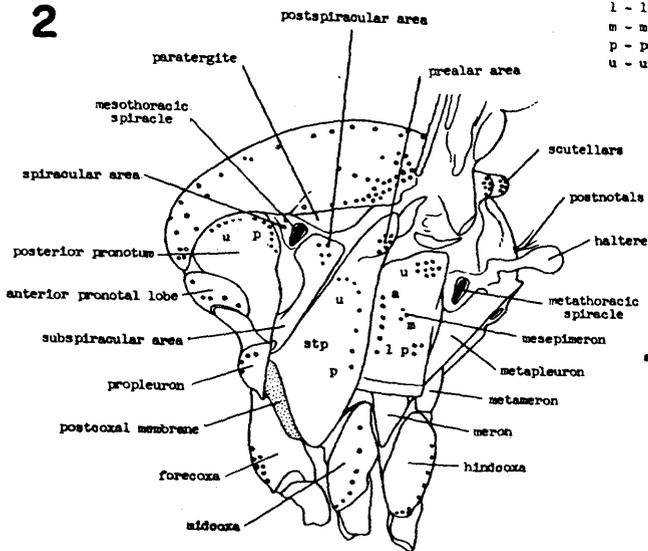
25. Dorsal view of head of an Anopheles larva.
26. Dorsal view of fourth abdominal segment of an Anopheles larva.
27. Anterior surface of hind femur of Culex pseudovishnui.
28. Ventral surface of proboscis of Culex tritaeniorhynchus showing accessory pale patches.

29. Dorsal and ventral views of thoracic region of an Anopheles larva.
30. Dorsal view of the male terminalia of a Culex subgenus Lophoceraomyia.
31. Lateral view of terminal segments of an Anopheles larva.
32. Dorsal view of male terminalia of an Aedes.

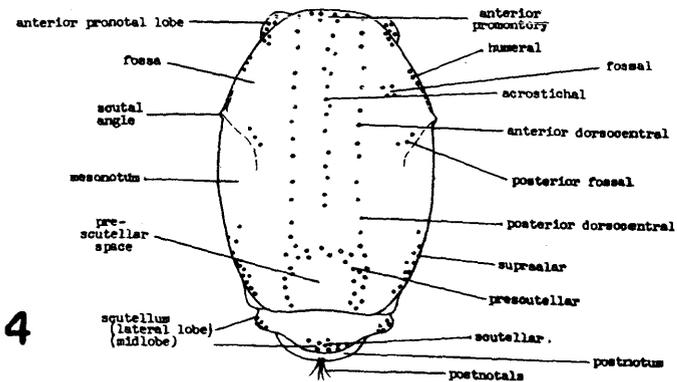
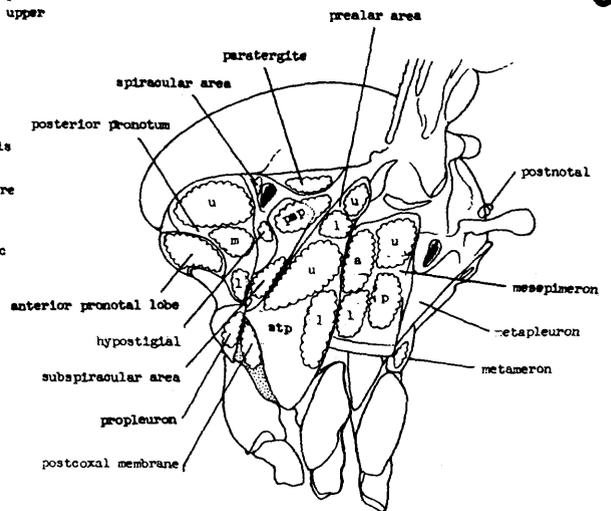


stp - sternopleuron  
 psp - postspiracular area  
 a - anterior  
 l - lower  
 m - middle  
 p - posterior  
 u - upper

2

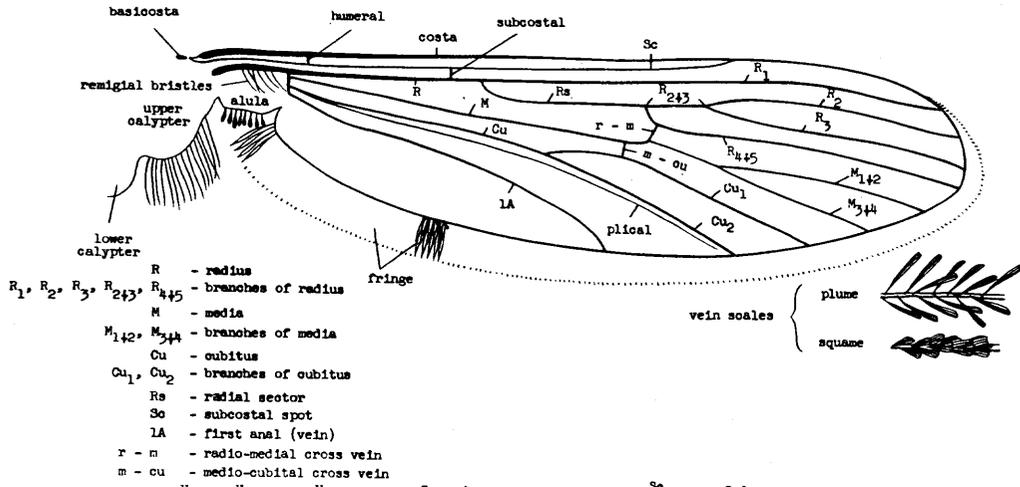


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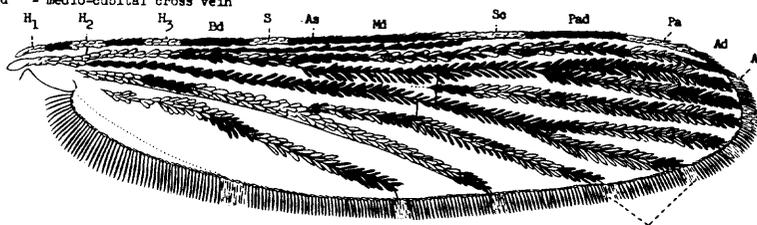


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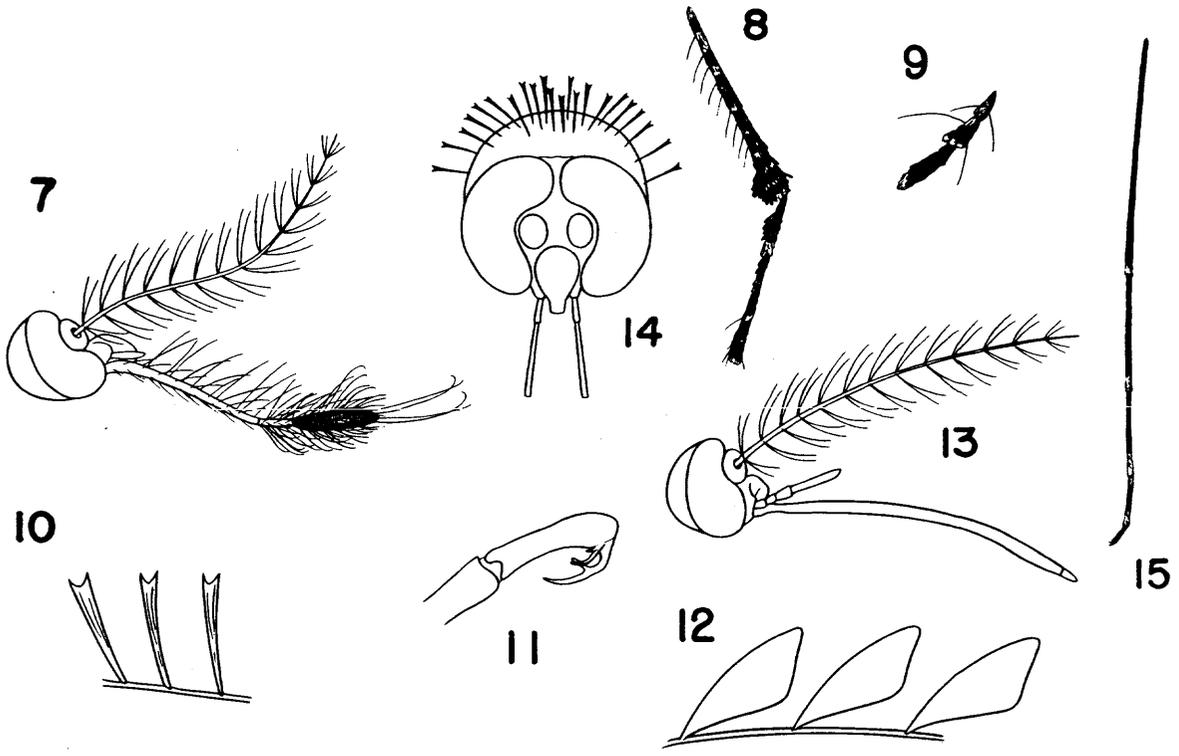
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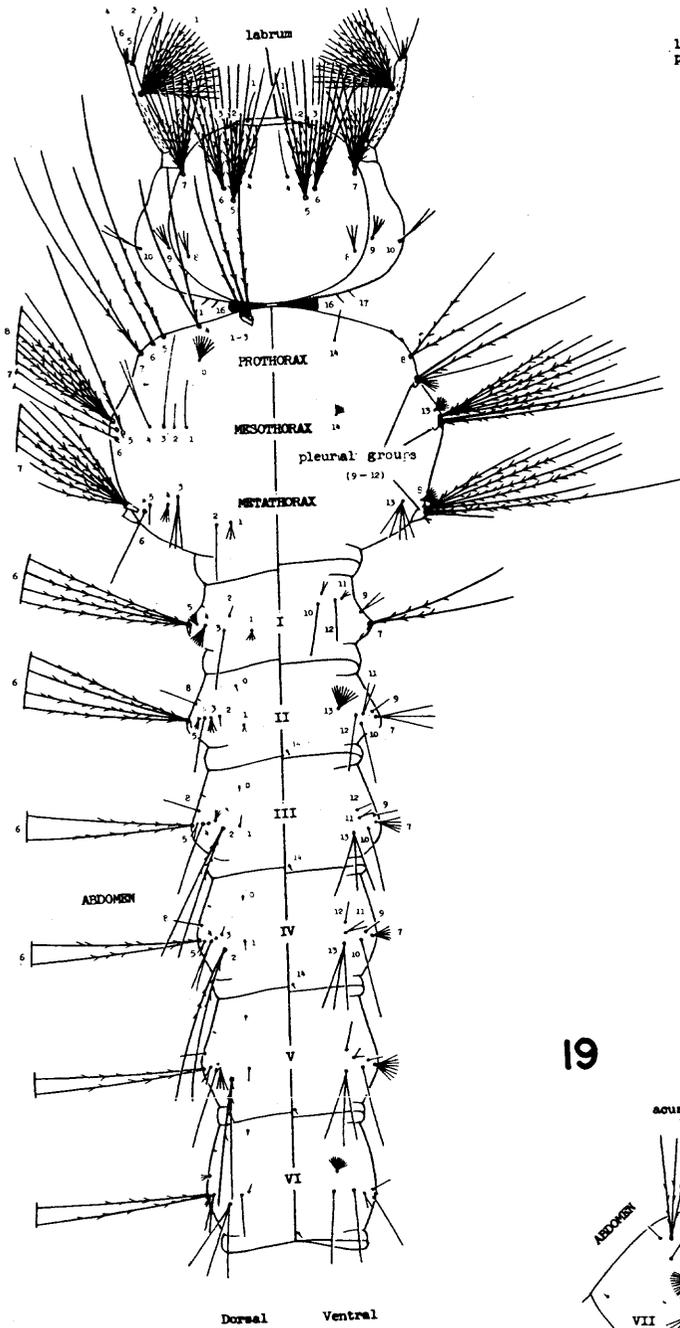


- H<sub>1</sub>, H<sub>2</sub>, H<sub>3</sub> - humeral spots
- Bd - basal dark spot
- S - sectoral spot
- As - accessory sector spot
- Mi - median dark spot
- So - subcostal spot
- Pad - preapical dark spot
- Pa - preapical spot
- Ad - apical dark spot
- A - apical spot

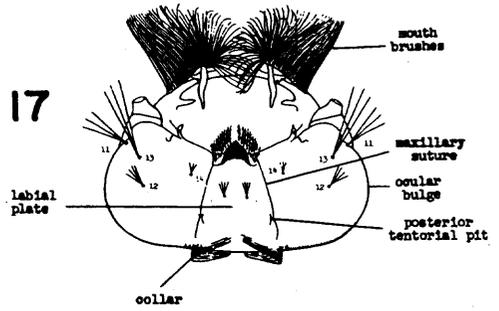


# PLATE III

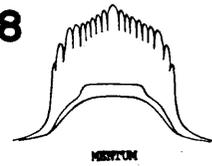
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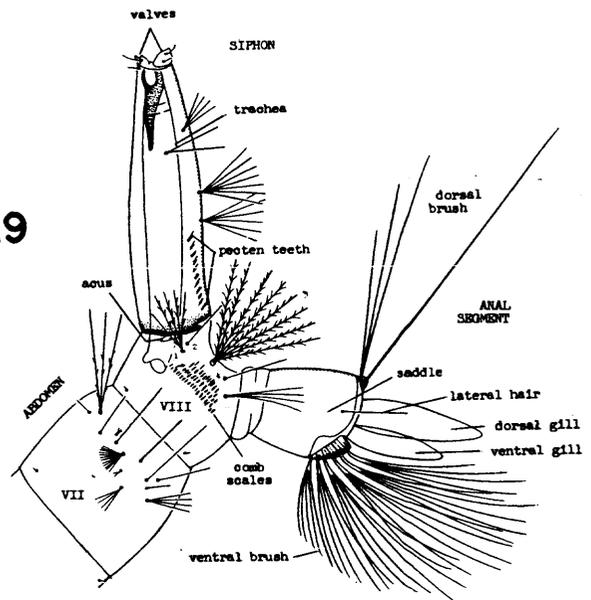
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# PLATE IV

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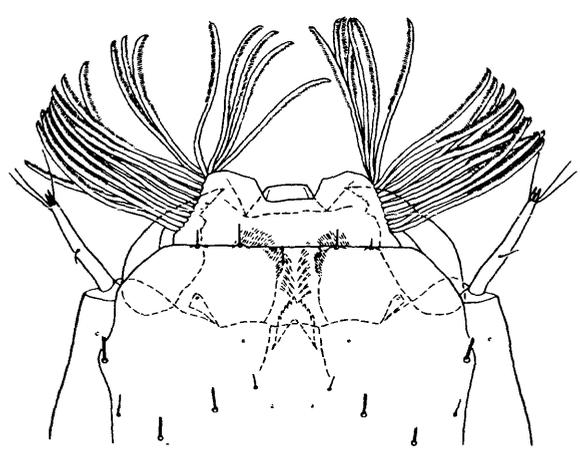
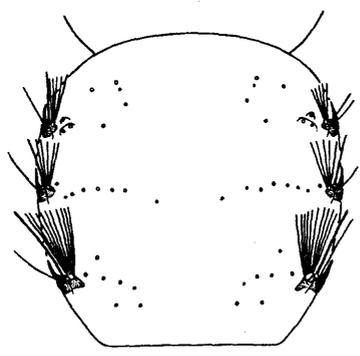
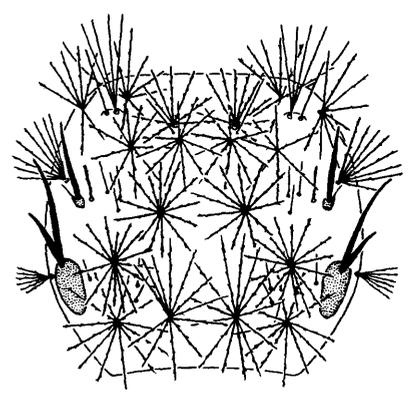
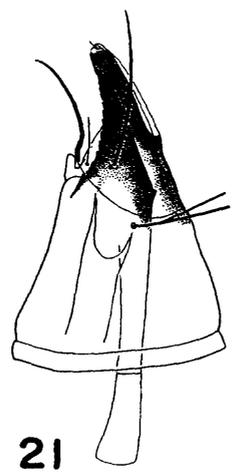
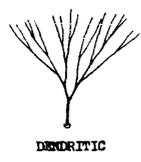
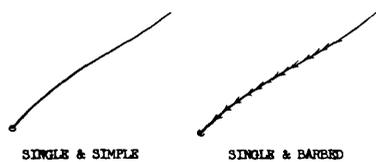


PLATE V

