

CONTRIBUTIONS TO THE MOSQUITO FAUNA OF
SOUTHEAST ASIA. - I
THE GENUS *Aedes*, SUBGENUS *Neomacleaya* THEOBALD
IN THAILAND¹

By
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INTRODUCTION

This is the first of two papers which will deal with a revision of the *Aedes*, subgenus *Neomacleaya* of South East Asia. The subgenus *Neomacleaya* was originally described (Theobald 1907: 238) as a distinct genus based on a single species. It has been synonymized (Edwards 1932: 174; Stone, Knight and Starcke 1959: 204) with subgenus *Aedes* s. str., and later Belkin (1962: 412) synonymized it with *Verrallina*. The name *Neomacleaya* is here resurrected for a subgenus of primarily Oriental mosquitoes previously placed in the subgenera *Aedes* or *Verrallina*.

This present paper deals with 20 species from Thailand, of which 7 are described as new, and 9 are reported as new records; *Aedes adustus* Laffoon is treated here as a synonym of *A. andamanensis* Edwards.

The terminology of the female terminalia used here is that employed by Laffoon (1946). The term postatrial plate is applied to those structures forming the posterior wall of the atrium, and the term preatrial plate for those forming the anterior wall. The preatrial plates and preatrial sclerite are normally folded over the postatrial plates (figure 3). In the figures the preatrial sclerite and plates are extended anteriorly to obtain a good view of the structures. The larval and pupal chaetotaxy and terminology used is that of Belkin (1962).

The specimens used in this study were largely collected by the SEATO Laboratory personnel in Bangkok, Thailand. The holotypes of the new species will be deposited in the U. S. National Museum, Washington, D. C. The paratypes whenever available will be distributed among the British Museum (Natural History), London, and the B. P. Bishop Museum, Honolulu, Hawaii.

An asterisk following the abbreviations used (♀-for female, ♂-for male,

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L-for larva, P-for pupa) indicates that at least some portion of that sex or stage is figured. Two asterisks after a locality or species indicate a new record.

Thai locality names are taken from the Official Standard Names Gazetteer No. 97 of the United States Board of Geographic Names, Washington 1966. First-order Administrative Units or Changwats, as they are called in Thailand, are italicized and precede place names.

Genus AEDES Meigen

Subgenus NEOMACLEAYA Theobald

- Neomacleaya* Theobald 1907, Mon. Cul. 4: 238. Type species: *Neomacleaya indica* Theobald. Monobasic.
Aioretomyia Leicester 1908, Cul. Malaya 3: 185. Type species: *Aioretomyia varietas* Leicester (Brunetti 1914: 55).

Closely related to the two subgenera *Verrallina* Theobald and *Aedes s. str.* from which *Neomacleaya* can be distinguished by the remarkably developed and complex female and male terminalia, the relatively short proboscis and certain characters of the larva and pupa. The female terminalia of *Verrallina* approach most closely those of *Aedes s. str.* in being uniform and simple in structure and offer no assistance in the identification of the species. The mesepimeral hairs which are present behind the scale patch extend to the lower portion of the sclerite in a few species of *Neomacleaya* while the anterior portion of the sternopleuron is normally bare. These hairs are always present in *Verrallina* and absent in *Aedes s. str.* The larvae have 8-12 (rarely 14) comb scales arranged in a single row (except in *A. campylostylus* which has comb scales arranged in an irregular row). Each scale is pointed and with a fine, lateral fringe. They are likely to be confused with those of *Aedes s. str.*, in which the comb scales are strongly pointed and with a short, fine lateral fringe. Species of *Verrallina* have more than 14 comb scales, each scale rounded and fringed apically. The pupae can be separated from those of most other subgenera by abdominal hair 9-VIII, which has 1-3 branches (except in *A. cyrtolabis*, in which it has 10 branches).

The subgenus possesses the following characters: FEMALE. Brown or blackish brown species. Head. Eyes contiguous; torus with fine hairs or small broad scales; proboscis slender, equal in length or slightly longer than fore femur by at most the length of the labella; scales on vertex flat, broad, with a few upright forked scales confined to the occiput; palpus short, from 1/10 - 1/6 the length of the proboscis. Thorax. All scales on scutum and scutellum narrow; dorsocentral and acrostichal bristles well developed; anterior pronotal lobe and posterior pronotum with bristles, a few scales present in some species and in *A. yusafi* the anterior pronotal lobe covered with broad, flat white scales; pleuron with patches of broad scales on upper mesepimeron and upper and lower sternopleuron; mesepimeral hairs behind the scale patch sometimes extending downwards to the middle of the sclerite; lower mesepimeron bare or with hairs; sternopleural hairs on anterior portion few in number or absent. Legs. Scales dark, with femora pale ventrally; hind claws simple or toothed; fore and mid claws equal or unequal, with

both claws toothed. Wings. Dark scaled; alula fringed with narrow or broad scales; squama fringed with long, fine hairs; cell R₂ longer than its stem; halter with pale stem and dark knob. Abdomen. Terga completely dark or with pale basal lateral markings or complete pale bands; sternal markings variable in most species. Terminalia. Cercus conical; postgenital plate with a median emargination; postatrial plate well sclerotized and variously developed, usually with long, thick hairs along the posterior margin of the opening; preatrial plate well developed, varied in size and shape; three spermathecae usually of different sizes: large, medium and small, each with a slender or swollen neck; sternum VIII with a median emargination, each side bearing a group of strong bristles.

MALE. Similar to female in general habitus. Head. Antenna plumose with about 10 to over 20 hairs in each whorl. Legs. Hind claws simple or toothed; fore and mid claws unequal with the larger claw toothed. Terminalia. Complex and variously developed; basimere strongly produced apically, with subapical projections and strong spines or processes on the inner mesal margin and base; aedeagus simple, with a large basal plate; paraproct (extension of sternum X) markedly developed in most species and varied in shape.

LARVA. Head. Wider than long, integument smooth or granulose; hair 1-C long and simple; 3-C fairly well developed; 4-C a small, short branched tuft and difficult to find; 5, 6-C with 3-6 branches; 7-C with at most 18 branches; 4, 7-C usually anterior to 5, 6-C; antenna short, spinose; hair 1-A branched. Thorax and Abdomen. Thoracic and abdominal setae simple, integument smooth; comb scales arranged in a single row (except in *A. campylostylus*), each scale pointed and with a lateral fringe; siphon usually 2 1/2 times as long as broad at base; pecten teeth well developed, the distal teeth widely spaced; saddle incomplete, spiculate or smooth distally; hair 1-X single, rarely double; ventral brush with at most 8 setae; precratal tufts present.

PUPA. Cephalothorax. Hair 11-C always single, strong and very close to 10-C. Abdomen. Most abdominal setae single or double; hair 1-I well developed, dendritic, with an expanded base, varied on other segments; 2-I-VII single, spine-like in some species; 3-I branched and farther away from 2-I in most species; 5-II-VII usually posterior to 4-II-VII; 9-VIII poorly developed, usually single except in *cyrtolabis*. Paddles. Outer margin finely serrated; one paddle hair (1-P) about 1/3 the length of the saddle.

DISTRIBUTION. The subgenus *Neomacleaya* is restricted to the Oriental region except for *A. neomacrodixoa* King and Hoogstraal and *A. panayensis* Ludlow, which also occur in the Australasian region (New Guinea, Schouten Islands, Morotai and Moluccas).

BIOLOGY. The adults have been collected biting man in mangrove swamps during the daytime, in dense jungle, and at light traps. The immatures have been found in various types of temporary ground pools such as: residual pools, flood pools in dry stream beds, foot prints in ricefields, muddy pools and road ruts, shaded grassy ground pools and leaf filled pools; also in crab holes along coastal areas; in brackish puddles in nipa palm swamps at the extreme upper limit of the tidal zone; and in tree holes.

The following species are recognized in Thailand:

1. *Aedes (Neomacleaya) andamanensis* Edwards

2. *Aedes (Neomacleaya) atrius* Barraud **
3. *Aedes (Neomacleaya) cautus* Barraud **
4. *Aedes (Neomacleaya) clavatus* Barraud **
5. *Aedes (Neomacleaya) cretatus*, n. sp.
6. *Aedes (Neomacleaya) cyrtolabis* Edwards **
7. *Aedes (Neomacleaya) dermajoensis* Brug **
8. *Aedes (Neomacleaya) dux* Dyar and Shannon
9. *Aedes (Neomacleaya) gibbosus*, n. sp.
10. *Aedes (Neomacleaya) hispidus*, n. sp.
11. *Aedes (Neomacleaya) incertus* Edwards **
12. *Aedes (Neomacleaya) indecorabilis* (Leicester) **
13. *Aedes (Neomacleaya) indicus* (Theobald) **
14. *Aedes (Neomacleaya) latipennis*, n. sp.
15. *Aedes (Neomacleaya) notabilis*, n. sp.
16. *Aedes (Neomacleaya) protuberans*, n. sp.
17. *Aedes (Neomacleaya) pseudodiurnus* (Theobald) **
18. *Aedes (Neomacleaya) torosus*, n. sp.
19. *Aedes (Neomacleaya) uncus* (Theobald)
20. *Aedes (Neomacleaya) vallistris* Barraud

KEYS TO THE SPECIES IN THAILAND

FEMALES

1. Abdominal terga with pale markings 2
Abdominal terga dark, without lateral pale patches or pale bands. . . . 14
- 2(1). Terga II-VI with pale basal or subbasal bands 3
Terga II-VI with pale lateral patches only, sometimes produced onto
dorsum 5
- 3(2). Terminalia as in figure 18, the larger spermatheca with a bent swollen
neck. *indicus* (Theobald)
Terminalia not as above, spermathecae each with a short neck. 4
- 4(3). Terminalia as in figure 5, the postatrial plate with characteristic
wing-like structures *cretatus*, n. sp.
Terminalia as in figure 18, the postatrial plate not as above.
hispidus, n. sp.
- 5(2). Hind tarsal claws toothed; terminalia as in figure 18, the postatrial
plate with 2 hairy lobed structures *notabilis*, n. sp.
Hind tarsal claws simple. 6
- 6(5). Meron of hind coxa with fine hairs 7
Meron of hind coxa bare 8
- 7(6). Lower mesepimeron with numerous fine hairs; terminalia as in figure

** Indicates a new record

- 20, the postatrial plate scalloped along the anterior margin of the opening *.gibbosus*, n. sp.
 Lower mesepimeron bare; terminalia as in figure 1, the postatrial plate with bluntly pointed apical arms *.andamanensis* Edwards
- 8(7). Lower mesepimeron with numerous fine hairs; terminalia as in figure 16, the postatrial plate with a characteristically large, cordate opening *.uncus* (Theobald)
 Lower mesepimeron bare 9
- 9(8). Terminalia as in figure 12, with simple, pocket-shaped postatrial plate *.incertus* Edwards
 Terminalia with well developed postatrial plates 10
- 10(9). Terminalia as in figure 18, the postatrial sclerite with lobed lateral corners *.cautus* Barraud
 Terminalia with rounded postatrial sclerite 11
- 11(10). Terminalia as in figure 17, the preatrial plate with a pair of strong transverse ridges, not hairy *.clavatus* Barraud
 Terminalia not as above 12
- 12(11). Terminalia as in figure 17, with 2 smaller preatrial plates
.vallistris Barraud
 Terminalia with markedly large preatrial plates 13
- 13(12). Terminalia as in figure 3, the postatrial plate with a pair of sclerotized pointed processes on each side of the opening
.atrius Barraud
 Terminalia as in figure 14, the postatrial plate lightly sclerotized, mostly covered with short hairs *.latipennis*, n. sp.
- 14(1). Hind tarsal claws toothed; terminalia as in figure 20, with a simple, bulbous postatrial plate *.indecorabilis* (Leicester)
 Hind tarsal claws simple; terminalia as in figure 9, with a pair of hairy finger-like processes on postatrial plate
.dux Dyar and Shannon

(Females of the following species unknown: *cyrtolabis* , *dermajoensis* , *pseudodiurnus* and *torosus*)

MALES

1. Abdominal terga with pale markings 2
 Abdominal terga dark without lateral pale patches or pale bands 16
- 2(1). Terga II-VI with pale basal bands 3
 Terga II-VI with pale lateral patches only, sometimes produced on to dorsum 4

- 3(2). Terminalia as in figure 6, the basimere with a large, bent peg-like process and 2 large spines near the base *cretatus*, n. sp.
Terminalia as in figure 8, the basimere with 2 subapical spines and 2 large subbasal spines *dermajoensis* Brug
- 4(2). Meron of hind coxa with fine hairs 5
Meron of hind coxa bare 6
- 5(4). Lower mesepimeron with numerous fine hairs; terminalia as in figure 11 *gibbosus*, n. sp.
Lower mesepimeron bare; terminalia as in figure 2. *andamanensis* Edwards
- 6(4). Lower mesepimeron with numerous fine hairs 7
Lower mesepimeron bare 10
- 7(6). Terminalia as in figure 7, the paraproct much enlarged, long and wavy *cyrtolabis* Edwards
Terminalia not as above, with small paraproct 8
- 8(7). Terminalia as in figure 19, the distimere crooked and with a small process at the middle *torosus*, n. sp.
Terminalia not as above, with simple distimere 9
- 9(8). Terminalia as in figure 19; sternum IX with 3 or 4 median spines *uncus* (Theobald)
Terminalia as in figure 19; sternum IX simple. *protuberans*, n. sp.
- 10(6). Paraproct divided or forked 11
Paraproct not as above 12
- 11(10). Terminalia as in figure 17, the basimere broadly produced distally and with a small knob-like process *clavatus* Barraud
Terminalia as in figure 20, the basimere strongly produced distally and with 4-5 strong tooth-like processes *cautus* Barraud
- 12(10). Paraproct broadly flattened. 13
Paraproct slender, tapered distally. 14
- 13(12). Terminalia as in figure 15, the distimere with a crescentic process at the base *latipennis*, n. sp.
Terminalia as in figure 19, the distimere very short, swollen distally with 4 or 5 projections *pseudodiurnus* Barraud
- 14(12). Terminalia as in figure 4, the basimere with 4-5 very strong internal curved spines *atrius* Barraud
Not as above. 15
- 15(14). Terminalia as in figure 17, the basimere projected apically into a slender pointed process, with 2 subapical projections and a group of strong spines on inner mesal margin *vallistris* Barraud

Terminalia as in figure 20, the basimere projected apically into a broad blunt projection, with a long slender elbowed process arising at the base *indicus* (Theobald)

- 16(1). Hind tarsal claws toothed; terminalia as in figure 13, the basimeres joined together subapically. *indecorabilis* (Leicester)
Hind tarsal claws simple; terminalia as in figure 10, the basimeres very short and not joined together *dux* Dyar and Shannon

(Males of *hispidus* and *notabilis* unknown; *incertus* and *indicus* uncertain)

PUPAE

1. Abdominal hair 9-VII-VIII with many branches; cephalothoracic hair 3-C extremely long, single (figure 7). *cyrtolabis* Edwards
Abdominal hair 9-VII always single; single or double (rarely 3-branched) on VIII; cephalothoracic hair 3-C much shorter, may be branched. 2
- 2(1). Abdominal hair 2-I-VII normally developed. 3
Abdominal hair 2-I-VII large and spine-like 7
- 3(2). Abdominal hair 9-VIII always single or split at tip. 4
Abdominal hair 9-VIII normally double, or 3-branched in some specimens 5
- 4(3). Abdominal hair 6-VII with 4-5 short, weak branches; 9-VII rather short; cephalothoracic 3-C double (figure 11). . . *gibbosus*, n. sp.
Abdominal hair 6-VII single; 9-VII conspicuously long; cephalothoracic hair 3-C single 6
- 5(3). Abdominal hair 7-III-V branched, single on VI-VII; cephalothoracic hair 10-C with 4 or more branches (figure 4). . . . *atrius* Barraud
Abdominal hair 7-III-VII single (except on V where it is double); cephalothoracic hair 10-C with 6 or more branches (figure 2). . . . *andamanensis* Edwards
- 6(4). Abdominal hair 7-I double; 4-VII-VIII double (figure 6). *cretatus*, n. sp.
Abdominal hair 7-I single; 4-VII-VIII single (figure 10). *dux* Dyar and Shannon
- 7(2). Abdominal hair 5-IV-VI very long, reaching the distal margins of the following segments; cephalothoracic hair 3-C with 4 branches. . . . 8
Abdominal hair 5-IV-VI shorter, not reaching the distal margins of the following segments; cephalothoracic hair 3-C single or double. 9
- 8(7). Abdominal hair 6-VII single; 7-III-IV branched, single on V; cephalothoracic hair 10-C with 5-6 branches (figure 8). *dermajoensis* Brug

Abdominal hair 6-VII with 3-4 branches; 7-III-V short, branched;
cephalothoracic hair 10-C with 3-4 branches (figure 13).
incertus Edwards

- 9(7). Abdominal hair 3-I close to 2-I; 7-VI-VII single, fairly weak; 9-VII
conspicuously long (figure 15). *latipennis*, n. sp.
Abdominal hair 3-I farther away from 2-I; 7-VI-VII double, very long;
9-VII very short and poorly developed (figure 16).
uncus (Theobald)

(Pupae of the following species unknown: *cautus*, *clavatus*, *hispidus*,
indecorabilis, *indicus*, *notabilis*, *protuberans*, *pseudodiurnus*, *torosus* and
vallistris)

FOURTH STAGE LARVAE

1. Anal gills short, as long as saddle (figure 9) . . . *dux* Dyar and Shannon
Anal gills longer than saddle 2
- 2(1). Abdominal hair 6-II single *cyrtolabis* Edwards
Abdominal hair 6-II double 3
- 3(2). Prothoracic hair 1-P double; hair 1, 3, 5-VIII with stout branches
(figure 14) *latipennis*, n. sp.
Prothoracic hair 1-P always single; hair 1, 3, 5-VIII with normal,
slender branches 4
- 4(3). Abdominal hair 4-VIII single; antennal hair 1-A with only 3 branches
which are stout (figure 20) *indicus* Theobald
Abdominal hair 4-VIII double; antennal hair 1-A with 3 or more
slender branches 5
- 5(4). Prothoracic hair 9-P with 3 branches (figure 12) . . . *incertus* Edwards
Prothoracic hair 9-P single 6
- 6(5). Head hair 5-C with 6-8 branches, 6-C with 4-5 branches; hair 12-P
double (figure 3) *atrius* Barraud
Head hair 5-C with at most 5 branches, 6-C with 2-4 branches; hair
12-P single 7
- 7(6). Anal gills about 4 times the length of the saddle; antennal hair 3-A
minute (figure 5) *cretatus*, n. sp.
Anal gills about 2 1/2 times the length of the saddle; antennal hair
3-A as long as 6-A (figure 1) *andamanensis* Edwards

(Larvae of the following species unknown: *clavatus*, *dermajoensis*, *gibbosus*,
hispidus, *indecorabilis*, *notabilis*, *protuberans*, *pseudodiurnus*, *torosus*,
vallistris, *uncus* and uncertain in *indicus*)

AEDES (NEOMACLEAYA) ANDAMANENSIS Edwards
(Figures 1, 2)

- Aedes* (*Neomacleaya*) *andamanensis* Edwards 1922a, Indian J. med. Res. 10: 272 (♂*).
- Neomacleaya indica* var. *simplex* Theobald 1908 (~~non~~ Theobald 1903), Rec. Indian Mus. 2: 291.
- Aedes* (*Aedes*) *adustus* Laffoon 1946, J. Wash. Acad. Sci. 36: 236 (♂*♀); Knight and Hull 1953, Pacif. Sci. 7: 473 (taxonomy). NEW SYNONYMY

A species having fine hairs on the metameron, forked apical projections of the male basimere and a large sclerotized postatrial plate in the female terminalia. The larva is recognized by the stout siphon with 12-14 pecten teeth, the last 3 or 4 distal teeth long and simple. The pupa has a long but fairly weak abdominal hair 2. Other differentiating characters are as follows:

FEMALE. Head. Vertex with pale narrow curved scales on the mid portion along the eye margin and occiput, patches of broad pale scales on both sides, and upright narrow scales confined to occiput; torus with small broad dark scales on inner side; palpus short, about 1/8 the length of the proboscis, blackish brown; proboscis longer than fore femur by the length of the labella, blackish brown. Thorax. Scutal and scutellar scales mostly golden mixed with dark to reddish brown scales; anterior pronotal lobe and posterior pronotum with narrow curved golden scales and bristles; postspiracular area with pale broad scales and 4-5 bristles; large patches of pale scales on upper mesepimeron and sternopleuron, a smaller patch on lower sternopleuron, the anterior portion bare or with up to 5 fine hairs; mesepimeral hairs behind scale patch extending slightly downwards; lower mesepimeron bare; metameron with fine hairs; propleuron with pale scales below and a row of bristles above. Wing. Alula fringed with broad dark brown scales. Legs. Dark brown, with the femora extensively pale ventrally; fore coxal scale patch mainly brown, with a small pale spot above; mid and hind coxae each with a small patch of pale scales; hind claws equal, simple; fore and mid claws toothed and equal. Abdomen. Terga dark, with pale lateral patches slightly produced on to dorsum; sterna largely pale scaled, narrowly dark at apices. Terminalia. As in figure 1. Three unequal spermathecae, each with a short, narrow neck; cercus short; postgenital plate broad, with a wide deep emargination; postatrial sclerite rounded, wide laterally; postatrial plate broadly sclerotized, with characteristic distal arms, and numerous short fine hairs; preatrial plate represented by two small lateral platelets and a larger median hairy piece.

MALE. General habitus as in the female. Legs. Hind claws equal, simple; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 2. Basimere produced into a large broad process with a deep concave depression at the apex, a slender forked prolongation with 2-4 prongs, another slender process divided at tip and a smaller projection near base of the distimere which may sometimes be absent; distimere long and slender, tapered distally; aedeagus simple, rather short; paraproct very long, swollen at base, tapering towards tip.

* following an abbreviation indicates that at least some part of that stage is illustrated.

LARVA. As in figure 1. Description and figure based on cast skins. **Head.** Hair 1-C rather stout; 3-C fairly long; 4-C inconspicuous, with many branches; 5-C with 5 rarely 6 barbed branches; 6-C with 4 rarely 6 barbed branches (8 branches in 1 specimen); 7-C well developed, with 10-12 branches on an expanded base; mental plate with 34-39 lateral teeth; antenna spinose; hair 1-A inserted before the middle, with 4-5 branches; 2-A long and stout; 4-A slender, half as long as 2-A; 3-A slender, as long as 6-A. **Thorax.** Hair 1-P single; 2-P double; 3-P with 3-4 shorter branches; 9, 10, 12-P single. **Abdomen.** Hair 6-I, II double (3-branched in some specimens), single on the following segments; 7-I single, with 3-5 short branches on other segments; segment VIII with 10-11 comb scales, each scale pointed and with a lateral fringe; hair 1-VIII with 4-5 barbed branches; 2-VIII double, simple; 3, 5-VIII each with 6-8 barbed branches; 4-VIII double, simple; siphon fairly stout, with 12-14 pecten teeth, each tooth with a strong lateral denticle except for the 3 or 4 distal teeth which are simple and longer, the last tooth inserted just over 1/2 to apical 1/3 of the siphon; siphonal tuft with 3 weak branches; saddle incomplete, smooth; hair 1-X single or double; 2-X with 6-8 branches; 3-X single; anal gills about 2 1/2 times as long as saddle; 2 precratal tufts present.

PUPA. As in figure 2. Description and figure based on cast skins. **Cephalothorax.** Hair 3-C with 2-3 short branches; 10-C with 6-9 branches; 11-C single; 12-C with 2-3 branches. **Abdomen.** Hair 2-I-VII weak, not modified; 3-I with 2-3 branches, near 2-I; 5-IV-V double, single on VI-VII; 7-III-VII single except V where it is double; 9-VII fairly long, single; 9-VIII normally double, poorly developed on other segments; 4-VIII single or double. **Paddles.** Outer edge finely serrated; hair 1-P simple.

TYPE DATA. *A. andamanensis* Edwards, type male, terminalia in celluloid mount on pin in the British Museum; type locality: ANDAMAN ISLANDS. *Aedes (Aedes) adustus* Laffoon, holotype male, terminalia on slide in the U. S. National Museum; type locality: Cape Melville, Balabac Island, PHILIPPINES.

DISTRIBUTION. THAILAND: 2 males, 8 females, 3 larval and 10 pupal skins, *Songkhla*, Haad Yai; 3 males, 6 females, *Khon Kaen*, Tham Pho Ti Yan; 1 male with pupal skin, *Rat Buri*, Ban Salok; 2 females, *Nakhon Si Thammarat*; 2 females, *Chiang Mai*; 1 female, *Narathiwat Waeng*. **Other distribution.** I have also seen specimens from ANDAMAN IS., INDIA, MALAYA, SINGAPORE, SUMATRA, INDOCHINA, JAVA **, NORTH BORNEO **, and the PHILIPPINES (as *adustus*).

TAXONOMIC DISCUSSION. The external characters and the female and male terminalia appear to be indistinguishable from *A. johnsoni* Laffoon and *A. margarsen* Dyar and Shamon, both from the Philippines. *A. andamanensis*, however, can be distinguished by the poorly developed projection at the base of the distimere which is difficult to find, or absent in some specimens, while it is well developed in *margarsen* and *johnsoni*. The number of prongs of the forked projection of the male terminalia is very variable. Also, the larva shows considerable variation in the development and number of branches on head hair 5, 6-C and so does cephalothoracic hair 10-C in the pupa. Concerning the synonymy of *adustus* with *andamanensis*, I have examined the type specimens and the two species agree very closely. I have no doubt that they are conspecific.

** indicates a new record.

BIOLOGY. The larvae have been collected in pools in dry stream beds and shaded road ruts (as *adustus*), and in puddles (Laffoon 1946).

AEDES (NEOMACLEAYA) ATRIUS Barraud
(Figures 3, 4)

Aedes (Neomacleaya) atrius Barraud 1928, Indian J. med. Res. 16: 371 (♀*);
Barraud 1934, Fauna Brit. India, Diptera 5: 293 (♀*).

A markedly distinct species on the basis of the female and male terminalia and on the characters of the larva and pupa. The male basimere bears 4-6 large curved spines, and the female postatrial plate has a pair of sclerotized pointed processes on each side of the opening. The larva is distinguished by the many branches of head hair 5, 6-C and by the numerous teeth (40-44) on the mental plate. The pupa can be recognized by cephalothoracic hair 10-C having 4 or more branches and by the position of abdominal hair 3-I which is close to 2-I. Other distinguishing features of the species are as follows:

FEMALE. Head. Vertex blackish brown with pale narrow scales from the middle to occiput and with pale narrow and broad scales around the eye margins, the upright scales dark, and with large patches of pale scales laterally; torus with small, dark flat scales on inner side; palpus dark brown, about 1/8 the length of the proboscis; proboscis slender, blackish brown, about as long as fore femur. Thorax. Scutal scales dark brown, golden along anterior margin and on the scutellum; pleuron with patches of loosely arranged white scales on the sternopleuron and upper mesepimeron; anterior pronotal lobe with a row of 10-12 bristles, without scales; posterior pronotum with a few scattered lanceolate brown scales and a row of 6 bristles posteriorly. Postspiracular area with 4-5 bristles and no scales; sternopleuron with a row of 10-12 bristles and a few hairs behind the upper scale patch, without hairs on the anterior portion; lower mesepimeron bare, a few hairs present behind the upper white scale patch; metameron bare; propleuron with more bristles than scales. Wing. Alula fringed with broad dark brown scales. Legs. Blackish brown, the femora extensively pale ventrally; fore coxal scale patch brown at the middle, pale above and below; mid coxa with a small white scale patch, no scales on the hind coxa; hind claws simple, equal; fore and mid claws equal, each claw toothed. Abdomen. Terga dark, sometimes with lateral pale patches produced on to dorsum on terga III-VII but not forming complete bands; sterna pale scaled on basal 1/2, except sternum VIII which is pale apically. Terminalia. As in figure 3. Three spermathecae, each with a long and narrow neck; cercus short, rather broad; postgenital plate broad, with a wide deep emargination; postatrial sclerite rounded; postatrial plate well sclerotized, with a pair of lateral pointed processes posteriorly, and many coarse hairs along the margin of the opening; preatrial plate very large, hairy and divided to near base.

MALE. Similar to female in general habitus. Legs. Hind claws simple, equal; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 4. Basimere with 2 lobe-like projections at the apex, with one lobe bearing a group of strong bristles while the other lobe is divided and bears 2 short spines at the tip, also with a row of 4-6 long strong curved spines on

inner mesal margin; distimere curved at the middle, narrowed apically and with scattered long setae; aedeagus simple, well sclerotized; paraproct tapered to a pointed tip.

LARVA. As in figure 3. Description and figure based on cast skins.

Head. Hair 1-C comparatively slender; 4-C very small and with 6-8 short branches; 5-C with 6-8 long, barbed branches; 6-C with 4-5 barbed branches; 7-C with 15-18 branches; 8-C single or double, simple; mental plate with 40-44 lateral teeth; antenna spinose; hair 1-A inserted just before the middle of the shaft, with 4-5 barbed branches; 2-A long, stout; 4-A slender, shorter than 2-A; 3-A slender, as long as 6-A. Thorax. Hair 1-P single; 2-P double, sometimes single; 3-P with 3 or 4 branches; 9, 10-P single; 12-P double. Abdomen. Hair 6-I-II double, single on the following segments; 7-I single, with 6 long weak branches on II; segment VIII with 12 pointed comb scales, each scale fringed laterally; 1-VIII with 5-6 barbed branches; 2, 4-VIII each with 2 simple branches; 3, 5-VIII with 9 and 10-11 barbed branches respectively; siphon slightly swollen at the middle, with 12-14 pecten teeth, the distal 3 or 4 teeth large, widely spaced and without denticles, the last tooth inserted at about apical 1/3 of the siphon; siphonal tuft subapical, with 3-4 fairly long branches; saddle minutely rugose, incomplete; hair 1-X single or double; 2-X with 8-10 branches; 3-X single; anal gills very long and slender, about 3 1/2 times the length of the saddle; 2 precratal tufts present.

PUPA. As in figure 4. Description and figure based on cast skins.

Cephalothorax. Hair 3-C double; 10-C with at most 8 branches; 11-C single; 12-C with 2 or 3 branches. Abdomen. Hair 3-I with 1-3 branches, long and single on II-III, near 2-I; 2-I-VII normally developed; 5-III-VI double; 7-III-V branched; 9-VIII normally double, 3-branched in some specimens, single and small on other segments except on VII where it is fairly long; 4-VIII usually double. Paddles. Outer margin finely serrated; hair 1-P simple.

TYPE DATA. I select here as lectotype a female labeled cotype, terminalia on a slide, in the British Museum, with the following data: "#2587 *Aedes (Aedes) atrius* Barraud/cotype female/Nongpoh, ASSAM".

DISTRIBUTION. THAILAND: 3 males, 7 females, 27 larval and 6 pupal skins, *Nakhon Nayok*; 2 males, 6 females, 5 larval and 6 pupal skins, *Kanchanaburi*, Khao Salak Phra; 1 female, *Nakhon Ratchasima*, Koraj Dhong Chad Thing. Other distribution. I have seen specimens from INDIA.

TAXONOMIC DISCUSSION. Several whole larval mounts in the U. S. National Museum collection from Thailand are referred provisionally to *atrius*. They show considerable variation, and it is difficult to be certain if the determination is correct. They have a number of similarities with *A. andamanensis*.

BIOLOGY. Larvae have been collected in ground pools and in puddles. Adults were caught in the jungle in Thailand. Barraud (1934) gives no information on the specimens from India.

AEDES (NEOMACLEAYA) CAUTUS Barraud
(Figures 18, 20)

Aedes (Aedes) cautus Barraud 1928, Indian J. med. Res. 16: 368 (♀*♂*).

A fairly large, blackish brown species. The terminalia are particularly

distinctive by the lobed lateral corners of the female postatrial sclerite and by the forked paraproct and strongly produced toothed apex of the male basimere. The larva and pupa are not known. Other distinguishing characters are as follows:

FEMALE. Head. Vertex blackish brown, with a few pale scales at the middle and on occiput, and small patches of pale scales on both sides; torus bare; palpus about 1/6 the length of the proboscis, dark brown; proboscis about as long as fore femur, dark brown. Thorax. Scutal scales dark brown, with some golden scales along the anterior margin; anterior pronotal lobe with a row of 8-9 bristles, without scales; posterior part of pronotum with a few brown curved scales and 5-6 bristles; postspiracular area with 3-4 bristles, without scales. Sternopleuron with a small patch of pale scales on the lower portion, a larger patch above and a row of 9-10 bristles extending downward behind this scale patch; lower mesepimeron bare, a few hairs present behind the upper white scale patch; propleuron with a patch of pale scales below and a row of bristles above; metameron bare. Wing. Alula fringed with broad scales. Legs. Dark brown, the femora pale ventrally; fore coxa mostly brown scaled, with a small pale spot above; mid and hind coxae each with a small patch of pale scales; hind claws equal, simple; fore and mid claws equal, each claw toothed. Abdomen. Terga dark, with the lateral pale patches sometimes produced on to dorsum; sterna pale scaled basally. Terminalia. As in figure 18. Three unequal, pear-shaped spermathecae; cercus rather short; postgenital plate broad, with a shallow median emargination; postatrial sclerite wide, with lobed lateral corners, flat or lobed medially; postatrial plate with numerous fine hairs along the margin of the opening; preatrial plate hairy, narrowly elongate with rounded basal margin, almost completely divided.

MALE. Description based on the type specimens at the British Museum. Similar to female in general habitus. Legs. Hind claws equal, simple; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 20, the figure copied from Barraud (1928, fig. 21). I have examined the type male terminalia and they are essentially as figured by Barraud. Basimere strongly produced apically into 4 or 5 tooth-like processes, with many strong bristles and 4 strong large spines on the inner mesal margin; distimere swollen pre-apically, pointed apically and with a long seta at apical 1/3; paraproct divided into 2 unequal slender processes; aedeagus short, of the *andamanensis* type.

LARVA and PUPA. Unknown.

TYPE DATA. I select here as lectotype a male, terminalia on a slide in the British Museum with the following data: "Type/Bombay, Deccan, Tavar-gatti, INDIA/P. J. Barraud/mid August 1921". Paratypes: 2 females, 1 male, terminalia in celluloid mount on pin, same data as lectotype.

DISTRIBUTION. THAILAND: 1 female, *Chiang Mai*; 2 females, *Khon Kaen*, *Tham Pho Ti Yan*; 3 females, *Nakhon Si Thammarat*, *Ban Nabon*. Other distribution. INDIA, NORTH BORNEO **, MALAYA (Stone *et al.* 1959).

BIOLOGY. The adults have been reared from larvae collected in jungle pools (Barraud 1934: 288). Females have been reported to bite man.

AEDES (NEOMACLEAYA) CLAVATUS Barraud
(Figure 17)

Aedes (Aedes) clavatus Barraud 1931, Indian J. med. Res. 19: 614 (♂*);

Barraud 1934, Fauna Brit. India, Diptera 5: 294 (σ^*).

This species is distinguished by having a divided paraproct of the male terminalia and by the characteristic structure of the female postatrial and preatrial plates, as figured. Other distinguishing characters are as follows:

FEMALE. Head. Vertex dark brown, with pale golden scales on both sides; many upright dark brown scales mixed with some pale broad scales on the occiput; torus with some small broad brown scales on inner side; palpus brown, about 1/8 the length of the proboscis; proboscis rather stout, dark brown, about as long as fore femur. Thorax. Scutal and scutellar scales reddish to dark brown; anterior pronotal lobe with 5-6 strong bristles and a few short setae; posterior part of pronotum with some curved narrow scales and 4 bristles posteriorly; postspiracular area with 3-4 bristles, without scales; small patches of pale scales on upper and lower sternopleuron and on upper mesepimeron; a row of 8-10 weak bristles behind the pale scale patch on upper sternopleuron, the anterior portion of sternopleuron bare; lower mesepimeron bare, a few hairs present behind the pale scale patch; metameron bare; propleuron with some pale scales below. Wing. Alula fringed with broad scales. Legs. Dark brown, the femora extensively pale ventrally; fore coxal scale patch mostly brown; mid coxa with a small patch of pale scales; no scales on hind coxa; hind claws equal, simple; fore and mid claws equal, each claw toothed. Abdomen. Terga blackish scaled, with the pale lateral patches sometimes produced on to dorsum on terga VI-VII; sterna mostly pale scaled. Terminalia. As in figure 17. Three unequal spermathecae, each with a small short neck; cercus rather short; postgenital plate short, with a shallow median emargination; postatrial sclerite rounded; postatrial plate very characteristic, with many long coarse hairs around the opening; preatrial plate weakly sclerotized at the middle, with a pair of sclerotized transverse ridges across the plate and a pair of additional elongate platelets on each side, not hairy.

MALE. Similar to female in general habitus. Legs. Hind claws equal, simple; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 17. Basimere broadly produced distally ending in a small knob-like process and with a short pointed subapical internal projection; distimere curved distally, notched at tip and with many setae at the distal curved portion; aedeagus well sclerotized, large, of the *andamanensis* type; paraproct divided into 2 processes.

LARVA and PUPA. Unknown.

TYPE DATA. I have seen the type male in the British Museum, with the terminalia on slide. Type locality: Sukna, North Bengal, Darjeeling District, INDIA.

DISTRIBUTION. THAILAND: 3 males, 1 female, *Satum*, Baraket; 1 female, *Trang*, Muang; 2 males, 4 females, *Chon Buri*, Khao Mai Keo; 1 female, *Nakhon Si Thammarat*, Khao Luang. Other distribution. I have also seen specimens from INDIA and VIETNAM **.

BIOLOGY. The adults have been collected in rain forests in baited traps, the kind of bait unknown.

AEDES (NEOMACLEAYA) CRETATUS, n. sp.
(Figures 5, 6)

Species with banded abdominal terga; male fore and mid claws unequal

with both claws toothed, basimere with 2 well differentiated apical projections, a large peg-like process and 1 or 2 spines near the base; female postatrial plate with a pair of wing-like lateral structures. The larva is distinguished by the very long anal gills and by the single prothoracic hair 9, 10, 12-P. The pupa has weak abdominal hair 2 on all segments. Other differentiating characters are as follows:

FEMALE. Head. Vertex dark, with small patches of pale broad scales at the middle, occiput and sides, pale lanceolate scales around the eye margin and a few dark brown upright scales confined to the occiput; torus with small dark scales on inner side; palpus about $1/8$ the length of the proboscis, brown; proboscis about as long as fore femur, dark brown. Thorax. Scutal and scutellar scales brown to golden brown; anterior pronotal lobe with 4 strong bristles and 5 or 6 short hairs, without scales; posterior part of pronotum with a few scattered narrow curved scales and 5 or 6 weak bristles; post-spiracular area with 6 or 7 weak bristles, without scales; only a few pale scales present on lower sternopleuron, 4 or 5 bristles and a few hairs behind the upper pale scale patch, 2-4 fine hairs on the anterior portion; lower mesepimeron bare, the few hairs behind the pale scale patch extending downwards to the middle of the sclerite; metameron bare; propleuron with more bristles than scales. Wing. Alula fringed with brown lanceolate scales. Legs. Largely brown, the femora pale ventrally; fore coxal scale patch mostly brown; mid coxa with a few pale scales; hind coxa without scales; hind claws simple, equal; fore and mid claws equal, both claws toothed. Abdomen. Terga brown with complete pale basal bands which may be broken dorsally; sterna mainly pale scaled. Terminalia. As in figure 5. One large and 2 smaller spermathecae, each with a long neck; cercus elongate; postgenital plate broad, with a deep median emargination; postatrial sclerite convex; postatrial plate with characteristic lateral wing-like structures and fine hairs along the basal margin of the opening; preatrial plate composed of a pair of hairy, elongate platelets and a much smaller pair laterally.

MALE. Similar to female in general habitus. Legs. Hind claws simple, equal; fore and mid claws unequal with both claws toothed. Terminalia. As in figure 6. Basimere with 2 well differentiated apical projections, one of which is long and slender while the other short, stout and hairy, a large peg-like process and 1 or 2 large spines on the inner margin near the base; distimere slender, curved distally; aedeagus simple, of the *andamanensis* type; paraproct slender, tapered distally.

LARVA. As in figure 5. Description and figure based on a male paratype cast skin. Head. Hair 1-C long and stout; 4-C small, a short branched tuft with 5-6 branches; 5-C with 3-5 barbed branches; 6-C with 3 barbed branches, the middle branch usually stronger and longer; 7-C with 9-12 barbed branches; 8-C double, simple; mental plate with about 40 lateral teeth; antenna spinose; hair 1-A inserted at about middle of the shaft, with 3 branches; 2-A long and stout; 4-A slender and shorter than 2-A; 3-A minute; 6-A about half as long as 4-A. Thorax. Hair 1-P single; 2, 3-P with 2 and 3 branches respectively; 9, 10, 12-P single. Abdomen. Hair 6-I-II double, single on the following segments; 7-I single, with 4 or 5 progressively short branches on other segments; segment VIII with 10 pointed comb scales, each scale fringed laterally; hair 1-VIII with 5-7 barbed branches; 2-VIII double or triple; 3, 5-VIII with 6-8 barbed branches; 4-VIII double, simple; siphon swollen basally, with 12-14 pecten teeth, the last 2 distal teeth widely spaced

and each tooth simple or with a very small lateral denticle, the last tooth inserted just beyond the middle of the siphon; siphonal tuft with 3 weak branches; saddle incomplete; hair 1-X single or double; 2-X with 6-8 branches; 3-X single; anal gills long and slender, about 4 times the length of the saddle; 2 or 3 precratral tufts present.

PUPA. As in figure 6. Description and figure based on a male paratype cast skin. **Cephalothorax.** Hair 3-C single; 10-C with 3 or 4 strong branches; 11-C single; 12-C with 1-3 branches. **Abdomen.** Hair 2 normal on all segments; 3-I with 2 or 3 long branches, rather close to 2-I, single on II-III; 4-VII-VIII double; 7-I double; 5-III-V, single on VI-VII; 9-VII single or forked at the tip, poorly developed on other segments except on VII where it is fairly long. **Paddles.** Outer margin serrated; hair 1-P simple.

TYPE DATA. Holotype male, THAILAND: *Khon Kaen*, Tham Pho Ti Yan, T-1822-5, 1962, terminalia on slide. Allotype female, *Nakhon Ratchasima*, Koraj Tha Klong, T-9338, 1962, terminalia on slide. Paratypes 7 females, 1 male, *Kanchanaburi*, Khao Salak Phra, 1965; 1 female, *Chiang Mai*, Huey Chang Kien, 1962; 1 female, same locality as allotype; 2 males, *Chon Buri*, Kasemsan waterfalls; 2 males, *Nakhon Nayok*, Khao Ta Kor, 1963; 2 males, same locality as holotype. Male holotype No. 69210, female allotype, 3 male and 3 female paratypes in the U. S. National Museum. 3 female and 2 male paratypes in the British Museum (Natural History). 3 female and 2 male paratypes in the B. P. Bishop Museum.

DISTRIBUTION. THAILAND.

BIOLOGY. The larvae have been collected in flood pools in rain forest.

AEDES (NEOMACLEAYA) CYRTOLABIS Edwards (Figure 7)

Aedes (Aedes) cyrtolabis Edwards 1928, Bull. ent. Res. 18: 273 (σ^*);
Edwards and Given 1928, Bull. ent. Res. 18: 344 (L*).

Species having numerous hairs on the lower mesepimeron. The record from Thailand is based on a single male specimen with an associated pupal skin collected in a tree hole. It is easily recognized by the marked development of the paraproct of the male terminalia, and by the abdominal hair 9-VII-VIII of the pupa which has 4 and 10 branches respectively. The female is not known. The species is further characterized by the following:

MALE. **Head.** Vertex dark, with a few pale scales on the occiput, around the eye margin and on sides; torus cannot be seen; palpus very short, about 1/10 the length of the proboscis; proboscis slightly longer than fore femur, dark brown. **Thorax.** Scutal and scutellar scales reddish to dark brown; anterior pronotal lobe with a row of 5 bristles, without scales; posterior part of pronotum with a few scattered dark brown, narrowed curved scales and 4 bristles; postspiracular area with 4 bristles, without scales; sternopleuron with small patches of pale scales, numerous fine hairs mixed with the lower scale patch, a row of 7-8 bristles on the upper scale patch and some fine hairs on the anterior portion; lower part of mesepimeron with numerous fine hairs which extend downwards almost to the suture; metameron bare; propleuron with some pale scales and weak bristles. **Wing.** Alula fringed with broad scales. **Legs.** Dark brown, the femora pale ventrally; fore coxa

brown scaled, with a small pale spot above; mid coxa with a few pale scales; hind coxa without scales; mid and hind claws missing; fore claws unequal, the larger claw with a large tooth. Abdomen. Terga dark dorsally, with pale lateral patches; sterna with basal patches of pale scales. Terminalia. As in figure 7. Basimere with a short apical projection and a smaller subapical thumb-like process; distimere large, swollen distally; aedeagus long and simple; paraproct markedly large, long and sinuous; tergum IX wedge-shaped at the middle.

FEMALE. Unknown.

LARVA. The following brief description was taken from Edwards and Given (1928: 344-345). Head. Hair 1-C long and slender; 4-C very small, branched; 5, 6-C each with 3 branches; 7-C with 10 branches; mental plate with about 20 lateral teeth; antenna spinose; hair 1-A inserted before the middle of the shaft, with 4-6 branches. Abdomen. Hair 6-I double; 2-II-VII single; segment VIII with 6-8 sharply pointed comb scales, each scale finely fringed; siphon slightly broadened to near middle, with about 12 pecten teeth, most of which have 1 or 2 strong basal denticles, the distal 3 teeth simple and more widely separated, the last tooth inserted a little beyond the middle of the siphon; siphonal tuft with about 4 branches; saddle incomplete, its posterior edge smooth; hair 1-X simple and rather small; anal gills very long, over 3 times as long as the saddle.

PUPA. As in figure 7. Description and figure based on a single cast skin. Cephalothorax. Hair 3-C single and very long; 10-C with 4 weak branches; 11-C single; 12-C with 6 long branches. Abdomen. Hair 3-I-II double and very close to 2-I-II; 2-I-II fairly long, shorter on other segments; 5-IV double, single on V-VI; 6-VII branched; 9-VII-VIII with 5 and 10 dendritic branches respectively. Paddles. Distal margin finely serrated; hair 1-P simple.

TYPE DATA. I have seen the type male on a slide in the British Museum. Type locality: SINGAPORE.

DISTRIBUTION. THAILAND: 1 male with an associated pupal skin, *Nakhon Nayok*, Khao Yai. Other distribution. SINGAPORE.

BIOLOGY. Edwards and Given (1928: 345) record the larval habitat as mangrove area. The single specimen from Thailand was collected in a tree hole.

AEDES (NEOMACLEAYA) DERMAJOENSIS Brug (Figure 8)

Aedes (Aedes) dermajoensis Brug 1931, Tijdschr. Ent. 74: 250 (σ^*).

A small dark species with pale basal bands on the abdominal terga. The fore and mid claws are unequal with both claws toothed. The basimere is projected apically into a short pointed process, with 1 or 2 short subapical spines and 2 long spines near the base. The pupa has abdominal hair 2-III-VI spine-like. The female and larva are not known. Other distinguishing characteristics are as follows:

MALE. Head. Vertex blackish brown, with pale lateral patches and a few upright dark scales on the occiput; torus bare; palpus very short, about

1/10 the length of the proboscis, dark brown; proboscis longer than fore femur by the length of the labella, dark brown. Thorax. Scutal and scutellar scales dark to reddish brown; anterior pronotal lobe with a row of 5 or 6 bristles, without scales; posterior part of pronotum with 3 or 4 bristles, without scales; upper and lower sternopleuron with small patches of broad pale scales; lower mesepimeron bare, a few hairs present behind the pale scale patch; metameron bare; propleuron with a small patch of pale scales. Wing. Alula fringed with broad dark brown scales. Legs. Dark scaled, the femora pale ventrally; hind claws simple, equal; fore and mid claws unequal, both claws toothed; fore coxal scale patch mainly brown; mid coxa with a patch of white scales; hind coxa without scales. Abdomen. With pale basal bands on terga II-VI; sterna dark scaled apically. Terminalia. As in figure 8. Basimere projected apically into a short pointed process, with 1 or 2 subapical spines and 2 long dark spines near the base; distimere swollen at the middle, abruptly tapered to a pointed bent tip, with some setae at the swollen portion; aedeagus small, very simple; paraproct relatively short, enlarged at the base, tapered distally.

FEMALE and LARVA. Unknown.

PUPA. As in figure 8. Description and figure based on cast skins.

Cephalothorax. Respiratory trumpet slender, cylindrical; hair 3-C with 4 branches; 10-C with 3-5 branches; 11-C single; 12-C with 5-6 short branches. Abdomen. Hair 2-III-VI spine-like; 3-I with 3-4 branches, very long and single on II-III; 5-IV-VI single, very long; 6-I-II, VI-VII single, double or 3-branched on III-V; 7-III, IV branched; 9-VIII long and single, very small on other segments. Paddles. Outer margin with sharp serrations; hair 1-P simple.

TYPE DATA. I have seen the type male in the British Museum, the terminalia and hind tarsal claws in celluloid mount on pin. Type locality: Benkulen, SUMATRA. The specimen is in very poor condition, much of the head is destroyed and only 1 fore leg is intact.

DISTRIBUTION. THAILAND: 3 males, each with associated pupal skins, *Songkhla*, Haad Yai. Other distribution. SUMATRA.

TAXONOMIC DISCUSSION. The Thailand specimens agree with Brug's figure of the terminalia and the type specimen except for the dark abdominal terga with small pale lateral patches.

BIOLOGY. Brug (1931: 250) records that this species was bred from a larva found in a forest pool. The Thailand specimens were collected in pools in a stream bed.

AEDES (NEOMACLEAYA) DUX Dyar and Shannon
(Figures 9, 10)

- Aedes (Aedes) dux* Dyar and Shannon 1925, Insec. Inscit. menst. 13: 81 (♂♀); Laffoon 1946, J. Wash. Acad. Sci. 36: 233 (♂*♀*L*);
Aedes (Aedes) sigmoides Barraud 1928, Indian J. med. Res. 16: 373 (♀*); Causey 1937, Amer. J. Hyg. 25: 414 (synonymy); Iyengar and Menon 1956, Bull. ent. Res. 47: 789 (♂*);
Aedes (Aedes) macrodixoa (female only) of Bohart 1945, U. S. Navmed 580: 65.

On the basis of the structures of the female and male terminalia, *A.*

dux can be readily separated from all other known species. The female postatrial plate is particularly distinctive by having a pair of lateral finger-like, hairy processes. The male basimere is very short and projects laterally towards the inner margin. The larva has very short gills and fewer pecten teeth. The pupa has poorly developed abdominal hair 2-I-VII, long and single 7-I. Other distinguishing characteristics are as follows:

FEMALE. Head. Vertex blackish brown, with small patches of pale scales at the middle and sides, some scattered ones on the occiput and upright dark scales behind the occiput; torus with a few fine hairs; palpus dark brown, about 1/8 the length of the proboscis; proboscis dark brown, longer than fore femur by the length of the labella. Thorax. Scutal and scutellar scales uniformly dark brown; anterior pronotal lobe with 4 strong and 5-6 weak bristles, without scales; posterior part of pronotum with some narrow, dark curved scales and 5-6 bristles; postspiracular area with 10-12 bristles, without scales; sternopleuron and upper part of mesepimeron with small patch of white scales, 8 bristles behind the upper scale patch on the sternopleuron, and no hairs on the anterior portion of sternopleuron; lower part of mesepimeron bare, the mesepimeral hairs confined to the area behind the scale patch; metameron bare; propleuron with 4-5 bristles and a small patch of white scales. Wing. Alula fringed with brown lanceolate scales. Legs. Dark brown, the femora pale ventrally; fore coxal scale patch brown, with a small pale spot above; mid and hind coxae each with a row of white scales; hind claws simple, equal; fore and mid claws equal, each claw toothed. Abdomen. Terga dark brown or with pale brown lateral patches, sometimes a small lateral spot of almost whitish scales may be present on tergum I; sterna brown. Terminalia. As in figure 9. Three unequal spermathecae, each with a long neck; cercus rather short; postgenital plate almost conical, with a deep median emargination; postatrial sclerite rounded; postatrial plate quite simple, with a pair of hairy lateral finger-like processes; preatrial plate represented by 2 small separated curved structures.

MALE. Essentially similar to female. Legs. Hind tarsal claws simple, equal; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 10. Basimere very short and projecting laterally towards the inner margin, with a long subapical process and a shorter curved spine; distimere swollen at the base, tapering to a curved tip, with some setae at the middle; aedeagus very simple; paraproct slender, joined distally.

LARVA. As in figure 9. Head. Hair 1-C long, fairly stout; 3-C small; 4-C with 5-6 very short weak branches; 5, 6-C each with 3 or 4 long barbed branches; 7-C with 7-9 long barbed branches; 8-C with 2 or 3 short branches; antenna spinose; hair 1-A inserted a little below the middle, with 6-8 finely barbed branches; 2-A long; 4-A slender and shorter than 2-A; 3-A minute; 6-A shorter than 4-A; mental plate with 18-21 lateral teeth. Thorax. Hair 1-P single; 2-P double; 3-P with 2 or 3 branches; 9, 10, 12-P single. Abdomen. Hair 6-I-II double, single on III-VI; 7-I single, with 4 short weak branches on II and much shorter branches on III-V; segment VIII with 10-12 comb scales, each scale pointed and finely fringed; hair 1-VIII with 3-5 barbed branches; 2-VIII double, simple; 3-VIII with 6-7 long, barbed branches; 4-VIII single, simple; 5-VIII with 8-10 barbed branches; siphon with 10-12 pecten teeth, each tooth with 2 or 3 lateral denticles, the last tooth inserted at about the middle of the siphon; siphonal tuft with 4-6 long branches; saddle incomplete, the integument minutely spinose; hair 1-X sin-

gle; 2-X with 4-6 branches; 3-X single; anal gills short, as long as the saddle; 2 or 3 precratal tufts present.

PUPA. As in figure 10. Cephalothorax. Hair 3-C single; 10-C with 5-8 branches; 11-C single; 12-C with 3 long branches. Abdomen. Hair 3-I with 2 or 3 branches, single on II-III; 2-I-VII weak, very small; 4-VII, VIII single; 5-IV-VII double; 6-I-II, VI-VII single; 7-I single; 7-V-VII single; 9-VII fairly long, single; 9-VIII single. Paddles. Outer margin finely serrated; hair 1-P simple.

TYPE DATA. *Aedes dux* Dyar and Shannon, holotype male in the U. S. National Museum; type locality: PHILIPPINE ISLANDS. *Aedes (Aedes) sigmoides* Barraud, type female in the British Museum; type locality: ANDAMAN ISLANDS.

DISTRIBUTION. THAILAND: 1 male, 3 females, 4 associated pupal skins, *Samut Prakan*; 1 male, 9 females, *Phra Nakhon*, Bangkok; 1 male, 1 female, *Chanthaburi*, Kaeo Khao Phloi Waen; 1 female, *Ranong*, Muang; 2 larvae and 1 cast skin (Philippines). Other distribution. I have seen specimens from the PHILIPPINES, INDOCHINA, JAVA and ANDAMAN IS. Stone *et al.* (1959) record it from HAINAN ISLAND.

BIOLOGY. The adults have been collected in a crab hole (as *sigmoides*) and at light traps. Larvae were found in foot prints in ricefields near mangrove swamps, in a salt marsh and in brackish water.

AEDES (NEOMACLEAYA) GIBBOSUS, n. sp.
(Figures 11, 20)

A species having fine hairs on the metameron and lower mesepimeron. It is differentiated by the markedly swollen distimere and strongly produced basimere of the male terminalia, and by the scalloped or sculptured anterior margin of the female postatrial plate. The pupa has small and poorly developed abdominal hair 2-I-VII and branched 6-VII. The larva is not known. Other distinguishing characters are as follows:

FEMALE. Head. Blackish brown, with pale patches on both sides, and a few upright dark scales confined to the occiput; torus with small dark brown scales; palpus about 1/8 the length of the proboscis, dark brown; proboscis longer than fore femur by the tip of the labella. Thorax. Scutal and scutellar scales mostly reddish or dark brown; anterior pronotal lobe with 8 strong bristles and a few short hairs; posterior part of pronotum with narrow curved brown scales and a row of 5-6 strong bristles; postspiracular area with 4 bristles, without scales; sternopleuron with scattered fine hairs on the anterior portion, a large pale and brown scale patch and about 18 bristles on the posterior area; mesepimeron with numerous hairs behind the pale scale patch, these continuing downwards to lower portion of the sclerite; propleuron with a row of bristles above and a patch of pale scales below; metameron with fine hairs. Wing. Alula fringed with dark brown broad scales. Legs. Dark brown, the femora pale ventrally; fore coxal scales all dark brown; mid and hind coxae each with patches of white scales; hind claws simple, equal; fore and mid claws equal, each claw toothed. Abdomen. Dark dorsally, with pale lateral patches; sterna largely pale with brown apices. Terminalia. As in figure 20. Cercus rather narrow; postgenital plate broad with a wide, deep emargination; postatrial sclerite rather poorly sclerotized, convex medially

and with strongly lobed lateral corners; postatrial plate distinctive, the apical margin of the opening scalloped or sculptured, the basal half with many short hairs; preatrial plate hairy, deeply emarginate basally; three unequal spermathecae, each with a narrow neck.

MALE. Essentially similar to female. Legs. Hind claws simple, equal; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 11. Basimere with 1 long strongly produced tapered process which is strongly bent before the apex and a much shorter process on the inner margin bearing a large spine and a subapical lobe with 3 or 4 spines; distimere large, expanded apically and with a pointed tip at one angle; aedeagus fairly simple; paraproct long and tapered distally.

LARVA. Unknown.

PUPA. As in figure 11. Description and figure based on a single cast skin. Cephalothorax. Hair 3-C double; 10-C with 4 branches; 11-C single; 12-C missing. Abdomen. Hair 3-I double, single on II-III; 2-I-II fairly long, small and poorly developed on other segments; 5-III-IV with 3 branches, double on V, single on VI-VII; 6-VII very small, branched; 9-VII fairly short; 9-VIII single, poorly developed on other segments. Paddles. With finely serrated margin; hair 1-P simple.

TYPE DATA. Holotype male, with pupal cast skin, THAILAND: *Songkhla*, Haad Yai, S187-138, 1963, terminalia on slides. Paratypes, 3 males, 9 females, MALAYA: Rantaw Panjang, Selangor, 10. ii. 1953, 4. iii. 1953, 26. xi. 1953 (J. A. Reid); 1 female, terminalia on slide, JAVA: Pagar Dewa, 27. xii. 1958. Holotype male, 1 male and 3 female paratypes in the U. S. National Museum (no. 69211). Two male and 7 female paratypes in the British Museum (Natural History) London.

DISTRIBUTION. THAILAND, MALAYA and JAVA.

TAXONOMIC DISCUSSION. On the basis of the external characters *A. gibbosus* is very similar to *A. singularis* except that in *singularis* the metameron is bare and the terminalia are markedly distinct.

BIOLOGY. The larvae were collected in ground pools among nipa palms and in puddles.

AEDES (NEOMACLEAYA) HISPIDUS, n. sp.
(Figure 18)

Species having pale subbasal bands on abdominal terga and broad pale scales on the postspiracular area. The female terminalia have markedly large preatrial plates. The male, larva and pupa are not known.

FEMALE. Head. Vertex largely dark brown, with a few pale narrow scales from its middle to occiput and around the eye margin, small patches of pale broad scales laterally and some dark upright ones confined to the occiput; torus with a few broad scales and fine hairs on the inner side; palpus about 1/8 the length of the proboscis, dark brown; proboscis slightly shorter than, or about as long as fore femur. Thorax. Scutal and scutellar scales brown to golden; anterior pronotal lobe covered with narrow golden scales and bristles; posterior part of pronotum with golden curved narrow scales and 4-5 bristles; postspiracular area with broad white scales and 5-6 bristles; sternopleuron with 2 large patches of white scales, a row of 8-9 bristles posteriorly, and no hairs on the anterior portion; lower part of mesepimeron bare; metameron

bare; propleuron with a group of bristles above and a small patch of pale scales below. Wing. Alula fringed with narrow scales. Legs. Brown, the femora pale ventrally. Fore coxal scale patch broadly brown at the middle, white scaled below and above; mid coxa with a patch of white scales; hind coxa without scales; hind claws simple, equal; fore and mid claws equal, each claw toothed. Abdomen. Terga II-VI with complete subbasal pale bands, broken on VII, continuous on VIII, each band connected to the pale lateral patches; sterna pale or yellowish at basal half, brown apically. Terminalia. As in figure 18. Three unequal spermathecae, each with a short neck; cercus elongate; postgenital plate deeply emarginate; postatrial sclerite convex; postatrial plate with fairly long and thick hairs along the margin of the opening; preatrial plate divided, very large and hairy.

MALE, LARVA and PUPA. Unknown.

TYPE DATA. Holotype female, THAILAND: *Udon (Udon Thani)*, Nong Bua Sampor, T-3184, 1962, terminalia on slide 2.iii.66 (fore claws missing). Paratypes, 2 females, *Ubol (Ubon Ratchathani)*, Boundary Chong Mek, T-870, 1963; *Chiang Mai*, Klong Loi, T-1788, 1962, both terminalia on slides. Female holotype and 1 female paratype in the U. S. National Museum (no. 69212); 1 female paratype in the British Museum (Natural History).

DISTRIBUTION. THAILAND.

TAXONOMIC DISCUSSION. *A. hispidus* is very similar to *A. indicus* in general habitus, from which *hispidus* differs in the details of the structure of the female terminalia.

BIOLOGY. Unknown.

AEDES (NEOMACLEAYA) INCERTUS Edwards (Figures 12, 13)

Aioretomyia taeniata Leicester 1908, Cul. Malaya 3: 190 (name preoccupied).
Aedes (Aedes) incertus Edwards 1922a, Indian J. med. Res. 10: 264 (*nom. nov.* for *taeniata* Leicester 1908); King and Hoogstraal 1947, J. Wash. Acad. Sci. 37: 115 (taxonomy).

A. incertus can be distinguished from most other species by the simple pocket-shaped postatrial plate of the female terminalia. The larval siphon has fewer pecten teeth, at most 10, and the prothoracic hair 9-P is branched. The pupa has spine-like abdominal hair 2-II-VI and branched 6-VII. Other distinguishing characters of the species are as follows:

FEMALE. Head. Vertex dark, with some narrow pale scales at the middle and around the eye margin, small patches of pale scales laterally and dark upright scales confined to the occiput; torus with small dark scales on the inner side; palpus about 1/6 the length of the proboscis, dark brown; proboscis rather stout, about as long as fore femur, dark brown. Thorax. Scutal and scutellar scales uniformly reddish brown; anterior pronotal lobe with bristles, without scales; posterior part of pronotum with a few narrow reddish brown scales and 4 bristles posteriorly; postspiracular area with 3 or 4 bristles; sternopleuron with small patches of white scales rather loosely arranged and a row of 10-11 bristles behind the upper pale scale patch, without hairs on the anterior portion; mesepimeron hairs confined to the area behind the pale scale patch, lower part of mesepimeron without hairs; metameron

bare; propleuron with a small patch of loose scales and a row of 5 bristles. Wing. Alula fringed with dark brown narrow scales. Legs. Dark brown, the femora extensively pale ventrally; fore coxal scale patch mostly brown, with a few pale scales above; mid coxa with a row of white scales; hind coxa without scales; hind tarsal claws simple, equal; fore and mid claws equal, each claw toothed. Abdomen. Terga dark brown, with some pale scales dorsally but usually dark in most specimens, with definite pale lateral patches; sterna pale scaled, the apices appearing brownish. Terminalia. As in figure 12. Three unequal spermathecae, each with a long narrow neck; cercus short; postgenital plate broad, with a very shallow emargination; postatrial sclerite rounded; postatrial plate simple, represented by a pocket-shaped structure with a pair of lateral arms, no hairs; preatrial plate small, poorly sclerotized, rounded and hairy.

MALE. Uncertain; the single male recorded from Merauke by Edwards (1922b: 468, terminalia not described) seems doubtful (King and Hoogstraal 1947: 115).

LARVA. As in figure 12. Head. Hair 1-C long and stout; 4-C small, with 5 or 6 short weak branches; 5-C with 3-4 long barbed branches; 6-C with 2-3 long barbed branches; 7-C with 9-11 barbed branches; 8-C with 3 weak branches; antenna spinose; hair 1-A inserted slightly below the middle of the shaft, with 4-6 long barbed branches; 2-A stout, long; 4-A slender, shorter than 2-A; 3-A much shorter and smaller than 6-A; mental plate with about 36 lateral teeth. Thorax. Hair 1-P single, long; 2-P double or forked; 3-P double; 9-P with 3 branches, 10, 12-P single. Abdomen. Hair 6-I-II double, single on segments III-VI; 7-I single, with 5 short branches on II, much shorter on the following segments; segment VIII with 8-10 pointed comb scales, each scale with a fine lateral fringe; hair 1-VIII with 8 barbed branches; 2-VIII with 3 long simple branches; 3-VIII with 8 barbed and longer branches; 4-VIII double, simple; 5-VIII with 8-10 barbed branches; 7-III-V branched; siphon fairly stout, evenly tapering, with 8-10 pecten teeth, the 2 distal teeth widely spaced, simple or with a small lateral denticle, the last tooth inserted a little beyond the middle of the siphon; siphonal tuft with 3-4 weak branches; saddle incomplete; hair 1-X double, long; 2-X with 9 long branches; 3-X single; anal gills long, more than twice the length of the saddle; 2 precratal tufts present.

PUPA. As in figure 13. Cephalothorax. Hair 3-C with 4 branches; 10-C with 3 short branches; 11-C single; 12-C with 6-8 rather weak short branches. Abdomen. Hair 3-I with 2 or 3 branches, single and long on II-III, rather close to 2-I; 2-II-VI spine-like, fairly weak on other segments; 5-IV-VI long, single; 6-VII branched; 9-VIII single and long, poorly developed on other segments. Paddles. With finely serrated margin; hair 1-P simple.

TYPE DATA. I select as lectotype a female in the British Museum labeled cotype of *A. taeniata*, with the following data: "Jungle 5th mile Gombak Rd./Kuala Lumpur/midday/29/2/04. Kuala Lumpur, FEDERATED MALAY STATES/Dr. G. F. Leicester/1912-350", terminalia mounted in celluloid on pin. The specimen is in a very poor condition, 3 legs and abdomen are mounted on board, the head and wings are missing and the thorax is badly broken.

DISTRIBUTION. THAILAND: 9 females and 8 associated larval and pupal skins, *Songkhla*, Haad Yai. Other distribution. MALAYA, BORNEO (Edwards 1922b), and JAVA **.

TAXONOMIC DISCUSSION. On the basis of the simple structures of the

female terminalia *A. incertus* could be confused with females of *Verrallina*. It differs, however, by the pointed comb teeth of the larva and by certain characters of the adult as noted above.

BIOLOGY. Adults have been bred from larvae collected in pools in a stream bed.

AEDES (NEOMACLEAYA) INDICUS (Theobald)
(Figures 18, 20)

Neomacleaya indica Theobald 1907, Mon. Cul. 4: 238 (♀).

Aedes (Aedes) indicus (Theobald), Edwards 1922a, Indian J. med. Res. 10: 264 (key); Barraud 1928, Indian J. med. Res. 16: 366 (♀*♂*); Barraud 1934, Fauna Brit. India, Diptera 5: 283 (♂*♀*L).

Skusea mediofasciata Theobald 1907, Mon. Cul. 4: 544 (♂*♀*).

The female of this species has banded abdominal terga and curved narrow scales on the postspiracular area; the large spermatheca has a markedly swollen neck and the preatrial plate is divided into 2 darkly pigmented rounded pieces. The male terminalia and larva have been described and figured by Barraud (1934: 284-285, figs. 68b and 69). The figures are copied here as in figure 20. The pupa is not known. Other characteristics of the species are as follows:

FEMALE. Head. Vertex dark brown, with a small spot of narrow golden scales at the middle and occiput, small patches of broad pale scales at the sides and a few upright ones confined to the occiput; torus with small broad scales and fine hairs on inner side; proboscis longer than fore femur by the length of the labella, dark brown. Thorax. Scutal and scutellar scales mostly brown mixed with some golden ones; pleural scales rather loosely arranged; anterior pronotal lobe covered with short and long bristles; posterior part of pronotum with narrow curved light brown scales and 5 or 6 bristles; postspiracular area with narrow curved golden scales and 4 or 5 bristles; sternopleuron with two small patches of pale scales, 5 or 6 bristles behind the upper scale patch, and no hairs on its anterior portion; lower part of mesepimeron bare; metameron bare; propleuron with flat scales and 6 or 7 bristles. Wing. Alula fringed with narrow or lanceolate scales. Legs. Dark brown, the femora pale ventrally; fore coxal scale patch mostly brown, with some pale scales on the top and bottom; mid and hind coxae each with a few pale scales; hind claws simple, equal; fore and mid claws equal, each claw toothed. Abdomen. With subbasal bands on terga II-IV, broken on V-VI; sterna mostly dark brown with some scattered pale scales basally. Terminalia. As in figure 18. Three spermathecae, the larger one with a curved swollen neck and punctate at the neck region; cercus elongate; postgenital plate rather narrow, deeply emarginate in Thai specimens, very shallow in 1 specimen from India; postatrial sclerite convex; postatrial plate with many long thick hairs along the posterior half of the opening; preatrial plate divided into 2 rounded pieces, dark pigmented.

MALE. According to Barraud (1934: 283) differs from the female by the lateral pale patches not forming complete bands on the abdominal terga. Terminalia. As in figure 20, copied from Barraud (1934: 284, fig. 68b). Similar to those of *A. nigrotarsis* from the Philippines. Basimere with a broad,

blunt apical projection and a long slender elbowed process arising at the base; distimere slender, curved and tapered to a pointed tip, although Barraud described and figured it as having a small terminal appendage; aedeagus simple; paraproct slender, slightly curved and long, pointed distally.

LARVA. As in figure 20, copied from Barraud (1934: 285, fig. 69). The distinguishing features as figured in Barraud (1934) are as follows: Head. Hair 5, 6-C each with 3 branches with the middle branch stouter; antennal hair 1-A inserted just below the middle of the shaft, with 3 stout branches. Abdomen. Segment VIII with 10 comb scales arranged in a row, each scale pointed and finely fringed to basal 1/2; hair 4-VIII long and single; siphon with 12 pecten teeth, each tooth with 2 small lateral denticles, the last distal tooth long and widely separated.

PUPA. Unknown.

TYPE DATA. *Neomacleaya indica* Theobald, type female in the British Museum, terminalia not mounted, the hind tarsal claws missing; type locality: INDIA. *Skusea mediofasciata* Theobald, type female in the British Museum on slide; type locality: INDIA.

DISTRIBUTION. THAILAND: 2 females, *Chon Buri*, Khao Mai Kaeo and *Nakhon Ratchasima*, Pak Thong Chai. Other distribution. I have seen specimens from INDIA and CEYLON.

TAXONOMIC DISCUSSION. I have examined the female type specimens from India in the British Museum but I have not seen the male ascribed to *indicus*. Barraud (1928: 366; 1934: 283) describes and figures the "clasper (or style) slender, curved, with a pointed small terminal appendage". I feel Barraud may have made an error about this character. It would certainly appear that the male belongs to a different group but it is likely that the tip of the (clasper) distimere was bent and that he mistook it for a terminal appendage. The structures of the male and female terminalia resemble those of *A. nigrotarsis* but the basal process on the male basimere is long and slender in *indicus*, more or less crescentic in *nigrotarsis*. The female preatrial plate is entire and well sclerotized in *nigrotarsis* but rounded and separated in *indicus*. Also, usually only the large spermatheca has a swollen, bent neck in *indicus*.

BIOLOGY. Barraud (1934: 286) records the larval habitat as open pools and rain-filled ditches.

AEDES (NEOMACLEAYA) INDECORABILIS (Leicester) (Figures 13, 20)

Verrallina indecorabilis Leicester 1908, Cul. Malaya 3: 200 (♂♀).

Verrallina imitator Leicester 1908, Cul. Malaya 3: 201 (♀); Stone, Knight and Starcke 1959. Thomas Say Found., Ent. Soc. Amer. 6: 206 (synonymy).

The record of this species in Thailand is based only on 2 slide mounts of the male terminalia. I have not been able to locate their corresponding bodies. The following description is based on the type specimens in the British Museum (Natural History), London.

FEMALE. The specimens are in a rather poor condition, many of the scales are rubbed off; those remaining on vertex dark brown, with some pale scales laterally, 4 or 5 brown upright scales on the occiput; torus with some flat small narrow scales on the inner side; palpus about 1/8 the length of the

proboscis, dark brown; proboscis as long as fore femur, dark brown. Thorax. With a few reddish brown scutal scales; anterior part of pronotal lobe with 6 bristles, 1 remaining pale broad scale; posterior part of pronotum with 2 bristles, without scales; upper and lower sternopleuron with small patches of scales and 5 bristles behind the upper scale patch; upper part of mesepimeron with a small patch of pale scales, without hairs behind this scale patch; lower part of mesepimeron bare; propleural scales and bristles gone; metameron bare. Wing. Alula fringed with narrow scales. Legs. Brown; fore coxal scale patch brown with a small pale spot above; mid coxa with a small pale spot; hind coxa almost bare; hind claws equal, toothed; fore and mid claws equal, each claw toothed. Abdomen. Terga brown, sometimes with a few pale scales laterally; sterna not seen. Terminalia. As in figure 20. Postgenital plate small, elongate with a shallow emargination; cercus narrow, elongate; postatrial plate bulbous, simpler than most other species; preatrial plate elongate, hairy and with a large lateral expansion.

MALE. Similar to female in habitus. Legs. Hind tarsal claws equal, toothed; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 13. Basimeres joined together at the subapical portion, bluntly produced apically; distimere markedly swollen at the middle then abruptly narrowed and curved distally, with many setae at the swollen portion; aedeagus slender and much elongate; paraproct long, tapered and curved distally.

LARVA and PUPA. Unknown.

TYPE DATA. *A. indecorabilis*, 1 male and 1 female labeled cotype in the British Museum. I select the male as lectotype. It has the following data: "Larva fr. pool in jungle patch/Gombak Rd. 5 miles fr. Kuala Lumpur/29/2/04. Kuala Lumpur, FEDERATED MALAY STATES/Dr. G. F. Leicester/1912-350". Terminalia and tarsal claws in celluloid mount on pin, rest of the body glued on board. *A. imitator*, 2 females labeled cotype in the British Museum. One female selected here as lectotype. It has the following data: "Jungle 5th mile Gombak Rd/11/2/04. Kuala Lumpur, FEDERATED MALAY STATES/Dr. G. F. Leicester/1912-350". Terminalia and rest of the abdomen in celluloid mount on pin.

DISTRIBUTION. THAILAND: 2 slide mounts of male terminalia. Other distribution. I have seen specimens from MALAYA and NORTH BORNEO**.

TAXONOMIC DISCUSSION. This species agrees with the descriptions of *uniformis* or *fragilis* except for the details of the terminalia, as noted above.

BIOLOGY. Leicester (1908: 201) records the larvae have been taken in a small jungle pool.

AEDES (NEOMACLEAYA) LATIPENNIS, n. sp.
(Figures 14, 15)

This species is readily differentiated from most other species by the characters of the terminalia: the male paraproct is broad and with 2 long bristles, and the distimere has a crescentic process at the base; the female postatrial plate is lightly sclerotized and covered with short hairs. The larva can be recognized by the well developed abdominal hair 1, 3, 5-VIII and by the branched thoracic hair 1-P; the pupa has abdominal hair 2-I-VII spine-like. Other characteristics are as follows:

FEMALE. Head. Vertex mostly dark brown, with pale scales along the

eye margin and occiput; torus with some fine hairs and small, broad dark scales; palpus dark brown, about $1/8$ the length of the proboscis; proboscis brown, longer than fore femur by the length of the labella. Thorax. Scutal and scutellar scales uniformly dark reddish brown; anterior pronotal lobe with 4 or 5 bristles, without scales; posterior part of pronotum with reddish brown, narrow curved scales and 5 bristles; postspiracular area with 5 or 6 bristles, without scales; sternopleuron with a few fine hairs on the anterior portion and patches of pale scales on the upper and lower areas, the lower scale patch mixed with some fine hairs; lower part of mesepimeron bare, the many fine hairs behind the upper scale patch extending downwards only to the middle of the sclerite; metameron bare; propleuron with some pale scales and bristles. Wing. Alula fringed with rather broad scales. Legs. Dark reddish brown, the femora pale striped for most of their length; fore coxal scale patch blackish brown, a few pale ones above; mid and hind coxae each with some pale scales; hind claws simple, equal; fore and mid claws equal, each claw toothed. Abdomen. Terga blackish brown dorsally, with pale lateral patches; sterna mostly pale scaled. Terminalia. As in figure 14. Three unequal spermathecae, each with a short neck; cercus long and slender; postgenital plate longer than wide, with a deep median emargination; postatrial sclerite rounded; postatrial plate lightly sclerotized, covered mostly with short branched hairs; preatrial plate markedly large, more or less separated, with fine hairs on most of the surface.

MALE. Similar to female in general habitus. Legs. Hind claws simple; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 15. Basimere with a group of strong bristles apically, a three-pronged process on the inner mesal margin, a long slender process arising from the base and a small hairy lobe at the base; distimere tapered distally, with a crescentic process at the base and a row of strong bristles at the middle; aedeagus simple, elongate; paraproct broad, flattened and with 2 long bristles.

LARVA. As in figure 14. Description and figure based on cast skins of paratypes. Head. Hair 1-C fairly stout; 4-C with 4 weak branches, very small; 5-C with 1-3 strong barbed branches; 6-C with 1-4 strong barbed branches, if 3-branched the middle branch usually longer and stronger; 7-C with 8 shorter branches; 8-C with 3 long simple branches; mental plate with 36-38 lateral teeth; antenna spinose; hair 1-A inserted below the middle of the shaft, with 5 barbed branches; 2-A long; 4-A slender, shorter than 2-A; 3, 6-A very short. Thorax. Hair 1-P double; 2, 3-P each with 3 or 4 branches; 9-P with 3 branches; 10, 12-P single. Abdomen. Hair 6-I-II normally double, single on III-VI; 7-I single, with 4 or 5 shorter branches on II, much shorter and poorly developed on other segments except on VI; segment VIII with 10-14 comb scales, each scale pointed and with a short lateral fringe; hair 1-VIII with 4 or 5 strong, stout branches; 2-VIII double or triple; 3-VIII with 4-6 strong, stout branches; 4-VIII double, slender; 5-VIII with 6-8 strong branches; siphon large, slightly swollen at the middle, with 14 pecten teeth, each tooth with 1-4 lateral denticles, the last tooth inserted at apical $1/2$ to $1/3$ of the siphon; siphonal tuft small, with 4 or 5 weak branches; saddle incomplete, smooth; hair 1-X single; 2-X with 6-8 rather short branches; 3-X single; anal gills twice the length of the saddle; 3 or 4 precratral tufts present.

PUPA. As in figure 15. Description and figure based on cast skins of paratypes. Cephalothorax. Hair 3-C single, short; 10-C with 3 branches; 11-C single; 12-C double. Abdomen. Hair 3-I with 3 or 4 long branches,

single on II-III and close to 2-I; 2-I-VII spine-like; 5-IV-VII double; 6-VII branched; 9-VII fairly long or as long as 9-VIII, poorly developed on other segments. Paddles. With strong midrib and serrated outer margin; hair 1-P simple.

TYPE DATA. Holotype male, THAILAND: *Songkhla*, Nga Chang, SI-84-11, 1965, terminalia on slide. Allotype female, same locality as holotype except SI-82-12, terminalia on slide. Paratypes, 1 male, *Nakhon Si Thammarat*, Ban Tha Phae; 2 females, same locality as holotype. Male holotype, female allotype and 1 female paratype with associated skins on slides in the U. S. National Museum (no. 69213). One male and 1 female paratypes with associated skins on slides, in the British Museum (Natural History).

DISTRIBUTION. THAILAND.

BIOLOGY. Adults have been bred from larvae collected in pools in a stream bed.

AEDES (NEOMACLEAYA) NOTABILIS, n. sp.
(Figure 18)

Although this species is based only on a single female specimen, the terminalia are particularly distinctive in that the postatrial plate has 2 hairy lobed structures. Also, the hind claws are equal, each claw toothed. Other distinguishing features of the species are as follows:

FEMALE. Head. Vertex dark with a few pale scales at the sides and occiput, some upright dark scales confined to the occiput; torus with a few fine hairs on the inner side; palpus dark, about 1/6 the length of the proboscis; proboscis dark brown, its length in proportion to the fore femur not determined because the fore legs are missing. Thorax. Scutal scales reddish brown to golden brown along the anterior margin; pleural scales rather loosely arranged; anterior pronotal lobe with 5 or 6 bristles, without scales; posterior part of pronotum with 4 bristles; postspiracular area with 5 bristles; sternopleuron with a few pale scales and fine hairs on the upper portion, several fine hairs and 5 or 6 bristles below, the scales rubbed off; few upper mesepimeral scales mixed with fine hairs; lower mesepimeron bare; propleuron with a few pale scales and 3 or 4 bristles; metameron bare. Wing. Alula fringed with narrow scales. Legs. Fore legs missing, the remaining legs mainly dark brown, the femora pale ventrally; mid and hind coxae each with a few scattered pale scales; mid and hind claws equal, each claw toothed. Abdomen. Terga dark, with white basal lateral patches; sterna mainly dark, with a few scattered pale scales. Terminalia. As in figure 18. One large and 2 smaller spermathecae, each with a short neck; cercus short, the basal half broad; postgenital plate rounded, deeply emarginate; postatrial sclerite convex, weakly sclerotized; postatrial plate very characteristic, with 2 hairy lobed structures basally; preatrial plate separated, small and hairy.

MALE, LARVA and PUPA. Unknown.

TYPE DATA. Holotype female, THAILAND: *Chon Buri*, Bang Lamung, C1-1, 1963, terminalia on slide 30. iv. 66, no. 69214 in the U. S. National Museum.

DISTRIBUTION. THAILAND.

BIOLOGY. Unknown.

AEDES (NEOMACLEAYA) PROTUBERANS, n. sp.
(Figure 19)

Based on only 2 male specimens, the female, larva and pupa not being known. On external characters *A. protuberans* appears to be indistinguishable from *A. uncus* or *A. torosus*, but *protuberans* is differentiated by the characters of the male terminalia. Other salient characters are as follows: anterior portion of sternopleuron with fine hairs; lower part of mesepimeron with numerous hairs; metameron bare. Hind tarsal claws equal, simple; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 19. Basimere with a long, pointed apical prolongation and 2 short processes, one of which bears 3 or 4 sharp spines while the other simple and pointed; distimere swollen near the middle, tapered distally; aedeagus large and well sclerotized, of the *uncus* type; paraproct very short, stubby.

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. Holotype male, THAILAND: *Nakhon Si Thammarat*, Luang, T-1593e-1, 1962, terminalia on slide. Paratype, 1 male, same data and locality as holotype except T-1593D. Male holotype and 1 paratype in the U. S. National Museum (no. 69215).

DISTRIBUTION. THAILAND.

TAXONOMIC DISCUSSION. Fitting the descriptions of *A. uncus* except for the details of the male terminalia as noted above.

BIOLOGY. Unknown.

AEDES (NEOMACLEAYA) PSEUDODIURNUS (Theobald)
(Figure 19)

Skusea pseudodiurna Theobald 1910, Rec. Indian Mus. 4: 32 (♂).

Aedes (Aedes) pseudodiurnus (Theobald), Barraud 1928, Indian J. med. Res. 16: 371 (♂*); Barraud 1934, Fauna Brit. India, Diptera 5: 295 (♂*).

The record of this species in Thailand is based on a single male specimen. The terminalia are particularly distinctive in having a short and unusually broad paraproct and a short, markedly swollen distimere with 4 or 5 projections, as in figure 19. The female, larva and pupa are not known. Other distinguishing characteristics of the species are as follows:

MALE. Head. Vertex with the scales mostly rubbed off but the remaining ones brown, those on the occiput pale; torus with a few fine hairs; palpus very short, about 1/8 the length of the proboscis; proboscis about as long as fore femur, brown. Thorax. Scutal and scutellar scales reddish or dark brown; anterior pronotal lobe with 5 bristles, without scales; posterior part of pronotum with 4 bristles, without scales; postspiracular area with 1 bristle, without scales; sternopleural and mesepimeral scales and bristles mostly rubbed off, but a few hairs behind the upper mesepimeral scales; lower part of mesepimeron bare; propleuron with bristles above and pale scales below; metameron bare. Wing. Fringing scales on alula rubbed off. Legs. Brown, the femora pale ventrally; hind claws equal, simple; fore claws unequal, the larger claw toothed; mid claws missing. Abdomen. Most scales rubbed off but with pale lateral markings according to Barraud (1934: 295). Terminalia. As in figure 19. Basimere rather simple, with only a

small subapical projection on the inner margin; distimere very characteristic, short and markedly swollen distally, with 4 or 5 small projections and short setae; aedeagus very simple; paraproct short, unusually broad.

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. Type male in the Indian Museum, Calcutta, India; type locality: Sukna, Darjeeling District, base of E. Himalaya 500 ft. (West Bengal), INDIA.

DISTRIBUTION. THAILAND: 1 male, *Chon Buri*, Khao Mai Kaeo.

Other distribution. INDIA.

TAXONOMIC DISCUSSION. Although the specimen is in quite poor condition, the structures of the male terminalia fit very well the figures of Barraud.

BIOLOGY. The single male specimen was collected in a bait trap during the daytime (kind of bait unknown).

AEDES (NEOMACLEAYA) TOROSUS, n. sp.
(Figure 19)

Based on only 2 male specimens, the female, larva and pupa not being known. Very similar to *A. uncus* or *A. protuberans* in general habitus but easily distinguished by the characters of the male terminalia, as in figure 19. Other salient characters are as follows: anterior portion of the sternopleuron with fine hairs; lower mesepimeron with numerous hairs; metameron bare; hind tarsal claws equal, simple; fore and mid claws unequal, the larger claw toothed. Terminalia. Basimere with a long, slender prolongation, a large hairy lobe and a large hooked spine at the inner mesal margin; distimere sinuous, tapered distally and with a small pointed process at the middle; aedeagus large and well sclerotized, of the *uncus* type; paraproct very short and stubby.

FEMALE, LARVA and PUPA. Unknown.

TYPE DATA. Holotype male, THAILAND: *Khon Kaen*, Tham Pho Ti Yan, T-1822e, 1962, terminalia on slide. Paratype, 1 male, same date and locality as holotype except T-1822E. Male holotype and 1 paratype in the U. S. National Museum (no. 69216).

DISTRIBUTION. THAILAND.

TAXONOMIC DISCUSSION. Fitting the descriptions of *A. uncus* except for the details of the male terminalia, as noted above.

BIOLOGY. Unknown.

AEDES (NEOMACLEAYA) UNCUS (Theobald)
(Figures 16, 19)

Culex uncus Theobald 1901, Mon. Cul. 2: 53 (♀*); Laffoon 1946, J. Wash. Acad. Sci. 36: 237 (♀*♂*).

Aioretomyia varietas Leicester 1908, Cul. Malaya 3: 185 (female only, synonymy by Knight and Hull 1953, Pacif. Sci. 7: 474).

A species having numerous fine hairs on the lower mesepimeron. The female postatrial plate with a characteristically large cordate opening; male sternum IX with a median pair of large spines along the distal margin and the

basimere with apical prolongations bearing 2 or 3 large spines. The pupa has abdominal hair 2-I-VII spine-like, and 6-VII branched. The larva is not known with certainty. Other distinguishing features of the species are as follows:

FEMALE. Head. Vertex blackish brown with patches of pale scales laterally, a few scattered pale ones on the occiput and around the eye margin, a few dark upright scales confined to the occiput; torus with a few fine hairs on inner side; palpus very short, about 1/10 the length of the proboscis, blackish brown; proboscis long and slender, longer than fore femur by 1 1/2 times the length of the labella, dark brown. Thorax. Scutal scales brown, with some golden scales on the front margin, prescutellar area and above the wing base; sternopleuron with a large patch of white scales on the upper portion, a small patch below mixed with some fine hairs, 8-10 bristles behind the scale patch and many fine hairs on the anterior portion; lower mesepimeron with numerous fine hairs which extend downwards to the suture; propleuron with pale and brown scales and a row of bristles; metameron bare. Wing. Alula fringed with narrow scales. Legs. Dark brown, the femora extensively pale ventrally; hind claws simple, equal; fore and mid claws equal, each claw toothed; fore coxal scale patch mostly brown, paler above; mid and hind coxae with a few pale scales. Abdomen. Terga dark, with large pale lateral patches; sterna dark at apices. Terminalia. As in figure 16. Three unequal spermathecae, each with a short narrow neck; cercus elongate; postgenital plate broad, with a shallow median emargination; postatrial sclerite convex medially; postatrial plate with a characteristically large, cordate opening and with many long hairs basally; preatrial plate large, nearly completely divided.

MALE. General habitus essentially as in the female. Legs. Hind claws simple and equal; mid and fore claws unequal, the larger claws toothed. Terminalia. As in figure 19. Basimere with 2 long slender projections, one of which bears 2 or 3 large spines at the tip while the other is split at the tip, also with a short process armed with 6-8 strong spines and a shorter blunt projection; distimere elbowed at the middle, rather stout for most of its length; aedeagus much enlarged and well sclerotized; paraproct very short and stubby; sternum IX with 2 pairs of large, sharp spines along the distal margin.

LARVA. Unknown, though I have seen a single cast skin in poor condition that cannot be associated with certainty.

PUPA. As in figure 16. Description and figure based on cast skins. Cephalothorax. Hair 3-C double; 10-C with 6-8 branches; 11-C single; 12-C with 5-6 branches. Abdomen. Hair 2-I-VII spine-like; 3-I with 5-7 branches, long and single on II-III; 5-II-III with 6-8 branches, double on IV-VI; 6-VII branched; 9-VIII single, fairly long, very small on other segments. Paddles. Hair 1-P forked.

TYPE DATA. I have examined the female lectotype in the British Museum, selected by Knight and Hull 1953. Its terminalia are missing. Type locality: Klang among the Plantains, Selangor, MALAYA.

DISTRIBUTION. THAILAND: 6 males, 24 females with 30 associated pupal skins, *Songkhla*, Haad Yai; 2 females with associated pupal skins, *Trang*, Muang; 2 females, *Nakhon Ratchasima*, Koraj Tha Klong; 2 females, *Khon Kaen*, Tham Pho Ti Yan; 1 female, *Nakhon Nayok*, Sariga Village; 2 females, *Chon Buri*, Khao Mai Kaeo. Other distribution. I have also seen specimens from JAVA, NORTH BORNEO, MALAYA, SARAWAK, ASSAM and the PHILIPPINES.

TAXONOMIC DISCUSSION. The male terminalia show considerable

variation in the number of the spines at the tip of an apical prolongation of the basimere (2 or 3 in most specimens) and in the development of the spines along the margin of sternum IX. These spines are strongly developed in specimens from Thailand and Malaya, poorly developed or absent in some specimens from Palawan. Also, the shape of the female preatrial plate is quite variable. *A. uncus* is remarkably similar to *A. hirsutipleura* and I can find no characters to separate the two species except that in *hirsutipleura* the spines on sternum IX are not as developed as in *uncus*, and there are 4 spines at the tip of the apical prolongation. In this respect *hirsutipleura* resembles some specimens from Palawan but differs by having the female preatrial plate almost divided in *uncus*, entire in *hirsutipleura*. I do not feel that the above differences in the terminalia are of significance, but more specimens of *hirsutipleura* will have to be examined. The differences are not quite clear and constant.

BIOLOGY. The larvae have been collected in various types of temporary ground pools and in axils of the "elephant ear" plant (*Colocasia*). Adults were captured biting man in shaded areas in the jungle during the daytime.

AEDES (NEOMACLEAYA) VALLISTRIS Barraud
(Figure 17)

Aedes (Aedes) vallistris Barraud 1928, Indian J. med. Res. 16: 369 (♂*♀*);
Barraud 1934, Fauna Brit. India, Diptera 5: 290 (♂*♀*); Iyengar and
Menon 1956, Bull. ent. Res. 47: 791 (♂).

A dark species with pale lateral patches on abdominal terga. It is easily differentiated by the characteristic structures of the male and female terminalia, as figured. The larva and pupa are not known with certainty. The distinguishing features are as follows:

FEMALE. Head. Vertex dark or blackish with a narrow pale line around the eye margin, small patches of pale scales laterally and on the occiput, a few dark ones confined to the occiput; torus with fine hairs on the inner side; palpus dark, about 1/6 the length of the proboscis; proboscis dark, longer than fore femur by the length of the labella. Thorax. Scutal scales dark to reddish brown, with some golden scales on the front margin and above to wing base; anterior pronotal lobe with 2-4 pale broad scales and 8 bristles; posterior part of pronotum with some scattered narrow brown scales and a row of 5 or 6 bristles posteriorly; postspiracular area with 3-4 pale broad scales and 5-7 bristles; sternopleuron bare on the anterior portion, with large patches of pale scales on the upper and lower portions, a row of 10-12 bristles behind the upper scale patch; upper part of mesepimeron with a large patch of white scales, the hairs behind this patch extending downwards to the middle of the sclerite, the lower portion bare; propleuron mostly covered with pale scales; metameron bare. Wing. Fringing scales on the alula rather narrow or lanceolate. Legs. Dark brown, the femora pale ventrally; fore coxal scale patch mostly brown with a small pale spot above; mid and hind coxae each with a small patch of pale scales; hind claws equal, simple; fore and mid claws equal, each claw toothed. Abdomen. Terga dark, with pale lateral patches extending on to dorsum but not forming complete bands; sterna largely pale or dirty white basally. Terminalia. As in figure 17. Two large spermathecae and 1 smaller one, each with a short neck; cercus short and broad; postgenital

plate short and broad, with a shallow median emargination; postatrial sclerite convex or rounded; postatrial plate with short lateral arms and numerous long hairs along basal half of the opening; preatrial plate divided into 2 small platelets which are provided with minute hairs.

MALE. Similar to female in general habitus. Legs. Hind claws simple, equal; fore and mid claws unequal, the larger claw toothed. Terminalia. As in figure 17. Basimere with a short apical and 2 subapical projections and a small lobe bearing a group of strong spines; distimere short, broad and curved abruptly narrowing to a pointed tip, with 3-4 long setae at the curved portion; aedeagus fairly simple; paraproct long and slender, evenly tapered distally.

LARVA and PUPA. Unknown.

TYPE DATA. A male is selected here as lectotype: terminalia in celluloid mount on pin in the British Museum with the following data: "Type/ASSAM, GOLAGHAT/P. J. Barraud/Dec. 1924". Paratypes, 2 females, 1 male, terminalia in celluloid mount on pin, same locality as lectotype but the date 13. xi. 1925.

DISTRIBUTION. THAILAND: 2 males, 12 females, *Chiang Mai*; 2 females, *Nakhon Si Thammarat*; 1 female, *Udorn (Udon Thani)*, Nong Bau; 1 female, *Ubol (Ubon Ratchathani)*, Chang Puex; 1 female, *Nakhon Ratchasima*, Koraj Tha Klom; 2 females, 1 male, *Nakhon Nayok*. Other distribution. I have also seen specimens from ASSAM and BURMA.

BIOLOGY. The adults have been collected in bait traps, and the larvae in jungle pools.

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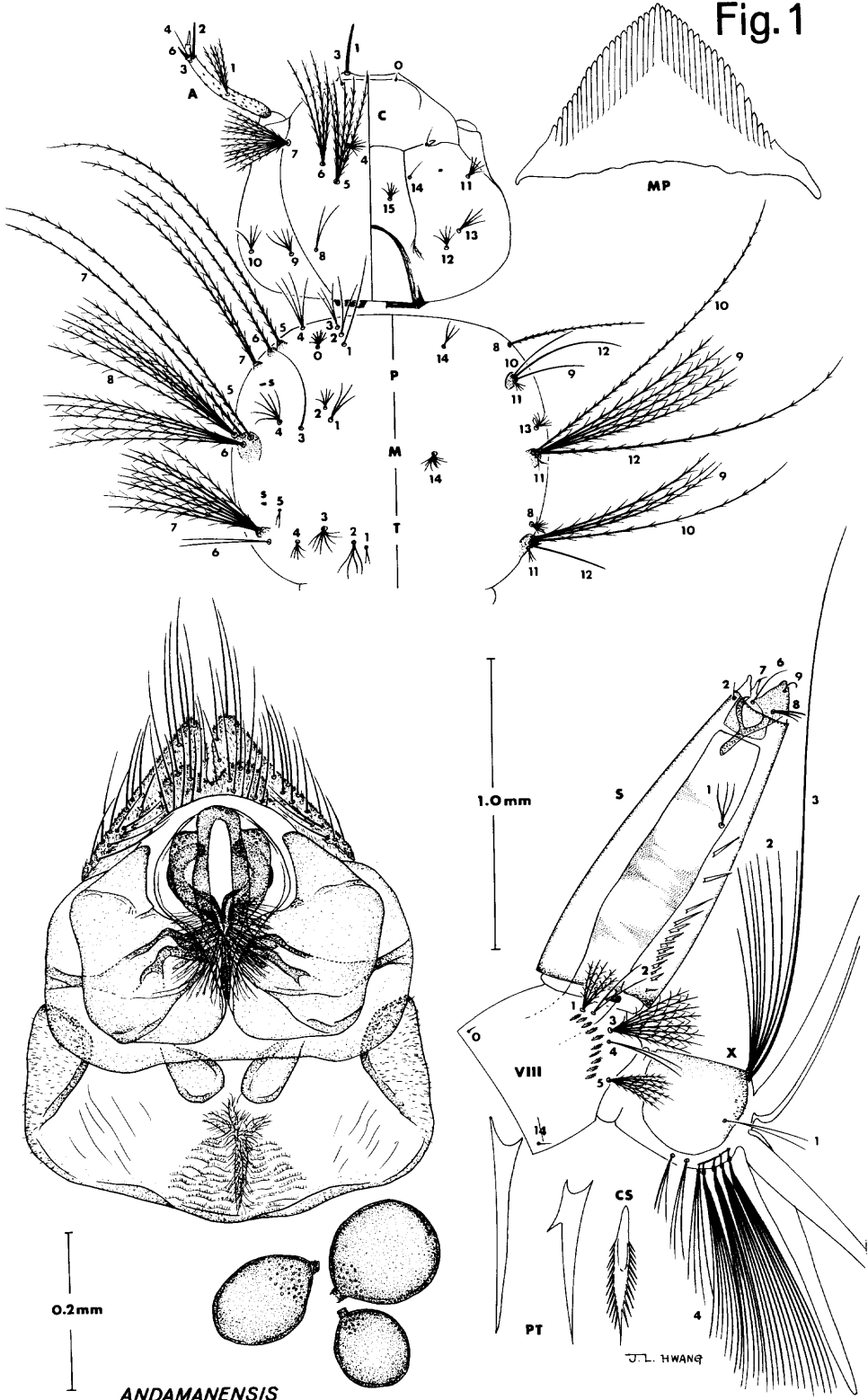
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Fig. 1



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ANDAMANENSIS

1.0mm

J.L. HWANG

Fig. 2

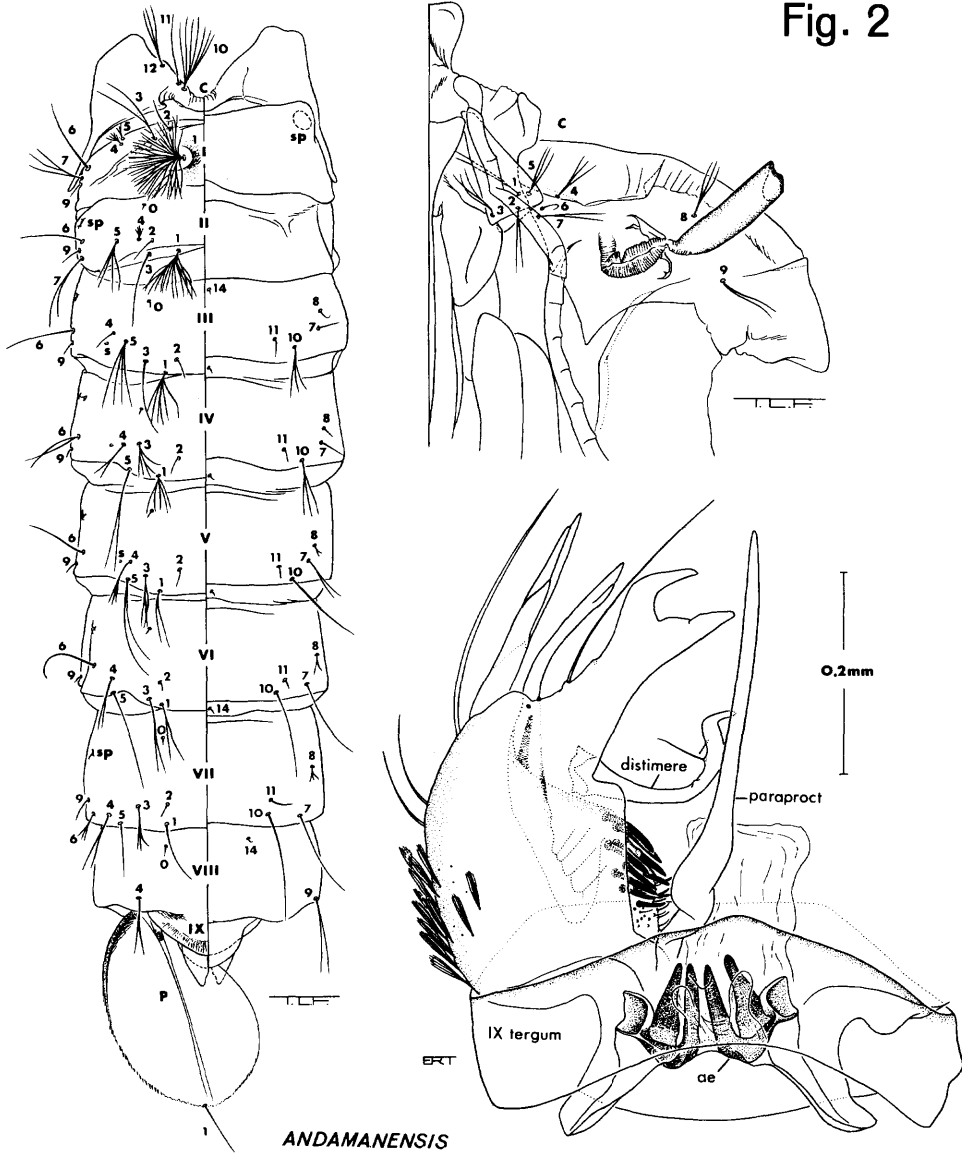


Fig. 3

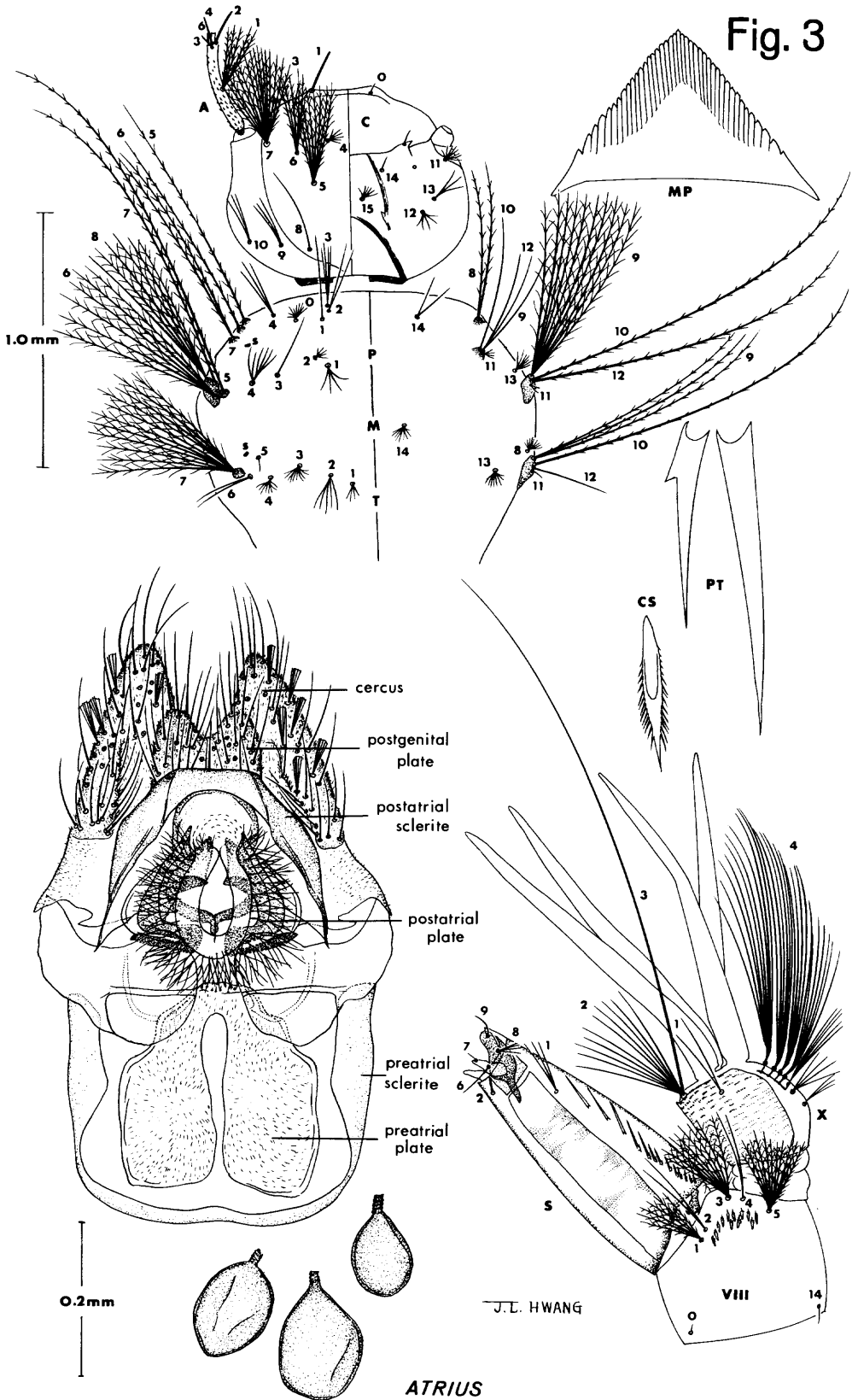
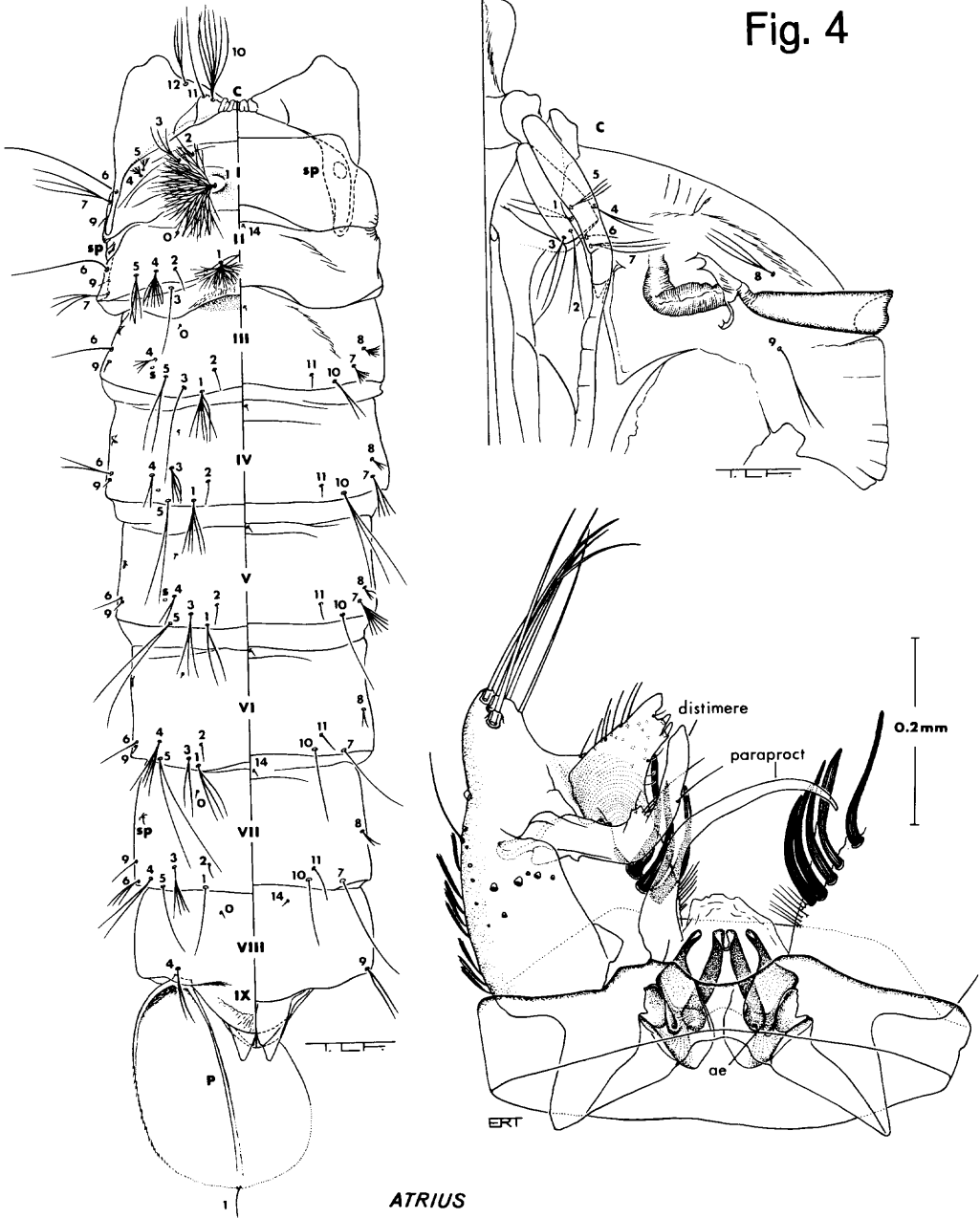


Fig. 4



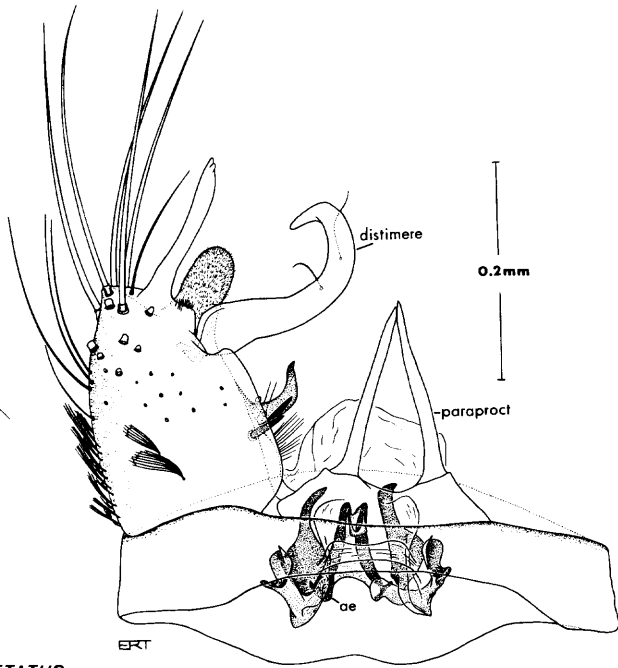
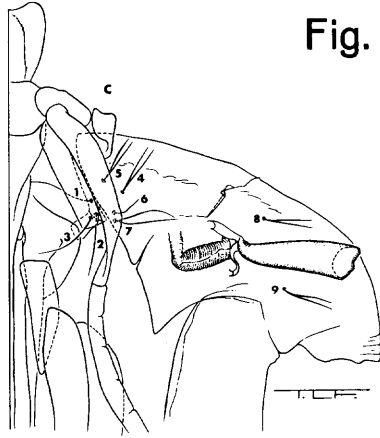
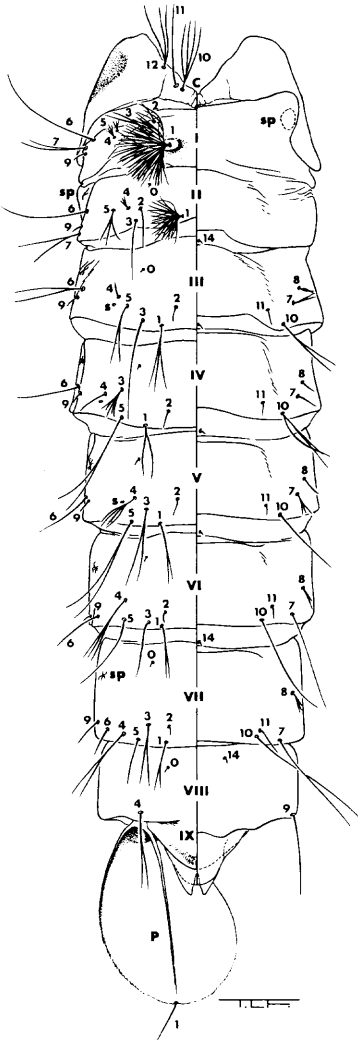
ATRIUS

Fig. 5



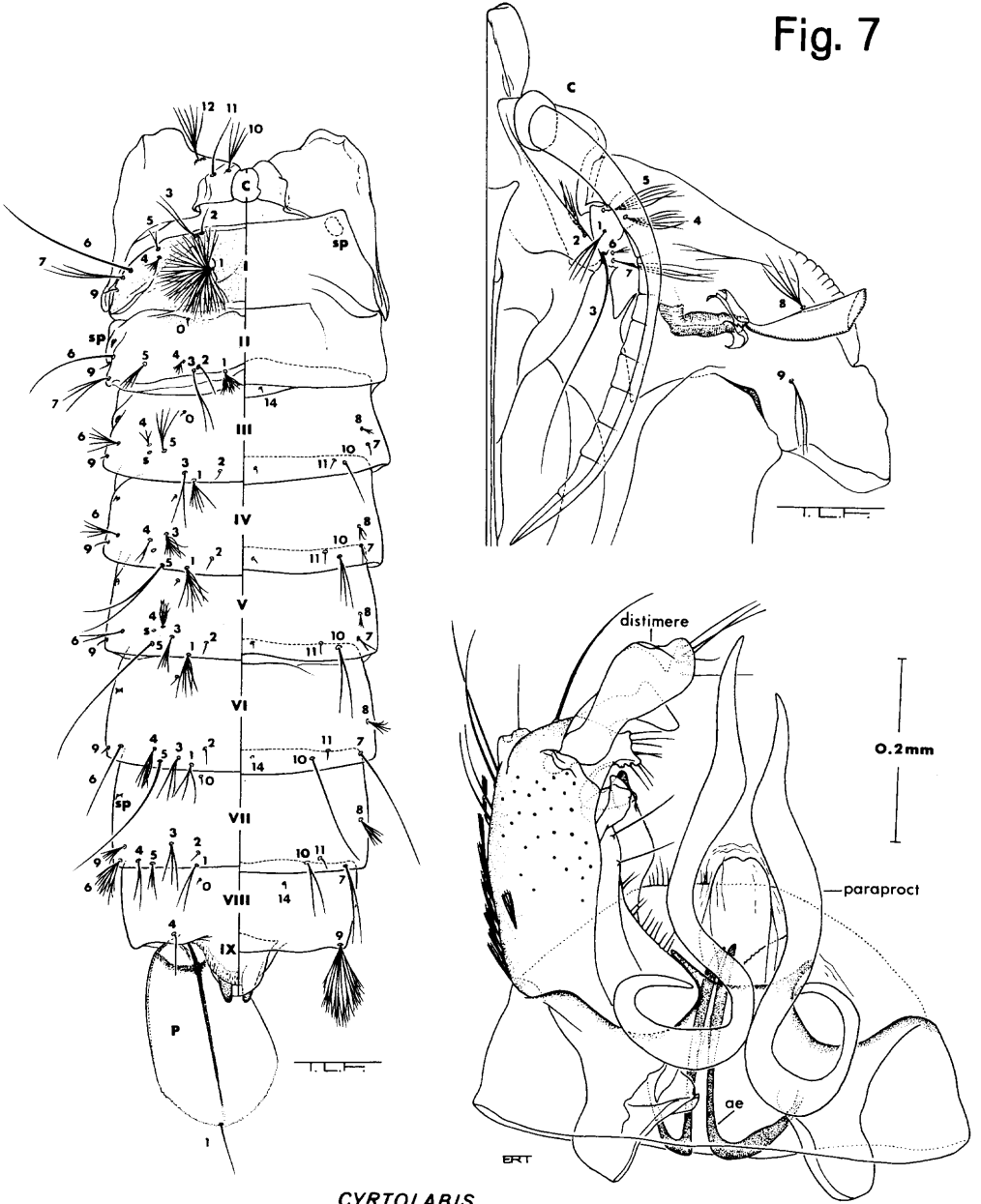
CRETATUS

Fig. 6



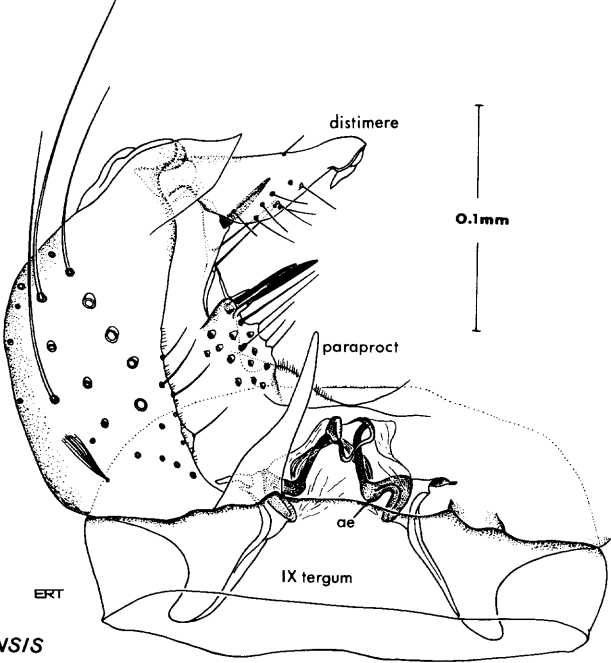
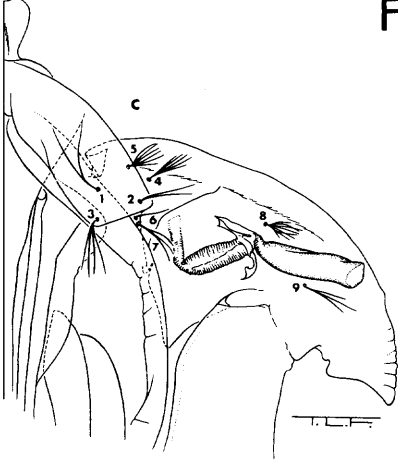
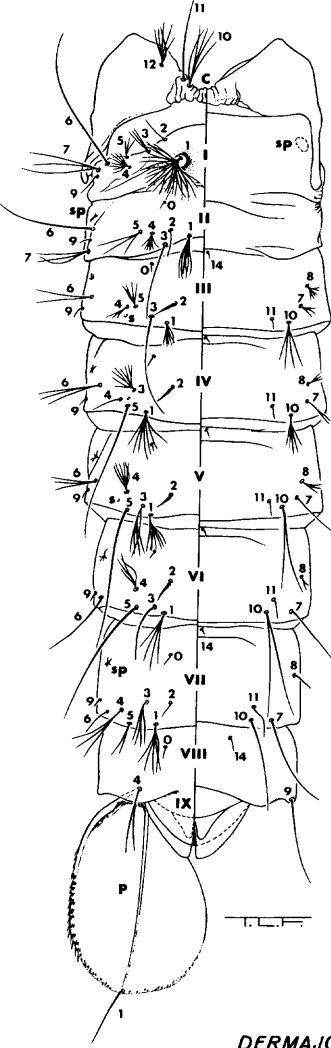
CRETATUS

Fig. 7



CYRTOLABIS

Fig. 8



DERMAJOENSIS

Fig. 9

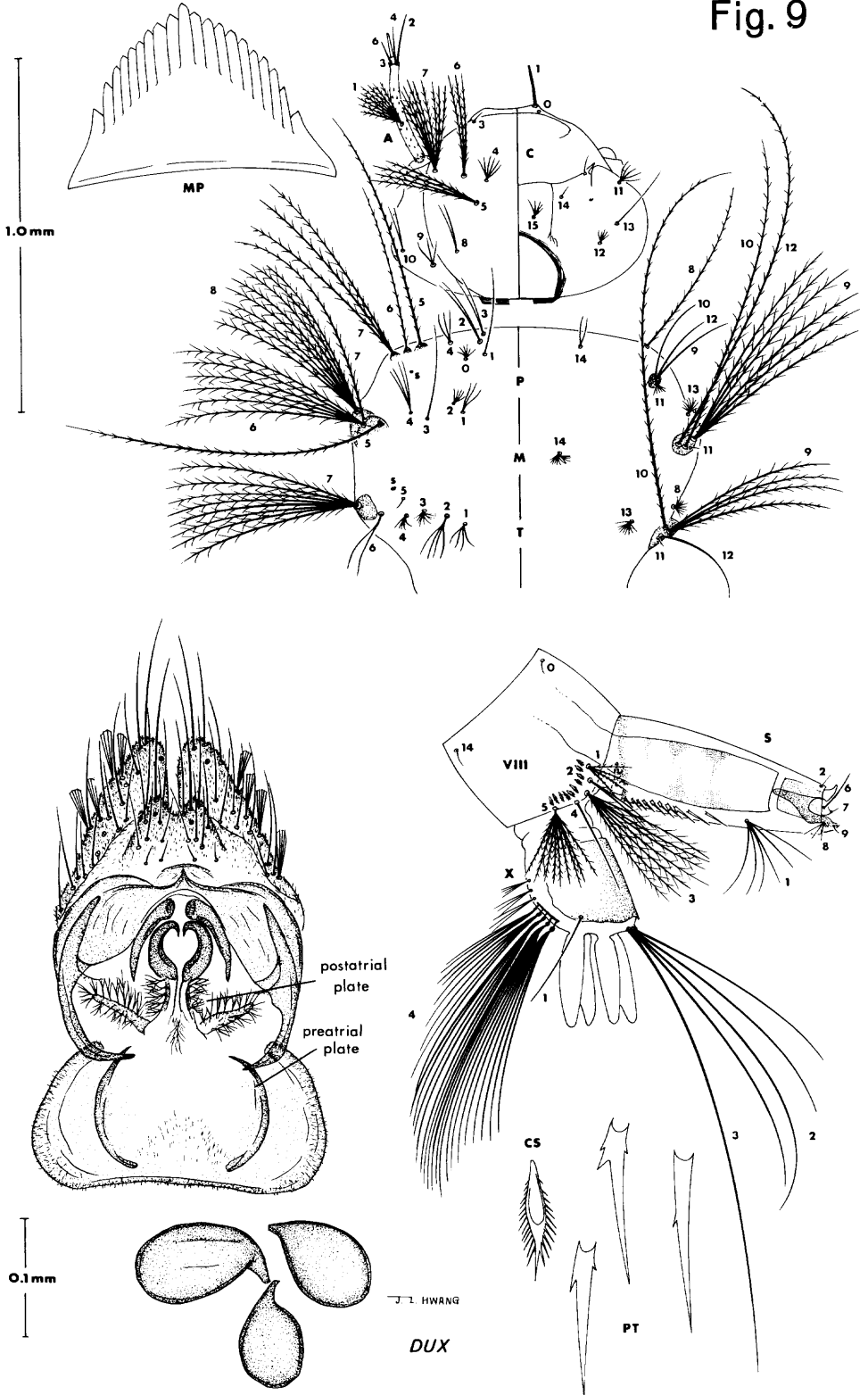
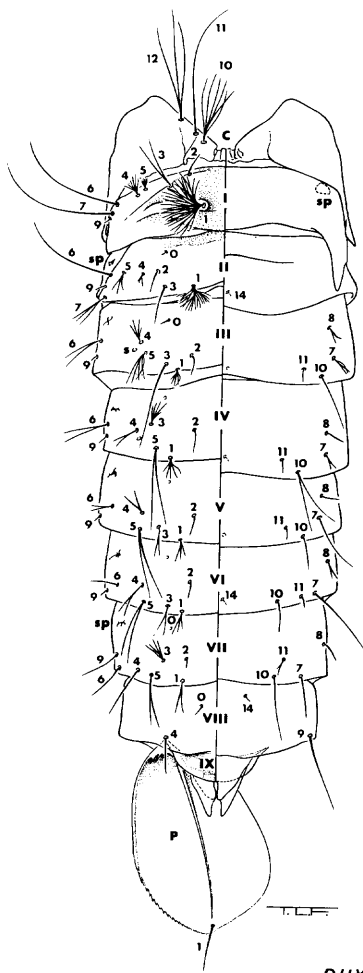


Fig.10



DUX

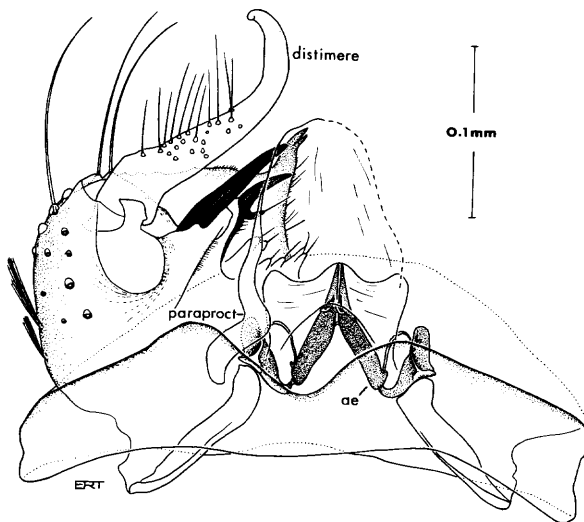
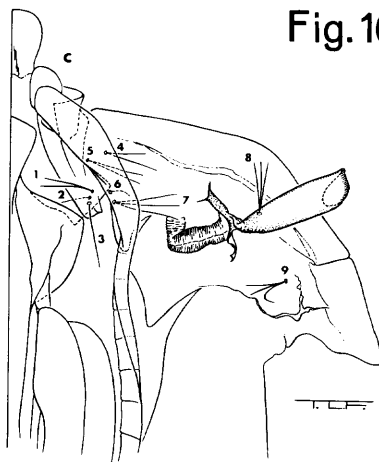
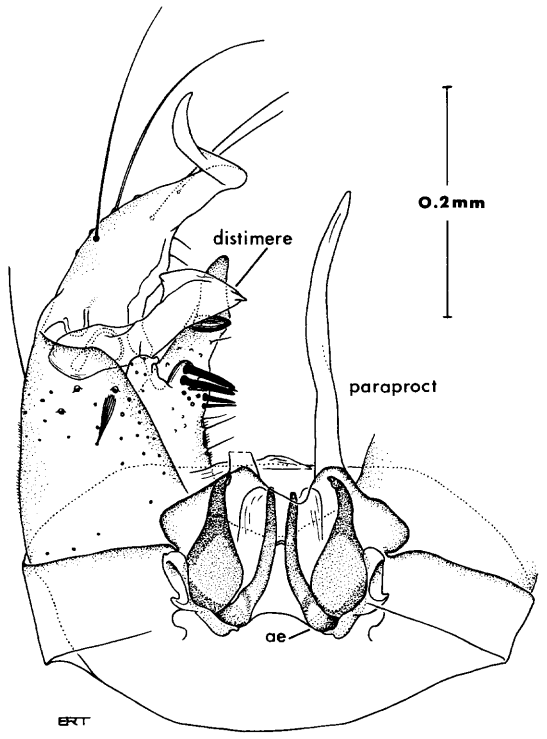
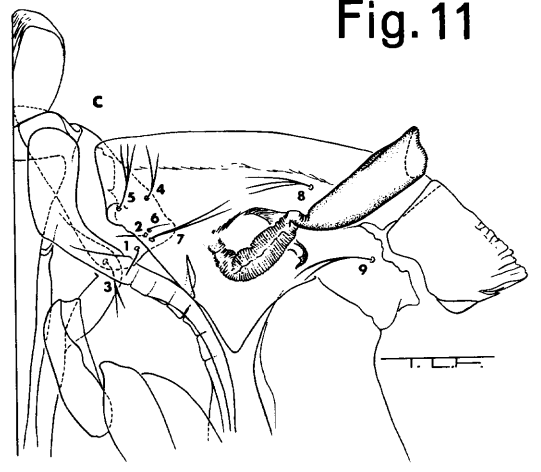
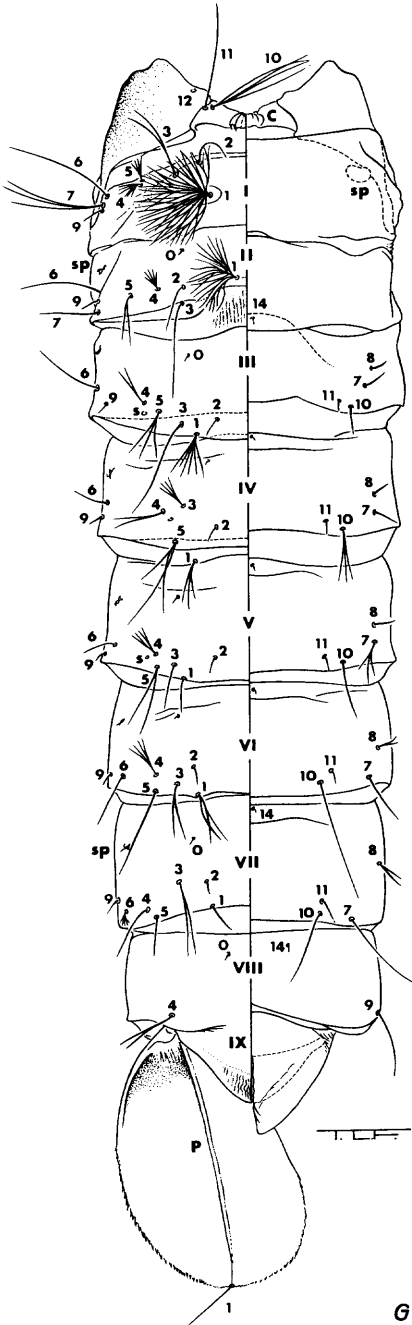


Fig. 11



GIBBOSUS

Fig. 12

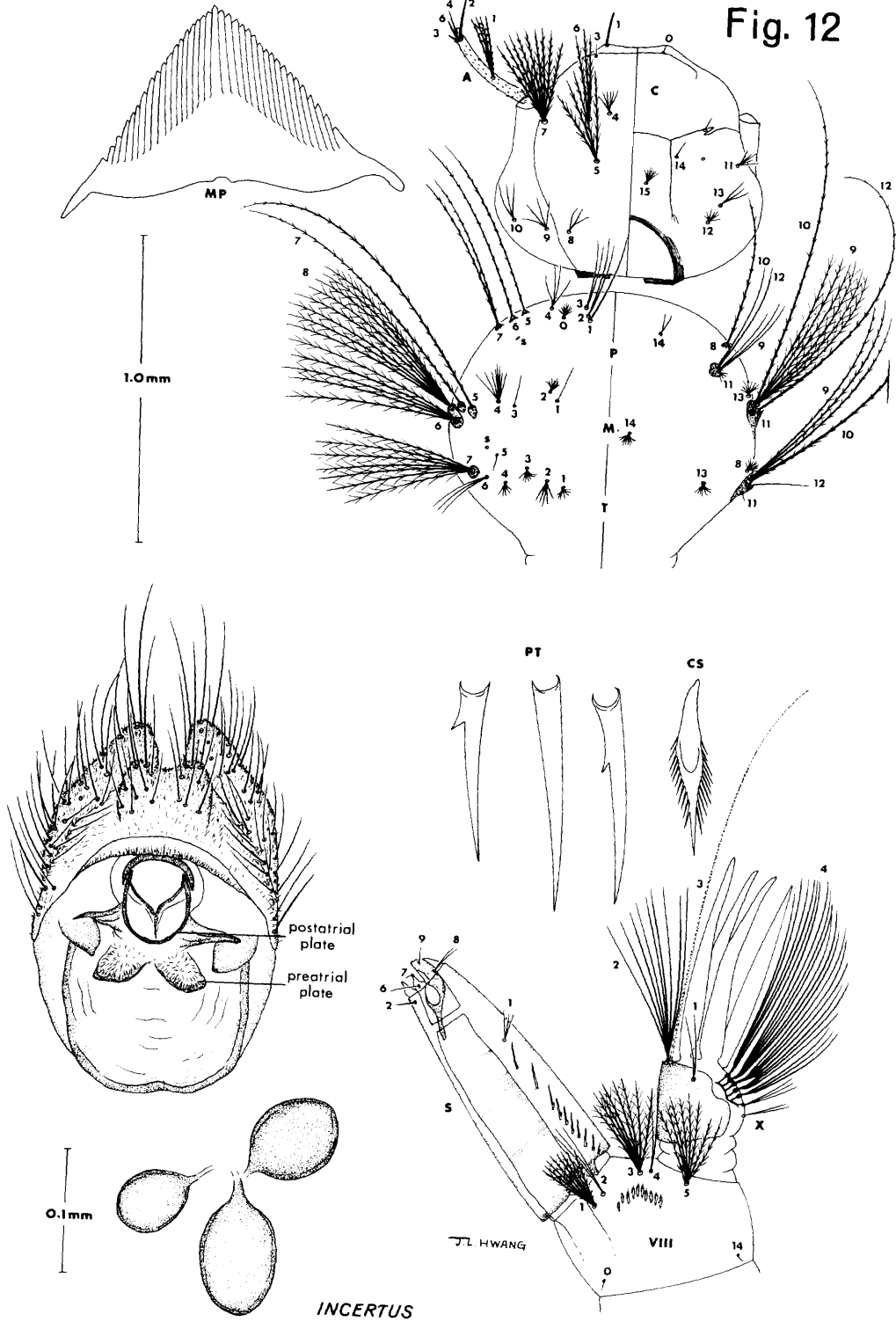


Fig. 13

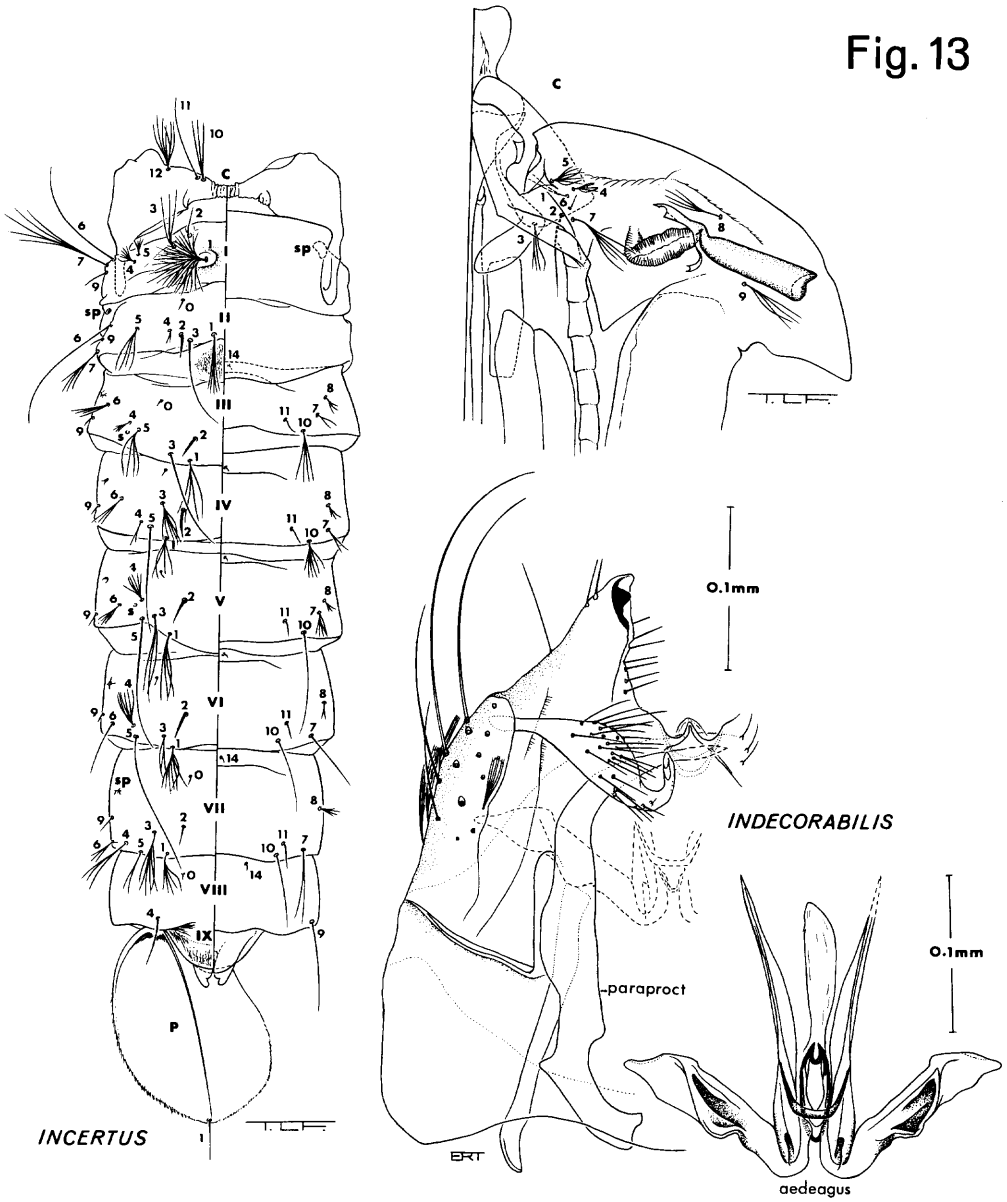
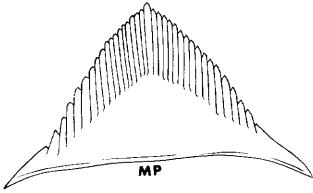
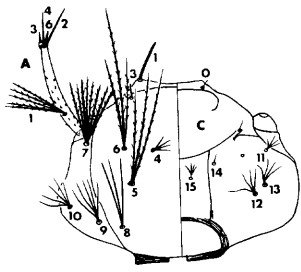
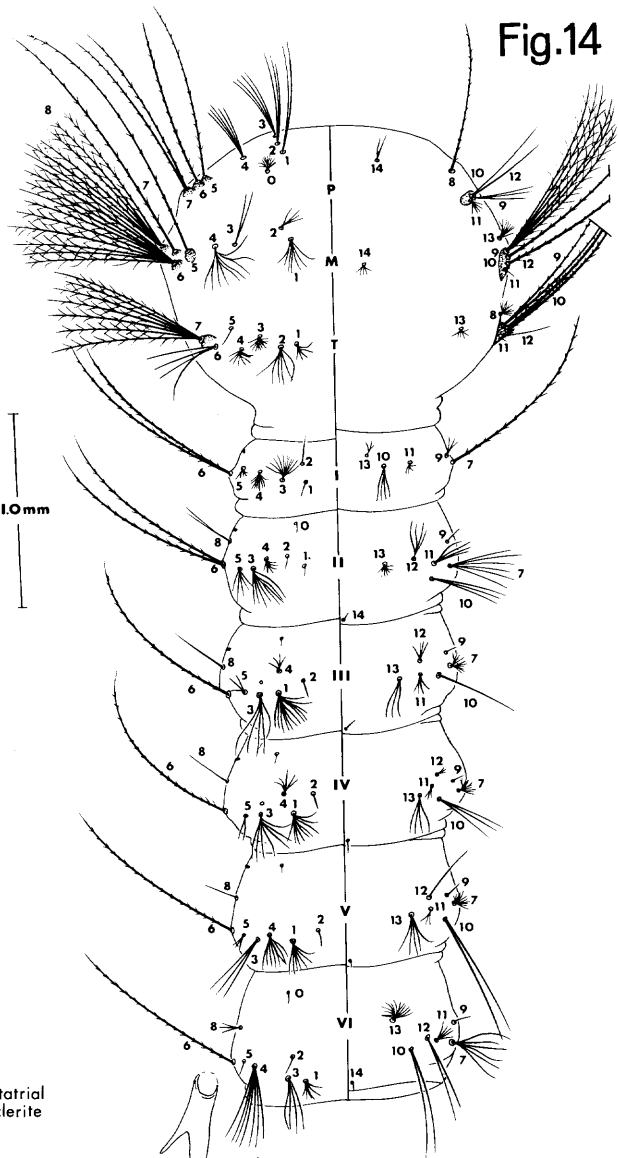


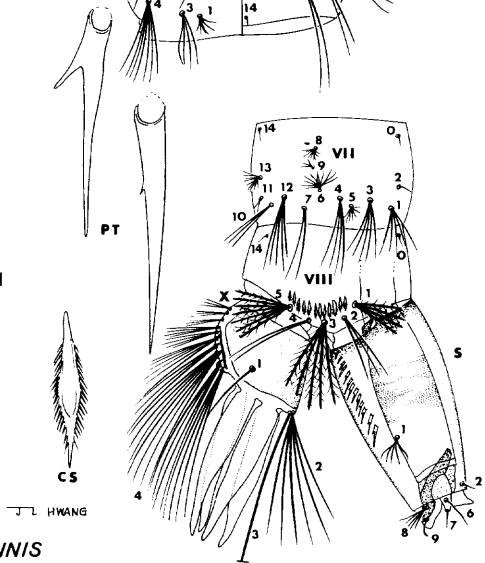
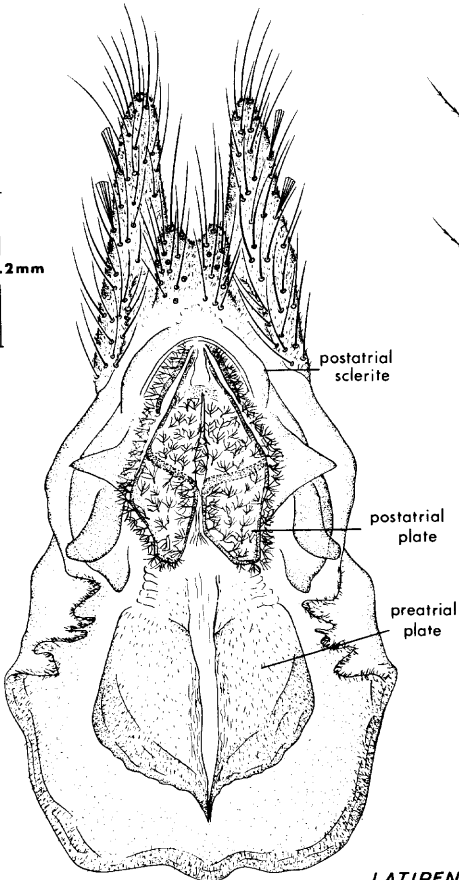
Fig.14



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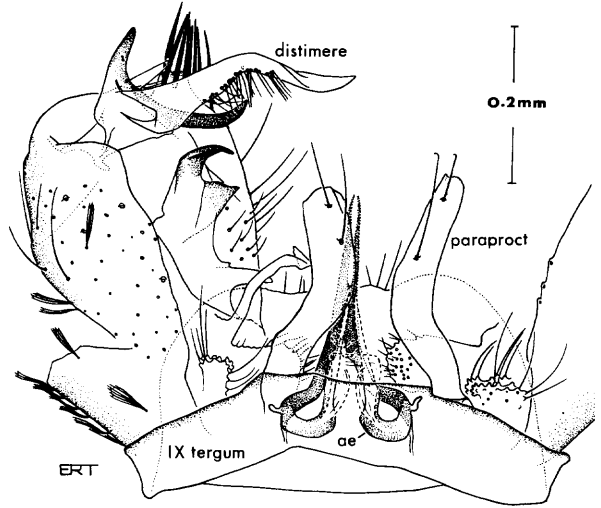
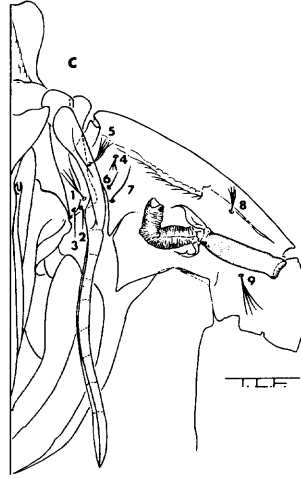
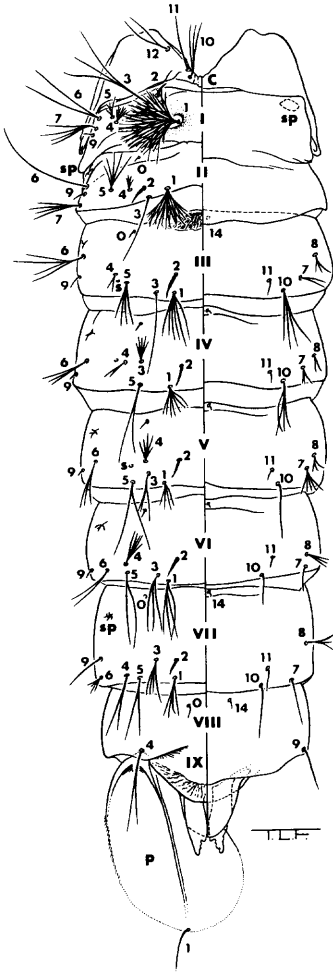


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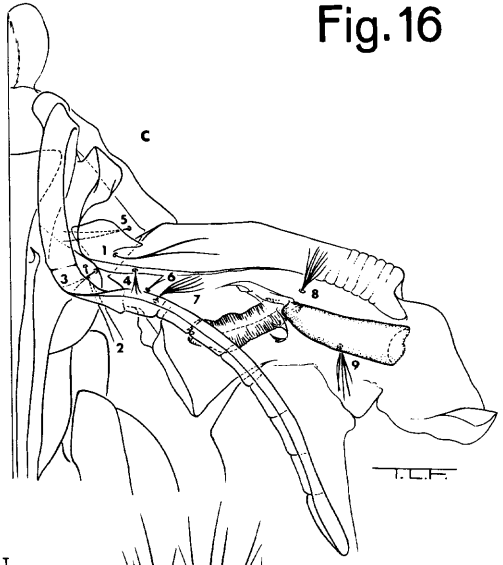
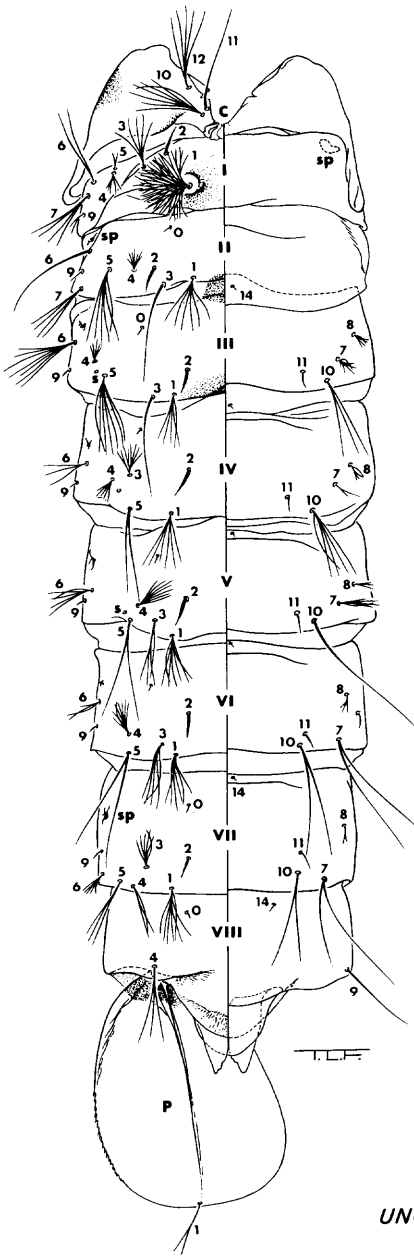
LATIPENNIS

Fig. 15

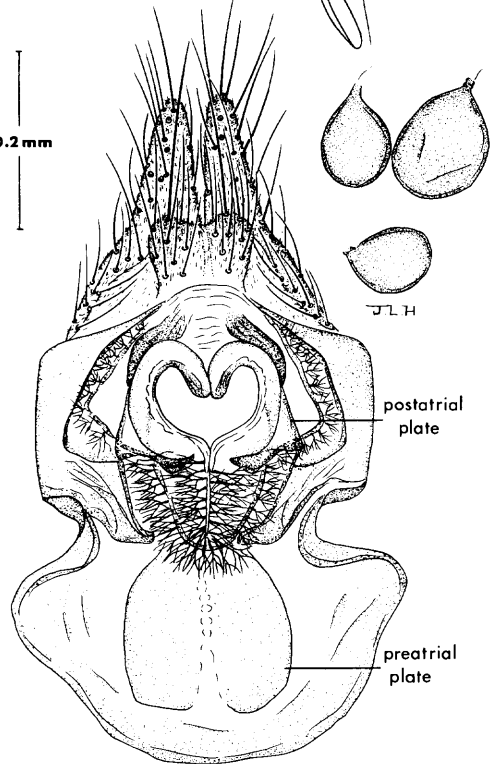


LATIPENNIS

Fig. 16

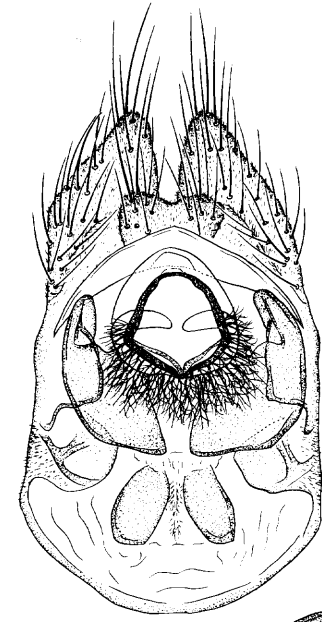


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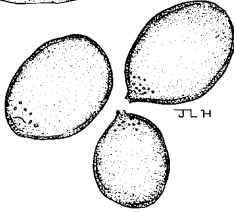


UNCUS

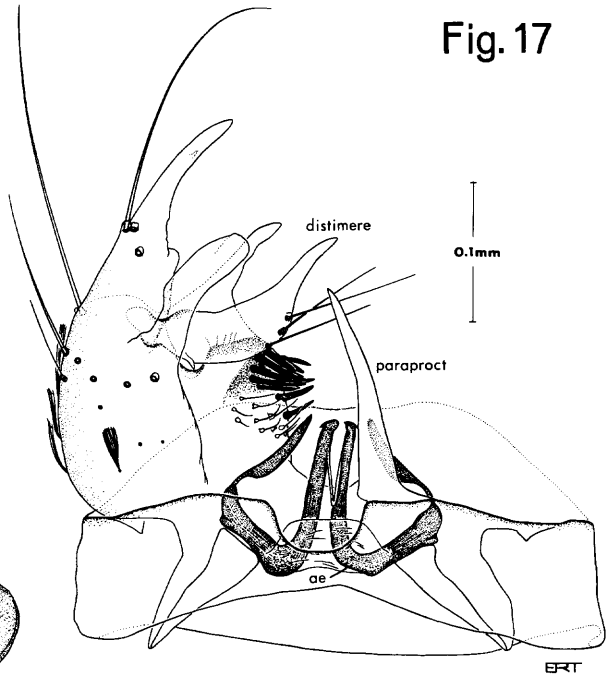
Fig. 17



0.1mm



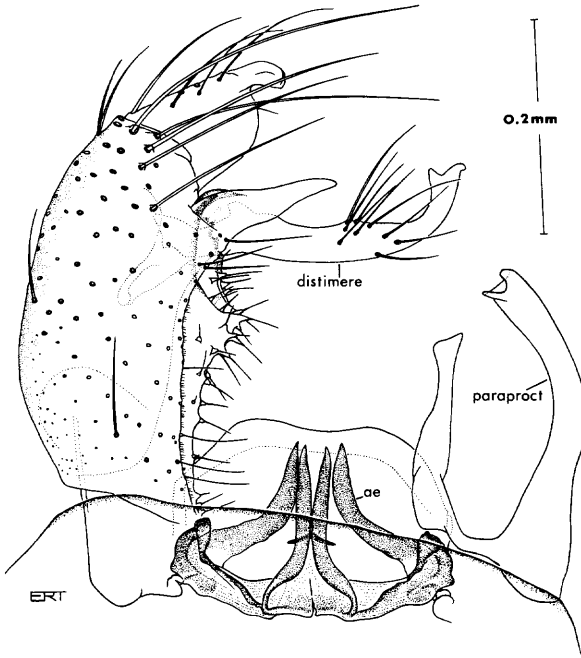
JLH



0.1mm

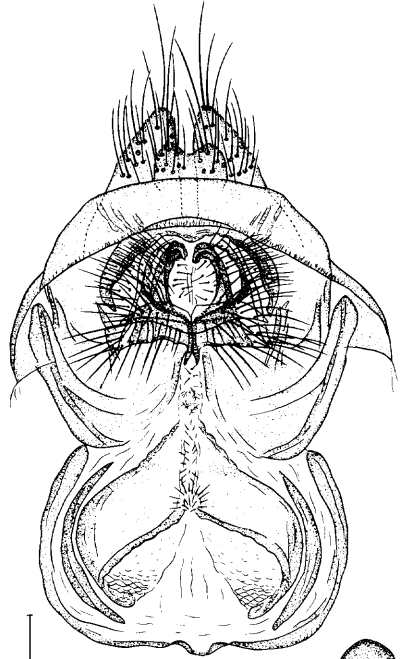
ERT

VALLISTRIS



0.2mm

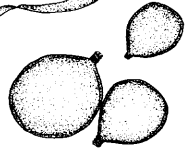
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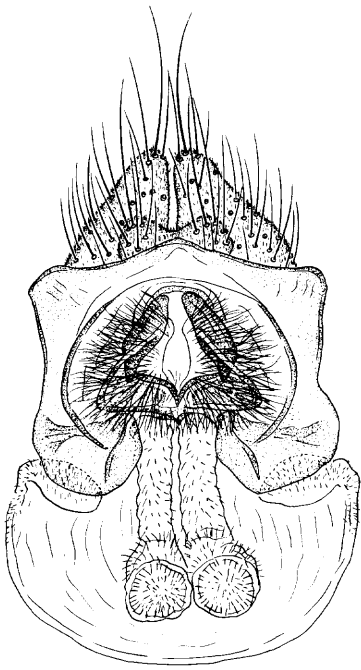


0.2mm

JLH

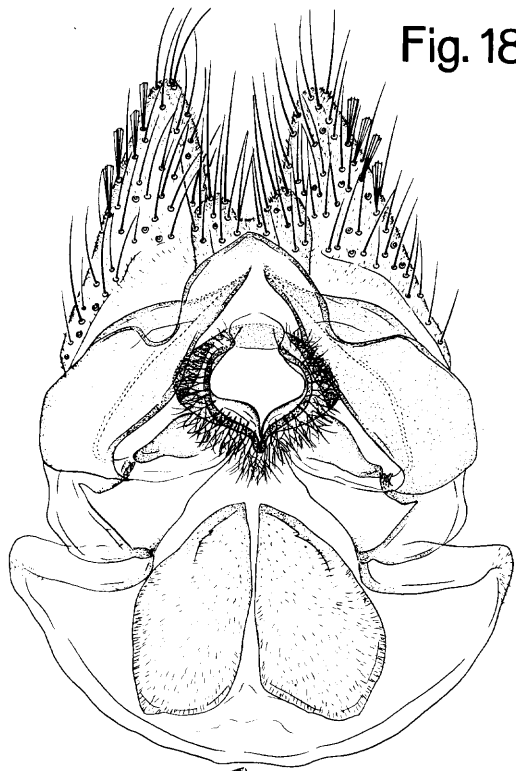
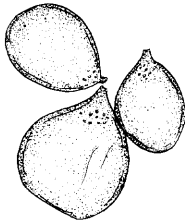
CLAVATUS





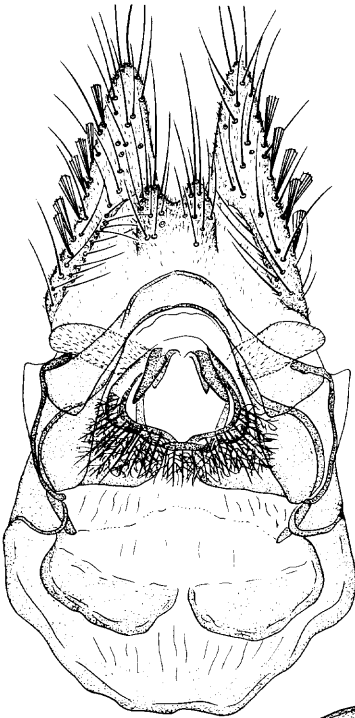
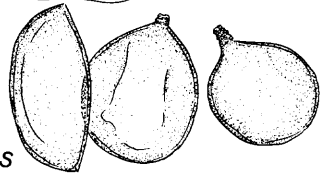
0.2mm

CAUTUS



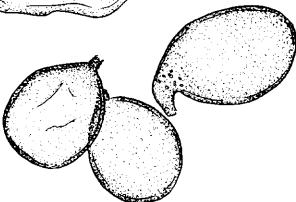
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HISPIDUS

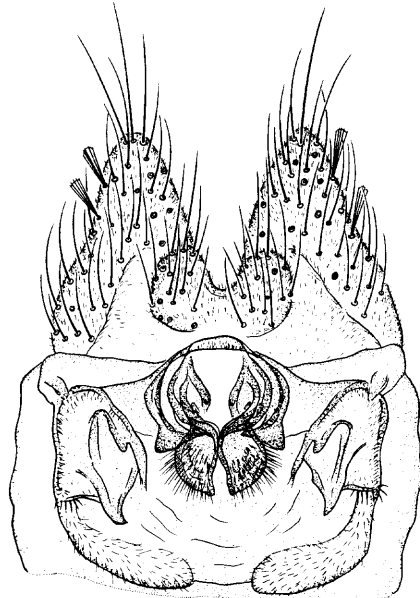


0.2mm

INDICUS



J.L. HWANG



0.1mm

NOTABILIS

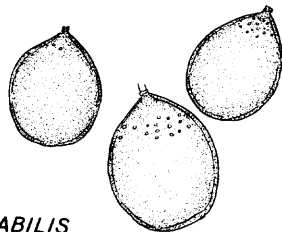
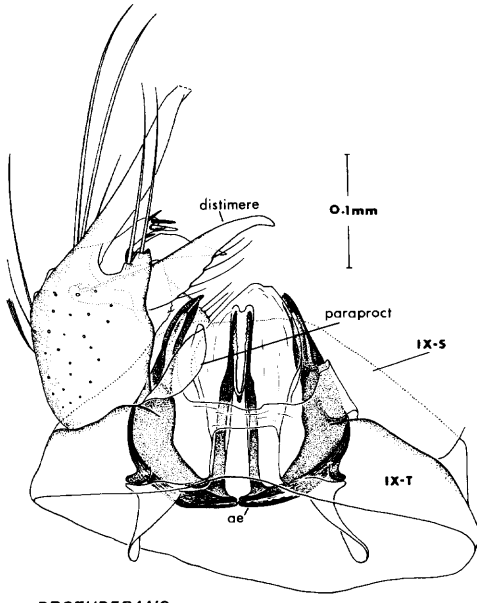
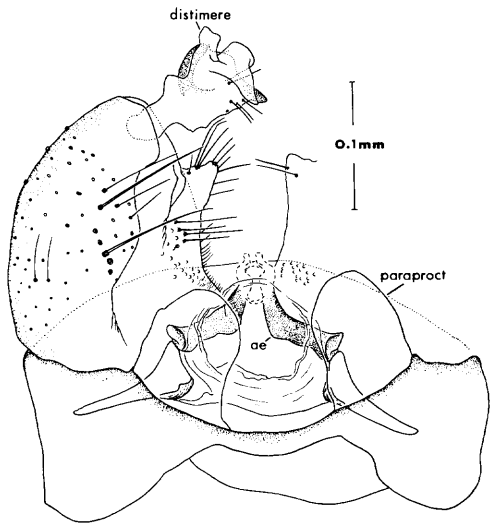


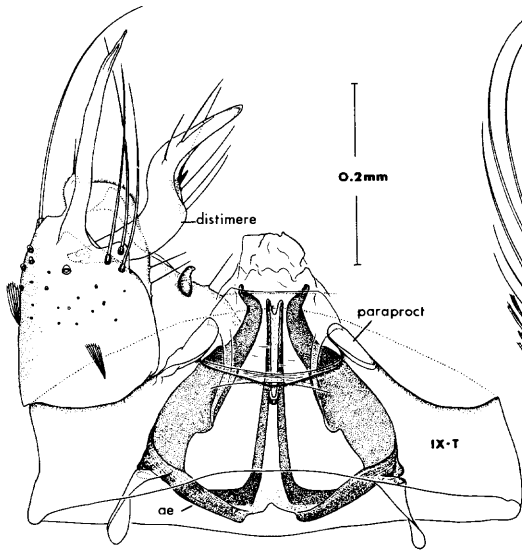
Fig. 19



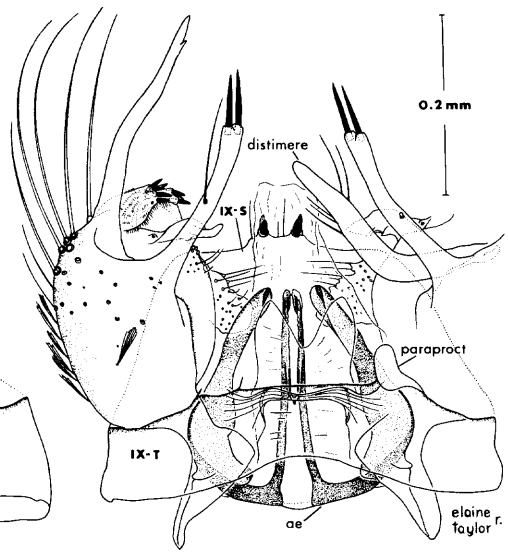
PROTUBERANS



PSEUDODIURNUS

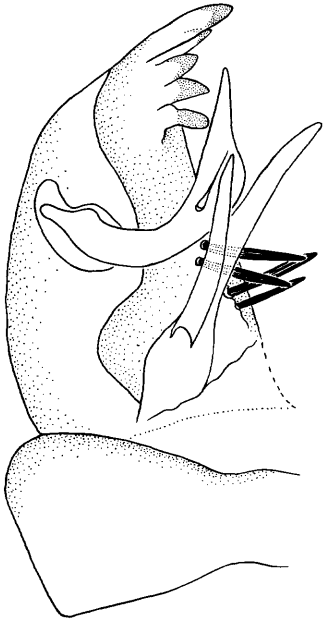


TOROSUS



UNCUS

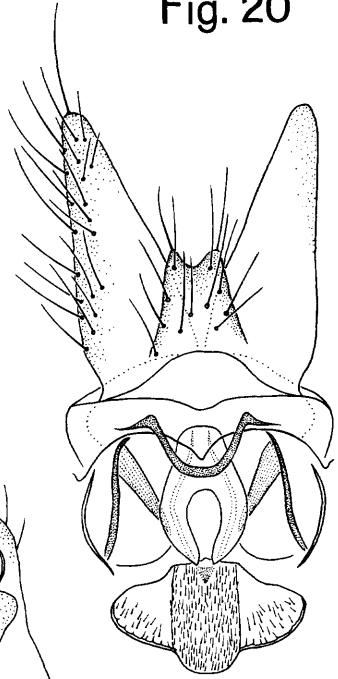
Fig. 20



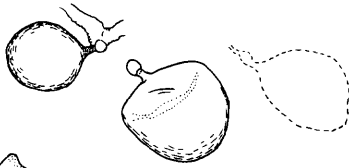
0.1 mm

CAUTUS
(from Barraud, 1928)

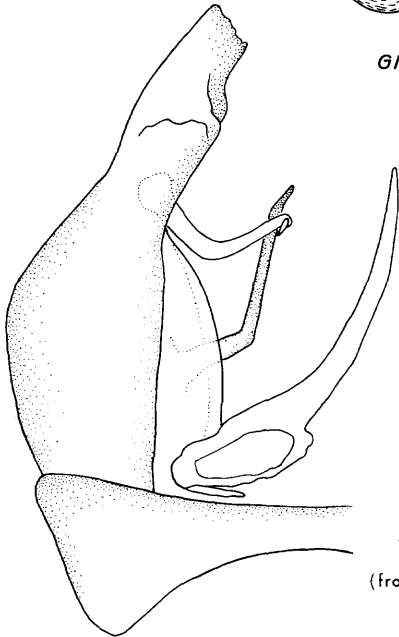
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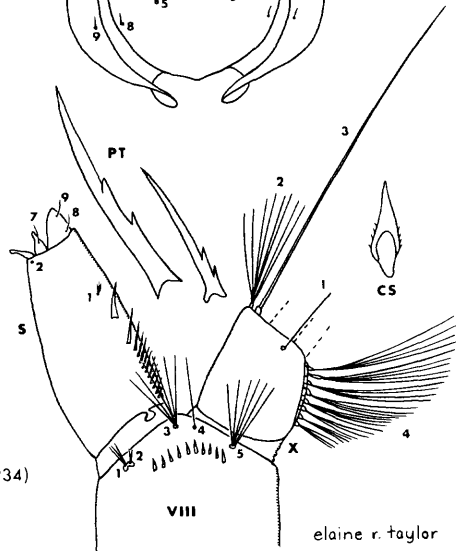
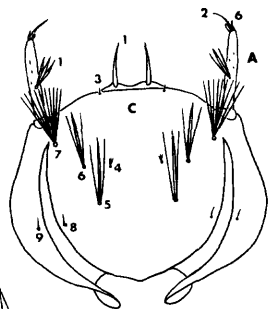
INDECORABILIS



GIBBOSUS



INDICUS
(from Barraud, 1934)



elaine r. taylor

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