

*Contributions
of the
American Entomological Institute*

Volume 13, Number 2, 1976



MEDICAL ENTOMOLOGY STUDIES - V.

THE SUBGENUS *RHINOSKUSEA* OF THE
GENUS *AEDES* (DIPTERA: CULICIDAE).

by

John F. Reinert

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 1976		2. REPORT TYPE		3. DATES COVERED 00-00-1976 to 00-00-1976	
4. TITLE AND SUBTITLE Medical Entomology Studies - V. The Subgenus Rhinoskusea fo the Genus Aeddes (Diptera: Culicidae)				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Walter Reed Army Institute of Research, Department of Entomology, Washington, DC, 20012				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT see report					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 62	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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THE SUBGENUS *RHINOSKUSEA* OF THE GENUS
AEDES (DIPTERA: CULICIDAE)¹.

By

John F. Reinert²

ABSTRACT

The subgenus *Rhinoskusea* Edwards is redescribed and compared to other subgenera of *Aedes* Meigen. Three species, *longirostris* (Leicester), *pillaii* Mattingly and *wardi* new species, are included in the subgenus and are described and illustrated. Tables listing the range and mode of the setal branching of the pupae and larvae of the 3 species are given.

INTRODUCTION

The subgenus *Rhinoskusea* of the genus *Aedes* Meigen was originally described by Edwards (1929: 342) for the species *longirostris* (Leicester). The type species of the subgenus had been included in various generic combinations prior to its assignment to *Rhinoskusea* and are as follows: *Ficalbia* Theobald by Leicester (1908: 228), *Uranotaenia* Lynch Arribalzaga by Taylor (1918: 841, as *hilli*) and *Skusea* Theobald by Edwards (1917: 224).

This primarily Oriental subgenus consists of 3 morphologically very similar species (*longirostris*, *pillaii* Mattingly and *wardi* new species). The present study redefines the subgenus and gives characters which separate all stages of *Rhinoskusea* from the other subgenera of *Aedes*. Morphologically similar features of the subgenus and other subgenera are discussed. All stages of the 3 included species are quite similar except the male which possesses very distinct characters of the genitalia. Descriptions and illustrations are presented for the female and male genitalia and immatures of *longirostris*, *pillaii* and *wardi*. The female and male habitus of *longirostris* are also given. Tables 1-6 list the range and mode of the setal branching of the pupae and larvae of the 3 species.

¹This work was supported in part by Research Contract DAMD-17-74-C-4086 from the U. S. Army Medical Research and Development Command, Office of the Surgeon General and carried out at the Medical Entomology Project, Smithsonian Institution, Washington, D. C. 20560.

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Abbreviations used in references to literature conform to the BIOSIS List of Serials, Biosciences Information Service of Biological Abstracts, Philadelphia, 1972. In synonymy sections, an asterisk following the abbreviations used (A = adult, ♀ = female, ♂ = male, P = pupa, L = larva) indicates that at least some portion of that sex or stage is figured. In the distribution sections, abbreviations used are the same as in the synonymy but with the following 2 additions, p = pupal skin and l = larval skin. Seven specimens (6 larvae of *pillaii*) were used to determine the range and mode of the setal branching in pupal and larval descriptions and tables. In the pupal descriptions and tables the number of branches on abdominal seta 1-I was measured on the basal third of the seta. Measurements on the illustrations are in millimeters. Distribution records are indicated as follows: countries are in capital letters, provinces and primary administrative divisions are in italics, and place names have the first letter capitalized. The number of specimens examined from each province follows the last place name of the province in the distribution section. The spelling of provincial and locality names was taken from the following Official Standard Names Gazetteers prepared by the Geographic Names Division, U. S. Army Topographic Command and the Office of Geography, U. S. Department of the Interior: Malayasia (1970); Philippine Islands (vols. I and II, 1953); South Vietnam (1971); and Thailand (1966). Locality names which did not appear in the gazetteers were spelled according to the collection data sheets and labels on the specimens.

Information in the biology and distribution sections was taken from the collection data sheets and specimen labels of the specimens that I examined. References in the published literature are also given.

Nomenclature and chaetotaxy used for the female, male, male genitalia, pupa and larva follow Knight (1970, 1971), Knight and Laffoon (1970a, 1970b, 1971a, 1971b) and Laffoon and Knight (1973). The terminology of the female genitalia follows Reinert (1974).

GENUS *Aedes* MEIGEN

SUBGENUS *RHINOSKUSEA* EDWARDS

Type species: *Ficalbia longirostris* Leicester

Ficalbia of Leicester 1908: 228.

Aedes (*Rhinoskusea*) Edwards 1929: 342.

Aedes (*Rhinoskusea*) of Edwards 1932: 160; Barraud 1934: 216; Knight and Hull 1952: 163; Mattingly 1958: 35; Stone et al. 1959: 178; Mattingly 1961: 10; Huang 1968: 187; Stone and Delfinado 1973: 307.

FEMALE. Small dark mosquitoes with few pleural setae and scales. *Head.* Antenna dark, moderately long, 6 setae in flagellar whorls, pedicel with a few scattered short fine hairs and occasionally a few small dark scales mesally; clypeus dark, bare; maxillary palpus dark scaled, 4-segmented, short, 0.13-0.14 length of proboscis; proboscis dark scaled, narrow, long, noticeably longer than femur I; eyes contiguous; interocular setae absent; ocular setae numerous; vertex and lateral surface of head with only broad decumbent scales; occiput with a few erect forked scales. *Thorax.* Scutum covered with narrow curved dark scales except for a very small patch of broad dark scales on median anterior promontory area; prescutellar space with a narrow median longitudinal

stripe of narrow curved scales; scutellum with a patch of broad dark scales on each lobe; scutal setae dark and present on following areas: median anterior promontory, dorsocentral (numerous anterior and posterior), acrostichal (numerous anterior and posterior), scutal fossal (anterior, lateral and posterior), supra-alar (numerous), posterior medial scutal, postalar callar and scutellar (lateral and median lobes); antepnota widely separated, not enlarged, without scales, 7-14 setae; postpronotum without scales, 2-3 posterior setae; propleuron without scales, 2-6 setae; prosternum, subspiracular area, mesomeron and metameron bare; postspiracular area without scales, 1-4 setae; paratergite narrow, bare; mesepisternum with a small patch of pale scales on lower posterior area, 1-2 upper and 3-7 long and 3-7 short posterior setae; prealar knob without scales, 2-5 setae; mesepimeron without scales and lower setae, 4-10 short setae on posterior dorsal area. *Legs.* Coxae I-III each with a patch of scales and setae; femora I-III each long and relatively narrow, anterior surface dark scaled, III also with a narrow anteroventral pale scaled stripe on basal area; tibiae long, dark scaled; tarsi I-III each dark scaled, III with tarsomere 1 long, slightly longer than tibia III; posttarsi I-III each with 2 ungues, each pair of ungues equal in size and simple. *Wing.* Dorsal and ventral veins dark scaled; alula with a single row of several narrow dark scales on margin; upper calypter with a number of long dark setae on margin; remigium usually with 1 short seta (often hidden beneath scales). *Halter.* Pedicel pale; capitellum dark scaled. *Abdomen.* Terga dark scaled, usually with a small laterobasal pale scaled patch on I-VI; sterna pale scaled; terga and sterna with numerous short dark setae, mostly along posterior margins. *Genitalia.* Tergum VIII lightly pigmented, base and apex nearly straight, a number of short setae scattered over apical 0.45-0.93, those along apex short, basolateral seta absent, covered with minute spicules, scales usually absent (only 1-2 scales when present), basal 0.65-0.90 retracted into segment VII, VIII-Te index 0.68-0.83, VIII-Te/IX-Te index 1.44-1.91, length 0.16-0.19 mm, width 0.20-0.26 mm; sternum VIII lightly to moderately pigmented, base slightly concave mesally, apex with a shallow to moderately deep median indentation (0.02-0.16 deep), numerous short setae scattered over most of area, setae 1-3-S widely separated, located in a more or less diagonal line, 1-S basomesad, 3-S apicolaterad, covered with minute spicules, scales usually absent (only 1-5 scales when present), apical intersegmental fold moderately pigmented, VIII-S index 0.72-0.87, length 0.20-0.23 mm, width 0.25-0.31 mm; tergum IX moderately pigmented, base without median indentation, apex with a small median indentation and with 2-6 setae on each side of midline, 5-11 total setae, covered with minute spicules, a short flap on lateral area, IX-Te index 0.72-0.87, length 0.09-0.11 mm, width 0.12-0.13 mm; insula lightly pigmented, short, wide, lip-like, 3-5 long setae, covered with short hair-like spicules; lower vaginal lip lightly to moderately pigmented, narrow, covered with short spicules, lower vaginal sclerite absent; upper vaginal lip moderately to heavily pigmented, moderately broad to broad laterally, covered with short spicules, upper vaginal sclerite absent; postgenital lobe short, wide, apex broad with a small median indentation or straight (0.00-0.17 deep), 3-7 setae on each side of midline, 7-13 total setae, covered with short hair-like spicules, dorsal PGL index 0.38-0.59, ventral PGL index 1.00-1.35, ventral length 0.06-0.08 mm; perianal membrane with scattered short spicules; cercus moderately long, apex sharply rounded with 2-4 long stout setae, completely covered with short spicules, dorsal surface with a number of short to moderately long setae on apical 0.71-0.85, scales absent, ventral surface without setae, cercus index 2.07-3.20, cercus/dorsal PGL index 1.86-2.79, cercus

length 0.14-0.18 mm; one large seminal capsule, heavily pigmented, spherical, several small seminal capsule pores near orifice, base of accessory gland duct moderately pigmented.

MALE. Essentially as in the female. *Head.* Antenna moderately long, lightly plumose, 5-6 setae in flagellar whorls, setae not directed mainly dorsally-ventrally, apical 2 flagellomeres long, together longer than combined length of basal 11 flagellomeres; maxillary palpus very short, 0.09-0.13 length of proboscis, 4-segmented, similar to female; proboscis long, narrow, noticeably longer than femur I. *Thorax.* Setal groups usually with fewer setae than in female. *Legs.* Femora I-III each long and relatively narrow; tarsus III with tarsomere I long, longer than tibia III; posttarsi I-III each with 2 unguis, I and II each with one large and one small unguis, larger one simple or toothed, III with unguis equal in size, both simple. *Abdomen.* Terga with laterobasal pale scaled areas reduced in size; lateral setae of terga short. *Genitalia.* Tergum IX narrow mesally, broader laterally, setae present or absent; gonocoxite long, narrow, curved mesally, dorsal surface with several short to moderately long setae on mesal area and several long stout setae on outer margin, ventral surface with short to moderately long setae on mesal area, long ones on apical portion of outer area, mesal surface membranous; gonostylus moderately long to long, narrow to broad, with spicules and several short setae, gonostylar claw short, flared apically, longitudinally striated, heavily pigmented, scoop-like, attached subapically, gonostylus attached at apex of gonocoxite; basal mesal lobe large, apical portion free, with setae; proctiger moderately long, paraproct a narrow heavily pigmented strip from base to apex which terminates in a small bluntly rounded lobe, cercus membranous with a large lightly to moderately pigmented wrinkled plate covering most of mesal area, cercal setae present; phallosome simple, aedeagus consists of a short broad trough with base concave and apex broadly convex, paramere length approximately equal to length of aedeagus, parameral apodeme short; sternum IX large, extended cephalad, lateral areas heavily pigmented, with or without setae.

PUPA. Cephalothorax and abdominal segments moderately pigmented, some segments also with heavily pigmented areas. *Cephalothorax.* Setae 1, 3-CT approximately equally developed, 2-CT slightly shorter; 4, 5-CT stout, single to triple, approximately equally developed; 6-CT short, single; 7-CT long, double to 4-branched; 8-CT double to 5-branched. *Metanotal plate.* Seta 10-CT double to 5-branched; 11-CT long, stout, double. *Respiratory trumpet.* Heavily pigmented; hair-like spicules on inner surface of meatus; basal portion of meatus tracheoid; pinna moderately long; index 4.04-5.93. *Abdomen.* Small dark granules on membrane beneath seta 1-I and on median dorsal and median ventral intersegmental membranes of II-VII; small spicules covering segments II-VIII and male genital lobe; setae 2, 3-I with bases approximated; 6, 7-I approximately equal in length and development; 3-III removed from caudal margin; 5-III-VI long, double to 6-branched; 4-VII much longer than 5-VII; 4, 9-VII approximately equally developed; 9-VIII with secondary branching on apical one half. *Paddle.* Ovoid with basal area of inner margin depressed; midrib nearly reaches apex; basal area of outer margin with a few minute serrations; apical portion of outer and inner margins with a few minute spicules, hair-like fringe absent; seta 1-P moderately long, stout, triple to 5-branched (double on one side of one specimen); index 1.39-1.90.

LARVA. *Head.* Moderately pigmented; seta 4-C short, with 4-7 fine branches, mesad and slightly caudad of 5-C; 5-C long, stout, barbed, with 5-7 branches, slightly mesad and caudad of 6-C; 6-C barbed, double or triple, longer and stouter than 5-C; 7-C long, stout, barbed, with 9-16 branches,

slightly cephalad and widely laterad of 6-C; 11-C moderately long, triple to 11-branched; 12-C small, double or triple; 13-C long, barbed, double to 4-branched; dorsomentum heavily pigmented, with 19-23 stout teeth; lateral palatal brush setae filamentous. *Antenna*. Long, narrow, curved mesad, moderately pigmented, with numerous spicules; seta 1-A moderately long, with 5-8 branches; 2-A very long; 2, 3-A noticeably subapical in attachment; 3, 6-A short; 4-A long. *Thorax*. Setae 1-3-P single, 1-P very long; 5-P very long, longer than 6, 7-P, single; 9-T barbed, double or triple. *Abdomen*. Setae 6-III-VI long, barbed, double; 2-VIII long, single; 1-X long, single, attached on saddle; 2-X long, with 4-7 branches; 3-X very long, single; ventral brush of segment X with 10 setae on grid, each with 4-10 branches (caudal 7-8 setae with 6-10 branches); 4 anal papillae, small, knob-like; saddle small, incompletely rings segment X, with small spicules, acus absent; comb of segment VIII consists of a large triangular patch of 34-104 scales, each scale with apical area flared and with a fringe of denticles. *Siphon*. Moderately pigmented; acus well developed, heavily pigmented; index 2.43-3.54; pecten on basal 0.44-0.55 of siphon, composed of 4-15 teeth, distal 1-2 teeth wider spaced than remainder of teeth; seta 1-S long, barbed, attached far distad (0.76-0.84 from base), distal to last pecten tooth, triple to 6-branched; 2-S small, single, attached on dorsoapical margin of siphon; 9-S stout, hook-like.

EGG. Not known.

DISCUSSION. The subgenus *Rhinoskusea* is characterized and separated from the other subgenera of *Aedes* by the following: in the adults by the combination of (1) head with vertex with only broad decumbent scales and occiput with a few erect forked scales, (2) scutum with narrow curved scales except for a small patch of broad scales on median anterior promontory area, (3) dorsocentral (anterior and posterior) and acrostichal (anterior and posterior) setae numerous, (4) scutellum with broad scales on each lobe, (5) thoracic pleura without scales except for a small lower patch on the mesepisternum (anteprenotum and paratergite also without scales), (6) propleuron with 2-6 setae, and (7) tarsus III with tarsomere 1 slightly longer than tibia III; in the female genitalia by the combination of (1) only a single large seminal capsule, (2) insula lip-like with 3-5 long setae, (3) upper vaginal sclerite absent, and (4) postgenital lobe short and broad; in the male genitalia by the combination of (1) proctiger with a dorsomedian wrinkled plate and with cercal setae, (2) aedeagus simple, wide and trough-like, (3) basal mesal lobe with a long apical portion which is free of gonocoxite and without an apical filament, and (4) gonostylus with a short, longitudinally striated, scoop-like gonostylar claw; in the pupae by the combination of (1) small dark granules on membrane beneath seta 1-I and on intersegmental membranes of II-VIII, (2) seta 11-CT long, stout and double, (3) seta 5-III-VI long, double to 6-branched, (4) seta 4-VII much longer than 5-VII, (5) seta 9-VIII multiple branched with secondary branches on apical one half, and (6) seta 1-P moderately long and triple to 5-branched; and in the larvae by the combination of (1) setae 2, 3-A noticeable subapical in attachment to antenna, (2) development and position of setae 4-6-C, (3) comb consists of numerous scales in a triangular patch, (4) seta 1-S long, multiple branched and attached far distad on siphon, (5) seta 1-X long, single and attached to saddle, (6) ventral brush with 10 multiple branched setae on grid, and (7) anal papillae small and knob-like.

Rhinoskusea is a very distinct subgenus whose exact affinities with other subgenera of *Aedes* are not evident. It does share characters with several other *Aedes* subgenera.

The adults of *Rhinoskusea* are small unornamented mosquitoes and are most

similar in habitus to those of the subgenus *Levua* Stone and Bohart; however, they also resemble members of subgenera *Lorrainea* Belkin, *Cancraedes* Edwards, *Geoskusea* Edwards, *Verrallina* Theobald and *Paraedes* Edwards. Species of these subgenera can be distinguished from those of *Rhinoskusea* by one or more of the features listed above.

Males of *Rhinoskusea* have short maxillary palpi which are similar to those of the following subgenera of *Aedes*: *Aedes* Meigen, *Bothaella* Reinert, *Cancraedes*, *Christophersiomyia* Barraud, *Huaedes* Huang, *Leptosomatomyia* Theobald, *Nothoskusea* Dumbleton, *Paraedes*, *Verrallina* and most species of *Geoskusea*. *Rhinoskusea* males are easily separated from these subgenera by the genitalia and one or more of the above characters.

The male genitalia of the subgenus *Rhinoskusea* are very distinctive, easily separated from the other subgenera of *Aedes*, and show no close affinities to any of the other subgenera of the genus. *Rhinoskusea* genitalia are easily recognized by the development of the basal mesal lobe, proctiger, IX sternum, and gonocoxite.

Female genitalia of the species of *Rhinoskusea* possess features which easily distinguish them from each other and from members of other subgenera of *Aedes*. The single large seminal capsule is similar to that found in *Cancraedes*, *Paraedes*, some African *Aedimorphus* Theobald and *niveus* group of *Finlaya* Theobald, however, *Rhinoskusea* genitalia are easily separated from those of these subgenera by the development of the insula which is lip-like with long setae, but tongue-like without setae in the former 3 subgenera. From *Finlaya* they are easily separated by the development of terga VIII and IX and sternum VIII. Genitalia of *Rhinoskusea* are also similar to those of *Geoskusea* and *Pseudoskusea* Theobald but are separated from them by having only a single seminal capsule.

Pupae of *Rhinoskusea* species are very similar and are difficult to separate to species. They do possess features which distinguish them from the species of the other *Aedes* subgenera. Pupae of the subgenus *Rhinoskusea* are similar to those of subgenera *Cancraedes*, *Geoskusea* and *Pseudoskusea*, however, they can be distinguished from these 3 subgenera, as well as the other subgenera of *Aedes*, by the above combination of features.

Larvae of the 3 species of *Rhinoskusea* are very similar and are difficult to separate from each other, however, they possess characters that make them easily distinguishable from other species of *Aedes*. *Rhinoskusea* larvae are most similar to those of subgenera *Cancraedes*, *Geoskusea* and *Pseudoskusea*. They can be distinguished from these subgenera, as well as all the subgenera of *Aedes*, by the combination of features listed above. The comb resembles those of *Cancraedes*, *Geoskusea*, *Halaedes*, *Levua*, *Lorrainea*, *Pseudoskusea* and *Skusea* of *Aedes* and *Opifex fuscus* Hutton. The development of the anal papillae into small knob-like structures is similar to those of other aedine mosquitoes which inhabit small collections of water with a higher saline content than rain water (e.g., *Aedes* subgenera *Cancraedes*, *Halaedes*, *Levua* and *Skusea* and *Opifex* Hutton).

DISTRIBUTION. The subgenus *Rhinoskusea* is found throughout much of Southeast Asia, Sri Lanka, Papua New Guinea and the northern tip of Australia. Species of the subgenus are confined to coastal and river areas which contain brackish water. The distributions of the 3 species of *Rhinoskusea* are shown on the map in Figure 1.

BIONOMICS. Immatures of the species of *Rhinoskusea* usually inhabit brackish water in crab holes or small ground pools located in coastal mangrove areas. They have, on a few occasions, been collected from several other types

of small containers in coastal areas such as: beached boat, tin plate, depression in a log, discrete containers, obstructed earth drain and rock pools.

Adults have been collected in light traps, human- and carabao-baited traps and resting in crab holes. Females have been taken while feeding on man.

MEDICAL IMPORTANCE. Few investigations have been conducted for pathogen isolation on members of the subgenus even though the females feed on man and other animals. One attempt at arbovirus isolation from specimens of *Rhinoskusea* from Sarawak was negative (Macdonald et al. 1965).

KEYS TO SPECIES OF *AEDES (RHINOSKUSEA)* *

FEMALE GENITALIA

1. Cercus index 2.07-2.17; tergum VIII with setae on apical 0.45-0.58.
Cercus index 2.38-3.20; tergum VIII with setae on apical 0.84-0.93. *pillaii* 2
2. Cercus index 2.38-2.70. *wardi*
Cercus index 2.81-3.20. *longirostris*

MALE GENITALIA

1. Basal mesal lobe not bifid, 12-19 long setae; sternum IX without setae.
Basal mesal lobe bifid, 2-5 short apical setae on ventromesal arm;
sternum IX with 3-8 setae. *pillaii* 2
2. Basal mesal lobe with a long stout seta at base; gonostylus narrow at apex, 0.83-0.88 length of gonocoxite. *wardi*
Basal mesal lobe without a seta at base; gonostylus broadened at apex, 0.63-0.70 length of gonocoxite. *longirostris*

PUPAE

1. Paddle index 1.68-1.90. *longirostris*
Paddle index 1.39-1.59. 2
2. Seta 11 on III-V always single. *pillaii*
Seta 11 double at least on one side of III-V. *wardi*

FOURTH STAGE LARVAE

1. Comb with 66-104 scales. *longirostris*
Comb with 34-64 scales. 2
2. Seta 8-S single; seta 8-M with 6-7 branches. *wardi*
Seta 8-S usually double; seta 8-M with 8-10 branches. *pillaii*

*Adult females can not be separated with certainty except by the genitalia.

SPECIES TREATMENT

AEDES (RHINOSKUSEA) LONGIROSTRIS (LEICESTER)

(Figs. 2, 3, 6, 9, 12, 14)

Ficalbia Longirostris Leicester 1908: 228 (♀, ♂).*Ficalbia longirostris* of Brunetti 1912: 494; Brunetti 1920: 172.*Uranotaenia hilli* Taylor 1918: 841 (♂*).*Aedes longirostris* of Edwards 1922a: 259 (key); Edwards 1926: 120 (L*); Stojanovich and Scott 1965: 13, 19 (♀*, L*, keys); Stojanovich and Scott 1966: 49, 109 (♀*, L*, keys); Parrish 1968a: 4, 5; Parrish 1968b: 2, 4; Parrish 1969: 554.*Skusea longirostris* of Edwards 1917: 224.*Aedes (Skusea) longirostris* of Edwards 1922b: 467; Edwards 1924: 391 (♀, ♂); Barraud 1928: 363 (♂*).*Aedes (Rhinoskusea) longirostris* of Edwards 1932: 160; Barraud 1934: 216 (♀, ♂*, L); Taylor 1934: 19; Causey 1937: 413; Lee 1944: 79 (L*); Knight et al. 1944: 25 (A, key); Brug and Bonne-Wepster 1947: 185; Horsfall 1955: 411; Army Mosq. Proj. 1965: 17, 64 (keys); Stone et al. 1966: 51, 59 (keys); Mattingly 1971: Fig. 42e (P*); Grothaus et al. 1971: 18.*Aedes (Rhinoskusea) longirostris* in part of Macdonald 1957: 22; Mattingly 1958: 38 (♀*, ♂*, P*, L*); Stone et al. 1959: 178; Steffan 1966: 211; Basio 1971: 26, 130 (♂*); Stone and Delfinado 1973: 307.*Aedes (Rhinoskusea) pillaii* Mattingly, in part of Mattingly 1958: 21, 39, 40 (♀*).

FEMALE (Fig. 2). *Head*. Antenna dark brown, 0.85-0.94 length of proboscis, pedicel dark brown with a few short fine brown hairs mesally; clypeus dark brown, bare; maxillary palpus dark brown scaled, 4-segmented, approximate length of each segment in parenthesis, 1 (0.16), 2 (0.15), 3 (0.17) and 4 (0.52), total length 0.13-0.14 length of proboscis; proboscis long, narrow, dark brown scaled, 1.09-1.15 length of femur I; ocular setae dark brown, numerous; vertex and lateral surface covered with broad decumbent blackish-brown scales, postgena with a small patch of pale brown scales; occiput with a few erect forked blackish-brown scales. *Thorax*. Scutal integument dark brown; scutum covered with narrow curved dark brown scales except for a very small patch of broad dark brown scales on median anterior promontory area; prescutellar space with a narrow median longitudinal patch of narrow curved dark brown scales; scutellum with a patch of broad dark brown scales on each lobe; scutal setae blackish-brown, numerous, on following areas: 2 long and 3-6 short median anterior promontory, numerous acrostichal (anterior and posterior), numerous dorsocentral (anterior and posterior), scutal fossal (2-3 long and 3-6 short anterior, 3-4 long lateral and 2-3 long posterior), numerous supra-alar, 6 posterior medial scutal, 1 postalar callar and scutellar (3 long and 3 short to 4 long and 4 short ones on lateral lobe, 5 long and 4 short to 7 long and 6 short ones on median lobe); pleural integument brown; antepnotum without scales, 8-14 dark setae; postpronotum without scales, 1 long and 1-2 short posterior dark setae; propleuron without scales, 4-6 (usually 5-6) dark setae; prosternum, subspiracular area, paratergite, mesomeron and metameron bare; postspiracular area without scales, 1-4 dark setae; mesepisternum with a small patch of pale brown scales on lower posterior area (scales often rubbed off), 1-2 upper and 4-7 long and 5-7 short posterior dark setae;

prealar knob without scales, 2-5 (usually 3-4) dark setae; mesepimeron without scales, 5-10 (usually 6-8) short dark setae on posterior dorsal area. *Legs.* Coxae I-III each with several brown setae, I with anterior surface brown scaled with a small dorsal and a small ventral patch of pale scales, II and III each with a small patch of pale scales on anterior surface; trochanters I-III each with pale scales and a few short setae; femora I-III each with anterior surface blackish-brown scaled, III also with a narrow anteroventral stripe of pale scales on basal area, I-III each with posterior surface blackish brown scaled with a narrow longitudinal pale scaled stripe on basal area, stripe dorsal on I and ventral on II and III; tibiae I-III and tarsi I-III each blackish-brown scaled, tarsus III with tarsomere 1 as long as or slightly longer than tibia III; posttarsi I-III (Fig. 14) each with 2 ungues, each pair equal in size and simple. *Wing.* Dorsal and ventral veins with dark brown scales; alula with several narrow dark brown scales on margin; upper calypter with a number of long brown setae on margin; 1 short remigial seta (often hidden beneath scales). *Halter.* Pedicel pale; capitellum dark brown scaled. *Abdomen.* Terga blackish-brown scaled, I with a small patch of pale scales on laterotergite, II-VI each with a small laterobasal patch of pale scales with a brown hue (several specimens from Thailand with pale scaled patches reduced or absent); sterna II-VI pale scaled, VII with pale scales basally and brown ones on apical area; terga and sterna with numerous short setae, mostly along posterior margins. *Genitalia* (Fig. 3). Tergum VIII lightly pigmented, base and apex nearly straight, short setae scattered over apical 0.84-0.92, setae along apex short, basolateral seta absent, covered with minute spicules, scales absent, basal 0.65-0.90 retracted into segment VII, VIII-Te index 0.76-0.83, VIII-Te/IX-Te index 1.55-1.82, length 0.16-0.17 mm, width 0.20-0.22 mm; sternum VIII lightly to moderately pigmented, base slightly concave mesally, apex with a shallow median indentation (0.02-0.05 deep), short setae scattered over apical 0.93-0.99, seta 1-3-S widely separated, located in a more or less diagonal line, 1-S basomesad, 2-S approximately 0.32 from 1-S, 3-S apicolaterad and approximately 0.68 from 2-S, covered with minute spicules, none to 5 scales (usually absent), apical intersegmental fold moderately pigmented, VIII-S index 0.79-0.86, length 0.20-0.21 mm, width 0.25-0.26 mm; tergum IX moderately pigmented, base without median indentation, apex with a small median indentation and with 2-5 (usually 3-4) short setae on each side of midline, 5-9 total setae, covered with minute spicules, a short flap on lateral area, IX-Te index 0.73-0.80, length 0.09-0.10 mm, width 0.12-0.13 mm; insula lightly pigmented, short, wide, lip-like, 3-5 (usually 4) long setae, covered with short hair-like spicules; lower vaginal lip lightly pigmented, narrow, covered with short spicules, lower vaginal sclerite absent; upper vaginal lip moderately pigmented, moderately broad laterally, covered with short spicules, upper vaginal sclerite absent; postgenital lobe short, wide, apex broad with a small median indentation (0.08-0.17 deep), 4-6 (usually 5) setae on each side of midline, 8-11 total setae, covered with short hair-like spicules, dorsal PGL index 0.52-0.59, ventral PGL index 1.11-1.27, ventral length 0.07 mm; perianal membrane with scattered short spicules; cercus moderately long, apex sharply rounded with 2-3 long stout setae, completely covered with short spicules, dorsal surface with a number of short to moderately long setae on apical 0.78-0.83, scales absent, ventral surface without setae, cercus index 2.81-3.20, cercus/dorsal PGL index 2.46-2.79, cercus length 0.17-0.18 mm; one large seminal capsule, heavily pigmented, spherical, several small seminal capsule pores near orifice, base of accessory gland duct moderately pigmented.

MALE (Fig. 2). Essentially as in the female but with the following differ-

ences. *Head*. Antenna 0.70-0.82 length of proboscis, apical flagellomere long, approximately 0.39 total length, flagellomere 12 approximately 0.21 total length, basal 11 flagellomeres 0.40 total length; maxillary palpus very short, 0.10-0.13 length of proboscis, 4-segmented, approximate length of each segment in parenthesis, 1 (0.18), 2 (0.16), 3 (0.23) and 4 (0.43); proboscis 1.14-1.26 length of femur I. *Thorax*. Setal differences as follows: scutal fossal (2 long and 3-4 short anterior, 2-3 long lateral and 1-2 long posterior); 4 posterior medial scutal; 5-8 on anteprenotum; 3-4 on propleuron; 1-2 on postspiracular area; 1 upper and 3-5 long and 4-5 short posterior on mesepisternum; 2-4 on prealar knob; and 4-7 on posterior dorsal area of mesepimeron. *Legs* (Fig. 14). Posttarsi I-III each with 2 ungues, I and II each with ungues unequal, larger one with a narrow basal tooth, smaller one simple, III with ungues equal, both simple. *Abdomen*. Terga with laterobasal pale scaled patches somewhat reduced in size. *Genitalia* (Fig. 6). Tergum IX moderately pigmented, narrow mesally, broadened laterally, setae absent, covered with small spicules; gonocoxite long, narrow, curved mesally, moderately pigmented, covered with minute spicules, apex of dorsomesal area with a caudally produced long finger-like projection bearing numerous moderately long curved setae on mesal and apical surfaces, dorsal surface with a patch of moderately long setae on apical 0.4, a few long stout setae along outer margin on apical 0.7, basomesal area with a small narrow lobe bearing 1-3 (usually 1-2) moderately long narrow setae, ventral surface with a few long stout setae on apical 0.5 and several short to moderately long setae on mesal area from base to apex, a few setae somewhat stouter on basomesal area, a number of broad scales on ventral and lateral surfaces, mesal surface membranous; gonostylus moderately long, 0.63-0.70 length of gonocoxite, moderately to heavily pigmented, basal 0.58 narrow, apical 0.42 moderately broad with small spicules, 17-25 short setae, mostly along outer margin and apex, some specimens with a scale basad of setae, gonostylar claw short, flared apically, longitudinally striated, heavily pigmented, scoop-like; basal mesal lobe large, bifurcated into a narrow heavily pigmented pointed dorsal arm and a broad moderately pigmented ventral arm which bears a short dorsoapical flap and an apical ventrally curved pointed flap, 2-5 (usually 3-4) short fine apical setae, a few small spicules on basal area of ventral arm, base below furcation broad with a moderately broad median strip connecting it with its mate and a short dorsal extension with spicules which is connected to the ventral margin of the small basomesal lobe of the gonocoxite; proctiger moderately long, paraproct consists of a narrow heavily pigmented strip along outer margin from base to apex of proctiger, apex a small heavily pigmented bluntly rounded lobe, cercus membranous with a large moderately pigmented wrinkled plate covering most of mesal area, 3-6 (usually 4-5) short cercal setae on each side of midline near apex; tergum X narrow, heavily pigmented, curved, base attached to base of paraproct and apex attached to caudoventral margin of tergum IX; phallosome simple, aedeagus consists of a moderately pigmented short broad trough, base concave, apex broadly convex, paramere with length equal to length of aedeagus, moderately pigmented, moderately broad near middle, attached at approximately 0.37 from base to parameral apodeme, parameral apodeme short, approximately 0.87 length of paramere, narrow, moderately pigmented; sternum IX large, extended cephalad, lateral areas heavily pigmented, a narrow heavily pigmented mesal strip with 3-7 (usually 3-4) short setae near caudal margin, remainder membranous, covered with minute spicules.

PUPA (Fig. 9). Chaetotaxy as figured and recorded in Table 1. Cephalothorax and abdominal segments moderately pigmented with heavily pigmented

areas. *Respiratory trumpet*. Heavily pigmented; index 4.55-5.42, mean 4.71. *Abdomen*. Seta 8-VII triple to 5 (usually 4) branched; 9-VIII with 6-10 branches; 11-III-V single. *Paddle*. Ovoid with inner basal margin depressed; very few minute serrations on most of basal 0.32-0.45 of outer margin, few minute spicules on apical 0.55-0.68 of outer and apical 0.15-0.32 of inner margins; midrib moderately pigmented, nearly reaches apex; seta 1-P moderately long, triple to 5-branched (double on one side of one specimen); index 1.68-1.90, mean 1.83.

LARVA (Fig. 12). Chaetotaxy as figured and recorded in Table 4. *Head*. Seta 4-C with 4-5 branches; 5-C with 5-7 branches; 6-C double, occasionally triple; 7-C with 10-14 branches; 10-C usually double, occasionally triple; 12, 13-C double or triple; dorsomentum with 20-23 teeth, usually 21. *Antenna*. Seta 1-A with 5-8 (usually 6-7) branches, attached 0.50-0.53 from base of antenna; 2-A very long; 3-A short, 0.24-0.29 length of 2-A; 4-A long, 0.65-0.73 length of 2-A; 6-A short, 0.32-0.39 length of 2-A. *Thorax*. Seta 8-M with 6-9 branches; 2-T double or triple. *Abdomen*. Seta 13-II with 4-8 (usually 5-6) branches; 1-III, IV single; 2-X with 4 branches, 5-branched in one specimen; ventral brush of segment X with 10 setae on grid, each with 4-8 branches; comb of segment VIII consists of a patch of 66-104 (usually 72-86) scales, each scale with apical area flared and with a fringe of denticles; saddle small, incompletely rings segment X, with short rows of small spicules. *Siphon*. Index 3.07-3.54, mean 3.31; pecten on basal 0.50-0.55 of siphon, composed of 10-15 (usually 12-14) teeth, each tooth (except occasionally basal 1-3) long, slender and with several fine and 2-3 stouter ventral and several fine dorsal denticles near base; seta 1-S long, triple to 5-branched, attached 0.77-0.84 from base of siphon, distad of last pecten tooth; seta 8-S single.

DISCUSSION. Females of the 3 species of the subgenus are extremely similar in habitus features and no consistent characters were found with which to separate them, however, several features of the genitalia can be used to distinguish all 3 species (see discussion of *pillaii* for separating features). Mattingly's (1958: 21) female genitalia figure (e) is of *longirostris* and not *pillaii* (see discussion under type-data).

Male genitalia of *longirostris* are similar to those of *wardi* but can be separated from them by several features (see discussion section of *wardi*). Specimens of *longirostris* from Thailand have the ventral arm of the basal mesal lobe narrower than specimens from Malaysia and Singapore. Mattingly (1958: 37), on his illustration of the male genitalia, mistakenly labeled the wrinkled mesal plate of the cercus as the phallosome.

Pupae of *longirostris* are very similar to those of the other 2 species of the subgenus. Features to separate the 3 species are given in the pupal key.

The larvae of *longirostris* are very similar to those of both *pillaii* and *wardi*, however, the 3 species can be distinguished by using the characters mentioned in the larval key. The siphonal indices can also be used to separate *longirostris* and *wardi*.

The records of *longirostris* from Nakhon Phanom and Udorn, Thailand by Parrish (1968b: 10, 16) are questionable and need confirmation. It is doubtful that *longirostris*, which breeds in coastal brackish water habitats, would occur as far inland as the above 2 localities. Unfortunately, none of the specimens from these localities, on which the records were based, are now in existence.

TYPE-DATA. After examining all the specimens in the British Museum (Natural History) (BMNH) (kindly loaned to me by Peter F. Mattingly) I believe the "series" of specimens mentioned by Leicester (1908: 229) actually consisted of several collections of specimens collected in the general vicinity of the mouth

of the Klang River. The only bionomic and locality data presented by Leicester in his original description for his new species *Ficalbia longirostris* are as follows: "The series were bred from larvae found in stagnant water at Kuala Klang. Time of capture January." His description was also based on both females and males.

There are 6 males and 5 females in the BMNH that could have been from Leicester's (1908: 229) "series" of specimens. All these specimens have a printed label with the following information: Fed. Malay States, Dr. G. F. Leicester, 1912-350 (BMNH accession number). All the specimens are mounted on a large octagonal shaped white paper stage (except one male mounted on a rectangular stage) and have more or less similar information written in ink by Leicester on the underside. However, each of the specimens bears slightly different data and none of the specimens was collected in January. The specimens possess the following data on the underside of the mounting stage (each specimen is here numbered for identification): No. 1, ♂, "Klang Pt., 29/12/03, Stagnant pool"; No. 2, ♂, "Stagnant pool, Klang Pt., behind houses, 29/12/03"; No. 3, ♂, "Stagnant pool behind some houses in Klang Pt., 29/12/03"; No. 4, ♂, "Larva fr [from] stagnant pool behind houses, Klang pt., 29/12/03"; No. 5, ♂, "Larva fr mud hole, Klang Pt. (Aglyph) [? spelling], 27/12/03"; No. 6, ♀, "Caught in a crab hole, Klang, Daniells [sic], 27/11/03"; No. 7, ♀, "Caught in a crab hole, Klang, Daniels, 27/11/03"; No. 8, ♀, "Klang, jungle, day, 27/11/03"; No. 9, ♀, "Klang, jungle, day, 27/11/03"; No. 10, ♂, "Crab hole, K. Klang" [rectangular stage]; and No. 11, ♀, "Port Dickson, 12/4/04". Specimens 8, 9 and 10 each also had "*Ficalbia*" handwritten on the upper side of the stage. Specimens 1, 2, 6, 7 and 8 have a small green rectangular card with the number "101" glued to the underside of the stage while specimen No. 11 has a number "102" on this green card.

It is my opinion that the above specimens, Nos. 1-7 and 10, constituted Leicester's "series" from which he described his new species *longirostris*. All the specimens, which are mounted similarly, were collected in the same general area, Klang (3°02'N, 101°27'E) and Kuala Klang or Klang Pt. (3°00'N, 101°24'E) [taken from Gazetteer No. 11, Malay States, Hydrographic Office, U. S. Navy Department, H. O. Publication No. 891, October 1944], near the mouth of the river Klang (Kuala = river or stream), collected as larvae, and collected just prior to January, the stated time of capture (no collection date recorded for specimen No. 10). It is possible that the specimens were collected as larvae on 27 November and 27 and 29 December of 1903 and did not emerge as adults until the following January. Specimens Nos. 8, 9 and 11 are not considered as belonging to the type-series because of the following: Nos. 8 and 9 were collected in the jungle during the day as adults and not "bred from larvae"; and No. 11 was collected much later on 13 April 1904 at a different site (Port Dickson, 2°30'N, 101°48'E), had a different number (102) and no immature collection information.

The above specimens, Nos. 2-7 and 10, are relabeled as paralectotypes, each with the following information on the label: Paralectotype, *Ficalbia longirostris* Leicester. Specimens Nos. 2, 6 and 7 had previously been marked as paratypes [paralectotypes] and specimen No. 1 as holotype (sic) [lectotype] by P. F. Mattingly (18: IX: 1957). Mattingly's "paratype" [paralectotype], specimen No. 8, and "allotype" [paralectotype], specimen No. 11, are here considered not to belong to the original type-series for the reasons stated above. Mattingly (1958: 39, 40) provisionally transferred a female, specimen No. 6, to his new species, *pillaii*; however, the females of *pillaii* and *longirostris* can not be separated with certainty by habitus features but can be dis-

tinguished by the genitalia. The genitalia of specimen No. 6 are definitely like those of *longirostris*, therefore, this specimen is retained as a paralectotype of *longirostris*. Paralectotype male, specimen No. 4, however, is *pillaii* as clearly demonstrated by the structures of the genitalia. The lectotype male contains the following data on the adult labels: [on underside of octagonal stage] Klang Pt., 29/12/03, Stagnant pool; 101 [green label]; Type [circular label with red border]; Fed. Malay States, Dr. G. F. Leicester, 1912-350; and *Ficalbia longirostris* Leicester, Holotype, P. F. Mattingly, 18: IX: 1957. The lectotype is in good condition with all appendages intact except for right tarsi I-III which are mounted in Canada balsam on a microscope slide. The scutum is rubbed and somewhat folded. The genitalia are in good condition and are mounted in a drop of Canada balsam on a small coverslip attached to the adult pin.

I have examined one male paratype (with genitalia mounted) of *Uranotaenia hilli* Taylor, deposited in the BMNH, and concur that it is conspecific with *longirostris*. The paratype possesses the following information on the labels: G. F. Hill, 3.3.16, Darwin, N.T.; 321; larvae in crab holes mangrove swamps; and Paratype ♂, *Uranotaenia hilli* Taylor. The genitalia are in good condition and are mounted in a drop of Canada balsam on a celluloid point attached to the adult pin. The adult is in poor condition. The holotype male of *hilli* is deposited in the School of Tropical Medicine, Sidney, Australia.

DISTRIBUTION. 992 specimens examined: 270♀, 271♂, 8 pl, 8 l, 61 L, and 231 with associated immature skins (137 p, 94 pl).

AUSTRALIA. Northern Territory, Darwin; 1♂ (paratype of *hilli*).

INDONESIA. Java, Batavia; 2 L.

MALAYSIA. Sabah, Kuala Penyu; 5♀ pl, 1♂ pl, 13♂, 1 pl, 4 L. Selangor, Klang; 2♀ (paralectotypes), 2♀, Klang Pt.; 1♂ (lectotype), 4♂ (paralectotypes), K. Klang; 1♂ (paralectotype), Carey Island, Gunong Swettenham, Jugra, Kg. Rantau, Kg. Sireh, Port Dickson, Rantau Panjang, Telok Gong; 14♀ pl, 5♂ pl, 1♂ p, 38♀, 14♂, 3 pl, 2 L. Trengganu, Kemaman; 2♀.

PHILIPPINE ISLANDS. Sulu Archipelago, Tawi Tawi Group, Sanga Sanga Island, Lapit Lapit; 1♀, 1♂.

SINGAPORE. Kuala Simpong, Paya Lebar Airport area, Pulau Ubin, West coast road at 8.5 miles; 23♀ pl, 8♂ pl, 17♀ p, 12♂ p, 80♀, 37♂, 1 lp, 8 l, 25 L.

THAILAND. Chumphon, Amphoe Muang, Pak Nam Chumphon; 5♀, 14♂. Ranong, Khao Muang Lak; 37♀ pl, 1♂ pl, 19♀ p, 88♂ p, 17♀, 65♂, 3 pl, 28 L. Trat, Tran Mayom Waterfalls, Ko Chang; 3♀. Samut Prakan, Amphoe Muang, Bang Po 6; 1♀. Samut Sakhon, Amphoe Muang, Ta Chalom; 4♀, 1♂. South Thailand; 3♂.

Distribution from literature.

AUSTRALIA. Northern Territory, Darwin (Taylor 1918: 841, Edwards 1924: 391, Taylor 1934: 19, Lee 1944: 79, Mattingly 1958: 38).

PAPUA NEW GUINEA (Australian Trust Territories). North coast; New Ireland (Peters in Peters and Christian 1963: 54); New Guinea (Steffan 1966: 211).

INDIA. Andaman Islands, Port Mount (Barraud 1928: 363; 1934: 217, spelled Port Mouat).

INDONESIA. Java, Batavia (Mattingly 1958: 39).

MALAYSIA. Kuala Klang (Leicester 1908: 229); Selangor, Kampong Sireh, Rantau Panjang (Macdonald 1957: 22); Port Dickson (Mattingly 1958: 38).

SINGAPORE. Naval Base (Edwards 1926: 120); Blakang Mati Island (Colless 1957: 110).

THAILAND. Haad Raj Samran (Causey 1937: 413); Ban U-Tapao (Parrish 1968b: 7); Chantaburi, Klong District, Ban Bangcham, Ban Ja Kayang; Choburi, Muang District (Harinasuta et al. 1974: 111-21).

VIETNAM. Phu Cat, Tuy Hoa (Parrish 1968a: 20, 23); Phu Cat Air Base, Tan Son Nhut Air Base, Tuy Hoa Air Base (Parrish 1969: 554); Chu Lai, Da Nang, Khue Bac, Phu Bai (Grothaus et al. 1971: 18).

BIONOMICS. The normal immature habitat is brackish water in crab holes and small ground pools located at or near sea level. Immatures in Malaysia were collected from colored, brackish, temporary, unmoving water in small crab holes, lobster burrows, a small ditch, and small ground pools, located in unshaded or partially shaded areas of mangrove swamps and coastal coconut groves at sea level. In Sabah larvae were taken from brackish water in small ground pools and small buffalo footprints located in a coconut palm area at sea level. Immatures in Singapore were collected from colored, brackish, temporary, unmoving water in small 1.0-1.5 m deep crab holes, small ground pools and a small marshy depression with crab holes, in unshaded and partially shaded areas of a mangrove salt marsh, open swamp, and coastal coconut palm areas at or near sea level. In Thailand immatures were collected from clear, brackish, temporary, unmoving water in small crab holes and a small ground pool located in partially shaded areas of mangroves and at an elevation near 3 m.

Adults have been taken in Malaysia and Thailand in the jungle during the day. In Singapore, Malaysia and Thailand adults were collected resting in crab holes and in the latter 2 countries females were taken feeding on man.

In Malaysia immatures are reported from stagnant water (Leicester 1908: 229), small shady ground pools under nipah palms (Mattingly 1958: 40), and in ground pools and crab holes in coastal swamps (Macdonald 1957: 22). In Singapore Edwards (1926: 120) reports larvae collected from a mangrove area and Colless (1957: 108-14) records the immatures collected from mangrove swamp pools, an obstructed earth drain, discrete containers, and large and small crab holes. In Thailand immatures were found in rock pools containing brackish water (Causey 1937: 413) and from weedy ponds (Harinasuta et al. 1974: 118).

Adults were collected from crab holes in the Andaman Islands (Barraud 1928: 363; 1934: 217), from crab holes and light traps in Vietnam (Grothaus et al. 1971: 18), and from CDC light traps in mangrove forests, human bare leg collection in thick mangrove areas and a net trap using human bait in Thailand (Harinasuta et al. 1974: 111-7).

Aedes (Rhinoskusea) pillaii MATTINGLY

(Figs. 4, 7, 10, 14)

Aedes (Rhinoskusea) pillaii Mattingly 1958: 40 (♀*, ♂*, L*).

Aedes (Rhinoskusea) pillaii of Stone et al. 1959: 178; Stone and Delfinado 1973: 307.

FEMALE. Description as for *longirostris* except for the following minor differences. *Head*. Antenna 0.87-0.89 length of proboscis; maxillary palpus 0.13 length of proboscis; proboscis 1.03-1.19 length of femur I. *Thorax*. Pleural integument somewhat paler brown; pleural setae as follows: 7-10 on antepnotum; 1-2 long and 1 short on postpronotum; 3-5 on propleuron; 1-3 on postspiracular area; 1-2 upper and 3-4 long and 5-6 short posterior on

mesepisternum; 2-4 on prealar knob; and 4-7 on posterior dorsal area of mesepimeron. *Genitalia* (Fig. 4). Tergum VIII lightly pigmented, base and apex nearly straight, short setae scattered over apical 0.45-0.58, setae along apex short, basolateral seta absent, covered with minute spicules, none to 2 scales (usually absent), basal 0.65-0.80 retracted into segment VII, VIII-Te index 0.68-0.73, VIII-Te/IX-Te index 1.44-1.73, length 0.16-0.18 mm, width 0.24-0.26 mm; sternum VIII lightly to moderately pigmented, base slightly concave mesally, apex with a moderately deep median indentation (0.13-0.16 deep), numerous short setae scattered over apical 0.88-0.97, setae 1-3-S widely separated, located in a more or less diagonal line, 1-S basomesad, 2-S approximately 0.33 from 1-S, 3-S apicolaterad and approximately 0.67 from 2-S, covered with minute spicules, scales absent, apical intersegmental fold moderately pigmented, VIII-S index 0.72-0.74, length 0.22-0.23 mm, width 0.30-0.31 mm; tergum IX moderately to heavily pigmented, median area wrinkled, base without median indentation, apex with a median indentation and with 2-4 (usually 3) moderately stout and moderately long setae on each side of midline, 5-7 total setae, covered with minute spicules, a short flap on lateral area, IX-Te index 0.79-0.83, length 0.10-0.11 mm, width 0.13 mm; insula lightly pigmented, short, wide, lip-like, 4 long setae, covered with short hair-like spicules; lower vaginal lip moderately pigmented, narrow, covered with short spicules, lower vaginal sclerite absent; upper vaginal lip moderately to heavily pigmented, moderately broad to broad laterally, covered with minute spicules, upper vaginal sclerite absent; postgenital lobe short, wide, apex broad with a small median indentation (0.09-0.13 deep), 5-7 (usually 6) setae on each side of midline, 11-13 total setae, covered with short hair-like spicules, dorsal PGL index 0.52-0.59, ventral PGL index 1.02-1.16, ventral length 0.07-0.08 mm; perianal membrane with scattered short spicules; cercus moderately long, apex sharply rounded with 3-4 long stout setae, completely covered with short spicules, dorsal surface with a number of short to moderately long setae on apical 0.74-0.85, scales absent, ventral surface without setae, cercus index 2.07-2.17, cercus/dorsal PGL index 1.86-2.28, cercus length 0.14-0.16 mm; one large seminal capsule, heavily pigmented, spherical, several small seminal capsule pores near orifice, base of accessory gland duct moderately pigmented.

MALE. Essentially as in the female but with the following differences.

Head. Antenna 0.73-0.77 length of proboscis, lightly plumose; maxillary palpus short, 0.09-0.10 length of proboscis; proboscis 1.06-1.08 length of femur I. *Thorax.* Setal differences as follows: scutal fossal (2 long and 3-4 short anterior, 3 lateral and 1-2 posterior); 4 posterior medial scutal; 5-9 on antepnotum; 1-2 long and 1 short on postpronotum; 5-8 on propleuron; 1-2 on postspiracular area; 1 upper and 2 long and 4-5 short posterior on mesepisternum; 2-3 on prealar knob; and 5-6 on posterior dorsal area of mesepimeron.

Legs (Fig. 14). Posttarsi I-III each with 2 ungues, I and II with ungues unequal in size, all simple, III with ungues equal in size, both simple. *Abdomen.* Terga with laterobasal pale scaled patches somewhat reduced in size. *Genitalia* (Fig. 7). Tergum IX heavily pigmented, narrow mesally, broadened laterally, 2-5 (usually 3-4) long stout setae on each side of midline on caudal margin, covered with minute spicules; gonocoxite long, narrow, curved mesally, heavily pigmented, covered with minute spicules, dorsal surface with an elongated patch of short to moderately long setae on basal 0.75 of mesal area, several long stout setae on median area from base to near apex, ventral surface with a few long stout setae on apical 0.6 and several short setae along mesal margin from base to apex, apicomeral area of ventral surface with a very short projection bearing a few moderately long curved setae, a number of broad

scales on ventral and lateral surfaces, mesal surface membranous; gonostylus moderately long, 0.43-0.49 length of gonocoxite, broad, somewhat rectangular in shape, apex with 7-8 short setae and a mesal apical projection bearing subapically the gonostylar claw which is short, flared apically, longitudinally striated, heavily pigmented, scoop-like; basal mesal lobe consists of a long free narrow heavily pigmented lobe bearing 12-19 (usually 13-14) moderately long setae on mesal margin, outer margin of lobe folded ventrally into a broad flap, basal area broad, moderately pigmented, covered with short hair-like spicules, connected with its mate by a moderately broad strip which is covered with small hair-like spicules; proctiger moderately long, paraproct consists of a narrow heavily pigmented strip along outer margin from base to apex of proctiger, apex a small heavily pigmented bluntly rounded lobe, cercus membranous with a large lightly to moderately pigmented wrinkled plate covering most of mesal area, 3-5 (usually 3-4) short cercal setae on each side of midline near apex; tergum X narrow, heavily pigmented, curved, base attached to base of paraproct and apex attached to caudoventral margin of tergum IX; phallosome simple, aedeagus consists of a moderately pigmented short broad trough, base concave, apex broadly convex with a very small median indentation, paramere approximately 0.88 length of aedeagus, moderately to heavily pigmented, moderately broad near middle, attached at approximately 0.44 from base to parameral apodeme, parameral apodeme approximately 0.87 length of paramere, narrow, moderately pigmented; sternum IX large, extended cephalad, lateral areas heavily pigmented, remainder membranous, setae absent, covered with minute spicules.

PUPA (Fig. 10). Chaetotaxy as figured and recorded in Table 2. Cephalothorax and abdominal segments I-III moderately pigmented with a few small heavily pigmented areas, remainder of abdomen moderately pigmented. *Respiratory trumpet*. Heavily pigmented; index 4.89-5.93, mean 5.41. *Abdomen*. Seta 8-VII double or triple, usually double; 9-VIII with 5-8 branches; 11-III-V single. *Paddle*. Ovoid with inner basal margin depressed; a few minute serrations on most of basal 0.43-0.49 of outer margin, a few minute spicules on apical 0.51-0.66 of outer and apical 0.13-0.30 of inner margins; midrib moderately pigmented, nearly reaches apex; seta 1-P moderately long, triple to 5-branched; index 1.41-1.57, mean 1.47.

LARVA (Fig. 14). Chaetotaxy as figured and recorded in Table 5. *Head*. Seta 4-C double to 4-branched, usually double or triple; 5-C with 5-7 branches; 6-C double; 7-C with 10-16 (usually 10-14) branches; 10-C double to 4-branched, usually triple; 12-C double or triple; 13-C double to 4-branched, usually triple; dorsomentum with 19-22 teeth, usually 21. *Antenna*. Seta 1-A with 5-7 (usually 5-6) branches, attached 0.42-0.52 from base of antenna; 2-A very long; 3-A short, 0.22-0.25 length of 2-A; 4-A long, 0.55-0.66 length of 2-A; 6-A short, 0.33-0.35 length of 2-A. *Thorax*. Seta 8-M with 8-10 (usually 8) branches; 2-T single or double, usually single. *Abdomen*. Seta 13-II with 4-6 (usually 5-6) branches; 1-III, IV single; 2-X with 5 branches, occasionally 4- or 6-branched; ventral brush of segment X with 10 setae on grid, each with 4-8 branches; comb of segment VIII consists of a patch of 34-54 (usually 39-50) scales, each scale with apical area flared and with a fringe of denticles; saddle small, incompletely rings segment X, with spicules, not in rows. *Siphon*. Index 2.46-3.16, mean 2.93; pecten on basal 0.44-0.52 of siphon, composed of 4-10 (usually 5-9) teeth, each tooth (except occasionally basal 1-3) long, slender and with a few fine and 2-3 stouter ventral and occasionally a few fine dorsal denticles near base; seta 1-S long, with 4-6 (usually 5-6) branches, attached 0.79-0.84 from base of siphon, distad of last pecten tooth; seta 8-S double,

single in one specimen.

DISCUSSION. Females of *longirostris*, *pillaii* and *wardi* can not be separated with certainty using habitus features, however, they can be distinguished by the female genitalia. Female genitalia of *pillaii* possesses: sternum VIII with a moderately deep (0.13-0.16 of total sternum length) median apical indentation, tergum VIII with setae only on apical 0.45-0.58, and cercus broader with index of 2.07-2.17. *Aedes longirostris* possesses the following: sternum VIII with a very shallow (0.02-0.05) median apical indentation, tergum VIII with setae on apical 0.84-0.92, and cercus with index of 2.81-3.20, while *wardi* possesses the following: sternum VIII with a very shallow (0.03-0.04) median apical indentation, tergum VIII with setae on apical 0.93-0.98, and cercus with index of 2.38-2.70.

The male genitalia of *pillaii* are easily separated from those of the other 2 species of the subgenus by the very broad gonostylus, shape of the basal mesal lobe, and absence of both basal and apical lobes on the dorsal surface of the gonocoxite, presence of very well developed setae on tergum IX, and absence of setae on sternum IX.

Males of *pillaii* can be distinguished from those of *longirostris* and *wardi* by posttarsi I and II which have the unguis simple while the latter 2 species each have the larger ungue of posttarsi I and II with a narrow basal tooth.

Larvae of *pillaii* are separated from both *longirostris* and *wardi* by setae 8-S and from *longirostris* by the number of comb scales and pecten teeth.

TYPE-DATA. The holotype male, deposited in the BMNH, possesses the following data on the adult labels: MALAYA, SELANGOR, Kompong Sireh, 31: iii: 1953, J. A. Reid; 604 [collection number]; *A. Rhinoskusea* sp. indet., Det. J. A. Reid; Type [circular label with red border]; and *Aedes (Rhinoskusea) pillaii* Mattingly, Holotype ♂, P. F. Mattingly, 15: X: 57. The holotype adult is in excellent condition with all appendages intact except for right tarsi I-III which are mounted in Canada balsam on a microscope slide. The genitalia are in good condition and are mounted in a drop of Canada balsam on a celluloid point attached to the adult pin. Mattingly (1958: 40) also records the following for the holotype "from larvae in small shady ground pool under Nipah palm."

The allotype is in fair condition, however, it is rubbed and 3 legs, abdomen and genitalia are missing. Larval and pupal skins from the allotype are mounted on a microscope slide. The following information is included on the adult labels: SELANGOR, Rantau Panjang, 3.7.1952, J. A. Reid; Ex. Coll. I.M.R. Malaya [on underside of above label]; 463/5 [collection number]; allotype [circular label with red border]; *Aedes (Rhinoskusea) pillaii* Mattingly, Allotype ♀, P. F. Mattingly, 15: X: 57.

Paratypes are as follows and bear the same collection data as listed for the allotype except the collection numbers. One paratype male genitalia is mounted in a drop of Canada balsam on a celluloid point attached to a pin with labels (adult missing) which possess the collection number 463/2. A microscope slide with larval and pupal skins contains the same number (463/2). A slide with larval and pupal skins bears the collection number 463/3 and is labeled a paratype. The adult male from these skins could not be located (Mattingly 1958: 40). I have examined all the type material which is deposited in the BMNH.

DISTRIBUTION. 36 specimens examined: 4♀, 18♂, 1 pl, 7 with associated immature skins (2 p, 5 pl).

MALAYSIA. *Selangor*, Kampong Sireh; 1♂ (holotype), Rantau Panjan; 1♀ pl (allotype), 1♂ genitalia, 1 p, 1 lp (paratypes), Carey Island, Klang; 11♂, Klang Pt.; 1♂ (paralectotype no. 4 of *longirostris*).

SINGAPORE. West coast road at 8.5 miles; 2♀ pl, 1♂ pl, 1♀ p, 1♂ p, 2♂.

Distribution from literature.

MALAYSIA. Selangor, Kampong Sirek, Rantau Panjang (Mattingly 1958: 40).

BIONOMICS. Immatures in Singapore were collected from colored, brackish, temporary, unmoving water in small 1 m deep crab holes, in unshaded and partially shaded areas of a salt marsh and an open swamp at sea level. Adults were taken in Malaysia resting in crab holes in a mangrove swamp area.

Mattingly (1958: 40) reports the larvae collected in Malaysia from a crab hole and from a small shady ground pool under a nipah palm.

AEDES (RHINOSKUSEA) WARDI NEW SPECIES
(Figs. 5, 8, 11, 13, 14)

Aedes longirostris of Senior-White 1927: 69.

Aedes (Rhinoskusea) longirostris of Carter 1950: 89; Chow et al. 1954: 117;

Knight and Hull 1952: 163 (♀, ♂*, L*); Baisis 1974: 27 (♀*, ♂*, P*, L*).

Aedes (Rhinoskusea) longirostris in part of Macdonald 1957: 22; Stone et al.

1959: 178; Delfinado et al. 1962: 439; Steffan 1966: 211; Mattingly 1958:

38; Basio 1971: 26; Stone and Delfinado 1973: 307.

FEMALE. Description as for *longirostris* except for the following minor differences. *Head*. Antenna 0.88-0.92 length of proboscis; maxillary palpus 0.13-0.14 length of femur I; postgena with a large patch of pale scales. *Thorax*. Pleural setae as follows: 9-11 on antepnotum; 1-2 long and 1 short on postpronotum; 2-4 (usually 3-4) on propleuron; 2-4 on postspiracular area; 1-2 upper and 4-6 long and 3-6 short posterior on mesepisternum; 3-5 (usually 4) on prealar knob; and 5-7 (usually 5) on posterior dorsal area of mesepimeron. *Abdomen*. Terga II-VI each with laterobasal pale scaled patches larger in size and whiter colored. *Genitalia* (Fig. 5). Tergum VIII lightly pigmented, base and apex straight, short setae scattered over apical 0.86-0.93, setae along apex short, basolateral seta absent, covered with minute spicules, scales absent, basal 0.75-0.90 retracted into segment VII, VIII-Te index 0.74-0.83, VIII-Te/IX-Te index 1.74-1.91, length 0.17-0.19 mm, width 0.22-0.23 mm; sternum VIII lightly pigmented, base slightly concave mesally, apex with a shallow median indentation (0.03-0.04 deep), numerous short setae scattered over apical 0.93-0.98, setae 1-3-S widely separated, located in a more or less diagonal line, 1-S basomesad, 2-S approximately 0.29 from 1-S, 3-S apicolaterad and approximately 0.71 from 2-S, covered with minute spicules, scales absent, apical intersegmental fold moderately pigmented, VIII-S index 0.75-0.87, length 0.21-0.22 mm, width 0.27-0.28 mm; tergum IX moderately pigmented, base without median indentation, apex with a small median indentation and with 3-6 short setae on each side of midline, 5-11 total setae, covered with minute spicules, a short flap on lateral area, IX-Te index 0.72-0.87, length 0.09-0.10 mm, width 0.13 mm; insula lightly pigmented, short, wide, lip-like, 4 long setae, covered with small hair-like spicules; lower vaginal lip lightly pigmented, narrow, covered with short spicules, lower vaginal sclerite absent; upper vaginal lip moderately pigmented, moderately broad laterally, covered with short spicules, upper vaginal sclerite absent; postgenital lobe short, wide, apex broad with a very small median indentation or straight (0.00-0.13 deep), 3-6 setae on each side of midline, 7-11 total setae, covered with small hair-like spicules, dorsal PGL index 0.38-0.52, ventral PGL index 1.00-1.35, ventral length 0.06-0.08 mm; perianal membrane with scattered

short spicules; cercus moderately long, apex sharply rounded with 3-4 long stout setae, completely covered with short spicules, dorsal surface with a number of short to moderately long setae on apical 0.71-0.81, scales absent, ventral surface without setae, cercus index 2.38-2.70, cercus/dorsal PGL index 2.09-2.77, cercus length 0.16-0.17 mm; one large seminal capsule, heavily pigmented, spherical, several small seminal capsule pores near orifice, base of accessory gland duct moderately pigmented.

MALE. Essential as in the female but with the following differences.

Head. Antenna 0.68-0.83 length of proboscis; maxillary palpus very short, 0.09-0.12 length of proboscis; proboscis 1.16-1.27 length of femur I. *Thorax.* Setal differences as follows: scutal fossal (2 long and 3-6 short anterior, 3 lateral and 2 posterior); 4 posterior medial scutal; 5-9 on antepronotum; 1 long and 1 short on postpronotum; 3-4 on propleuron; 1-3 on postspiracular area; 1 upper and 4-5 long and 3-6 short posterior on mesepisternum; 2-4 on prealar knob; and 5-6 on posterior dorsal area of mesepimeron. *Legs.* Posttarsi I-III (Fig. 14) each with 2 unguis, I and II each with unguis unequal in size, larger one with a narrow basal tooth, smaller one simple, III with unguis equal in size, both simple. *Abdomen.* Terga with laterobasal white scaled spots somewhat reduced in size. *Genitalia* (Fig. 8). Tergum IX moderately to heavily pigmented, narrow mesally, broadened laterally, none to 3 setae, covered with small spicules; gonocoxite long, narrow, curved mesally, moderately to heavily pigmented, covered with minute spicules, apex of dorso-mesal area with a caudally produced long finger-like projection bearing numerous moderately long curved setae located mostly on mesal and apical surfaces, dorsal surface with a patch of moderately long setae on apical 0.4, a few long stout setae along outer margin on apical 0.7, basomesal area with a small narrow lobe bearing 3-8 (usually 4-6) moderately long narrow setae, ventral surface with a few long stout setae on apical 0.6 and several short to moderately long setae on mesal area from base to apex, a few setae somewhat stouter on basomesal area, a number of broad scales on ventral and lateral surfaces, mesal surface membranous; gonostylus long, 0.83-0.88 length of gonocoxite, moderately to heavily pigmented, narrow with a very slightly expanded area at approximately 0.63 from base, numerous small spicules, 17-29 short setae, mostly along apical 0.5 of outer margin and apex, some specimens with 1-2 small scales basad of setae, gonostylar claw short, flared apically, longitudinally striated, heavily pigmented, scoop-like; basal mesal lobe large, bifurcated into a long moderately broad dorsal arm with a bluntly rounded apex, and a very broad heavily pigmented ventral arm which bears a short dorsoapical flap and a broad short apical ventrally curved flap with a short point near its base, 3-5 (usually 4-5) short fine apical setae, a single moderately long stout setae on mesal margin at point of furcation, base below furcation broad with a moderately broad median strip with short spicules connecting it with its mate and a short dorsal extension with spicules which is connected to the ventral margin of the small basomesal lobe of the gonocoxite; proctiger moderately long, paraproct consists of a narrow heavily pigmented strip along outer margin from base to apex of proctiger, apex a small heavily pigmented bluntly rounded lobe, cercus membranous with a large moderately pigmented wrinkled plate covering most of mesal area, 4-7 (usually 6-7) short cercal setae on each side of midline near apex; tergum X narrow, heavily pigmented, curved, base attached to base of paraproct and apex attached to caudo-ventral margin of tergum IX; phallosome simple, aedeagus consists of a moderately pigmented short broad trough, base concave, apex broadly convex with a very small median indentation, paramere approximately 1.13 length of aede-

gus, moderately to heavily pigmented, moderately broad near middle, attached at approximately 0.37 from base to parameral apodeme, parameral apodeme approximately equal in length to length of paramere, narrow, moderately pigmented; sternum IX large, extended cephalad, lateral areas heavily pigmented, a narrow heavily pigmented mesal strip with 3-8 (usually 3-4) short setae near caudal margin, holotype also with a scale mixed with setae, remainder membranous, covered with minute spicules.

PUPA (Fig. 11). Chaetotaxy as figured and recorded in Table 3. Cephalothorax and abdominal segments mostly heavily pigmented. *Respiratory trumpet*. Heavily pigmented; index 4.04-5.13, mean 4.46. *Abdomen*. Seta 8-VII triple to 5 (usually 4) branched; 9-VIII with 4-8 (usually 7-8) branches; 11-III-V usually double, at least double on one side of segments. *Paddle*. Ovoid with inner basal margin depressed; a few minute serrations on most of basal 0.43-0.45 of outer margin, a few minute spicules on apical 0.55-0.57 of outer and apical 0.15-0.29 of inner margins; midrib moderately pigmented, nearly reaches apex; seta 1-P moderately long, triple or 4-branched; index 1.39-1.59, mean 1.51.

LARVA (Fig. 13). Chaetotaxy as figured and recorded in Table 6. *Head*. Seta 4-C double or triple, occasionally with 4-6 branches; 5-C with 5-7 branches; 6-C double; 7-C with 9-13 (usually 10-12) branches; 10-C double or triple, usually triple; 12-C double; 13-C double or triple, usually double; dorsomentum with 19-21 teeth, usually 21. *Antenna*. Seta 1-A with 5-6 branches, attached 0.49-0.56 from base of antenna; 2-A very long; 3-A short, 0.22-0.27 length of 2-A; 4-A long, 0.73-0.77 length of 2-A; 6-A short, 0.39-0.42 length of 2-A. *Thorax*. Seta 8-M with 6 branches, occasionally with 7 branches; 2-T double. *Abdomen*. Seta 13-II with 6-9 (usually 8-9) branches; 1-III, IV single or double, usually double; 2-X with 5-7 branches; ventral brush of segment X with 10 setae on grid, each with 4-9 branches; comb of segment VIII consists of a patch of 47-64 (usually 47-62) scales, each scale with apical area flared and with a fringe of denticles; saddle small, incompletely rings segment X, with short rows of small spicules. *Siphon*. Index 2.43-2.57, mean 2.49; pecten on basal 0.50-0.54 of siphon, composed of 8-12 (usually 10) teeth, each tooth (except occasionally basal 1-3) long, slender and with a few fine and 2-3 stouter ventral and occasionally a very few fine dorsal denticles near base; seta 1-S long, with 5-6 branches (one specimen with 4 branches on one side), attached 0.76-0.81 from base of siphon, distad of last pecten tooth; seta 8-S single.

DISCUSSION. Females of *wardi* can be distinguished from the other 2 species of the subgenus only by the genitalia (see discussion of *pillaii* for separating features).

The male genitalia of *wardi* resemble those of *longirostris* but are easily distinguished from the later species by the longer and narrower gonostylus, the number of setae (usually 4-6) on the small dorsal basomesal lobe of the gonocoxite, and the basal mesal lobe which has both dorsal and ventral arms broader and bears a moderately long stout seta basomesad of furcation.

Larvae of *wardi* can be distinguished from those of *longirostris* by the number of comb scales and the siphonal index and from *pillaii* by setae 8-M and 8-S.

Macdonald et al. (1965: 338) record collections of *Aedes (Rhinoskusea)* species unidentified which fed on man at Kampong China, Kuching, Sarawak. The specimens were destroyed by the investigators in virus isolation attempts and therefore could not be studied here, however, it is probable that they belonged to the present new species, *wardi*.

This new species is dedicated to Ronald A. Ward, Medical Entomology Project Manager, in appreciation of his support.

TYPE-DATA. The type-series consists of the holotype male, allotype and 4 male and 37 female paratypes. The holotype is deposited in the U. S. National Museum (Natural History) (USNM) and possesses the following data on the adult labels: PHILIPPINE ISLANDS, *Luzon, Zambales*, Subic U. S. Naval Base, 10 June 1968, LS-3 (Tidal Swamp); S. 360-6 [collection number]; F. E. Baisas Collection; T75.5 [genitalia preparation number]; and HOLOTYPE ♂, *Aedes (Rhinoskusea) wardi*, John F. Reinert, April '75. The holotype is in excellent condition with all appendages intact. The genitalia are mounted in Canada balsam on a microscope slide and are in excellent condition. Pupal and larval skins associated with the holotype are mounted in Canada balsam on a microscope slide. The allotype with its associated pupal and larval skins possesses the same collection data as the holotype except the collection number--S. 360-8. Paratypes are as follows: S. 360-1(♀ pl), S. 360-2(♂), S. 360-3(♀ pl), S. 360-5(♂ pl), S. 360-7(♂ pl), all with other data as in holotype; S. 331-1(♀ pl), S. 331-2(♀ pl), S. 331-3(♀), S. 331-4(♀ l), S. 331-5(♀ pl), S. 331-6(♀ pl), S. 331-7(♀ pl), S. 331-8(♀ pl), S. 331-9(♀), S. 331-10(♀ pl), S. 331-11(♀ pl), S. 331-12(♀), S. 331-13(♀ pl), S. 331-14(♀), S. 331-15(♀ pl), S. 331-16(♀ pl), S. 331-18(♀ pl), S. 331-19(♀), S. 331-20(♀), S. 221-21(♀), all with data as in holotype except for the following--20 May 1968, larval site 3, shaded; S. 375-1(♀ pl), S. 375-2(♀ pl), S. 375-3(♀ pl), S. 375-4(♀ pl), S. 375-5(♀ pl), S. 375-7(♀ pl), S. 375-8(♀ pl), S. 375-9(♀ pl), S. 375-10(♀ pl), S. 375-11(♀ l), S. 375-12(♀ pl), all with data as in holotype except for the following--18 June 1968, tidal swamp, Fairway 14; and S. 376-1(♀ pl), S. 376-2(♀ pl), S. 376-3(♀ pl), S. 376(1♀, 2♂), all with data as in holotype except for the following--18 June 1968, LS-3-A (larval site). The type specimens are deposited in the USNM except for 2 female and one male paratypes (with associated skins) which will be deposited in the BMNH and 2 female paratypes (with associated skins) which will be deposited in the Bernice P. Bishop Museum.

DISTRIBUTION. 294 specimens examined: 95♀, 57♂, 5 pl, 1 l, 17 L, 57 with associated larval and pupal skins and 2 with associated larval skins.

INDONESIA. *Celebes*, Dongkala, Kabaena by Boeton; 1♂. *Kalimantan*, Tarakan; 3♀ pl, 16♀, 24♂.

PHILIPPINE ISLANDS. *Balabac*, Cape Melville; 1♀, 4 L. *Luzon, Zambales*, Olongapo, Subic U. S. Naval Base; 1♂ pl (holotype), 1♀ pl (allotype), 27♀ pl, 2♂ pl, 2♀ l, 8♀, 2♂ (paratypes), 18♀ pl, 14♀, 16♂, 5 pl, 6 L. *Mindanao, Zamboanga*, Zamboanga City; 1♂. *Mindoro*, San Jose; 1♀, 4♂, 7 L. *Palawan*, Iwahig; 1♀. *Samar*, Pintanahon; 3♀ pl, 1♂ pl, 4♂, 1 l.

SRI LANKA. Trincomalee; 1♂.

Distribution from literature.

INDONESIA. Kabaena (Brug and Bonne-Wepster 1947: 185, Macdonald 1957: 22), Tarakan (Mattingly 1958: 39).

MALAYSIA. Sarawak, First Division, Kuching, Kompong China (Macdonald et al. 1965: 338).

PHILIPPINE ISLANDS. *Balabac*, Cape Melville; *Mindanao*, Zamboanga, Zamboanga City; *Mindoro*, near Mangarin Bay, San Jose; *Palawan*, Iwahig, Iwahig Penal Colony, Tacburos; *Samar*, Pintanahon near Osmena (Knight and Hull 1952: 165); *Pampanga*, Clark Air Base; *Laguna*, Los Banos (Basio 1971: 26); *Luzon, Zambales*, Subic U. S. Naval Base; throughout Philippines from Luzon to Mindanao (Baisas 1974: 28).

SRI LANKA. Trincomalee, Orr's Hill (Senior-White 1927: 69, Mattingly 1958: 39).

BIONOMICS. Immatures in the Philippine Islands were collected from shaded and unshaded tidal swamps. Larvae were taken in a nipa palm swamp at Tarakan, Indonesia.

In the Philippine Islands immatures were collected from brackish water in crab holes, swamp pools near the beach and a beached boat, from a tin plate in a grassy area, and a depression in a log (Knight and Hull 1952: 165), and from pools and ponds affected by salt water tides (Baisas 1974: 28).

Adults in the Philippine Islands were collected resting in crab holes (Knight and Hull 1952: 165) and females collected from carabao-baited traps (Baisas 1974: 28). Females were taken biting man in Sarawak, Malaysia (Macdonald et al. 1965: 338).

ACKNOWLEDGMENTS

Grateful appreciation is expressed to: Bruce F. Eldridge and Ronald A. Ward, Walter Reed Army Institute of Research, for critically reading the manuscript; to Douglas J. Gould, U. S. Army Medical Component-SEATO, Bangkok, Thailand, and Shivaji Ramalingam, University of Malaya, Kuala Lumpur, Malaysia, for the collection and preparation of many specimens; to Peter F. Mattingly, British Museum (Natural History), London, and Wallace A. Steffan, Bernice P. Bishop Museum, Hawaii, for the generous loans of types and museum specimens; to Young T. Sohn, Medical Entomology Project (MEP), for preparing the illustrations; to Virginia M. Ford and Susan Hevel, MEP, for laboratory assistance; to Owilda J. R. Curtis, MEP, for typing the manuscript drafts; and to Janet D. Rupp, MEP, for typing the manuscript for offset reproduction.

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LIST OF FIGURE ABBREVIATIONS

Female Genitalia

AGDuB	= Accessory gland duct base	LVL	= Lower vaginal lip
Ce	= Cercus	PGL	= Postgenital lobe
DPGL	= Line of attachment of perianal membrane to dorsal surface of PGL	SCa	= Seminal capsule
		SCaP	= Seminal capsule pore
H	= Hinge	UVL	= Upper vaginal lip
I	= Insula	UVS	= Upper vaginal sclerite
IX-Te	= Tergum 9	VIII-S	= Sternum 8
		VIII-Te	= Tergum 8

Male Genitalia

Ae	= Aedeagus	IX-Te	= Tergum 9
AG	= Apodeme of gonocoxite	PaA	= Parameral apodeme
BML	= Basal mesal lobe	Par	= Paramere
Ce	= Cercus	Ppr	= Paraproct
Gc	= Gonocoxite	Pr	= Proctiger
Gs	= Gonostylus	VIII-S	= Sternum 8
IX-S	= Sternum 9	VIII-Te	= Tergum 8
		X-Te	= Tergum 10

Pupa

CT	= Cephalothorax	MP	= Metanotal plate
I-VIII	= Abdominal segments 1-8	P	= Paddle
		T	= Respiratory trumpet

Larva

A	= Antenna	M	= Mesothorax
C	= Head	MP	= Mouthpart
CS	= Comb scale	P	= Prothorax
Dm	= Dorsomentum	PT	= Pecten tooth
I-VIII, X	= Abdominal segments 1-8, 10	S	= Siphon
		T	= Metathorax

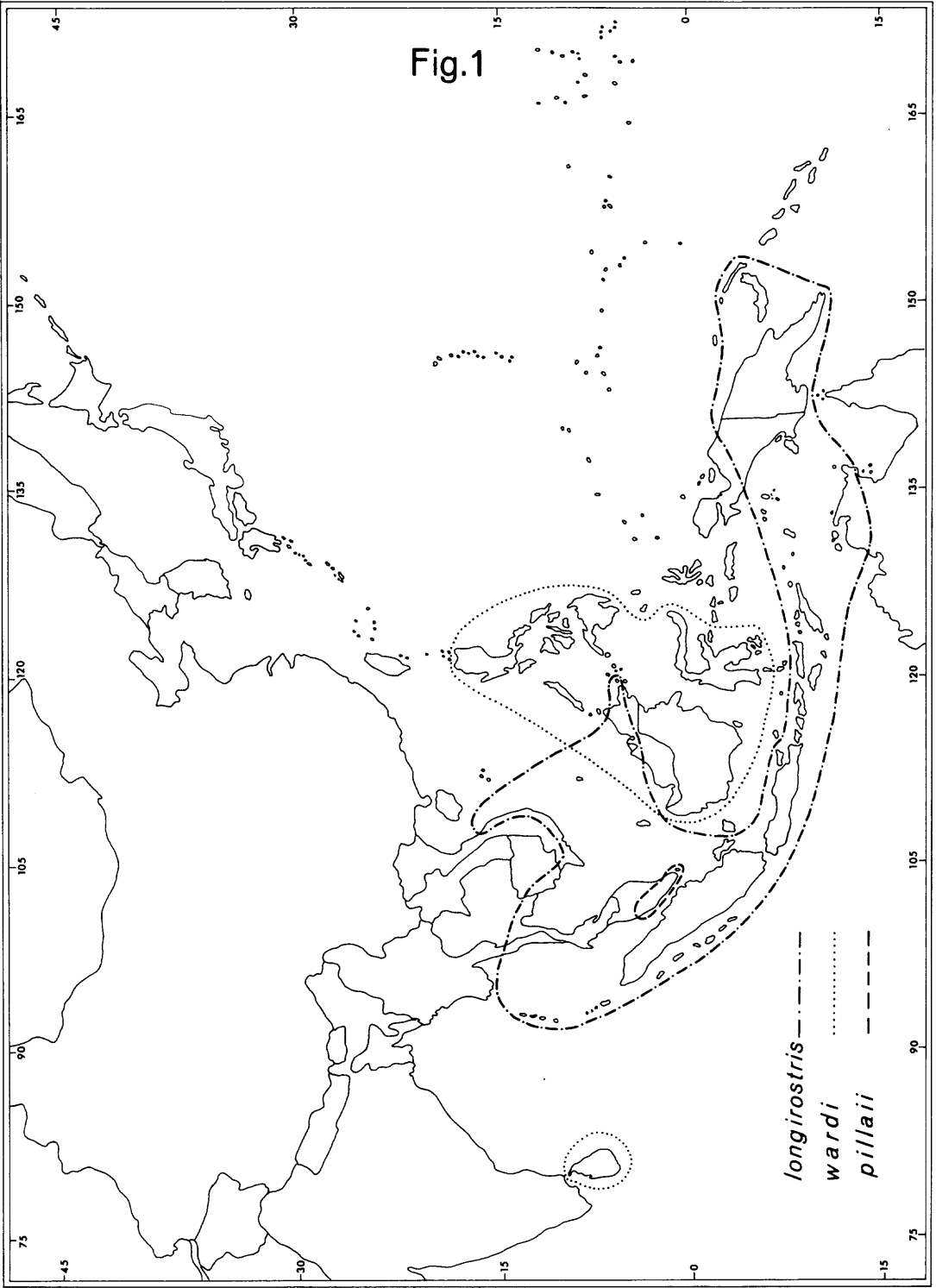
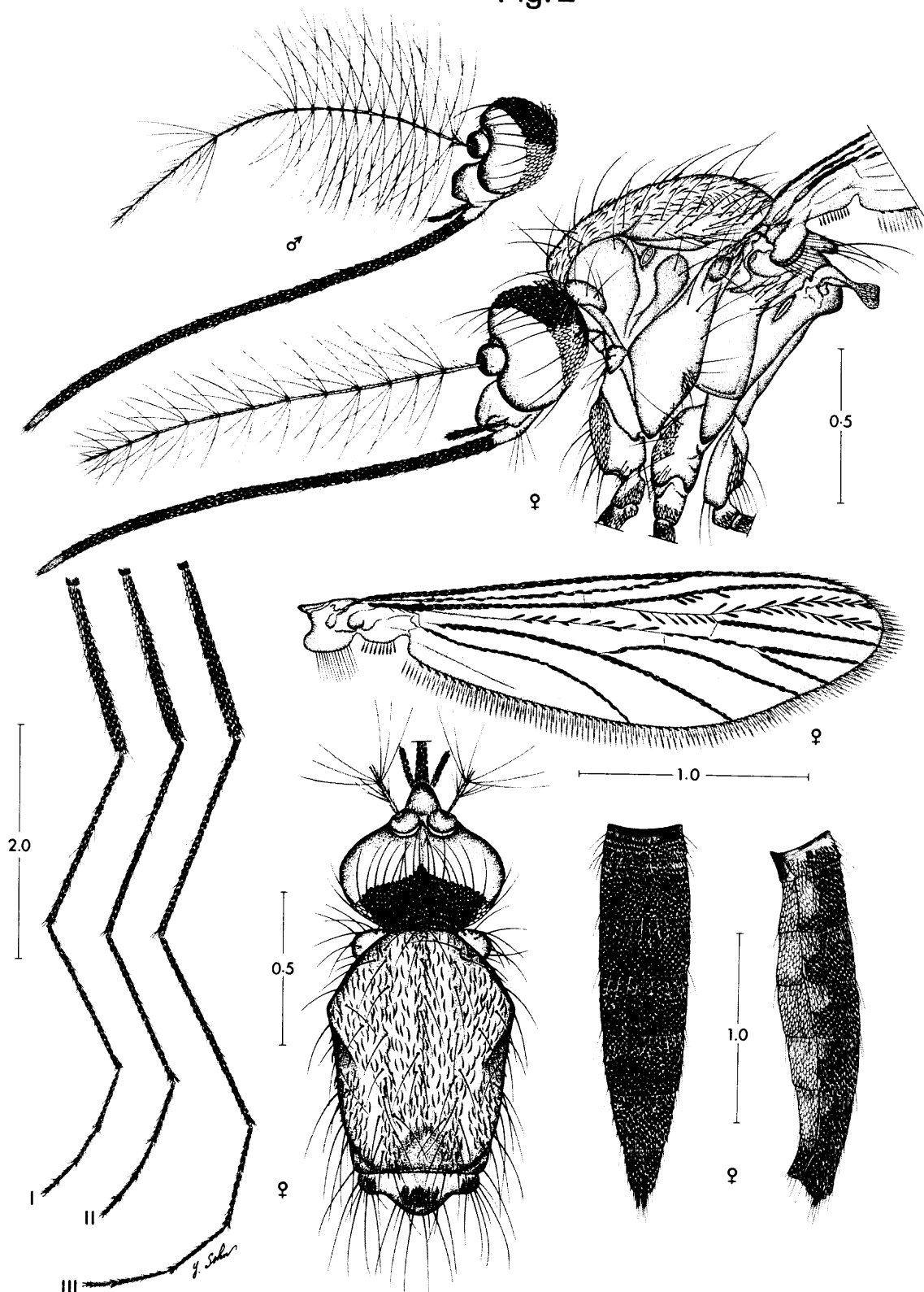
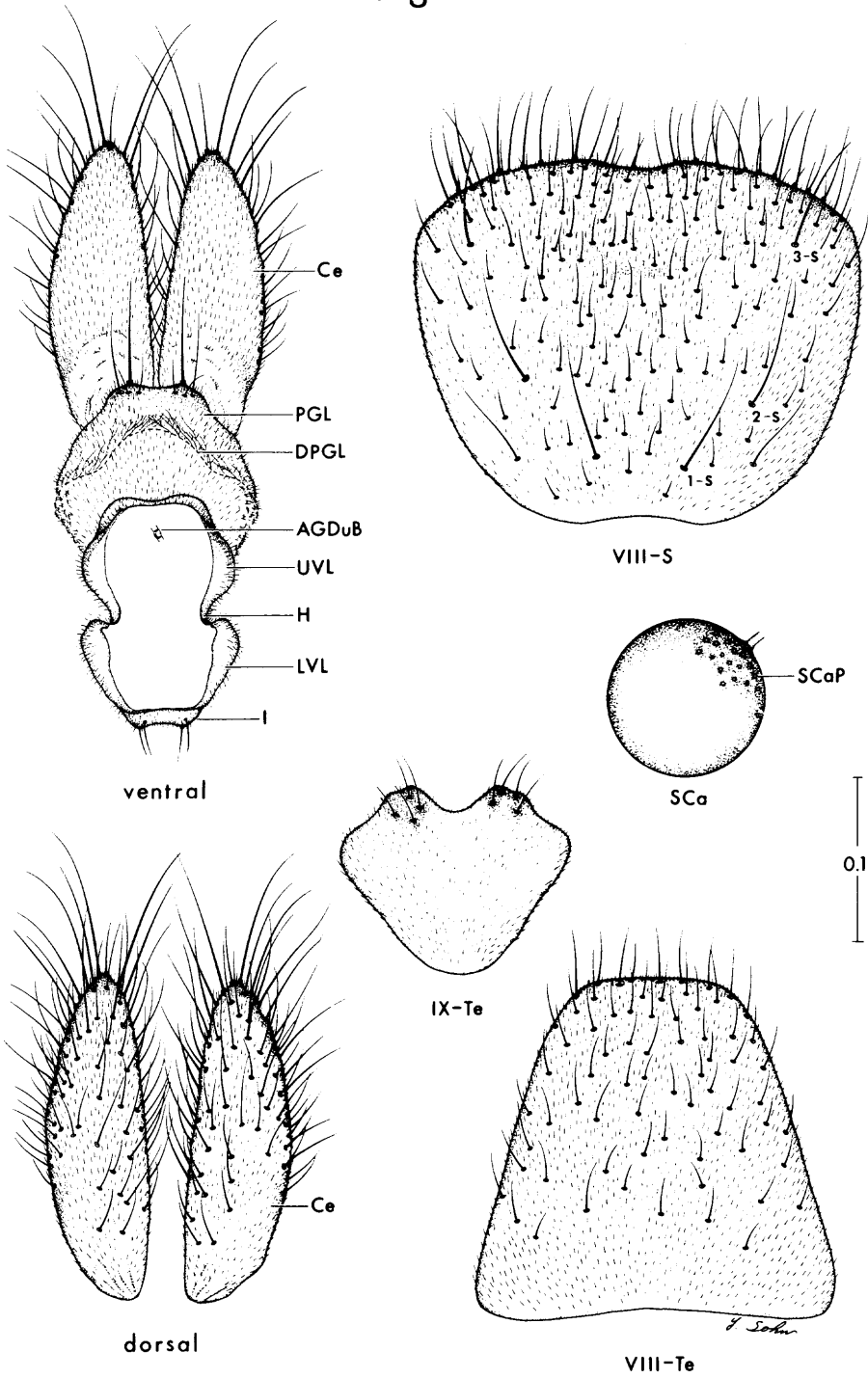


Fig. 2



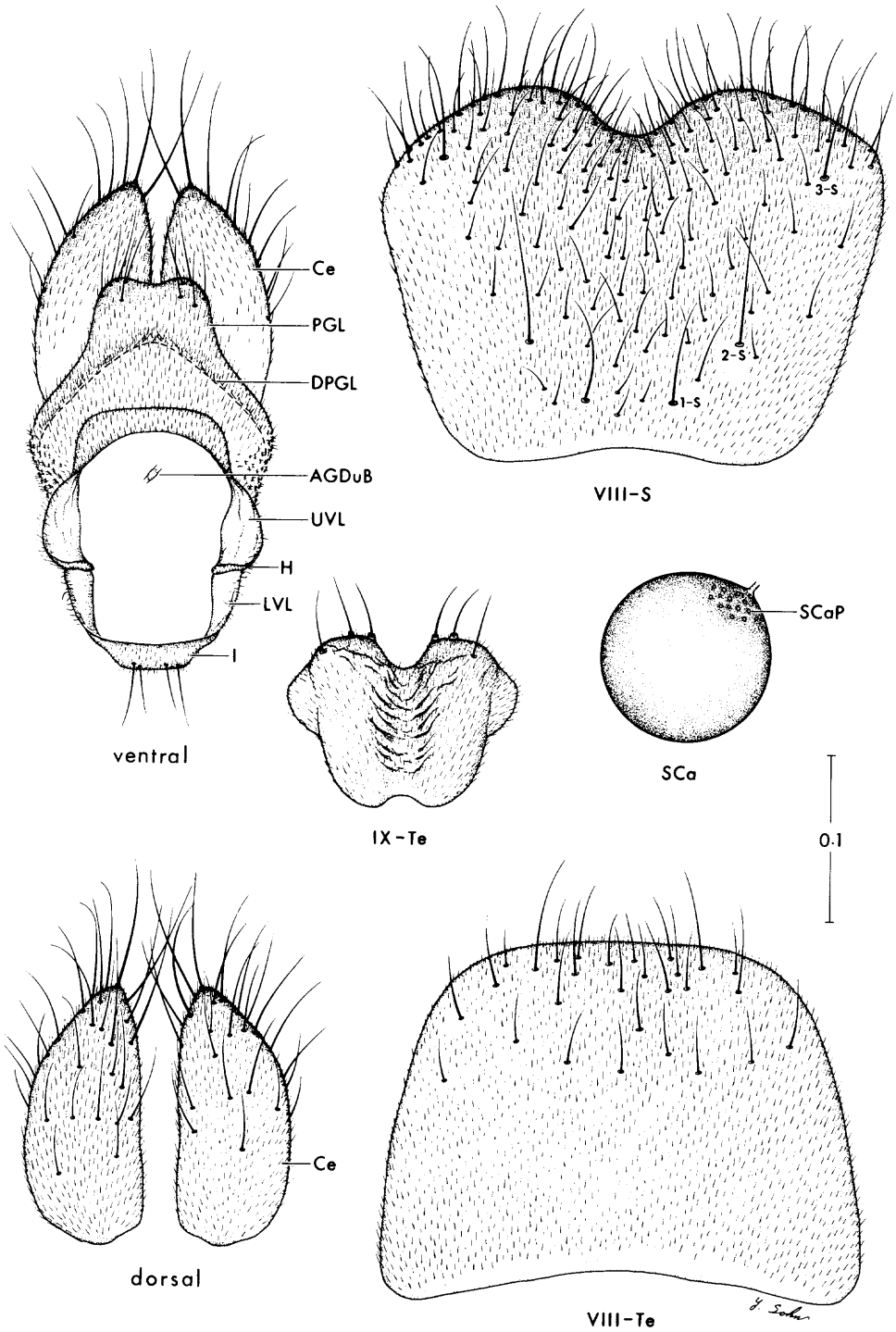
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Fig. 3



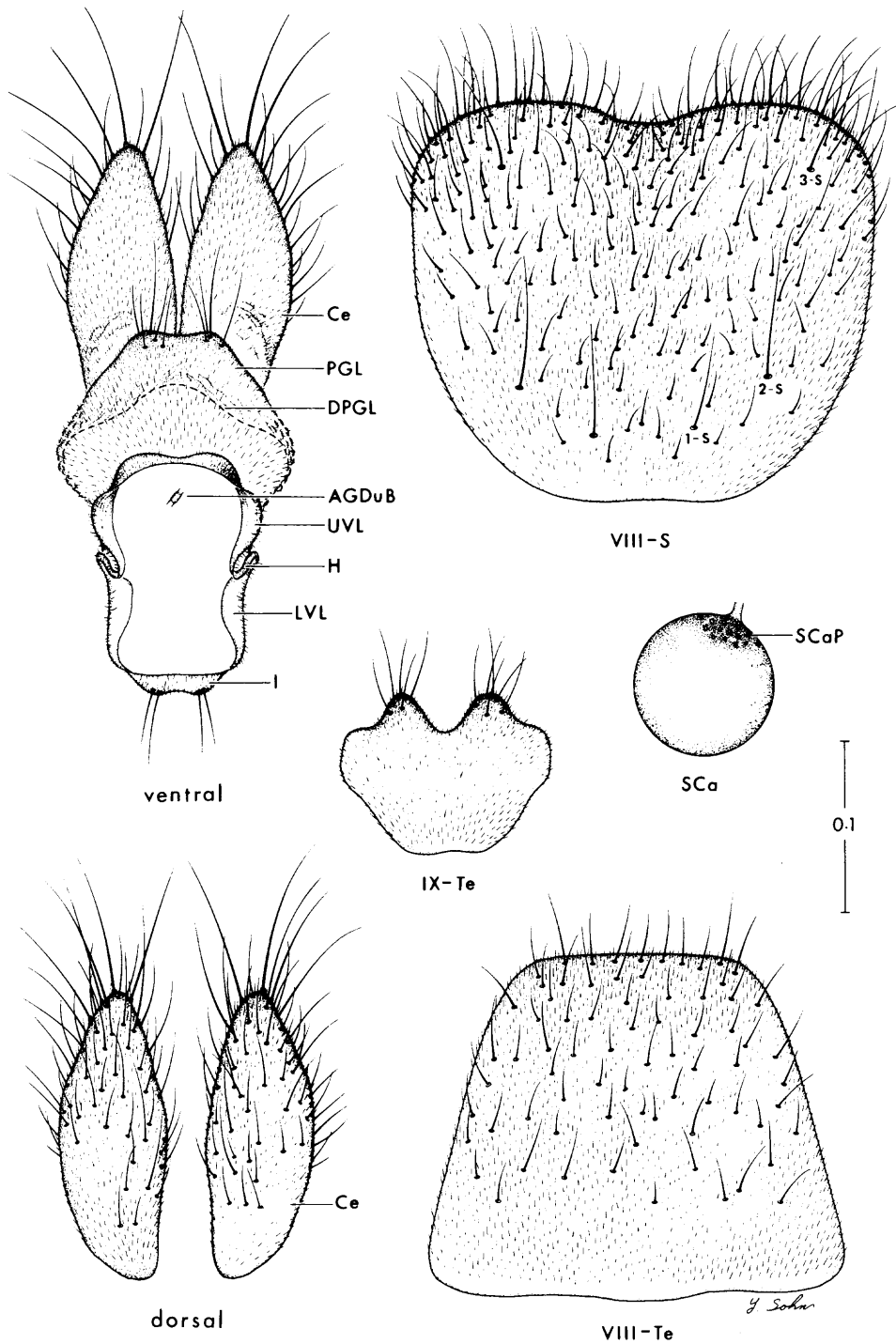
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Fig.4



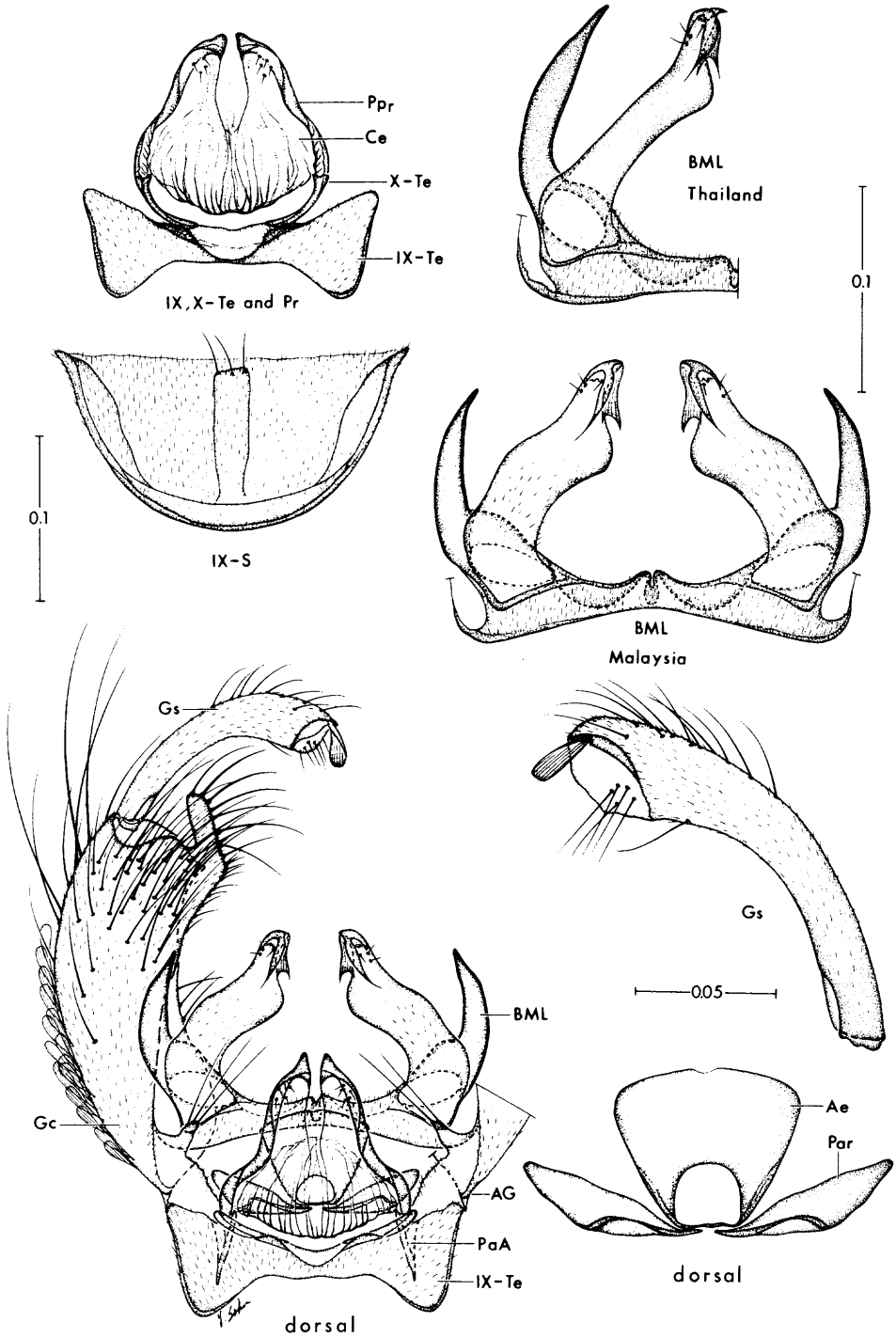
Aedes (Rhinoskusea) pillaii

Fig. 5



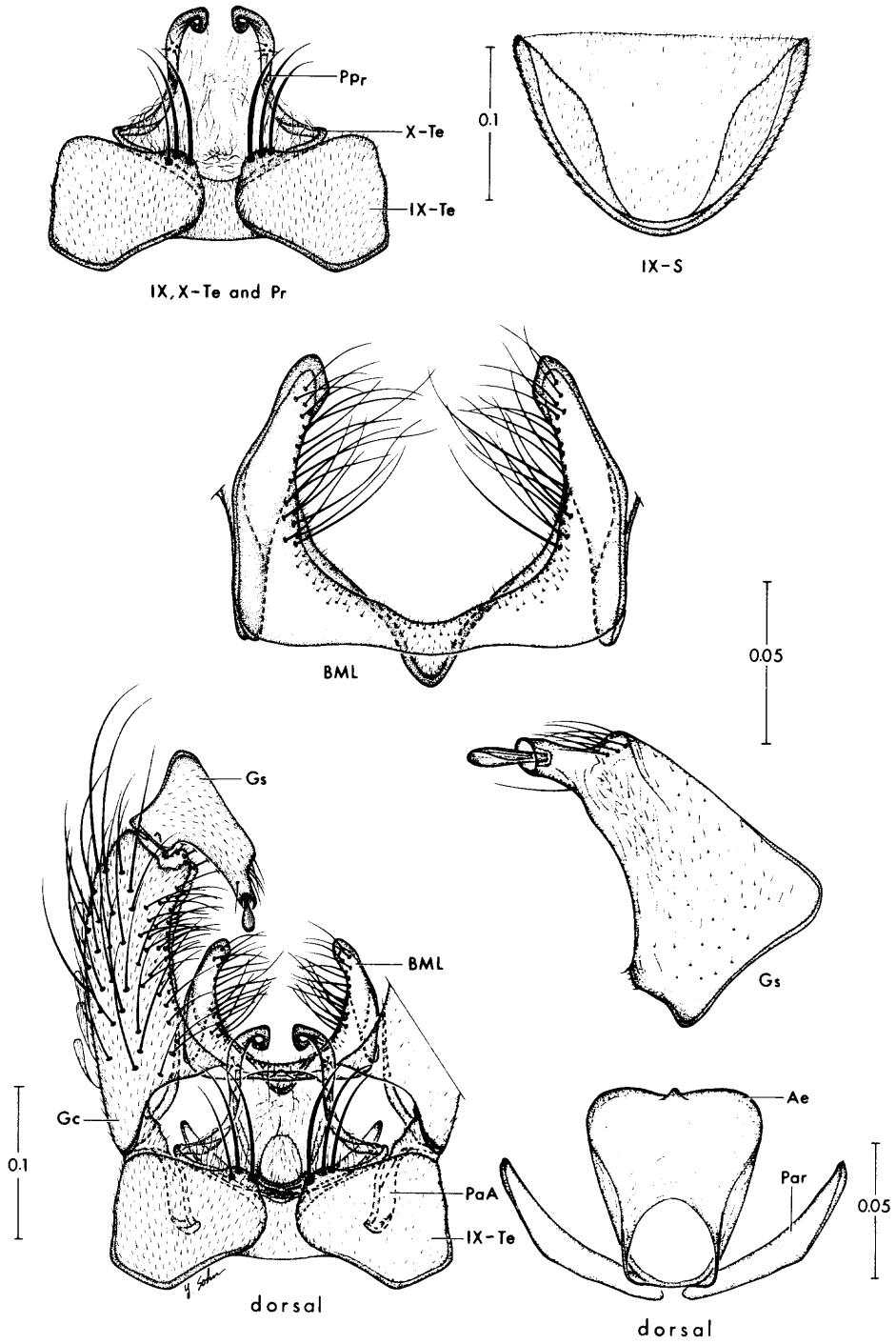
Aedes (Rhinoskusea) wardi

Fig. 6



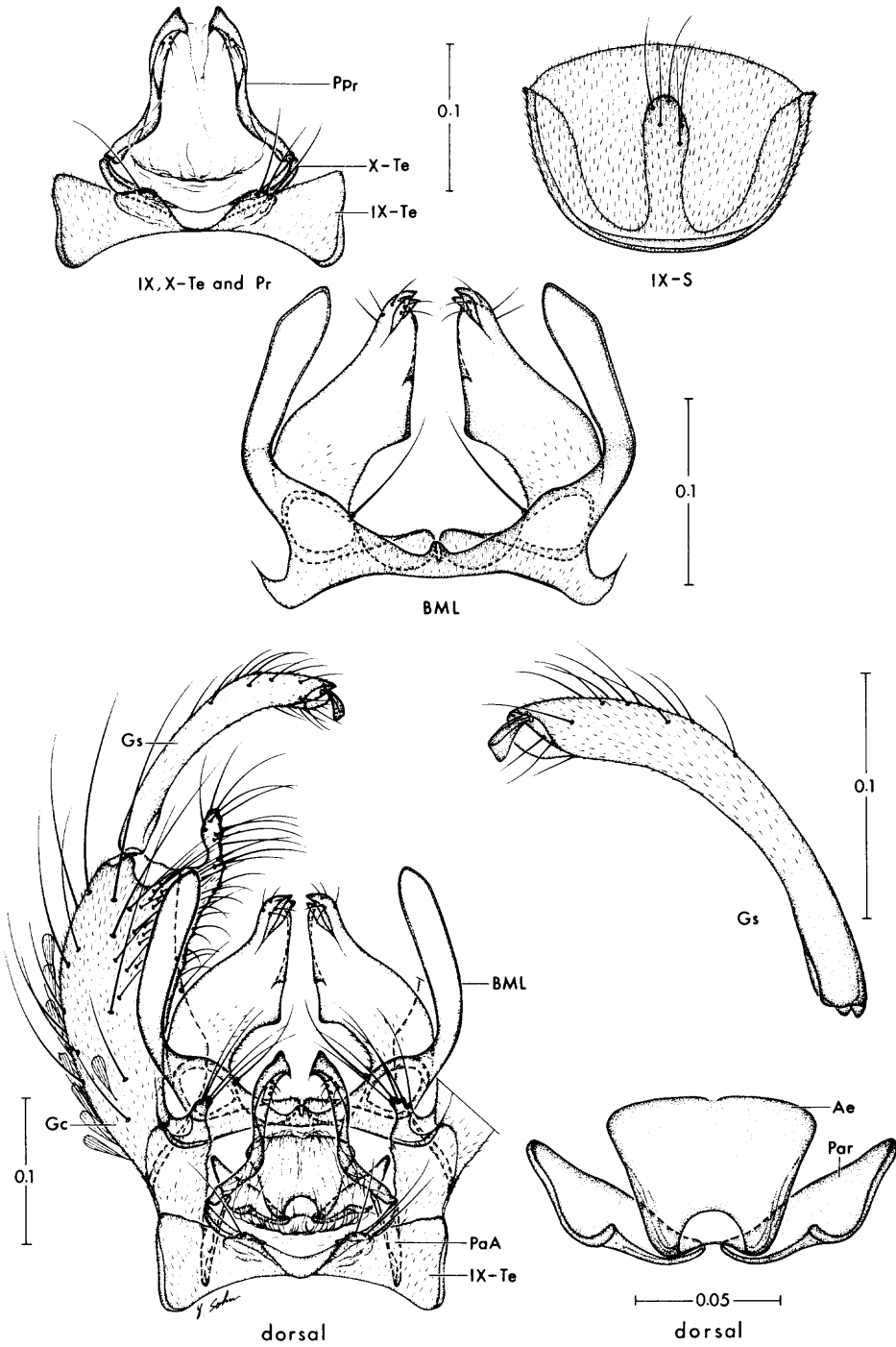
Aedes (Rhinoskusea) longirostris

Fig.7



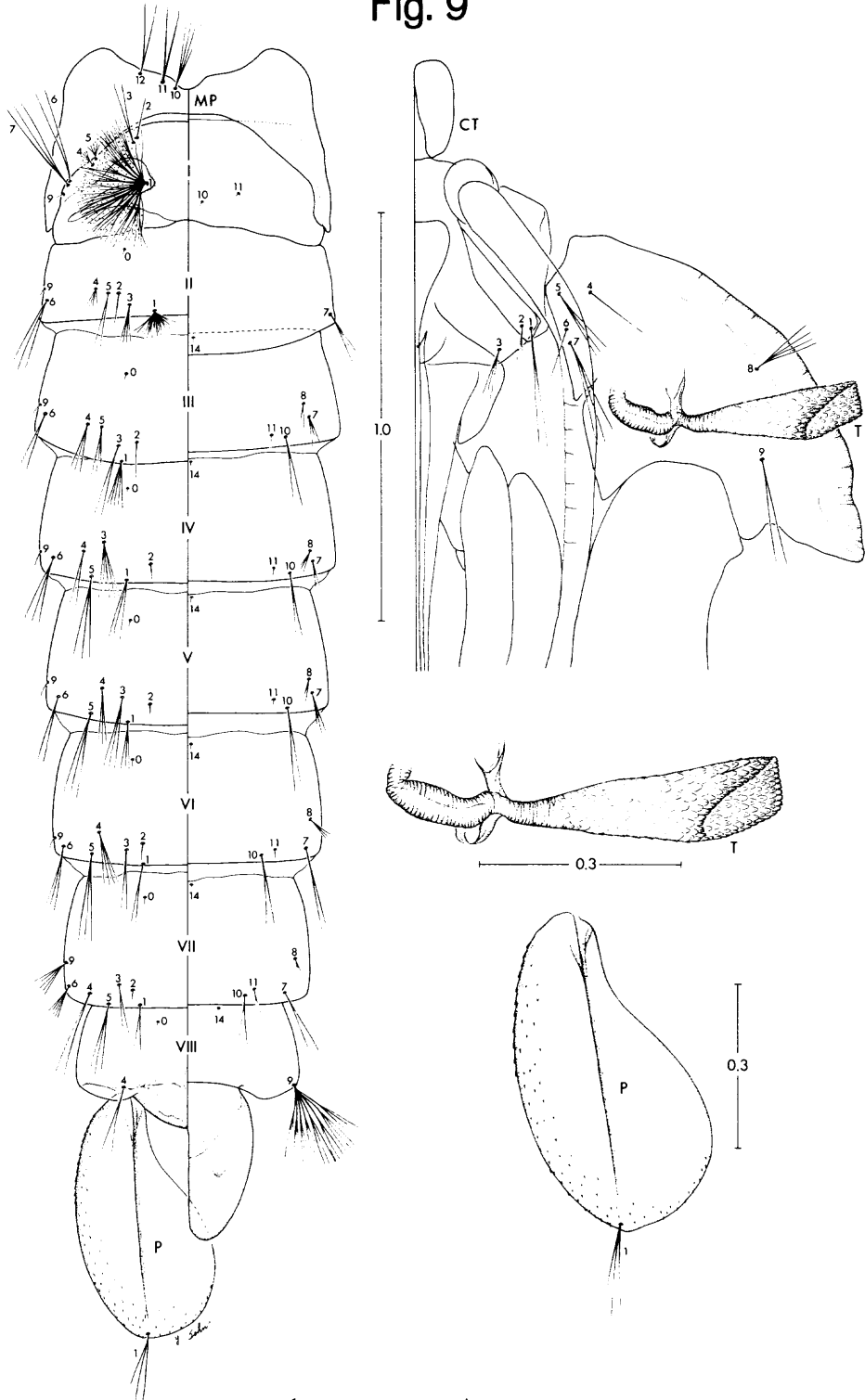
Aedes (Rhinoskusea) pillaii

Fig. 8



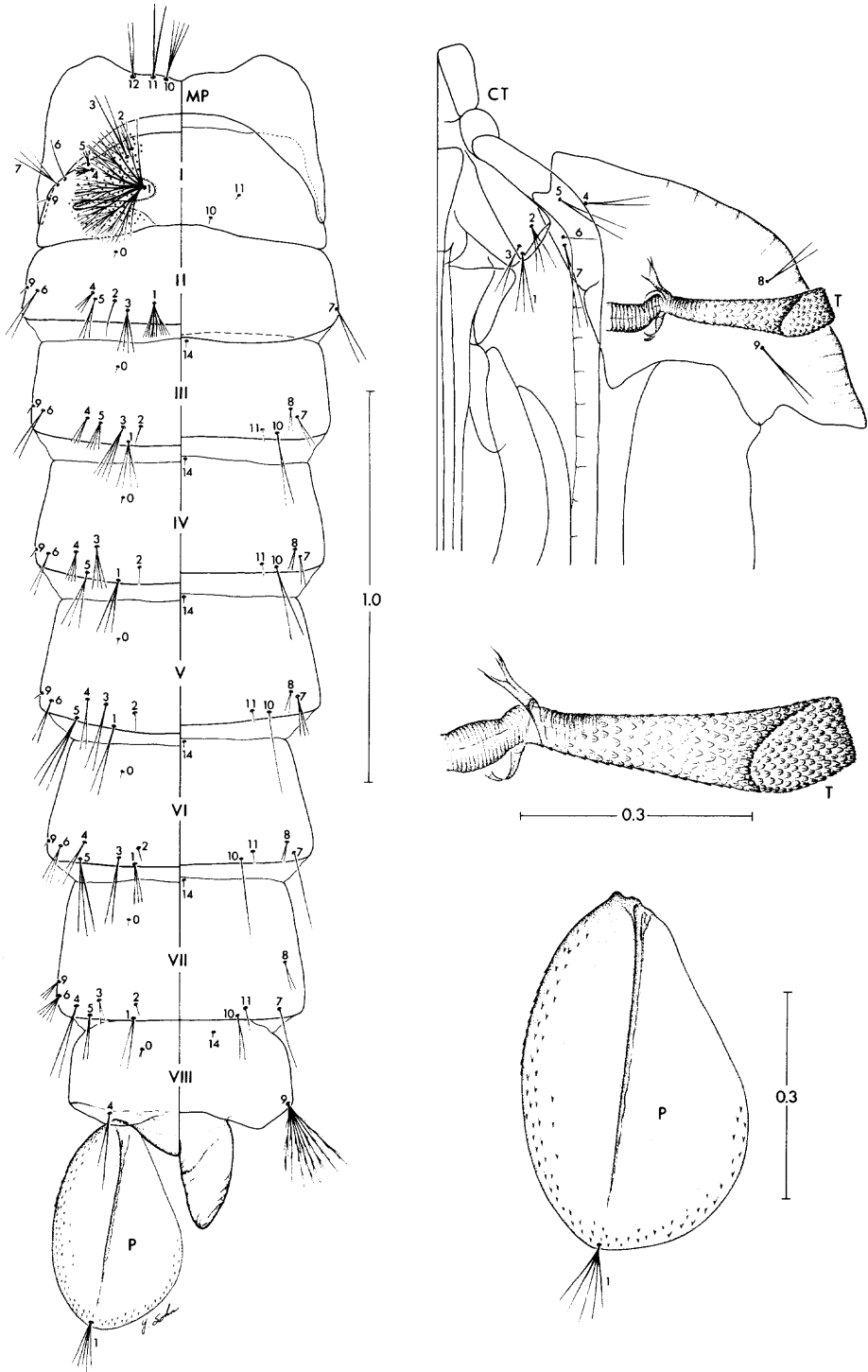
Aedes (Rhinoskusea) wardi

Fig. 9



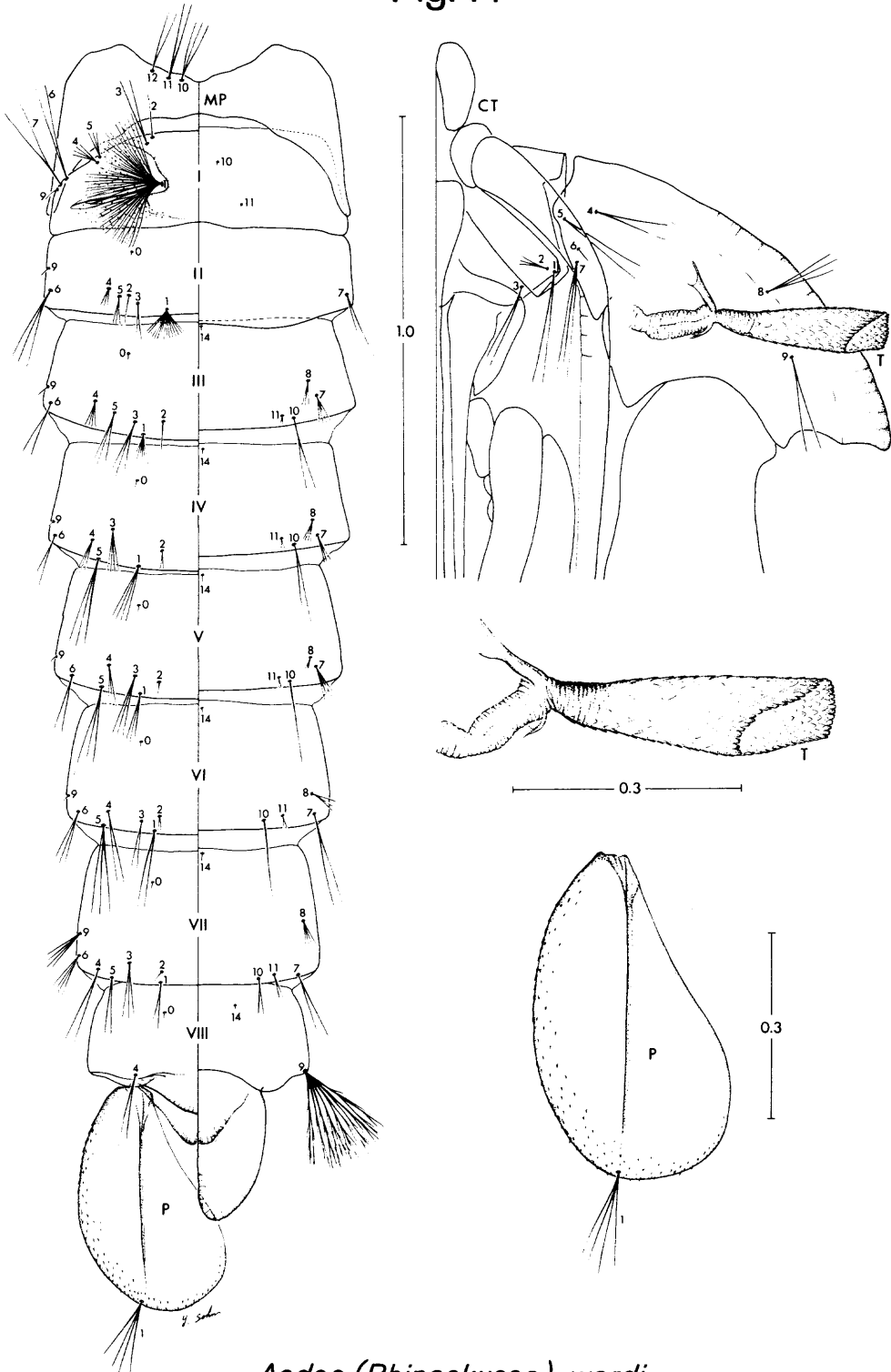
Aedes (Rhinoskusea) longirostris

Fig. 10



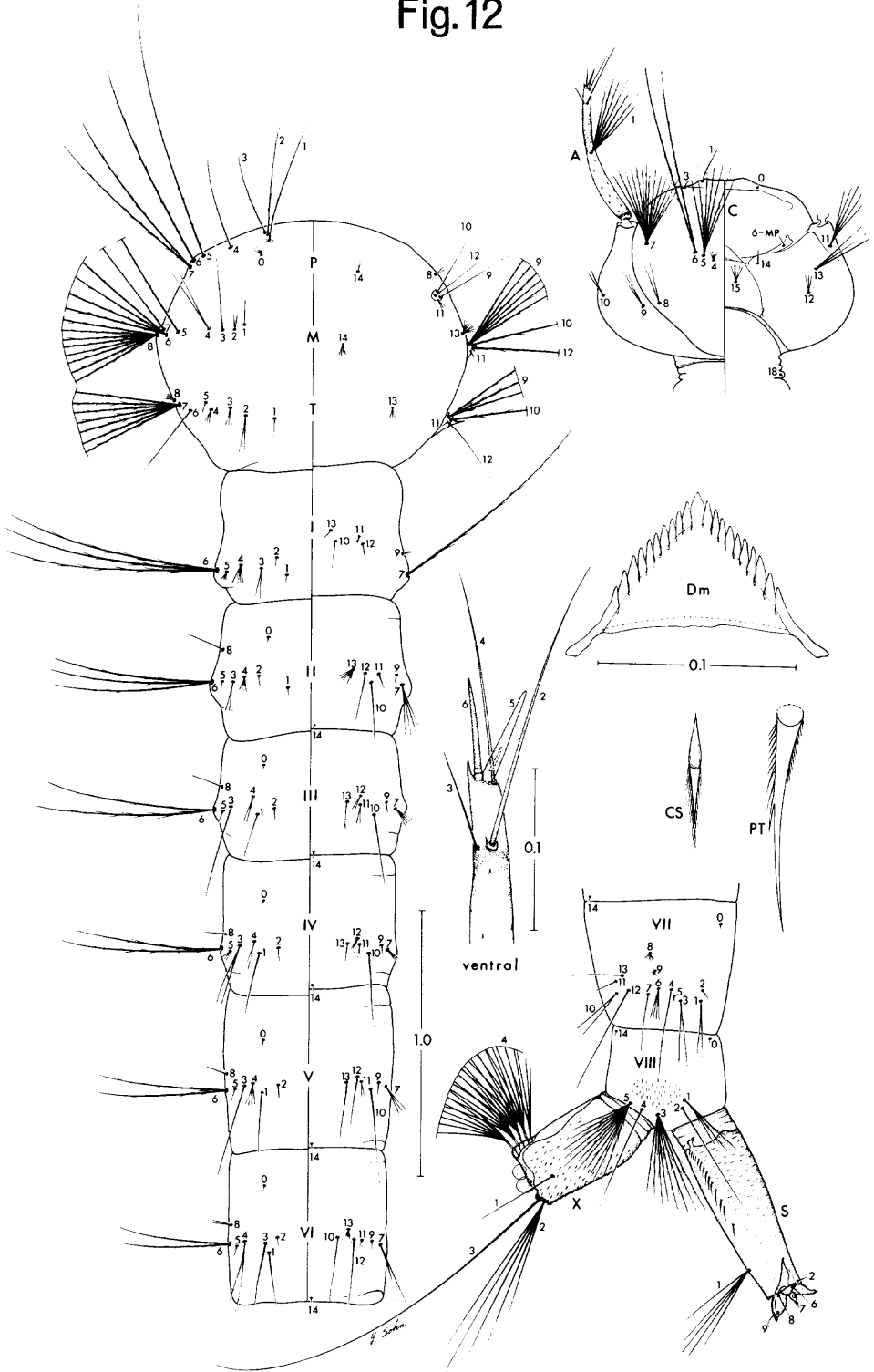
Aedes (Rhinoskusea) pillaii

Fig.11



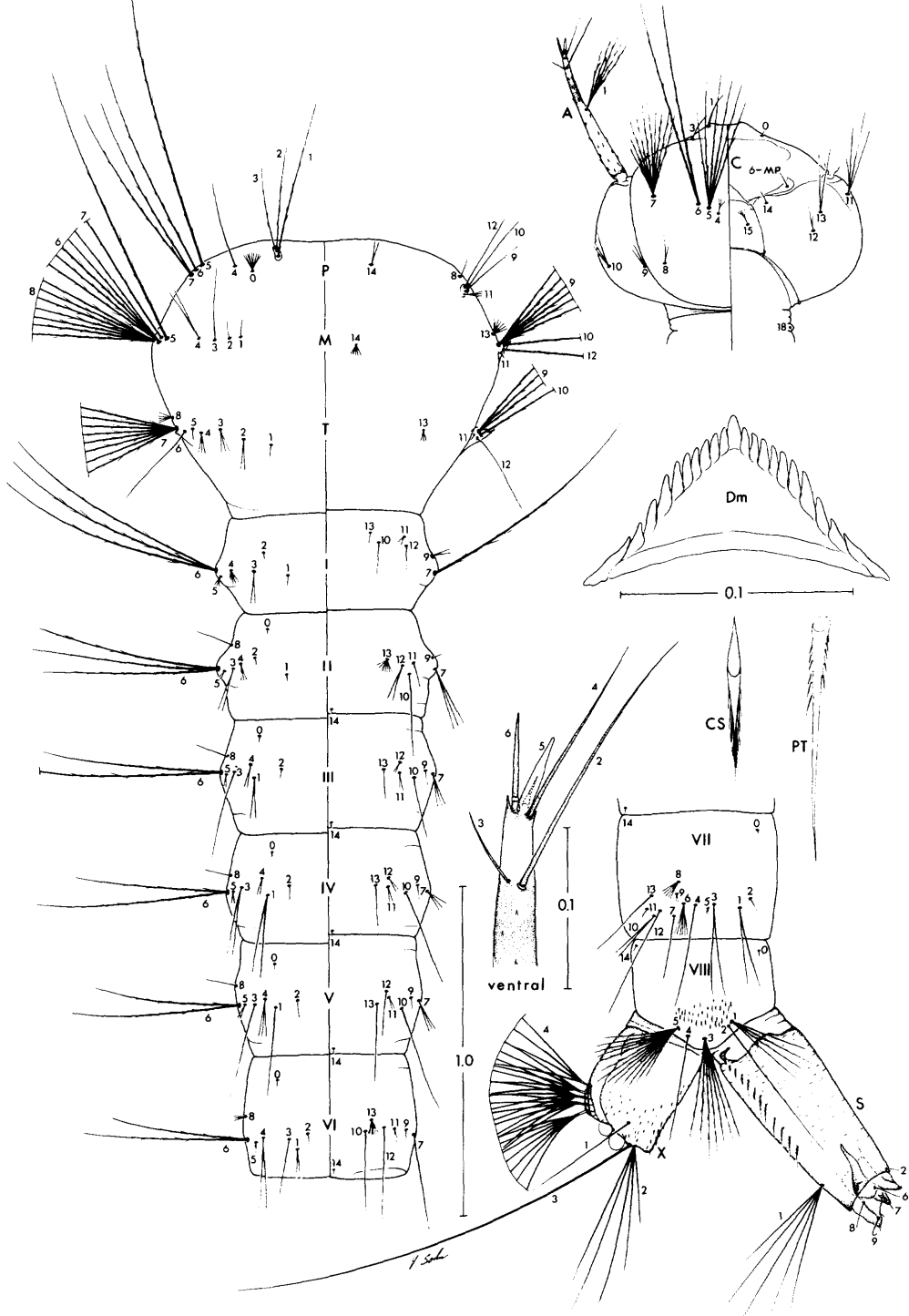
Aedes (Rhinoskusea) wardi

Fig.12



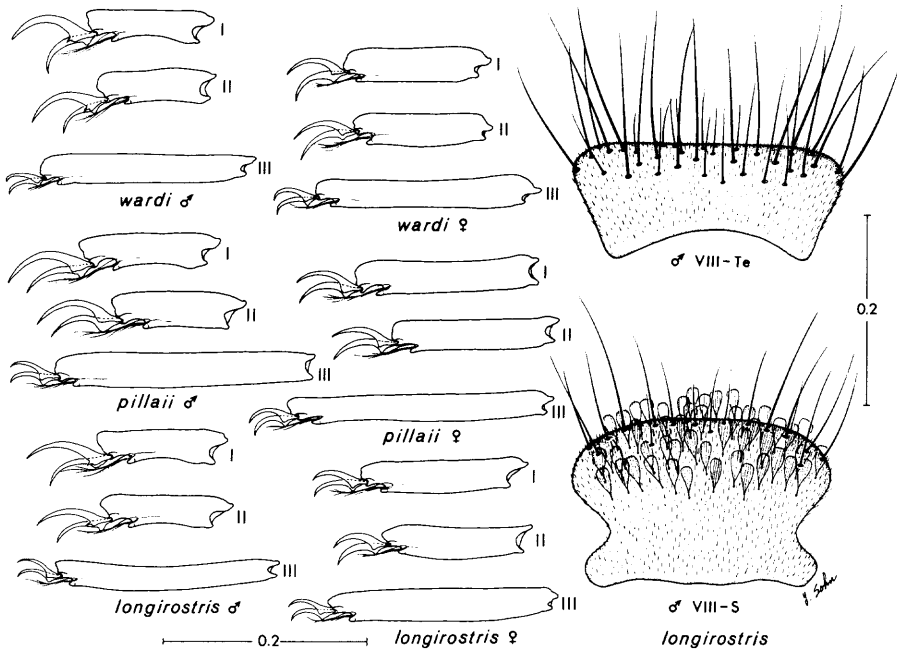
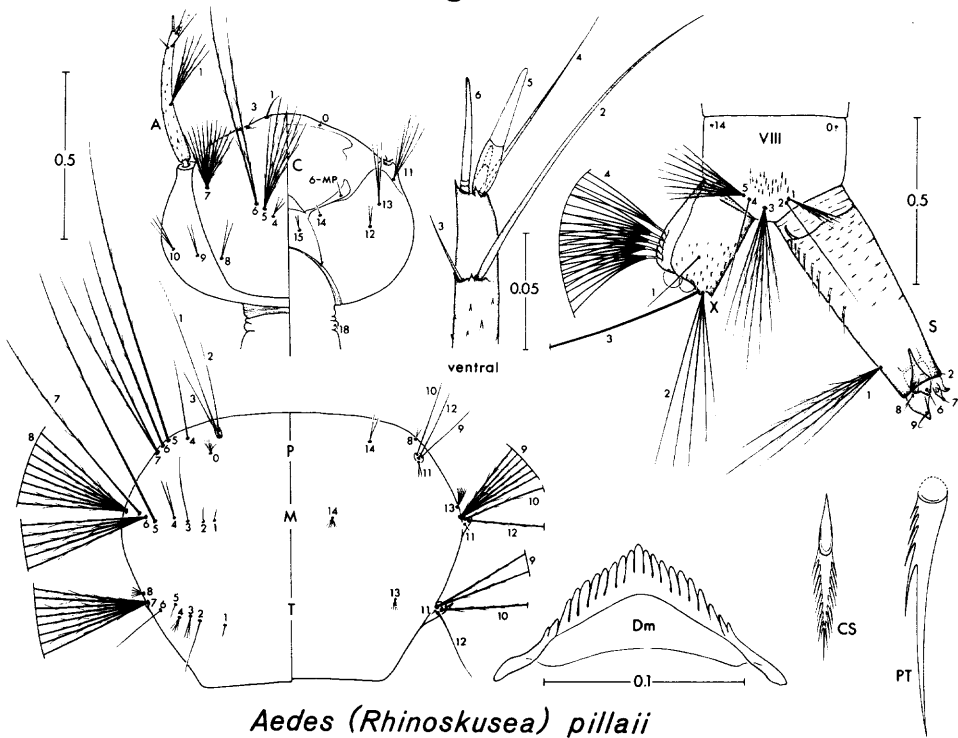
Aedes (Rhinoskusea) longirostris

Fig.13



Aedes (Rhinoskusea) wardi

Fig. 14



APPENDICES

TABLE 1. Record of the branching of the setae on the pupae of *Aedes (Rhinoskusea) longirostris* (7 specimens).

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Cephalothorax			Abdomen I (Cont.)			Abdomen III (Cont.)		
1	2-3	2	10	1	1	9	1	1
2	2-3	3	11	1	1	10	2-3	2
3	2-3	3	Abdomen II			11	1	1
4	1-3	2	0	1	1	14	1	1
5	2-3	3	1	13-25	13	Abdomen IV		
6	1	1	2	1	1	0	1	1
7	2-3	3	3	2-4	3	1	2-4	3
8	3-4	4	4	2-4	3	2	1-2	1
9	1-2	2	5	2-6	4	3	2-6	5
Metanotal Plate			6	2-4	2	4	2-4	3
10	3-5	3	7	2-3	2	5	3-4	4
11	2	2	9	1	1	6	1-3	2
12	2-5	3	Abdomen III			7	2-4	3
Abdomen I			0	1	1	8	2-4	3
1	13-36	27	1	3-6	4	9	1	1
2	1	1	2	1-2	1	10	1-3	2
3	2-3	2	3	2	2	11	1-3	1
4	3-6	5	4	2-4	3	14	1	1
5	2-6	4	5	2-6	2	Abdomen V		
6	1-3	2	6	1-3	2	0	1	1
7	1-3	2	7	3-5	3	1	2-4	3
9	1	1	8	2-3	3	2	1-2	1

TABLE 1 (Cont.)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Abdomen V (Cont.)			Abdomen VI (Cont.)			Abdomen VII (Cont.)		
3	2-4	3	4	2-4	3	5	2-4	3
4	2-6	3	5	2-4	3	6	2-5	5
5	2-4	3	6	2-5	4	7	2	2
6	1-4	3	7	1-2	2	8	3-5	4
7	2-4	3	8	2-5	3	9	3-5	3
8	2-4	3	9	1	1	10	2-3	2
9	1	1	10	1-2	2	11	1-2	2
10	1-2	1	11	1-2	1	14	1	1
11	1-2	1	14	1	1	Abdomen VIII		
14	1	1	Abdomen VII			0	1	1
Abdomen VI			0	1	1	4	1-3	2
0	1	1	1	1-2	1	9	6-10	7
1	2-3	2	2	1-2	1	14	1	1
2	1-2	1	3	2-4	3	Paddle		
3	2-3	2	4	2-3	2	1	2-5	3

TABLE 2. Record of the branching of the setae on the pupae of *Aedes (Rhinoskusea) pillaii* (7 specimens)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Cephalothorax			Abdomen I (Cont.)			Abdomen III (Cont.)		
1	2-3	2	10	1	1	9	1	1
2	2-3	3	11	1	1	10	2-3	2
3	2-3	2	Abdomen II			11	1	1
4	2	2	0	1	1	14	1	1
5	2	2	1	9-23	12	Abdomen IV		
6	1	1	2	1	1	0	1	1
7	2	2	3	2-5	3	1	2-4	3
8	2-5	3	4	2-4	3	2	1	1
9	2	2	5	3-6	3	3	3-5	4
Metanotal Plate			6	1-4	2	4	2-4	3
10	2-4	3	7	2-3	2	5	2-4	3
11	2	2	9	1	1	6	2-4	3
12	1-3	2	Abdomen III			7	2-3	2
Abdomen I			0	1	1	8	2-3	2
1	19-34	20	1	3-7	4	9	1	1
2	1	1	2	1	1	10	2-3	2
3	2	2	3	2-4	3	11	1	1
4	4-6	4	4	2-4	3	14	1	1
5	3-4	3	5	2-5	4	Abdomen V		
6	1-3	2	6	1-3	2	0	1	1
7	2-4	3	7	2-3	2	1	1-4	3
9	1	1	8	2-3	3	2	1	1

TABLE 2 (Cont.)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Abdomen V (Cont.)			Abdomen VI (Cont.)			Abdomen VII (Cont.)		
3	2-3	2	4	2-4	3	5	1-3	2
4	2-4	3	5	2-4	3	6	3-5	4
5	2-4	3	6	2-6	3	7	1-2	1
6	2-3	3	7	1-2	1	8	2-3	2
7	1-4	3	8	1-2	2	9	2-5	3
8	2-3	2	9	1	1	10	2-3	2
9	1	1	10	1-2	1	11	1	1
10	1-2	1	11	1	1	14	1	1
11	1	1	14	1	1	Abdomen VIII		
14	1	1	Abdomen VII			0	1-2	1
Abdomen VI			0	1	1	4	2	2
0	1	1	1	1-2	2	9	5-8	8
1	2-5	3	2	1	1	14	1	1
2	1	1	3	2-3	2	Paddle		
3	1-2	2	4	1-2	2	1	3-5	4

TABLE 3. Record of the branching of the setae on the pupae of *Aedes (Rhinoskusea) wardi* (7 specimens)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Cephalothorax			Abdomen I (Cont.)			Abdomen III (Cont.)		
1	2-3	2	10	1	1	9	1	1
2	2-3	3	11	1	1	10	2	2
3	2-3	3	Abdomen II			11	1-2	2
4	1-3	2	0	1	1	14	1	1
5	2-3	2	1	14-26	16	Abdomen IV		
6	1	1	2	1	1	0	1	1
7	2-4	3	3	2-3	3	1	2-4	3
8	2-5	4	4	2-4	3	2	1-2	1
9	2	2	5	2-5	4	3	2-6	4
Metanotal Plate			6	2-4	2	4	2-3	3
10	2-5	4	7	1-3	2	5	2-4	3
11	2	2	9	1	1	6	1-3	2
12	2-4	2	Abdomen III			7	2-4	3
Abdomen I			0	1	1	8	2-4	3
1	18-42	26	1	3-6	4	9	1	1
2	1	1	2	1-2	1	10	1-2	2
3	1-2	2	3	2-3	2	11	1-2	2
4	3-6	5	4	2-4	3	14	1	1
5	2-4	4	5	2-4	3	Abdomen V		
6	1-2	2	6	1-3	2	0	1	1
7	1-3	2	7	2-5	3	1	1-3	2
9	1	1	8	2-4	3	2	1-2	1

TABLE 3 (Cont.)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Abdomen V (Cont.)			Abdomen VI (Cont.)			Abdomen VII (Cont.)		
3	2-4	3	4	1-3	3	5	2-4	3
4	2-3	3	5	2-4	3	6	3-6	4
5	2-4	3	6	2-4	3	7	1-2	2
6	1-2	2	7	1-2	2	8	3-5	4
7	1-4	3	8	1-4	3	9	3-6	4
8	2-4	3	9	1	1	10	1-2	2
9	1	1	10	1-2	1	11	1-2	1
10	1-2	1	11	1-3	1	14	1	1
11	1-2	2	14	1	1	Abdomen VIII		
14	1	1	Abdomen VII			0	1-2	1
Abdomen VI			0	1-2	1	4	2-4	2
0	1	1	1	1-2	2	9	4-8	7
1	1-3	2	2	1-2	1	14	1-2	1
2	1-2	1	3	2-4	2	Paddle		
3	1-2	2	4	1-2	2	1	3-4	3

TABLE 4. Record of the branching of the setae on the larvae of *Aedes (Rhinoskusea) longirostris* (7 specimens)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Antenna			Prothorax (Cont.)			Mesothorax (Cont.)		
1	5-8	6	2	1	1	10	1	1
Head			3	1	1	11	1	1
0	1	1	4	1	1	12	1	1
1	1	1	5	1	1	13	6-10	8
3	1	1	6	1	1	14	3-6	4
4	4-5	4	7	2-3	2	Metathorax		
5	5-7	6	8	1-2	2	1	1-2	1
6	2-3	2	9	1-2	1	2	2-3	2
7	10-14	13	10	1	1	3	2-4	3
8	2-3	2	11	2-3	3	4	2-3	3
9	2-3	2	12	1	1	5	1	1
10	2-3	2	14	2	2	6	1	1
11	5-7	5	Mesothorax			7	6-8	7
12	2-3	3	1	1	1	8	2-6	4
13	2-3	2	2	1-2	2	9	2-3	3
14	1	1	3	1	1	10	1	1
15	3-5	3	4	2	2	11	1	1
18	1	1	5	1	1	12	1	1
6MP	1	1	6	4-6	5	13	3-4	3
Prothorax			7	1	1	Abdomen I		
0	5-8	7	8	6-9	6	1	1	1
1	1	1	9	5-7	6	2	1	1

TABLE 4 (Cont.)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Abdomen I (Cont.)			Abdomen II (Cont.)			Abdomen IV (Cont.)		
3	1-2	2	12	1	1	3	1-2	2
4	2-5	5	13	4-8	6	4	1-2	2
5	2-4	2	14	1	1	5	1-3	1
6	3	3	Abdomen III			6	2	2
7	1	1	0	1	1	7	2-4	2
9	2-3	2	1	1	1	8	1-2	1
10	1	1	2	1	1	9	1	1
11	1-2	1	3	1	1	10	1	1
12	1	1	4	2-3	2	11	2	2
13	1	1	5	1	1	12	1-3	2
Abdomen II			6	2	2	13	1	1
0	1	1	7	2-6	4	14	1	1
1	1	1	8	1	1	Abdomen V		
2	1	1	9	1	1	0	1	1
3	2	2	10	1	1	1	1-2	1
4	3-4	4	11	1-3	1	2	1	1
5	1-2	1	12	1-3	2	3	1	1
6	2-3	3	13	1	1	4	2-4	3
7	2-4	2	14	1	1	5	1-2	1
8	1	1	Abdomen IV			6	2	2
9	1	1	0	1	1	7	2-4	4
10	1	1	1	1	1	8	1-2	1
11	1	1	2	1	1	9	1-2	1

[illegible]

TABLE 5. Record of the branching of the setae on the larvae of *Aedes (Rhinoskusea) pillaii* (6 specimens)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Antenna			Prothorax (Cont.)			Mesothorax (Cont.)		
1	5-7	5	2	1	1	10	1	1
Head			3	1	1	11	1	1
0	1	1	4	1	1	12	1	1
1	1	1	5	1	1	13	5-10	6
3	1	1	6	1	1	14	4-7	6
4	2-4	3	7	2	2	Metathorax		
5	5-7	6	8	1-4	2	1	1-2	1
6	2	2	9	1	1	2	1-2	1
7	10-16	12	10	1	1	3	2-3	3
8	2	2	11	1-2	2	4	2-4	3
9	2-3	2	12	1	1	5	1	1
10	2-4	3	14	2	2	6	1	1
11	5-11	6	Mesothorax			7	8-11	8
12	2-3	2	1	1	1	8	4-6	5
13	2-4	3	2	1-2	1	9	2-3	2
14	1-2	1	3	1	1	10	1	1
15	2-4	2	4	2	2	11	1	1
18	1	1	5	1	1	12	1	1
6MP	1-2	1	6	4-6	5	13	3-5	4
Prothorax			7	1	1	Abdomen I		
0	6-10	7	8	8-10	8	1	1	1
1	1	1	9	6-8	6	2	1	1

TABLE 5 (Cont.)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Abdomen I (Cont.)			Abdomen II (Cont.)			Abdomen IV (Cont.)		
3	2	2	12	1	1	3	1-2	1
4	4-6	4	13	4-6	5	4	1-3	2
5	1-3	3	14	1	1	5	1	1
6	2-3	3	Abdomen III			6	2	2
7	1	1	0	1	1	7	2-4	2
9	2-3	2	1	1	1	8	1	1
10	1	1	2	1	1	9	1	1
11	1-2	1	3	1-2	1	10	1	1
12	1	1	4	1-2	2	11	1-2	1
13	1	1	5	1-2	1	12	1	1
Abdomen II			6	2	2	13	1	1
0	1	1	7	2-5	3	14	1	1
1	1-2	1	8	1	1	Abdomen V		
2	1	1	9	1	1	0	1	1
3	1-2	2	10	1	1	1	1-2	1
4	3-5	4	11	1	1	2	1	1
5	1-2	1	12	1-2	1	3	1	1
6	3-4	3	13	1	1	4	2-3	3
7	2-3	2	14	1	1	5	1	1
8	1	1	Abdomen IV			6	2	2
9	1	1	0	1	1	7	2-4	3
10	1	1	1	1	1	8	1	1
11	1	1	2	1	1	9	1	1

[illegible]

TABLE 6. Record of the branching of the setae on the larvae of *Aedes (Rhinoskusea) wardi* (7 specimens)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Antenna			Prothorax (Cont.)			Mesothorax (Cont.)		
1	5-6	5	2	1	1	10	1	1
	Head		3	1	1	11	1	1
0	1	1	4	1	1	12	1	1
1	1	1	5	1	1	13	6-11	7
3	1	1	6	1	1	14	5-7	5
4	2-6	3	7	2	2	Metathorax		
5	5-7	5	8	1-2	1	1	1-2	1
6	2	2	9	1-2	1	2	2	2
7	9-13	10	10	1	1	3	3-5	3
8	2	2	11	2-4	3	4	2-3	3
9	2-3	2	12	1	1	5	1	1
10	2-3	3	14	2	2	6	1	1
11	3-6	6	Mesothorax			7	6-8	7
12	2	2	1	1	1	8	5-6	5
13	2-3	2	2	1-2	1	9	2-3	3
14	1	1	3	1	1	10	1	1
15	2-5	3	4	2	2	11	1	1
18	1	1	5	1	1	12	1	1
6MP	1-2	1	6	5-6	5	13	3-5	3
Prothorax			7	1	1	Abdomen I		
0	6-10	9	8	6-7	6	1	1	1
1	1	1	9	5-6	6	2	1	1

TABLE 6 (Cont.)

Seta	Range	Mode	Seta	Range	Mode	Seta	Range	Mode
Abdomen I (Cont.)			Abdomen II (Cont.)			Abdomen IV (Cont.)		
3	2	2	12	1-2	2	3	2	2
4	4-6	5	13	6-9	8	4	1-2	2
5	2-4	3	14	1	1	5	1-2	2
6	3	3	Abdomen III			6	2	2
7	1	1	0	1	1	7	3-5	4
9	2-3	3	1	1-2	2	8	1	1
10	1	1	2	1-2	1	9	1	1
11	2-3	2	3	1	1	10	1	1
12	1	1	4	2-3	2	11	2-3	2
13	1-2	2	5	1-2	1	12	2-3	2
Abdomen II			6	2	2	13	1	1
0	1	1	7	2-4	4	14	1	1
1	1	1	8	1	1	Abdomen V		
2	1	1	9	1	1	0	1	1
3	2-3	2	10	1	1	1	1-2	1
4	3-6	3	11	2	2	2	1	1
5	1-2	2	12	2	2	3	1	1
6	3-4	3	13	1	1	4	3-4	4
7	2-4	3	14	1	1	5	1-2	2
8	1	1	Abdomen IV			6	2	2
9	1	1	0	1	1	7	2-3	3
10	1	1	1	1-2	2	8	1	1
11	1-2	1	2	1	1	9	1	1

[illegible]

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