

With best regards

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A NEW SUBGENUS OF *Aedes* (DIPTERA, CULICIDAE)

with illustrated key to the subgenera of the Papuan

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Subregion (Diptera: Culicidae)¹By Yiau-Min Huang²

Abstract. Both sexes, larva and pupa of *Aedes wauensis* n. sp. are described and illustrated. A new subgenus *Huaedes* is erected for this form and for *Aedes medialis* Brug and *Aedes variegatus* King & Hoogstraal, heretofore placed in the subgenus *Leptosomatomyia*.

The 109 species in 15 subgenera of *Aedes* from the Papuan Subregion are listed. Illustrated keys to adults (♀ and ♂) and 4th instar larvae of the subgenera of *Aedes* of this area are given. Some morphological characteristics of adults (♀ and ♂), ♂ genitalia and larvae of the subgenera of *Aedes* of this area are tabulated. Also, the breeding habitats of the subgenera of *Aedes* of this area are summarized.

Recently, a considerable amount of mosquitoes from the Papuan Subregion has been collected and deposited in the mosquito collection of the Bishop Museum, Honolulu. A highly ornamented species having very distinct characters in both adults and the immature stages was found while I was working on the genus *Aedes* of the area. I propose to establish a new subgenus for this species, and 2 others, being distinct from all other subgenera that have been described in this genus.

The nomenclature chosen for the chaetotaxy of the larva and pupa and the terminology of structural parts of the adult as used in this paper largely follows that of Belkin (1950, 1952, 1962).

Subgenus *Huaedes* Huang, n. subg.

Type-species: *Aedes (Huaedes) wauensis* Huang, n. sp., New Guinea. Included species: *Aedes (Leptosomatomyia) medialis* Brug, 1932, New Guinea; *Aedes (Leptosomatomyia) variegatus* King & Hoogstraal, 1946, New Guinea.

This subgenus is named in honor of Dr Stephen M. K. Hu, head of the Entomology Department, U. S. Naval Medical Research Unit No. 2 in Taipei, Taiwan, Republic of China in 1959, in

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acknowledgment of his counsel, guidance and inspiration, for which I am deeply grateful.

Adults. Proboscis with dark scales, longer than fore femur; palpus short, less than 1/4 of proboscis in both sexes; antenna less than 4/5 of proboscis; ♂ antenna plumose; clypeus bare; torus and 1st flagellar segment covered with pale scales on inner sides; decumbent scales of vertex largely pale and narrow; erect forked scales numerous, not restricted to occiput; all scales on scutum and scutellum narrow; acrostichal and dorso-central bristles present; paratergite with scales; postspiracular (*psp*) area with scales; patches of pale broad scales on propleuron (*ppl*), on the subspiracular (*ssp*) area, on the upper and lower portions of sternopleuron (*stp*) and on the anterior upper part of mesepimeron (*mep*); lower prealar (*pra*) area without patch of appressed scales; lower mesepimeral (*mep*) bristles present; femora and tibiae sprinkled with yellowish scales. ♀ with abdominal segment VIII partially retracted; tergite VIII rounded apically; sternite VIII emarginate medially; postgenital plate with a median emargination; cerci short and rounded apically; 3 spermathecae, 1 larger than the other 2.

♂ *Genitalia.* Sidepiece long, more than 2× as long as wide; its scales restricted to dorsolateral, lateral and ventral areas; with a bristly finger-like basal lobe (claspette); clasper simple, elongate, with a conspicuous apical spiniform; aedeagus with several teeth on each side; paraprocts sclerotized at apex; cercal setae absent.

Larva (4th Instar). Head hair 4-C small, branched, closer to 5-C than 6-C, cephalad and laterad of 5-C; 4, 5-C caudad of level of antenna; 6-C cephalad and mesad of 5-C. Hair 12 not developed on abdominal segment I. Comb scales in a triangular patch; each comb scale fringed without a terminal spine. Pentad hair 1-VIII small, branched. Siphon short, less than 4× as long as wide; acus present, small. Saddle complete; 1-X simple, distant from caudal margin; 2-X multiple branched; 3-X simple; ventral brush with more than 6 pr of plumose hairs on grid, without precratal tufts. Gills lanceolate.

Pupa. Hair 2-I and 3-I not widely separated, the distance between them as the distance between 4-I and 5-I; hair 1-II branched; hair 2-II laterad of hair 3-II; hair 2-V caudad of hair 3-V; hair 9-VII plumose, markedly different from 9-II-IV. Paddle margins with short distinct spicules; 1-P branched.

Systematics

A. wauensis, a very distinct species, has several unique features in both adults and immatures, different from all other aedine subgenera, so that I believe it is advisable to recognize a distinct subgenus for this form. *Adults:* (both sexes) Head with decumbent scales largely narrow, erect scales numerous, not confined to occiput; palpus short, less than 1/4 of proboscis; acrostichal and dorso-central bristles present; scutellum with all scales narrow; lower mesepimeral bristle present. *Male*

genitalia: Proctiger without cercal setae; aedeagus with several teeth on each side; basal lobe (claspette) developed, with several bristles; clasper simple, elongate, with a conspicuous apical spiniform. *Larva*: Saddle complete; ventral brush with more than 6 pr of plumose hairs on grid, without precratal tufts.

A. variepictus and *A. medialis*, formerly placed in the subgenus *Leptosomatomyia*, differ greatly from *A. aurimargo* Edwards (= *lateralis* Theobald 1905, the haplotype of *Leptosomatomyia*), and should be excluded from that subgenus. I find they are so similar in both external adult and male genitalic characters to *A. wauensis* that I believe they should be placed in the same subgenus *Huaedes*.

The adults of this subgenus are distinguished from *Leptosomatomyia* by hind tarsi with at least 1 segment conspicuously banded; scutellum with narrow scales only. The male genitalia are distinguished from *Leptosomatomyia* by having the clasper simple, elongate, with a conspicuous spiniform process at tip; in *Leptosomatomyia* the clasper is rather stout, curved, grooved on the outer side, with a stout and rather short process near apex. The pupa is distinguished from *Leptosomatomyia* by having hair I-II well developed, with expanded base and about 10 branches, paddle oval and rounded apically; in *Leptosomatomyia* this seta is small, with 3 to 4 branches and the paddle narrow, oval, apically with a blunt point. The larva is distinguished from *Leptosomatomyia* by the ventral brush with more than 6 pr of plumose hairs.

The female of this subgenus falls in the first half of couplet 55 in Mattingly's (1961) generic and subgeneric key to females. The *Aedes* subgenus *Leptosomatomyia* (part) should be *Aedes* subgenus *Huaedes*. The male of this subgenus falls together with *Leptosomatomyia* in the second half of couplet 30 in Mattingly's (1959) key to adult males. The 2 subgenera can be separated as follows: scutellum with all narrow scales (*Huaedes*), scutellum with broad scales on mid-lobe and narrow scales on side lobes (*Leptosomatomyia*). The pupa runs to the second half of couplet 44 in Mattingly's (1959) key to pupae (seta 7 in Mattingly's key is seta 9 in this paper); it falls in *Aedes* subgenus *Christophersomyia*, but the 3- to 5-branched paddle seta (1-P) is not very long and can be used to distinguish the pupa from *Christophersomyia*. The larva runs to the second half of couplet 26 in Mattingly's (1958) key to 4th stage larvae and can be separated from the others by the following: ventral brush with

more than 6 pr of plumose hairs on grid, without precratal tufts.

The adults of this subgenus are superficially very similar in coloration to some members of the *kochi* group of *Finlaya*; the male genitalia of this subgenus appear to have in common some rather basic genitalic characters with *Christophersomyia*, suggesting affinities with this subgenus. However, subgenus *Huaedes* can easily be separated from it by having acrostichal and dorsocentral bristles present, scutellum with all narrow scales, and the relatively complex male aedeagus which has rather distinct denticles. *Aedes* (*Christophersomyia*) *chionodes* Balkin 1962 does occur in New Guinea (new record).

Bionomics and Disease Relations

The immature stages of this group of mosquitoes are restricted to small water collections in plants. They have been recorded from bamboo, tree holes and pitcher plants. A female of *A. variepictus* was reported taken while trying to bite at 4:30 PM in a mossy forest at about 1400 m elevation. Nothing is known of the disease relations of members of the subgenus.

Distribution: The subgenus is known only from New Guinea.

***Aedes* (*Huaedes*) *wauensis* Huang, n. sp.**

Holotype: ♂ (BBM-NG 3017-37) with associated larval and pupal skins and genitalia (slide 670505-6), Wau, NE New Guinea, collected as a larva in a bamboo cut in a partial forest, elevation 1200 m, 9.V.1965, M. Sedlacek collector. Deposited in Bernice P. Bishop Museum.

Paratypes: 12 ♂♂, 5 ♀♀ as follows: 1 ♂ (BBM-NG 3017-30) with associated larval and pupal skins and genitalia (slide 670424-2), 3 ♂♂ (BBM-NG 3017-26, 36, 43), 2 ♀♀ (BBM-NG 3017-45, 51) with associated larval and pupal skins, 1 ♂ (BBM-NG 3020-9) with associated genitalia (slide 670424-1), all with same data as holotype; 2 ♂♂ (BBM-NG 3021-6, 19), 1 ♀ (BBM-NG 3021-7) with associated larval and pupal skins, 1 ♀ (BBM-NG 3021-1) with associated larval and pupal skins and genitalia (slide 670504-2), with same data as holotype except they were collected as larvae in bamboo uncut internode; 3 ♂♂ (BBM-NG 2284-14, 18, 34) with associated larval and pupal skins, 1 ♂ (BBM-NG 2284-39) with associated larval and pupal skins and genitalia (slide 670428-2), 1 ♀ (BBM-NG 2284-13) with associated larval and pupal skins and genitalia (slide 670504-3), all with same data as holotype, on 3.VI.1965, W. A. Steffan collector; 1 ♂ (BBM-NG 480-1) with associated larval and pupal skins and genitalia (slide 670420-1), all with same data as holotype, on 3.IV.1965, W. A. Steffan collector. Deposited in Bernice P. Bishop Museum. Paratypes in USNM, BMNH and U.Q.

♂: Proboscis with all scales dark, longer than fore femur; palpus less than 1/4 of proboscis, with dark scales sprinkled with 3 or 4 yellowish scales; antenna plumose, 3/5 of proboscis. Vertex with a wide median area of pale narrow scales and pale erect forked scales, with dark broad scales on each side except for a lateral stripe of pale broad scales. Scutum with dark narrow scales sprinkled with pale narrow scales; scutellum with

pale narrow scales on each lobe and 3-5 scattered dark narrow scales. Anterior pronotum (*apn*) with pale narrow scales on anterior portion and pale broad scales on posterior portion; posterior pronotum (*ppn*) with yellowish narrow scales and 5-7 pale broad scales below; upper sternopleuron (*stp*) with pale scale patch, pale broad scales reaching to the anterior corner; mesepimeron (*mep*) with a V-shaped pale scale patch, the open side of the V being directed backward, with 1 lower mesepimeron (*mep*) bristle just below the scale patch. Wing with dark scales on all veins except for a conspicuous line of yellowish scales near the base of vein R and also a line of yellowish scales (or 2-3 scattered yellowish scales in paratypes) near the base of vein C; first fork cell $1.5\times$ as long as its stem. Halteres with pale scales. Femur, tibia and 1st tarsal segment of all legs with dark scales sprinkled with yellowish scales; fore and mid tarsi with basal pale band on segments 1-4; hind tarsi with basal pale band on segments 1-5; fore and mid-legs with tarsal claws unequal, the larger one toothed; hind leg with tarsal claws equal, simple. Abdomen with a basal median yellowish patch and lateral pale spots on segments II-VII; these lateral spots begin at the basal ventral corner of each tergite, extend subapically for a short distance onto the dorsum of each segment.

♂ *Genitalia*: (FIG. 1a) Sidepiece long, $2.5\times$ as long as wide; its scales restricted to dorsolateral, lateral and ventral areas; with numerous bristles on the inner half of dorsal surface; with a bristly finger-like basal lobe $1/3$ as long as sidepiece; clasper elongate, $2/3$ as long as sidepiece, with a spiniform process at tip $1/3$ as long as clasper; aedeagus short, broad, lightly sclerotized dorsally, more strongly laterally, its sternal borders rugose and ending in 2 or 3 apical teeth which project tergally; paraprocts sclerotized at apex. Ninth tergite incompletely divided, with 10 hairs on each lobe.

♀: Essentially as in ♂. Differs from ♂ in the following respects: antenna $4/5$ of proboscis; wing with a conspicuous line of yellowish scales near the base of vein R and a few scattered yellowish scales near the base of vein C as in paratype males; first fork cell $1.7\times$ as long as its stem; fore and mid-legs with tarsal claws equal, simple.

Larva (4th Instar): (FIG. 2) Chaetotaxy as figured. *Head*: Antenna 0.5 length of head, without spicules; 1-A inserted before middle of shaft, double. Inner mouth brush pectinate at tip. Hairs 5-C 6-branched, 6-C single, 7-C 10-branched. Mentum with 11 teeth on each side. *Segment VIII*: Comb scales 18 in a triangular patch, each rounded and fringed apically; pentad hairs: 1-VIII 5-branched, 2-VIII double, 3-VIII 6-branched, 4-VIII single, 5-VIII 7-branched. *Siphon*: $2\times$ as long as wide; pecten teeth 10, the last reaching to 0.75 of siphon; pecten teeth evenly spaced, each tooth with 1-3 denticules; 1-S double, inserted at about last tooth and dorsad of the teeth; trachea broad, 0.5 width of siphon. *Anal segment*: Saddle complete; 1-X simple, as long as the saddle; 2-X 16-branched; 3-X single; ventral brush with 8 pr of plumose hairs on grid. Gills $4\times$ as long as the saddle, lanceolate.

Pupa: (FIG. 1b & c) Chaetotaxy as figured. *Trumpet* $3\times$ as long as wide; sculptured. *Metanotum*: Hair 10-C double; mesad and caudad of 11-C; 11-C single.

Abdomen: Hair 1-I well developed, with more than 10 branches, dendritic; 2-I single; 3-I single; 2-I and 3-I not widely separated, the distance between them as the distance between 4-I and 5-I; 1-II 10-branched, not dendritic; 2-II-VII spiniform; 2-III-VI mesad of hair 1; 3-II and 3-III single, as long as segment III; 5-IV, 5-V and 5-VI single, not reaching beyond the posterior margin of the following segment; 9-VIII 9-branched, plumose. *Paddle* rounded apically; marginal spicules present; 1-P 5-branched.

Natural habitats: Larvae of this species were

collected from bamboo in partial forest, elevation 1200 m, Wau area, NE New Guinea, IV-VI.1965.

Distribution: Specimens have been examined from NE New Guinea: Wau.

Remarks: Both males and females of this species have the wing with pale scales on both veins C and R and the 1st tarsal segment of all legs sprinkled with yellowish scales. This combination of characters differs from that of other species in the subgenus.

The male genitalia of this species are very similar to the male genitalia of *A. variepictus* King & Hoogstraal. This species can easily be distinguished from *variepictus* by having the sidepiece with numerous stouter bristles on the inner half of dorsal surface and by having a wider and shorter bristly finger-like basal lobe. The male genitalia of this species are quite similar also to *A. medialis* Brug. This species can easily be distinguished from *medialis* by the absence of a sub-basal tuft of broad flattened hairs on the inner side of sidepiece.

The immatures of *A. variepictus* and *A. medialis* are unknown. Several 4th instar larvae (BBM-NG 2401, 2404, 2347, 2352) from Tari area, SE New Guinea, present the same type of larval form as *wauensis*; they differ from *wauensis* by having head hair 6-C branched; unfortunately, no correlated adults were obtained. There is no doubt that they belong to either 1 of the other known species or to an undescribed member of this subgenus.

AEDES IN PAPUAN SUBREGION

Aedes is the dominant mosquito genus in the Papuan Subregion, as determined by the number of species and by the variety of types. At present, 15 subgenera of the genus *Aedes*, of which only *Huaedes* is new, are recognized here to be in the Papuan Subregion. A list of the species in each subgenus of the genus *Aedes* known to occur in this area is given. Illustrated keys to adults and larvae of the subgenera of *Aedes* of the Papuan Subregion are provided. Some of the morphological characteristics and the breeding habitats of the subgenera of *Aedes* of this area are summarized in TABLES 1, 2 & 3.

This study has been based mainly on the specimens in the mosquito collection of the Department of Entomology, Bernice P. Bishop Museum, Honolulu, Hawaii. Also, it has been necessary to rely upon available literature both for information regarding those species recorded from the Papuan Subregion but not represented in the collection and, to a great extent, for information regarding breeding habitats.

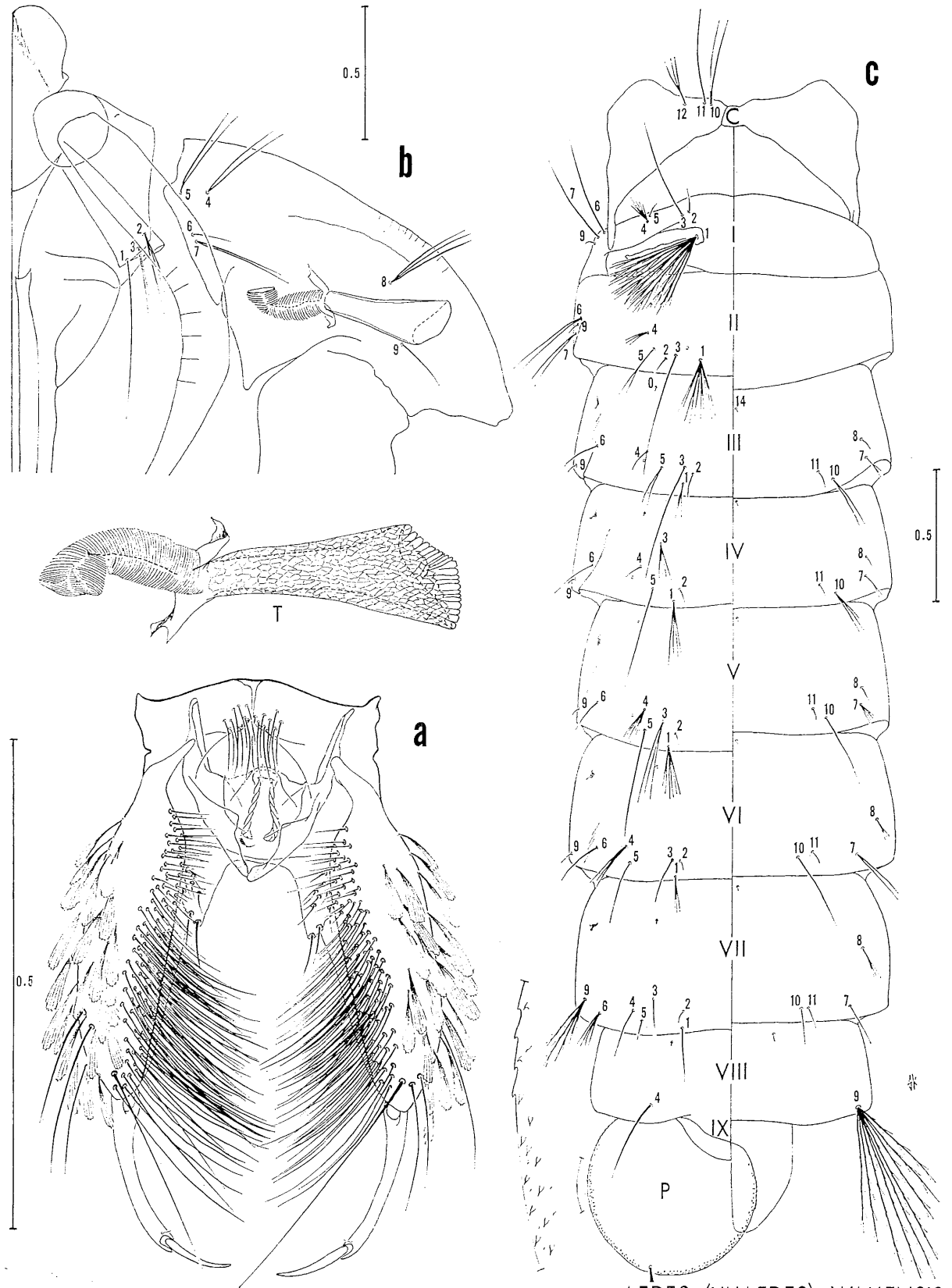
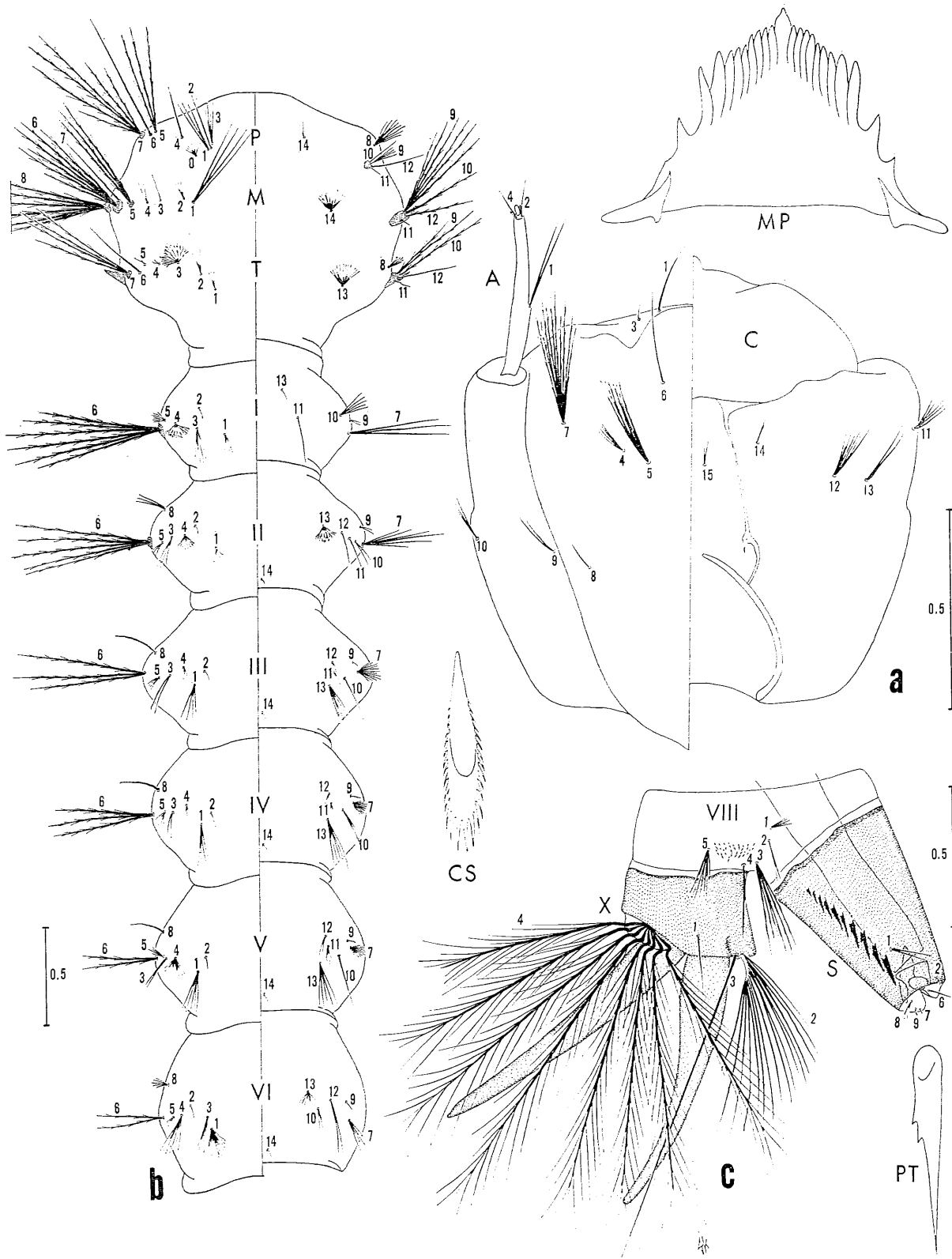


FIG. 1. (a) ♂ genitalia; (b & c) Pupa: b, cephalothorax; c, metanotum and abdomen.

Aedes (Huaedes) wauensis



AEDES (HUAEDES) WAUENSIS

FIG. 2. Larva: (a) head; (b) thorax and abdomen; (c) terminal segments.

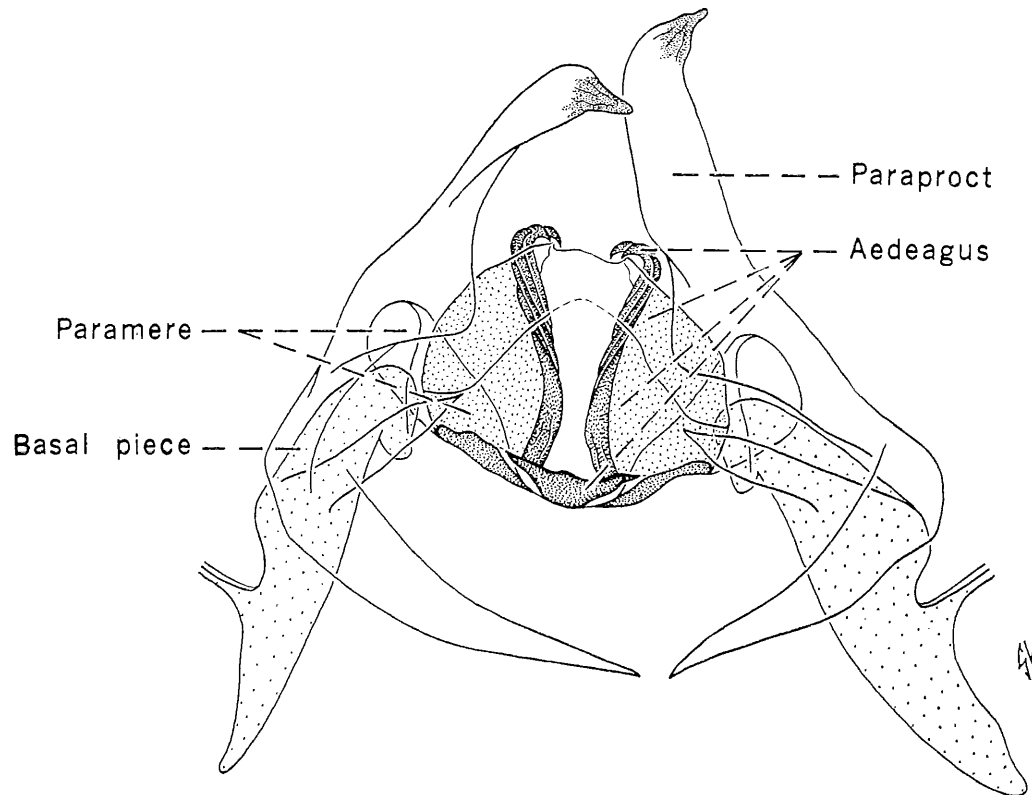


FIG. 3. *Aedes (Huaedes) wauensis* n.sp.: ♂ genitalia, showing the details of aedeagus and paramere.

The following is intended as a supplement to the first part of this article as well as a guide to the further studies of the *Aedes* of the Papuan Subregion.

TABLE 1. Some of the characters of the subgenera of *Aedes* of the Papuan Subregion.

CHARACTERS: SUBGENUS	ADULTS				LARVAE			
	Head with decumbent scales largely broad	Erect scales confined to occiput	Scutellum with broad scales on all lobes	Tarsi ringed	Pentad hair 1-VIII & 2-VIII on common basal plate	Saddle complete	Ventral brush with more than 6 pr of hairs on grid	Preccratal tufts present
1. <i>Mucidus</i>	—	—	—	+	+	—	+	+
2. <i>Ochlerotatus</i>	—	—	—	±	—	±	+	+
3. <i>Finlaya</i>	±	—	± ×	+	—	—	—	±
4. <i>Macleaya</i>	+	—	×	+	—	—	—	—
5. <i>Pseudoskusea</i>	+	+	—	—	—	—	—	—
6. <i>Lorrainea</i>	+	+	+	—	—	—	—	—
7. <i>Christophersiomyia</i>	+	+	+	+	—	—	—	—
8. <i>Geoskusea</i>	+	—	±	—	—	—	—	—
9. <i>Rhinoskusea</i>	+	+	+	—	—	—	—	—
10. <i>Stegomyia</i>	+	+	+	+	—	—	—	—
11. <i>Aedimorphus</i>	—	—	±	±	+	—	±	±
12. <i>Edwardsaedes</i>	—	—	—	+	+	+	—	+
13. <i>Verrallina</i>	+	+	—	—	—	—	±	+
14. <i>Leptosomatomyia</i>	+	+	×	—	—	—	—	—
15. <i>Huaedes</i>	—	—	—	+	—	+	+	—

+ Has the character

— Does not have the character

× Broad scales on mid-lobe and narrow scales on side-lobes

TABLE 2. Some of the characters of the subgenera of *Aedes* of the Papuan Subregion.

♂ GENITALIC CHARACTERS: SUBGENUS	Claspette well developed with a stem and a single apical filament						
	Proctiger with cercal setae	Aedeagus simple without teeth	Basal lobe developed (claspette present)	Claspette well developed with a stem and a single apical filament	Clasper without spiniform	Clasper with apical spiniform	Clasper with sub-apical or submedian spiniform
1. <i>Mucidus</i>	+	+	+	+	-	+	-
2. <i>Ochlerotatus</i>	+	+	+	+	-	+	-
3. <i>Finlaya</i>	+	+	+	+	-	+	-
4. <i>Macleaya</i>	?	?	+	-	?	?	?
5. <i>Pseudokusea</i>	-	+	-	-	-	+	-
6. <i>Lorrainea</i>	-	+	+	+	-	+	-
7. <i>Christophersomyia</i>	-	+	+	-	-	+	-
8. <i>Geokusea</i>	+	+	-	-	-	+	-
9. <i>Rhinoskusea</i>	+	+	+	-	-	+	-
10. <i>Stegomyia</i>	-	-	+	-	-	-	+
11. <i>Aedimorphus</i>	-	-	±	-	-	-	+
							×
12. <i>Edwardsaedes</i>	-	+	-	-	+	-	-
13. <i>Verrallina</i>	-	+	-	-	+	-	-
14. <i>Leptosomatomyia</i>	-	-	+	-	-	-	+
15. <i>Huaedes</i>	-	-	+	-	-	+	-

+ Has the character
 - Does not have the character
 * Claspette well developed and complex
 × Accessory spiniforms present
 ? Character unknown to me

TABLE 3. Summary of the breeding habitats of the subgenera of *Aedes* of the Papuan Subregion.

SUBGENUS	BREEDING HABITATS:									
	Temporary ground pools	Crab holes	Rock holes	Coconut shells	Tin cans	Log holes	Tree holes	Bamboos	Leaf axils	Pitcher plants
1. <i>Mucidus</i>	+		+							
2. <i>Ochlerotatus</i>	+		+							
3. <i>Finlaya</i>	+		+	+	+	+	+	+	+	+
4. <i>Macleaya</i>							+			
5. <i>Pseudokusea</i>		+								
6. <i>Lorrainea</i>					+		+			
7. <i>Christophersomyia</i>				+						
8. <i>Geokusea</i>		+								
9. <i>Rhinoskusea</i>	+	+	+		+					
10. <i>Stegomyia</i>	+		+	+	+	+	+	+	+	
11. <i>Aedimorphus</i>	+		+							
12. <i>Edwardsaedes</i>	+		+							
13. <i>Verrallina</i>	+	+	+							
14. <i>Leptosomatomyia</i>				+			+	+		
15. <i>Huaedes</i>							+	+		+

* Information obtained from literature

A LIST OF THE SUBGENERA AND SPECIES OF *Aedes* OF THE PAPUAN SUBREGION1. Subgenus *Mucidus* Theobald 1901

- A. (M.) alternans* (Westwood)
- A. (M.) aurantius* (Theobald)
- **A. (M.) aurantius chrysogaster* (Taylor)
- A. (M.) painei* Knight

2. Subgenus *Ochlerotatus* Lynch Arribalzaga 1891

- **A. (O.) inexpectatus* Bonne-Wepster
- A. (O.) mcdonaldi* Belkin
- **A. (O.) purpuraceus* Brug
- A. (O.) vigilax* (Skuse)

3. Subgenus *Finlaya* Theobald 1903

- A. (F.) albilabris* Edwards
- **A. (F.) alticola* Bonne-Wepster
- **A. (F.) anggiensis* Bonne-Wepster
- A. (F.) argenteitarsis* Brug
- A. (F.) argyronotum* Belkin
- A. (F.) aureostriatus* (Doleschall)
- A. (F.) avistylus* Brug
- A. (F.) bougainvillensis* Marks
- **A. (F.) buxtoni* Belkin
- A. (F.) candidoscutellum* Marks
- **A. (F.) clintoni* Taylor
- **A. (F.) derooki* Brug
- A. (F.) dobodurus* King & Hoogstraal
- A. (F.) franclemonti* Belkin

- A. (F.) fuscipalpis* Belkin
A. (F.) fuscitarsis Belkin
 **A. (F.) gani* Bonne-Wepster
 **A. (F.) gracilelineatus* Bonne-Wepster
A. (F.) hollandius King & Hoogstraal
A. (F.) hollingsheadi Belkin
A. (F.) josephinae Marks
A. (F.) keejei King & Hoogstraal
A. (F.) knighti Stone & Bohart
A. (F.) kochi (Donitz)
A. (F.) neogeorgianus Belkin
A. (F.) notoscriptus (Skuse)
A. (F.) novalbicans King & Hoogstraal
A. (F.) papuensis (Taylor)
A. (F.) plumiferus King & Hoogstraal
A. (F.) poicilius (Theobald)
A. (F.) quasirubithorax (Theobald)
 **A. (F.) roai* Belkin
 **A. (F.) rubiginosus* Belkin
A. (F.) schlosseri Belkin
A. (F.) solomonis Stone & Bohart
A. (F.) stanleyi Peters
A. (F.) subalbicans King & Hoogstraal
 **A. (F.) toxopeusi* Bonne-Wepster
 **A. (F.) tsiliensis* King & Hoogstraal
A. (F.) wallacei Edwards
4. Subgenus *Macleaya* Theobald 1903
 **A. (M.) littlechildi* Taylor
A. (M.) tremulus (Theobald)
5. Subgenus *Pseudokusea* Theobald 1907
 **A. (P.) culiciformis* (Theobald)
A. (P.) lunulatus King & Hoogstraal
 ?*A. (P.) multiplex* (Theobald)
6. Subgenus *Lorrainea* Belkin 1962
A. (L.) dasyorrrhus King & Hoogstraal
7. Subgenus *Christophersomyia* Barraud 1923
 ****A. (C.) chionodes* Belkin
8. Subgenus *Geoskusea* Edwards 1929
 **A. (G.) becki* Belkin
 **A. (G.) fimbripes* Edwards
A. (G.) longiforceps Edwards
 **A. (G.) perryi* Belkin
 **A. (G.) tonsus* Edwards
9. Subgenus *Rhinokusea* Edwards 1929
A. (R.) longirostris (Leicester)
10. Subgenus *Stegomyia* Theobald 1901
A. (S.) aegypti (Linnaeus)
A. (S.) albolineatus (Theobald)
 ?*A. (S.) annandalei* (Theobald)
A. (S.) gardnerii (Ludlow)
A. (S.) gurneyi Stone & Bohart
A. (S.) hebrideus (Edwards)
A. (S.) hoguei Belkin
A. (S.) paullusi Stone & Farner
A. (S.) quasiscutellaris Farner & Bohart
A. (S.) scutellaris (Walker)
A. (S.) varuae Belkin
11. Subgenus *Aedimorphus* Theobald 1903
A. (A.) alboscutellatus Theobald
A. (A.) caecus (Theobald)
 **A. (A.) lowisii* (Theobald)
A. (A.) nocturnus (Theobald)
12. Subgenus *Edwardsaedes* Belkin 1962
A. (E.) imprimens (Walker)
13. Subgenus *Ferrallina* 1903
 **A. (V.) azureosquamatus* Bonne-Wepster
 **A. (V.) bifoliatus* King & Hoogstraal
- A. (V.) butleri* Theobald
A. (V.) carmentis Edwards
 **A. (V.) ceramensis* Brug
A. (V.) cuccioi Belkin
 **A. (V.) embiensis* Huang
A. (V.) foliformis King & Hoogstraal
A. (V.) funereus (Theobald)
 **A. (V.) killertonis* Huang
 ***A. (V.) leilae* King & Hoogstraal
A. (V.) lineatus (Taylor)
A. (V.) mccormicki Belkin
 **A. (V.) milnensis* King & Hoogstraal
A. (V.) multifolium King & Hoogstraal
A. (V.) neomacrodixoa King & Hoogstraal
 **A. (V.) obsoletus* Huang
 **A. (V.) panayensis* Ludlow
A. (V.) parasimilis King & Hoogstraal
 **A. (V.) quadrifolium* Brug
A. (V.) quadrispinatus King & Hoogstraal
 ***A. (V.) reesi* King & Hoogstraal
A. (V.) sentanius King & Hoogstraal
A. (V.) similis King & Hoogstraal
 **A. (V.) simplus* King & Hoogstraal
A. (V.) trispinatus King & Hoogstraal
 **A. (V.) vanapus* Huang
A. (V.) variabilis Huang
14. Subgenus *Leptosomatomyia* Theobald 1905
A. (L.) aurimargo Edwards
15. Subgenus *Huaedes* Huang
A. (H.) wauensis Huang
 **A. (H.) medialis* Brug
 **A. (H.) variepictus* King & Hoogstraal
- * Larva unknown
 ? Record questionable
 ** Larva from N. Queensland has been described by Dr. E. N. Marks but has not been published. Thanks to her kindness, I have seen the specimens and her notes.
 *** The species from New Guinea is a new record. Larva from the same lot presenting the *Christophersomyia* subgeneric characters appear to be the larva of this species.

ILLUSTRATED KEY TO THE SUBGENERA OF *Aedes* OF THE
 PAPUAN SUBREGION

Adults

1. Wing membrane clouded on crossveins r-m, m-cu and base of Rs (FIG. 1a).....**Mucidus**
 Wing membrane not clouded on crossveins (FIG. 1b)... 2
2. Wing scales broad; wings spotted; scutellum with broad scales on all lobes (FIG. 2a, 2b, 2c)
 in part **Finlaya** (*kochi* group)
 Wing scales narrow (FIG. 2d)..... 3
3. Head with decumbent scales largely narrow, erect scales numerous, not confined to occiput (FIG. 3a)... 4
 Head with decumbent scales largely broad (FIG. 3b)... 9
4. Lower prealar (*pra*) with patch of appressed scales (FIG. 4a) 5
 Lower prealar (*pra*) without patch of appressed scales (FIG. 4b)..... 6
5. ♀ cercus long and slender; segments 4 and 5 of ♂ palpus thickened, with dense vestiture of long hairs or bristles (FIG. 5a & b)**Ochlerotatus**
 ♀ cercus short and broad; segments 4 and 5 of ♂ palpus slender, without dense vestiture of long hairs or bristles (FIG. 5c & d)in part **Finlaya**
6. Scutellum with broad scales (FIG. 6a)

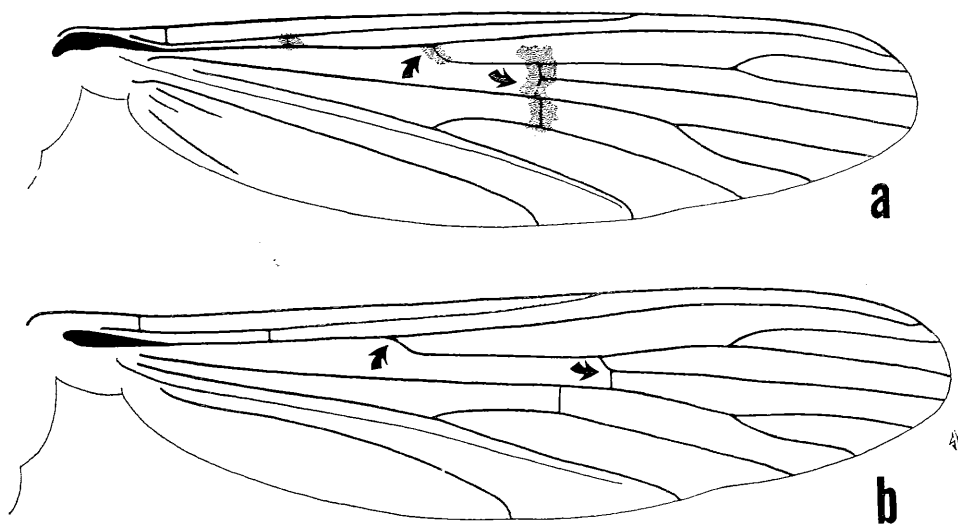


FIG. 1a, b.

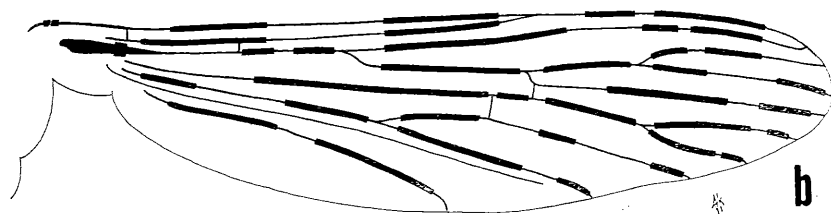
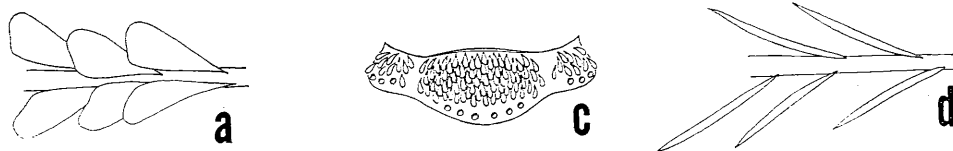


FIG. 2a, b, c, d.

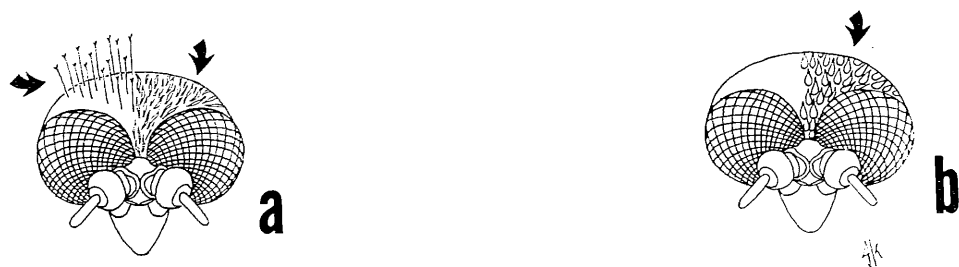


FIG. 3a, b.

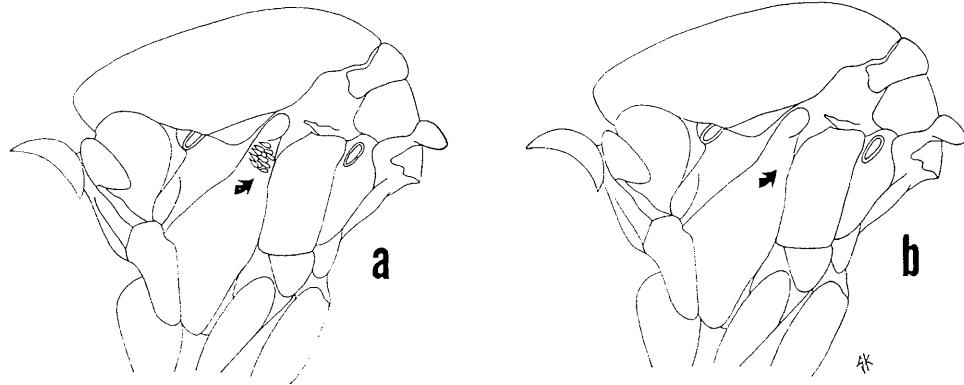


FIG. 4a, b.

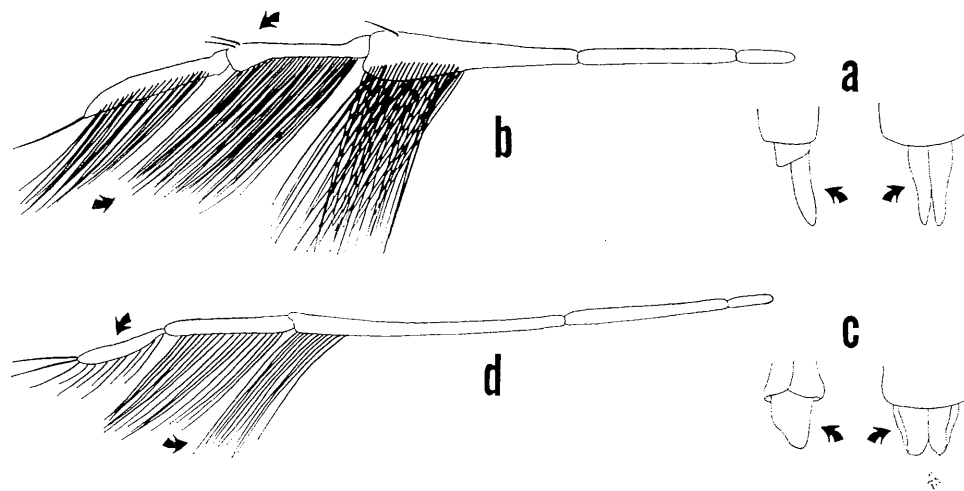


FIG. 5a, b, c, d.



FIG. 6a, b.

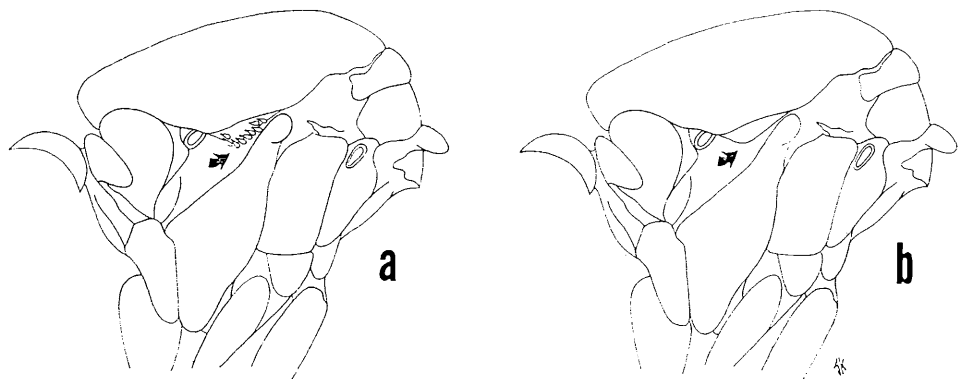


FIG. 7a, b.

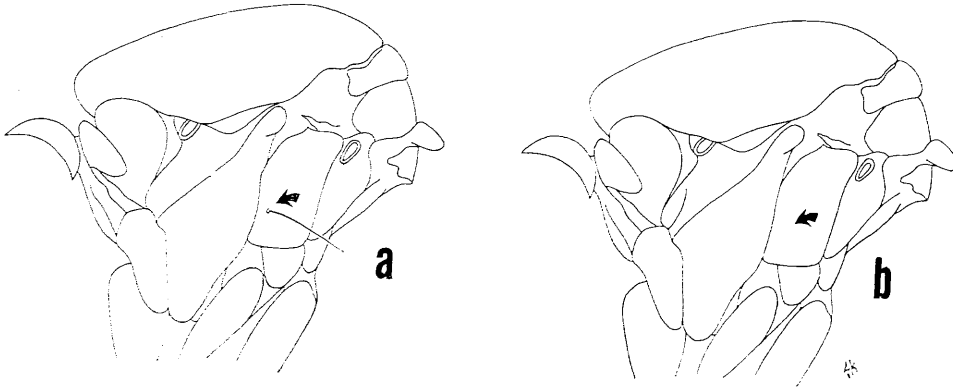


FIG. 8a, b.



FIG. 9a, b.

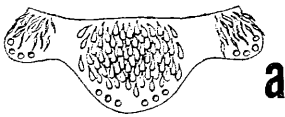


FIG. 10a, b.

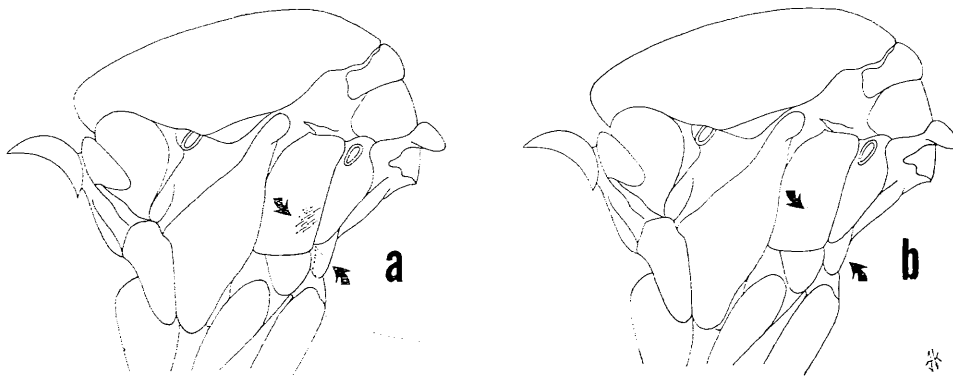


FIG. 11a, b.



FIG. 12a, b.



FIG. 13a, b.

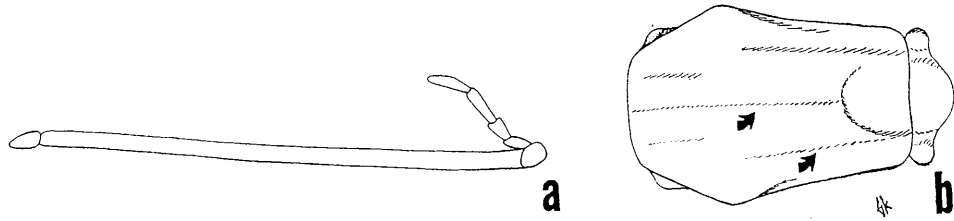


FIG. 14a, b.

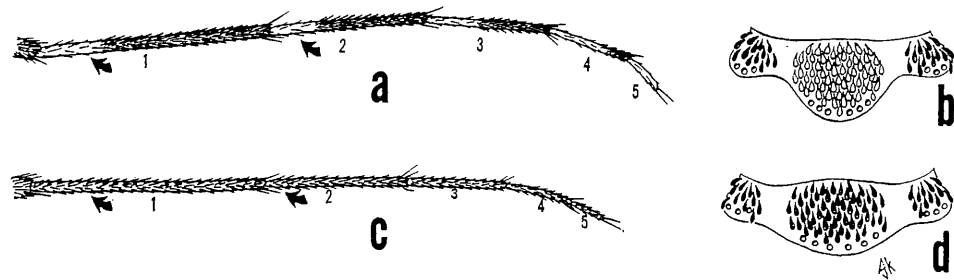


FIG. 15a, b, c, d.

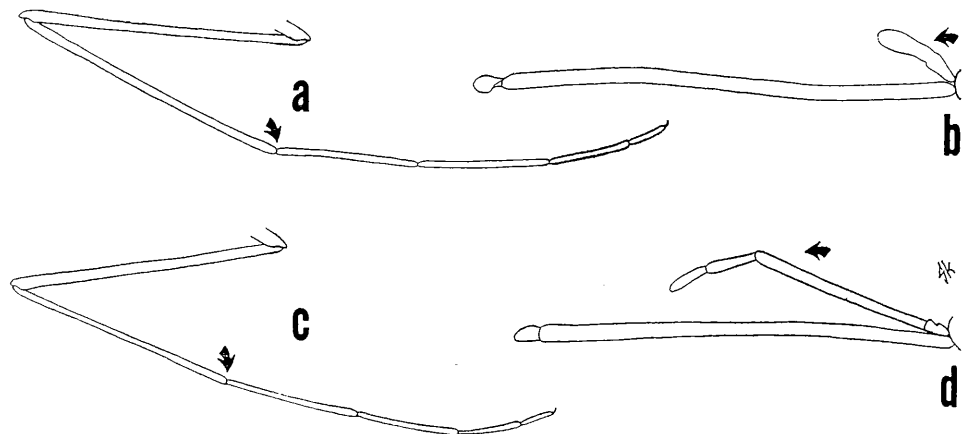


FIG. 16a, b, c, d.

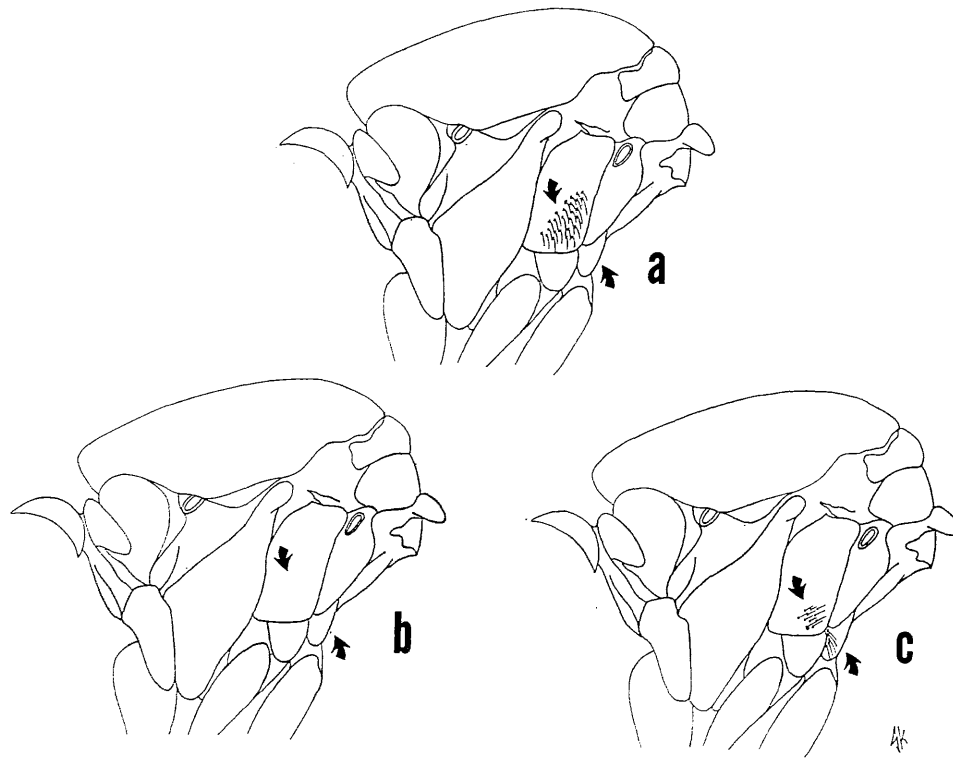


FIG. 17a, b, c.

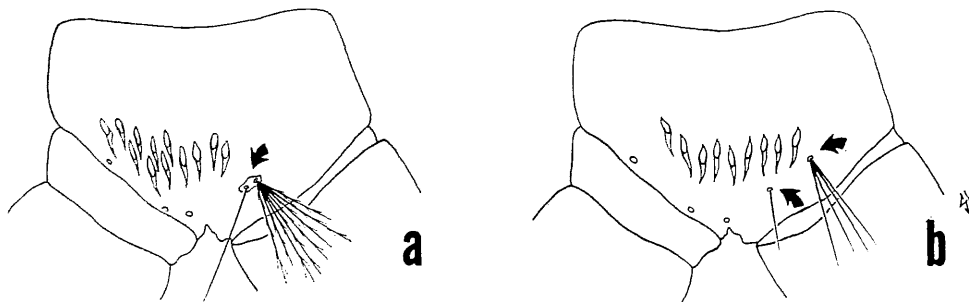


FIG. 18a, b.

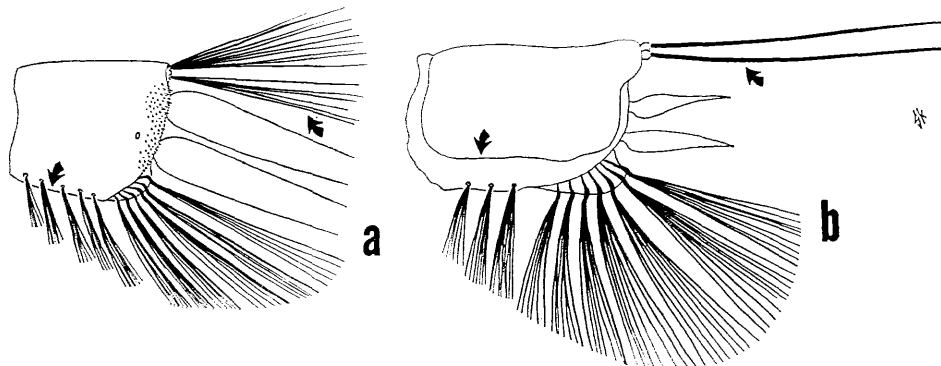


FIG. 19a, b.

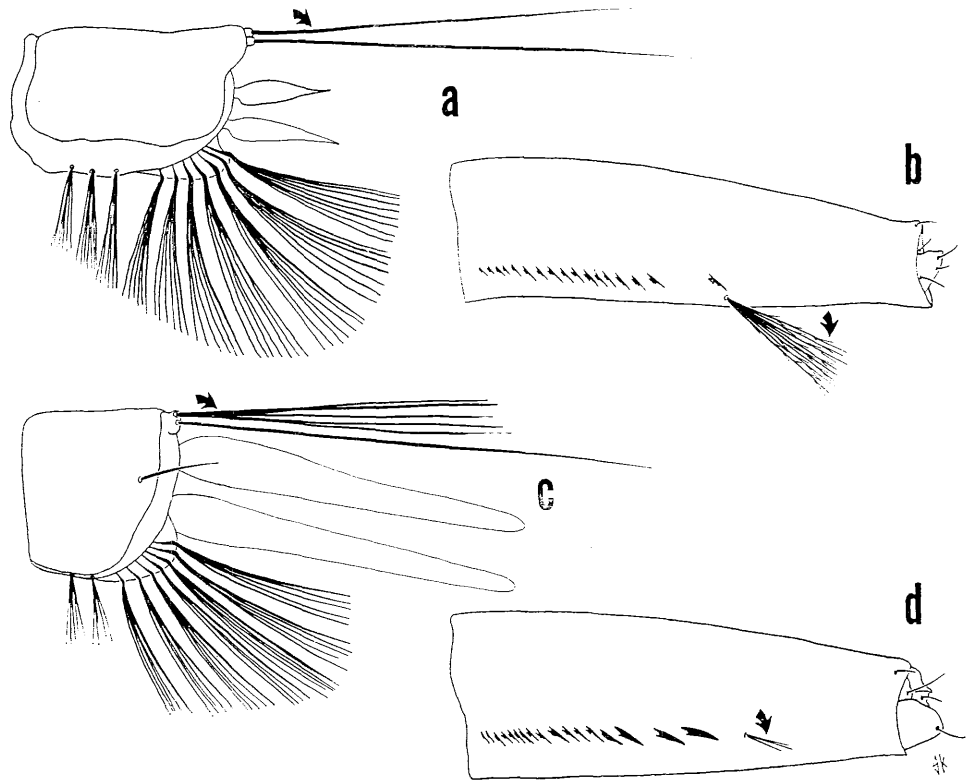


FIG. 20a, b, c, d.

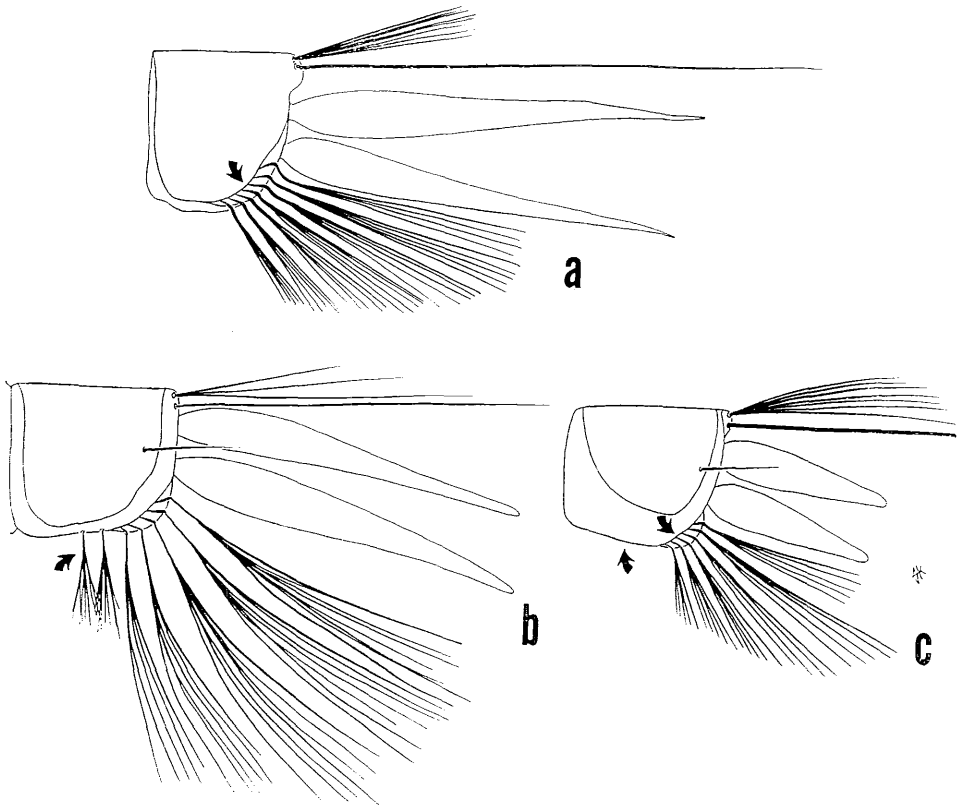


FIG. 21a, b, c.

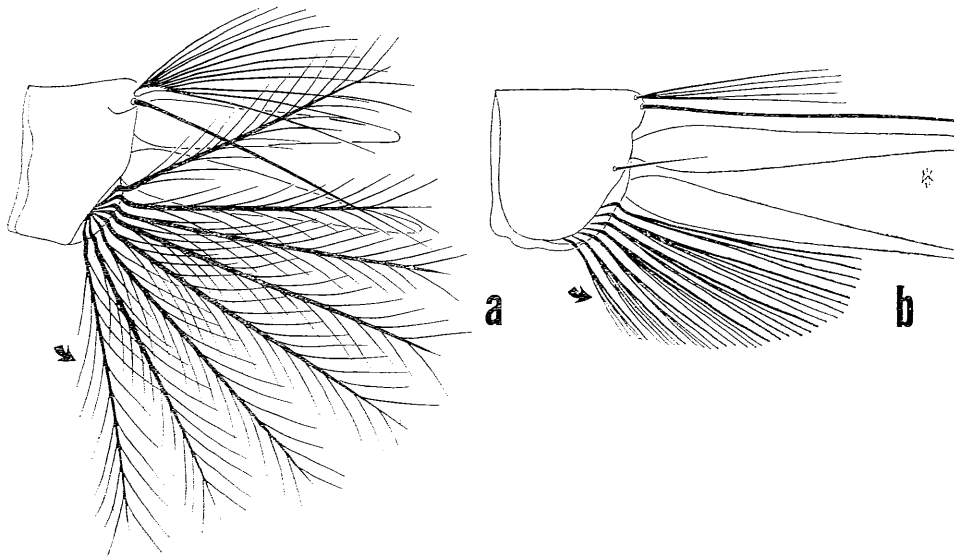


FIG. 22a, b.

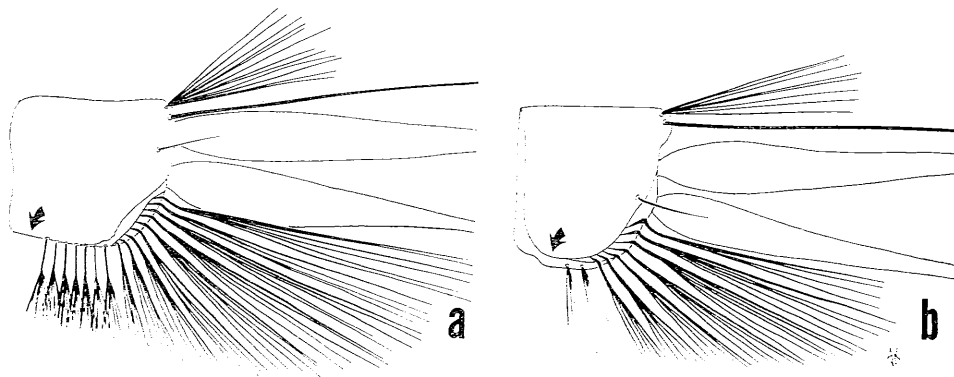


FIG. 23a, b.

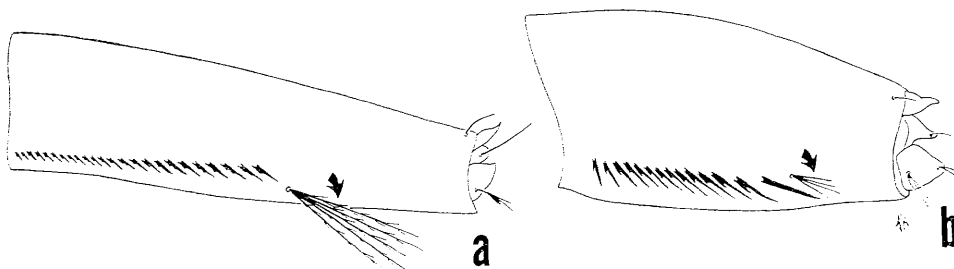


FIG. 24a, b.

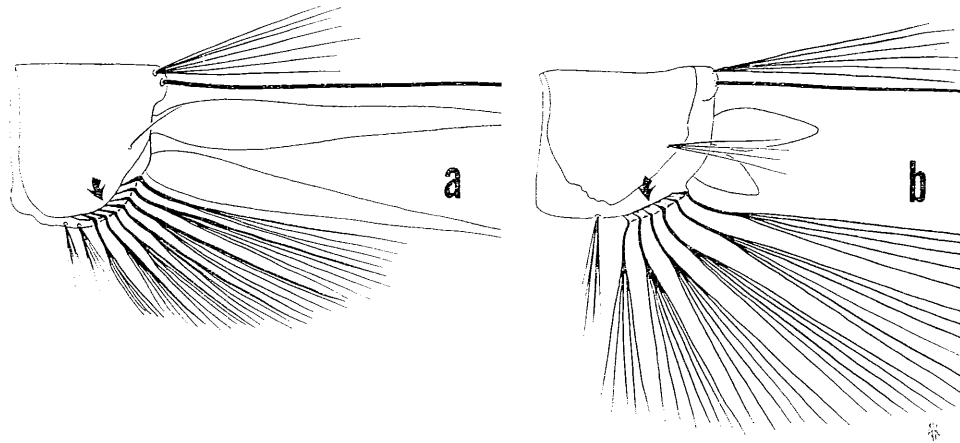


FIG. 25a, b.

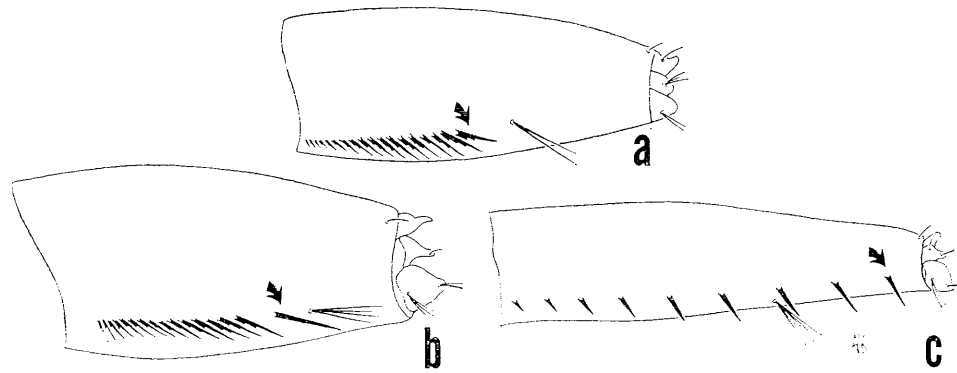


FIG. 26a, b, c.

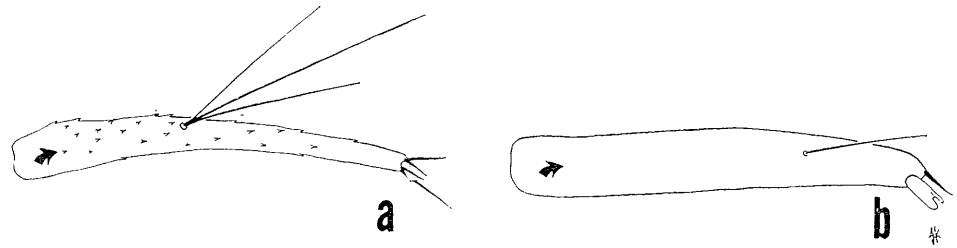


FIG. 27a, b.

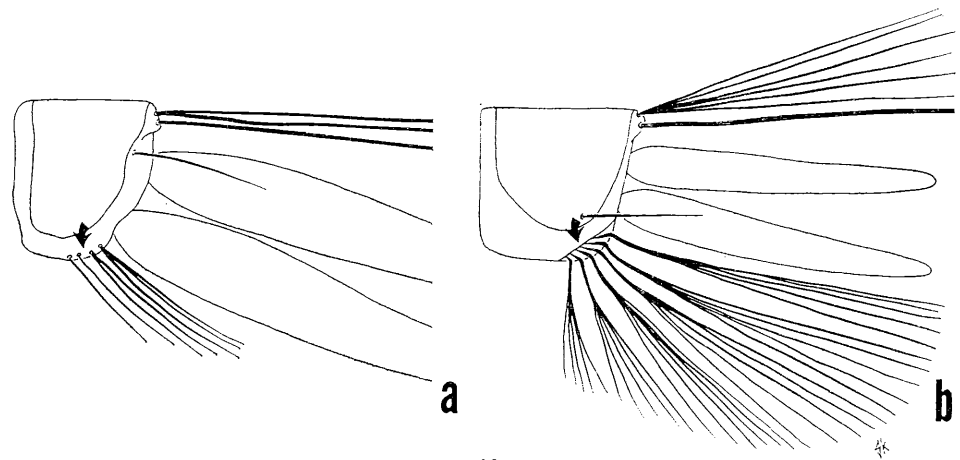


FIG. 28a, b.

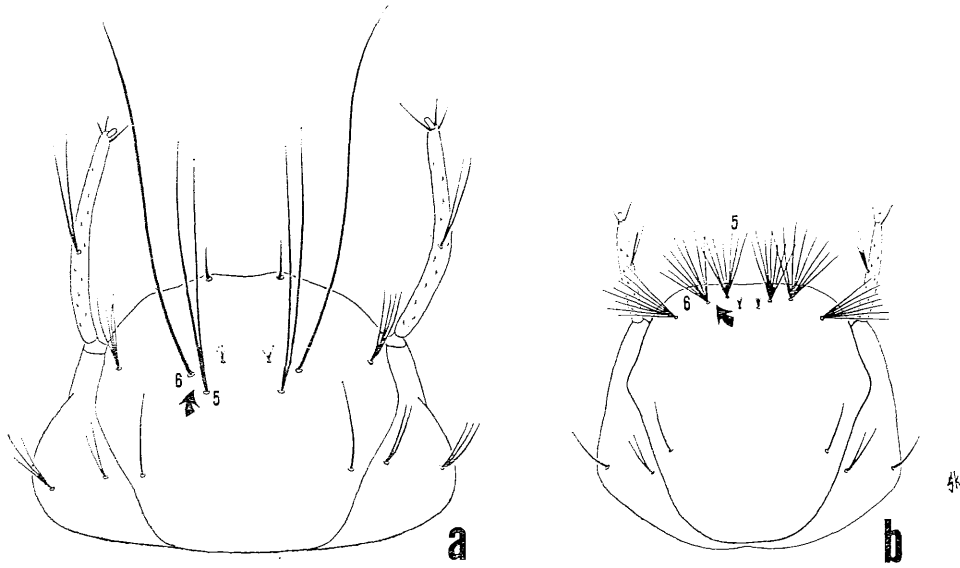


FIG. 29a, b.

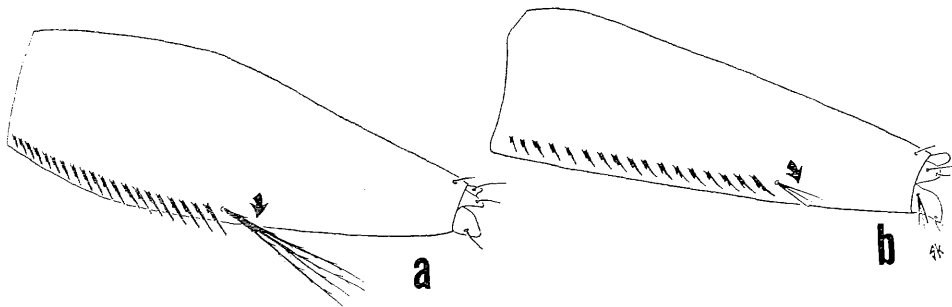


FIG. 30a, b.

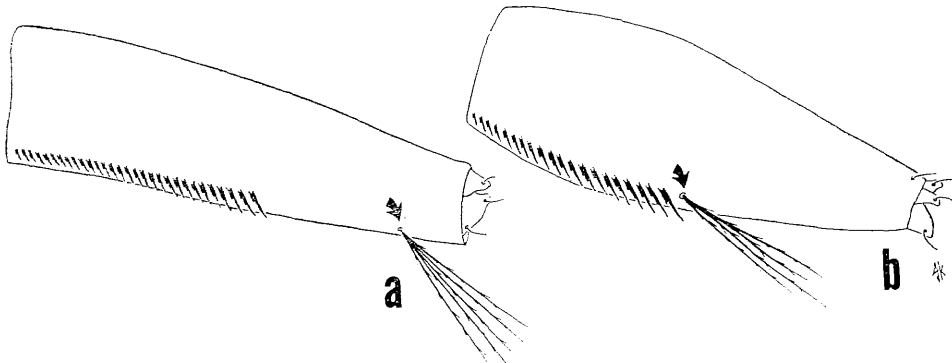


FIG. 31a, b.

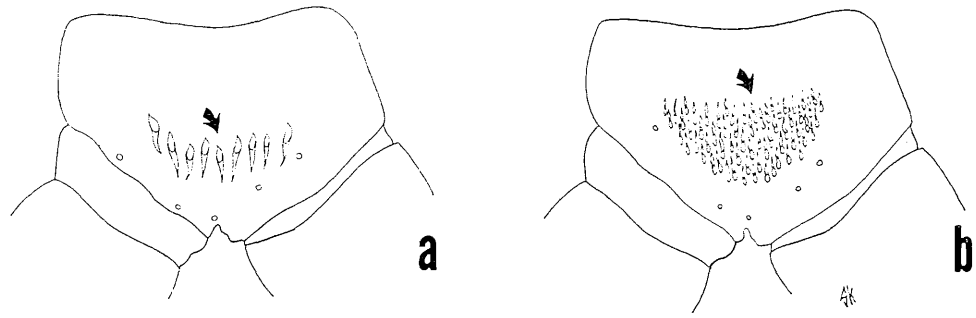


FIG. 32a, b.

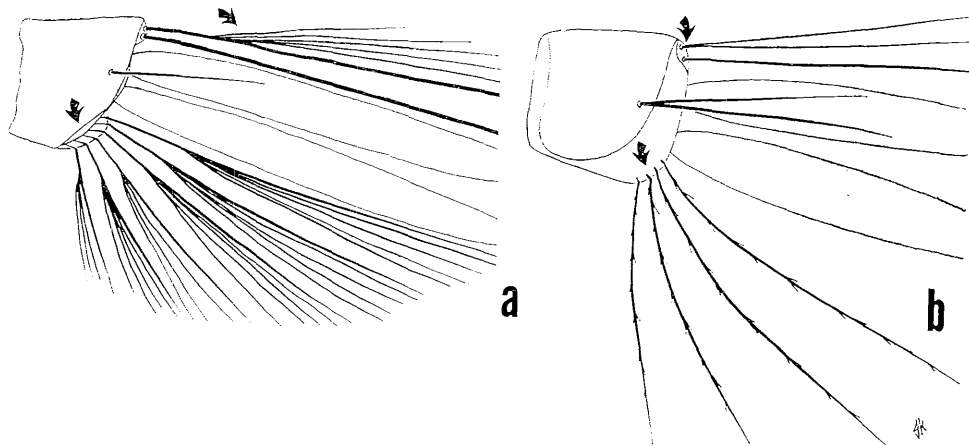


FIG. 33a, b.

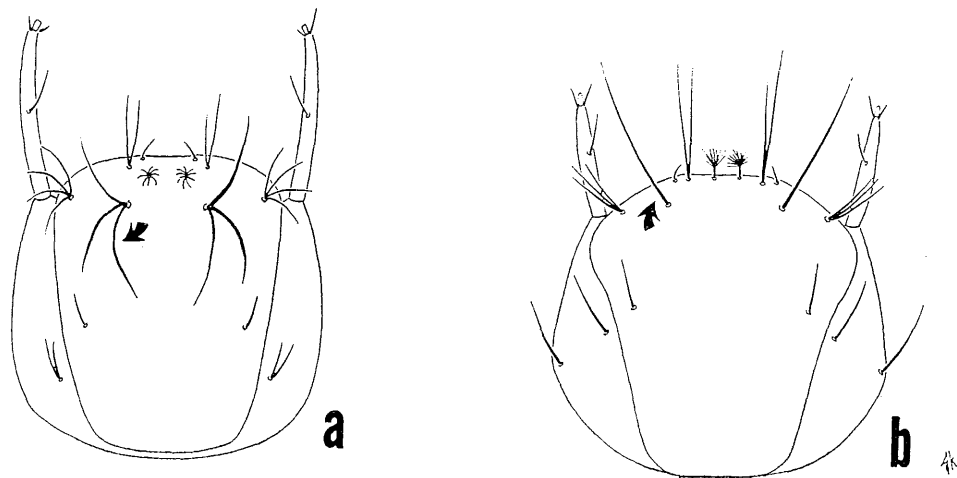


FIG. 34a, b.

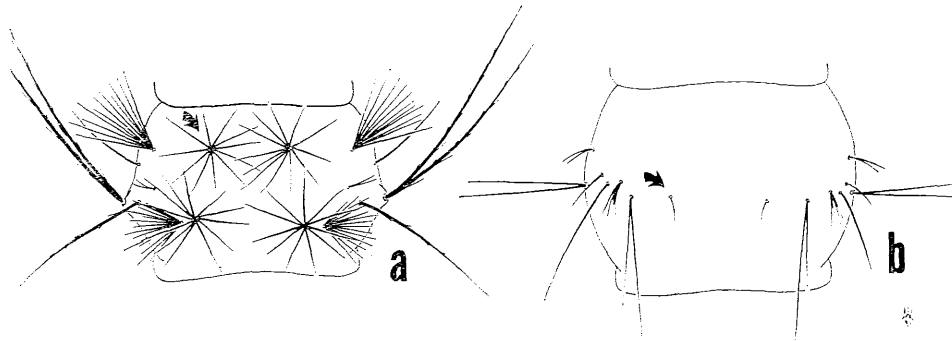


FIG. 35a, b.

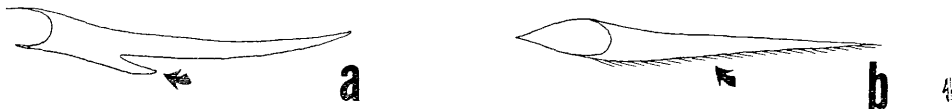


FIG. 36a, b.

-in part **Aedimorphus**
- Scutellum with narrow scales (FIG. 6b) 7
- 7. Paratergite with scales (FIG. 7a) 8
- Paratergite without scales (FIG. 7b) **Edwardsaedes**
- 8. Lower mesepimeron (*mep*) with bristle (FIG. 8a) **Huaedes**
- Lower mesepimeron (*mep*) without bristle (FIG. 8b) ...
-in part **Aedimorphus**
- 9. Erect scales numerous, not confined to occiput (FIG. 9a)10
- Erect scales confined to occiput (FIG. 9b).....12
- 10. Scutellum with broad scales on midlobe and narrow scales on side lobes; wing with all dark scales; hind tarsal segment 4 all dark, segment 5 all white (FIG. 10a & b) **Macleaya**
- Without this combination of characters.....11
- 11. Metameron with hairs; lower mesepimeron (*mep*) with numerous fine hairs (FIG. 11a).....**Geoskusea**
- Metameron without hairs; lower mesepimeron (*mep*) without hairs (FIG. 11b)in part **Finlaya**
- 12. Scutellum with broad scales at least on 1 lobe (FIG. 12a)13
- Scutellum with narrow scales on all lobes (FIG. 12b)....17
- 13. Scutellum with broad scales on midlobe, with narrow scales on side lobes (FIG. 13a).....**Leptosomatomyia**
- Scutellum with broad scales on all lobes (FIG. 13b) ...14
- 14. Palpus short, no more than 0.3 of proboscis; acrostichal and dorsocentral bristles absent (FIG. 14a & b) ...
- **Christophersiomya**
- Without this combination of characters.....15
- 15. Tarsi ringed; scutellum with silvery white broad scales at least on 1 lobe (FIG. 15a & b) ...**Stegomyia**
- Tarsi not ringed; scutellum with dark broad scales on all lobes (FIG. 15c & d)16
- 16. First hind tarsal segment at least as long as tibia; palpus short, no more than 1.7 of proboscis (FIG. 16a & b).....**Rhinoskusea**
- First hind tarsal segment shorter than tibia; palpus not short, at least 1.5 of proboscis (FIG. 16c & d) ...
- **Lorrainea**
- 17. Lower mesepimeron (*mep*) with hairs; metameron without hairs (FIG. 17a)**Verrallina**
- Lower mesepimeron (*mep*) without hairs; if with hairs the metameron also with hairs (FIG. 17b & c) ...

.....**Pseudoskusea**

Larvae (4th Instar)

- 1. Pentad hair 1-VIII and 2-VIII on common basal plate (FIG. 18a) 2
- Pentad hair 1-VIII and 2-VIII not on common basal plate (FIG. 18b) 4
- 2. Saddle complete; hair 3-X branched (FIG. 19a) ...
-**Edwardsaedes**
- Saddle incomplete; hair 3-X single (FIG. 19b) 3
- 3. Hair 2-X single; hair 1-S strongly developed (FIG. 20a & b).....**Mucidus**
- Hair 2-X branched; hair 1-S not strongly developed (FIG. 20c & d)**Aedimorphus**
- 4. Ventral brush with more than 6 pr of hairs or precratal tufts present (FIG. 21a & b) 5
- Ventral brush with no more than 6 pr of hairs; precratal tufts absent (FIG. 21c)10
- 5. Ventral brush with more than 6 pr of plumose hairs on grid and without precratal tufts (FIG. 22a) **Huaedes**
- Ventral brush with 5 or more pr of branched hairs on grid (FIG. 22b) 6
- 6. Saddle complete (FIG. 23a)in part **Ochlerotatus**
- Saddle incomplete (FIG. 23b) 7
- 7. Hair 1-S strongly developed (FIG. 24a) 8
- Hair 1-S not strongly developed (FIG. 24b) 9
- 8. Ventral brush with 7 pr of hairs on grid (FIG. 25a) ...
-in part **Ochlerotatus**
- Ventral brush with no more than 6 pr of hairs on grid (FIG. 25b)in part **Finlaya**
- 9. Pecten teeth evenly spaced, closely set, extending a little beyond middle of siphon (FIG. 26a)....in part **Finlaya**
- Pecten teeth with 1-3 posterior teeth more widely spaced than those preceding; if evenly spaced, the last tooth at least reaching to 0.75 of siphon (FIG. 26b & c) **Verrallina**
- 10. Antenna spicules present (FIG. 27a)11
- Antenna spicules absent (FIG. 27b)15
- 11. Ventral brush with 4 pr of hairs and without grid (FIG. 28a)**Christophersiomya**
- Ventral brush with 5-6 pr of hairs and with distinct grid (FIG. 28b).....12
- 12. Hair 5, 6-C both caudad of level of antenna (FIG.

- 29a)13
 Hair 5, 6-C never both caudad of level of antenna
 (FIG. 29b)in part **Finlaya**
13. Hair 1-S strongly developed (FIG. 30a)14
 Hair 1-S not strongly developed (FIG. 30b)...**Geoskusea**
14. Hair 1-S inserted far beyond last pecten tooth, at
 3/4 of siphon (FIG. 31a)**Rhinoskusea**
 Hair 1-S inserted not far beyond last pecten tooth, at
 about 1/2 of siphon (FIG. 31b)**Pseudoskusea**
15. Comb scales in a single row (FIG. 32a)16
 Comb scales in a patch (FIG. 32b)18
16. Ventral brush with 6 pr of hairs on grid; hair 2-X
 single at base, but with long hairs arising near its
 base along the dorsal side (FIG. 33a)
**Leptosomatomyia**
 Ventral brush with no more than 5 pr of hairs; hair
 2-X branched at base (FIG. 33b)17
17. Head hairs curved and drooping (FIG. 34a)...**Macleaya**
 Head hairs not curved and drooping (FIG. 34b) ...
**Stegomyia**
18. Thorax and abdomen with conspicuous stellate hairs
 (FIG. 35a)in part **Finlaya** (*kochi* group)
 Thorax and abdomen without conspicuous stellate
 hairs (FIG. 35b)19
19. Pecten tooth with lateral denticles (FIG. 36a) ...
in part **Finlaya**
 Pecten tooth very finely fringed to the tip along 1
 side (FIG. 36b)**Lorrainea**

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REFERENCES

- Assem, J. van den & J. Bonne-Wepster.** 1964. New Guinea Culicidae, a synopsis of vectors, pests and common species. *Zool. Bijdr.* **6**: 82-83.
- Belkin, J. N.** 1950. A revised nomenclature for the chaetotaxy of the mosquito larva (Diptera: Culicidae). *Amer. Midland Nat.* **44**(3): 678-98.
 1952. The homology of the chaetotaxy of immature mosquitoes and a revised nomenclature for the chaetotaxy of the pupa (Diptera, Culicidae). *Proc. Ent. Soc. Wash.* **54**(3): 115-29.
 1962. Mosquitoes of the South Pacific. I & II. 608 & 412 p. Univ. of Calif. Press, Berkeley and Los Angeles.
- Bick, G. H.** 1951. The ecology of the mosquito larvae of New Guinea. *Pacif. Sci.* **5**: 406-14.
- Brug, S. L.** 1932. Notes on Dutch East Indian mosquitoes. *Bull. Ent. Res.* **23**(1): 79-81.
- Edwards, F. W.** 1922. Mosquito Notes III. *Bull. Ent. Res.* **13**(1): 94-99.
- Huang, Y. M.** 1968. *Aedes* (*Verrallina*) of the Papuan Subregion (Diptera, Culicidae). *Pac. Ins. Mon.* **17**: 1-74.
- King, W. V. & H. Hoogstraal.** 1946. Three new species of *Aedes* from Netherlands New Guinea. *Proc. Ent. Soc. Wash.* **48**(4): 98-100.
- Mattingly, P. F.** 1957. The Culicine Mosquitoes of the Indomalayan Area. Part II. Genus *Heizmannia* Ludlow. Brit. Mus. (Nat. Hist.), London.
 1958. The Culicine Mosquitoes of the Indomalayan Area. Part III. Genus *Aedes* Meigen, subgenera *Paraedes* Edwards, *Rhinoskusea* Edwards and *Cancraedes* Edwards. Brit. Mus. (Nat. Hist.), London.
 1959. The Culicine Mosquitoes of the Indomalayan Area. Part IV. Genus *Aedes* Meigen, subgenera *Skusea* Theobald, *Diceromyia* Theobald, *Geoskusea* Edwards and *Christophersiomyia* Barraud. Brit. Mus. (Nat. Hist.), London.
 1961. The Culicine Mosquitoes of the Indomalayan Area. Part V. Genus *Aedes* Meigen, subgenera *Mucidus* Theobald, *Ochlerotatus* Lynch Arribalzaga and *Neomelaniconion* Newstead. Brit. Mus. (Nat. Hist.), London.
 1965. The Culicine Mosquitoes of the Indomalayan Area. Part VI. Genus *Aedes* Meigen, subgenus *Stegomyia* Theobald (Groups, A, B, and D). Brit. Mus. (Nat. Hist.), London.
- Penn, G. H.** 1947. The larva of *Aedes* (*Leptosomatomyia*) *aurimargo* (Diptera, Culicidae). *Proc. Ent. Soc. Wash.* **49**(4): 103-05.
 1949. The pupae of the mosquitoes of New Guinea. *Pacif. Sci.* **3**: 63-64.
- Peters, W.** 1958. Mosquitoes of New Guinea (Diptera: Culicidae). Part I. *Proc. Roy. Ent. Soc. Lond.* **27**: 90-91.
- Stone, A.** 1957. Notes on types of mosquitoes in the Hungarian National Museum (Diptera, Culicidae). *Ann. Ent. Soc. Amer.* **50**: 173.
 1961. A synoptic catalog of the mosquitoes of the world, suppl. 1. *Proc. Ent. Soc. Wash.* **63**(1): 37-43.
 1963. A synoptic catalog of the mosquitoes of the world, suppl. 2. *Proc. Ent. Soc. Wash.* **65**(2): 124-31.
- Stone, A., K. L. Knight & H. Starcke.** 1959. A synoptic catalog of the mosquitoes of the world (Diptera, Culicidae). *Thomas Say Found.* **6**: 135-211.
- Theobald, F. V.** 1903. Two new Australian Culicidae. *Entomologist* **36**: 154-56.
 1905. A catalogue of the Culicidae in the Hungarian National Museum with descriptions of new genera and species. *Ann. Nat. Mus. Hung.* **3**: 110-11.