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A REVISION OF THE CULICINE MOSQUITOES OF THE PHILIPPINES,
TRIBE CULICINI (DIPTERA, CULICIDAE)

A THESIS SUBMITTED TO THE GRADUATE SCHOOL OF THE
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IN ENTOMOLOGY
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By

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INTRODUCTION

Although much taxonomic work on the mosquito fauna has been carried out in the Philippines, the Culicine mosquitoes have not been monographed as a unit. Records of the description, distribution, bionomics, and relation to disease of the species are scattered throughout entomological and medical literature and are often inaccessible. Many of the species are poorly defined or inadequately described and illustrated. Little attempt has been made to study the larvae and pupae of many species, and species differentiation is primarily or entirely based on adult characters. A vast amount of material and information has accumulated over the years in connection with the malaria control program, the filariasis control work and at the present time with studies on mosquito-borne viruses in the Philippines. In view of this, there is a great need for a more comprehensive and readily available knowledge of the systematics, distribution, and bionomics of the vector species; and a thorough knowledge of the mosquito fauna of this area will materially contribute to a better understanding of the evolution of mosquitoes.

This study is a systematic treatment of all of the known species of the tribe Culicini from the Philippines, exclusive of the genus Aedes. The genus Aedes is not considered here since it has been adequately studied by Knight (1946, 1947 & 1949), Knight & Laffoon (1946), Knight & Rozeboom (1949), Knight & Hull (1951, 1952, 1953), Laffoon (1946), and Mattingly (1958, 1959, 1961).

All known stages of mosquitoes found in this area are redescribed and illustrated. Keys to the identification of the genera, subgenera and species are presented. A summary of available information on distribution, bionomics, and disease relations of all species are included. Much effort has been expended to include all references for each species recorded for the Philippines. The affinities and zoogeographical relationships of known Philippine species are briefly considered. Known distributions are presented in tabular forms.

A total of 99 species, 15 subgenera and 11 genera (exclusive of the Aedes) are included in this study, of which 36 are endemic to the Philippines. Six species are described as new, and 7 others are reported for the first time. The group with the largest number of species next to Aedes is the genus Culex, which has shown remarkable evolutionary development with 45 species, followed by Uranotaenia, Armigeres and Ficalbia; the rest are small genera containing only a few species. The following are changes in nomenclature: Uranotaenia reyi Baisas is proposed here as a synonym of U. ludlowae Dyar & Shannon; Culex palmi as C. annulirostris Skuse; C. salinus Baisas as C. sitiens Wiedemann, and C. confusus Baisas as C. mimulus Edwards. Culex laureli Baisas is resurrected from synonymy with C. malayi (Leicester), and C. josephinae Baisas from C. fraudatrix Theobald. Culex suborientalis Baisas is treated as a nomen dubium. Culex malayi and C. fraudatrix probably do not occur in the Philippines.

The present work is the first attempt to monograph the Culicine mosquito fauna of the Philippines as a whole. It is preliminary and largely descriptive in nature, and no groups have been intensely studied.

Much remains to be done on the composition and distribution of the mosquito fauna through intensive collection on every island. Several areas or islands are still poorly collected, or no collection has been made (fig. 2); many of the species are not adequately known, or one or more stages are unknown. The bionomics of most species are poorly known. Associations of the adults and immature stages are mostly presumptive; more individual rearings and detailed morphological studies of the immature stages are much needed.

METHODS AND TERMINOLOGY

This study is based largely upon the extensive pinned and slide specimen collection in the U. S. National Museum, Washington, D. C., and other material from the collections of the Bernice P. Bishop Museum, California Academy of Sciences, Johns Hopkins School of Hygiene & Tropical Medicine, and the Noona Dan Expedition 1961-62 collection in southern Palawan and Mindanao (Zoologisk Museum, Copenhagen).

The systematic treatment of the tribe Culicine is based on the Synoptic Catalogue of Mosquitoes of the World by Stone, Knight & Starcke (1959) and supplements by Stone (1961 & 1963), except that the genus Mansonia, as here recognized, is divided into two genera: Mansonia, with subgenera Mansonia and Mansonioides, and Coquillettidia, with subgenera Coquillettidia and Rhynchotaenia (see discussion of the genus, and Ronderos & Bachmann, 1963); and the genus Armigeres, with subgenera Armigeres and Leicesteria, subgenus Leicesteriomyia, is a synonym of Leicesteria as treated by Macdonald (1960).

The pupal and larval system of chaetotaxy and terminology of structural parts used in the key and text are largely those of Belkin (1962, vols. I & II). The Comstock-Needham system of wing venation and cell designation is used instead of the commonly used Loew system of numbering the longitudinal veins. Thus, longitudinal vein 1, longitudinal vein 2, with anterior branch 2.1 and posterior branch 2.2, and longitudinal vein 3 are R_1 , R_s (R_2 & R_3), and R_{4+5} of Comstock-Needham, respectively.

Whole larvae and pupae or cast skins mounted in balsam are used in this study. ♀ spermathecae and buccopharyngeal armature and ♂ genitalia

are cleared and mounted on microscope slides. Head and genitalia are cleared in KOH solution, washed in distilled water, dehydrated in alcohol through 95 per cent alcohol, phenol, then mounted in balsam; or very conveniently through phenol, phenol-balsam, then mounted in balsam. Terminology of structural parts and chaetotaxy used in the key are text are illustrated.

SYSTEMATIC ARRANGEMENT

The following systematic arrangement is that of Stone, Knight & Starcke (1959). Description and discussion of each genus precedes the treatment of the subgenus and its included species. Synonymy and references are listed chronologically. Species of doubtful occurrence, misdetermination, or erroneously recorded from the Philippines together with nomina nuda and nomina dubia are given at the end of each genus in which they are treated.

DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES*

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
FICALBIA (Ficalbia) ludlowae										X				Java ?
(Mimomyia) chamberlaini	X	X					X							India, Burma,Ceylon, Thailand, Sumatra, Java, Celebes, Tonkin, New Guinea, Queensland
hybrida	X									X				India, Ceylon,Assam, Thailand, Malaya, Java, Sumatra, Celebes, Borneo, Tonkin, New Guinea
(Etorleptomyia) elegans										X				Thailand, Malaya, Sumatra, New Guinea, New Britain, Solomon Is., Queensland
luzonensis	X	X								X				India, Ceylon, Java, Thailand, Malaya, Borneo, Tonkin, Hongkong, Taiwan, Okinawa
(Ravenalites) deguzmanae	X	X						X		X				Malaya ?, Andaman Is. ?
MANSONIA (Mansonioides) uniformis	X	X				X	X			X				Ethiopian, Oriental and Australian regions, Solomon Is., Japan, Ryukyu

* Exclusive of the genus Aedes

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
annulifera	X									X				Malaya, Thailand, New Guinea, Assam, India
annulata										X				Sumatra, Borneo, Malaya
dives		X								X				Borneo, Malaya, India, Indonesia, Hainan, Vietnam, New Guinea, Bismarck, Australia, Assam
COQUILLETIDIA (Coquillettidia) nigrosignata												X	X	Sumatra, Celebes, Malaya, Formosa
aureosquammata										X				Malaya, Sumatra
crassipes	X	X								X				Malaya, India, Assam, Borneo, Burma, Ceylon, Thailand, Yap Group, New Guinea, Caroline Is., Ryukyu
ochracea						X	X			X				India through SE Asia to North Japan
URANOTAENIA argyrotarsis		X	X						X	X				Malaya, Molluccas, New Guinea, Bismarck, Solomon Is.
clara		X								X				
arguellesi	X	X					X							
heiseri										X				
pylei	X									X				

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
testacea	X	X								X				Malaya, Thailand
lagunensis	X	X	X							X				
annandalei			X							X				India, Nepal, Burma, China, Formosa, Ryukyu, Okinawa
lateralis	X	X	X				X							India, Ceylon, Andaman Is., Malaya, Indonesia, New Guinea, Australia, Solomon Is., Bismarck, Borneo
ludlowae	X									X				
mendiolai	X	X								X				
rossi			X											
philippinensis	X	X								X				
nivea			X							X				Malaya
tubanguii	X	X						X		X				
bimaculata ?														Malaya, India, Thailand, China, Japan, Ryukyu, Formosa
pygmaea ?														Australia
HODGESIA malayi			X				X			X				Malaya, Ceylon, India, Molluccas, Indochina
quasisanguinae			X							X				Malaya, New Guinea, Celebes, Molluccas, Indochina

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
sanguinae ?														Africa
ZEUGNOMYIA														
fajardoi										X				
aguilari										X				
lawtoni	X									X				
gracilis	?													Malaya
ORTHOPODOMYIA														
maculipes			X											Andaman Is., Java, Malaya
andamanensis			X											Andaman Is., India, Malaya, Indonesia, New Guinea
mcgregori			X								X			
albipes ?														Malaya, India, Indochina, Borneo
anopheloides	X	X						X						India, Assam, Malaya, China, Japan, Ceylon
madrensis	X		X											Andaman Is., Malaya, Java, Thailand, Borneo, Sumatra
AEDEOMYIA														
catasticta	X	X	X					X		X				Oriental region, New Guinea, Solomon Is., Fiji, Marianas, Caroline Is.
HEIZMANNIA														
scintillans		X	X							X				Borneo, Sumatra, Malaya

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
ARMIGERES														
(Armigeres)														
apoensis										X				
aureolineatus**			X											Malaya, Ceylon, Thailand, Indochina, China, Borneo
baisasi	X	X			X	X	X	X	X			X		
manalangi	X	X								X				
ejercitoi	X									X				
joloensis	X	X	X		X	X				X		X		
malayi					X	X	X	X	X			X		Malaya, China, Thailand, Indochina, Assam, India, Borneo, New Guinea
setifer n. sp.			X											
subalbatus ?														Japan, China, Korea, Formosa, Ryukyu, Indochina, Thailand, Burma, India, Ceylon ?, Malaya ?
(Leicesteria)														
magnus	X	X								X				Ceylon, India, Burma, Malaya, Thailand, Java, Borneo, Indochina, Hongkong, Formosa
digitatus	X	X					X		X					Malaya, Thailand, Sumatra, Java, India

** New record

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
omissus**		X												Ceylon, India, Thailand, Formosa, Malaya
flavus	X													Burma, Thailand, Malaya, Java, Sumatra, Borneo, Formosa, China, Indochina
CULEX (Lutzia) fuscus	X	X	X				X			X		X		India, Ceylon, Andaman Is., Burma, Thailand, Malaya, Sumatra, Java, Borneo, Indochina, Formosa, USSR (Maritime Prov.), Korea, Japan, Palau Is., Caroline Is.
halifaxii	X	X	X	X	X	X				X		X		Malaya, India, Ceylon, Thailand, New Guinea, Bismarck, Solomon Is., Australia
(Neoculex) brevipalpis	X	X								X				India, Ceylon, Thailand, Indochina, China, Formosa, Ryukyu, Malaya, Indonesia, New Guinea, Bismarck
nematoides	?													
(Lophoceraomyia) josephinae	X	X				X				X				

** New record

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
lavatae	X	X								X				India, Ceylon, Burma, Andaman Is., Borneo, Sumatra
macdonaldi**		X												
mammilifer	X	X	X			X				X				
mindanaoensis										X				India, Burma, Thailand, Indochina, China, Ceylon ?
minor	X	X	X			X				X		X		
pachecoi	X													
reidi**			X											Malaya
rubithoracis	X	X												Malaya, India, Ceylon, Burma, Thailand, Sumatra, Java, Borneo, Formosa, Japan
uniformis**	X	X												Ceylon, Hainan Is., New Guinea
(Culiciomyia) fragilis	X	X				X	X			X				India, Ceylon, Malaya, Borneo, Thailand, - Bismarck, New Guinea, Solomon Is., Indonesia
nigropunctatus	X	X	X			X	X			X		X		Borneo, India, Ceylon, Thailand, Malaya, Sumatra, Java, Hainan Is., Ryukyu, Palau Is., Caroline Is.

** New record

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
pallidothorax**		X												India, Ceylon, Nepal, Burma, Thailand, Indochina, Malaya, China, Formosa, Ryukyu, Japan, Moluccas, New Guinea
papuensis**			X							X				New Guinea, Bismarck, Solomon Is.
spathifurca						X	X		X	X				Borneo, Java, Singapore, Malaya, Thailand, Ceylon, Maldiva Is.
(Mochthogenes) chiyutoi	X									X				
culionicus n. sp.				X										
latifoliatus n. sp.	X													
laureli	X	X	X			X	X			X				
tricontus n. sp.	X													
uncinatus n. sp.						X								
yeageri			X											
(Lophoceraomyia) cinctellus	X					X	X					X		Malaya, India, Sumatra, Java, Borneo, Hainan Is.
fulleri	X						X			X		X		
gibbulus n. sp.		X	X											

** New record

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
infantulus	X	X								X				China, Japan, Ceylon, India, Nepal, Maldive Is., Thailand, Java, Indochina
(Culex) annulus	X		X			X	X		X					China, Java, Malaya, Thailand
annulirostris	X	X					X							Indonesia, Australasian region
bitaeniorhynchus	X	X				X	X			X				Southern Palearctic, Ethiopian, Malagasy regions, New Caledonia, New Guinea, Palau Islands, Australia, Western Pacific
fasyi	X													
fuscocephalus	X	X				X	X	X		X				Ceylon, Burma, Java, India, Borneo, Sumatra, Malaya, Andaman Is., Thailand, Indochina, Formosa
gelidus	X	X	X		X	X	X			X				Nepal, Ceylon, Pakistan, India, Burma, Malaya, Formosa, China, Japan, Indochina, New Guinea
incognitus	X	X	X			X			X	X				
pseudovishnui**	X	X								X				Malaya, India, Thailand

** New record

(Continued) DISTRIBUTIONAL LIST OF PHILIPPINE CULICINE MOSQUITOES

	Philippine Islands											Other Localities		
	Luzon	Mindoro	Palawan	Culion	Balabac	Samar	Leyte	Negros	Calicoan	Mindanao	Basilan		Jolo	Tawi-Tawi
quinquefasciatus	X	X	X				X			X		X		Cosmotropical
mimulus	X		X		X		X			X	X	X		Borneo, Indonesia, Burma, Thailand, Malaya, Indochina, China, Ceylon, India, Nepal, New Guinea, Australia
sinensis	X													China, USSR (Maritime Prov.), India, Ceylon, Korea, Japan, Ryukyu, Formosa, Indonesia, Malaya, Thailand, Burma
sitiens	X	X	X				X		X	X		X		Oriental region, Okinawa, Africa, Madagascar, Australia, Pacific Is.
tritaeniorhynchus summosus	X	X	X			X	X			X		X		Formosa, Japan, Korea, China, Manchuria, Ryukyu, Indochina, Indonesia, Malaya, Thailand, India
whitmorei	X	X					X							Oriental region, China, Korea, USSR (Maritime Prov.), Japan, New Guinea

Tribe CULICINI

Belkin (1962) recognized the tribe Culicini to include only 2 genera: Culex, with subgenera Culex, Lutzia, Neoculex, Culiciomyia, Mochthogenes, and Lophoceraomyia as well as non-Philippine subgenera Acalleoemyia, Aallyntrum, Barraudius, Lasiosiphon, Aedinus, Carrollia, Eubonnea, Melanoconion and Microculex, and genus Deinocerites which is confined to the Neotropical region; while Edwards (1932) included the Sabethes group and all the genera listed below.

In the present study, the tribe Culicini as here recognized includes the following genera:

Subfamily Culicinae

Tribe Culicini

Genus Ficalbia (Subgenera Ficalbia, Mimomyia,
Etorleptiomyia & Ravenalites)

Genus Mansonia (Subgenus Mansonioides)

Genus Coquillettidia (Subgenus Coquillettidia)

Genus Uranotaenia

Genus Hodgesia

Genus Zeugomyia

Genus Orthopodomyia

Genus Aedeomyia

Genus Heizmannia

Genus Aedes

Genus Armigeres (Subgenera Armigeres & Leicesteria)

Genus Culex (Subgenera Lutzia, Neoculex, Mochthogenes,
Lophoceraomyia, Culiciomyia & Culex)

The Culicini are characterized as follows: Adults: Proboscis uniformly slender and flexible or somewhat swollen distally; palpus porrect, usually 5-segmented; antenna with torus (pedicel) swollen, always with 13 flagellomeres, strongly plumose in ♂. Scutellum always trilobed, each lobe bearing bristles or scales; other pleural scales or bristles usually strongly developed. Legs covered with broad scales; apical or subapical tibial spurs developed; claws with or without teeth in both sexes; pulvilli rudimentary except in Culex. Wing membrane with uniform microtrichia, decumbent and outstanding vein scales, and marginal fringe of different length along posterior border; alula fringed, rarely with scales; squama usually fringed with bristles or fine hairs. Wing venation as in figure 5. Haltere with bare basal stem and swollen distal knob covered with scales. Abdomen completely covered with broad flat scales; ♀ cercus strongly developed, usually 3 spermathecae, may be reduced to 2 or 1. ♂ genitalia variously developed; sidepiece often with lobes; clasper varied, usually with apical spine; phallosome more or less complex, with complex aedeagus; parameres usually developed; proctiger varied, often with cercal setae.

Pupa. Respiratory trumpet variable in position, rarely on distinct tubercle, wide or narrowed distally, always with distinct tracheoid. Metanotum with 3 pairs of hairs always present (C-10, 11 & 12). Abdominal segment I with h-1 developed, with numerous dendritic branches, rarely single or weak; segment II often with reduced chaetotaxy; III-VII usually complete (h-0, 1-11, 14); IX with h-0, 4, 9 & 14 present. Tergum IX represented by a median lobe between paddles, h-1 sometimes developed. Paddle variously developed, always movable at

base, usually with strong midrib and basal outer margin; the margin smooth, fringed with fine hairs or serrated; 1 or 2 apical hairs present or absent.

Larva. Head variable in size and shape; mental plate present and toothed; head capsule generally with 16 pairs of hairs, but h-2 often undeveloped and h-0 difficult to see; h-16 & 17 may be present as tiny spicules in some species. Antenna not segmented, but occasionally with a joint beyond subapical h-2 & 3. Prothorax with 15 pairs of hairs (h-0-14), h-13 often not developed; mesothorax with h-1-14 present; metathorax with h-1-13. Abdominal integument smooth or distinctly spiculate; segment I with h-0 & 8 not developed, h-12 may be missing; segment II-VII generally with 15 pairs (h-0-14); I & II with h-14 often not developed; segment VIII with h-0, 1-5 & 14 present. Comb teeth always present; siphon elongate, pecten teeth always present, rarely absent. Anal segment more or less cylindrical, dorsal brush or h-2 & 3 on prominent tubercle; saddle variously developed, lateral h-1 distad, accessory and ventral hairs present in Mansonia and Coquillettidia; ventral brush well developed, always present; anal papillae distinct and protruding.

KEY TO SUBFAMILIES, TRIBES AND GENERA

(ADULT)

1. Scutellum evenly rounded on posterior margin----- 2
 Scutellum more or less trilobed, and with distinct groups
 of bristles or scales----- Subfamily Culicinae, 3
- 2(1). Proboscis rigid, apical half strongly bent downward; palps
 short in both sexes----- Subfamily Toxorhynchitinae

- Proboscis flexible, straight, parallel to body axis;
- palps long in both sexes----- Subfamily Anophelinae
- 3(1). Spiracular bristles or scales absent----- Tribe Culicini, 4
- Spiracular bristles or scales present----- Tribe Sabethini
- 4(3). Anal vein short, ending about level with base of fork of
cubitus----- 5
- Anal vein long, ending well beyond base of fork of
cubitus----- 7
- 5(4). Cell R_2 always shorter than vein R_{2+3} -----
----- Uranotaenia F. Lynch-Arribalzaga
- Cell R_2 about as long as vein R_{2+3} or longer----- 6
- 6(5). Outstanding scales on wing veins emarginate at tips;
dorsocentral bristles present; scutellar lobes
unornamented----- Hodgesia Theobald
- Outstanding scales on wing veins sparse and normal in
shape; scutellar lobes with flat, silvery scales;
dorsocentral bristles lacking----- Zeugomyia Leicester
- 7(4). Postspiracular area with bristles or scales----- 8
- Postspiracular area bare, lacking bristles or scales----- 10
- 8(7). Wing scales unusually broad, asymmetrical; ♀ abdominal
tergum VIII with a row of teeth; ♂ palpus with
terminal segment minute----- Mansonia (Mansonioides)
- Wing scales narrow; lacking teeth on tergum VIII of ♀;
♂ palpus with last segment subequal to the penultimate
segment----- 9

- 9(8). Postspiracular area with broad scales; ♀ palpus long,
 about one half the length of proboscis-----
 ----- Armigeres (Leicesteria)
 Postspiracular area with bristles; ♀ palpus very short,
 about one fourth the length of proboscis----- 11
- 10(7). Anterior pronotal lobes unusually large; postnotum with
 a group of short bristles; dorsocentral and acrostichal
 bristles absent----- Heizmannia Ludlow
 Anterior pronotal lobes small; no postnotal bristles;
 dorsocentral and acrostichal bristles present----- 12
- 11(9). Lower mesepimeral bristles present; tarsi unmarked-----
 ----- Armigeres (Armigeres)
 Lower mesepimeral bristles absent; tarsi conspicuously
 banded----- Aedes (part)
- 12(10). Femora large and flattened with prominent scale tufts
 apically; antennal segments short and thick-----
 ----- Aedeomyia Theobald
 Femora normal, without apical tufts; antennal segments
 slender----- 13
- 13(12). Tarsomere IV of fore leg markedly short, tarsomere I
 longer than the length of tarsomeres II-V-----
 ----- Orthopodomyia Theobald
 Tarsomere IV not as short, tarsomere I about as long as
 the length of tarsomeres II-V----- 14
- 14(13). Proboscis swollen apically, usually bent upward-----
 ----- Ficalbia Theobald

- Proboscis not swollen, straight----- 15
- 15(14). Pulvilli large and well developed; cell R₂ usually longer
 than its stem----- Culex Linnaeus
- Pulvilli absent; cell R₂ about as long as its stem-----
 ----- Coquillettidia (Coquillettidia)

KEY TO SUBFAMILIES, TRIBES AND GENERA

(PUPA)

1. Paddle with outer margin broad, produced posteriorly
 beyond termination of midrib; lacking apical hair-----
 ----- Subfamily Toxorhynchitinae
- Paddle rounded or emarginate at apex of midrib; apical
 hairs present or absent----- 2
- 2(1). Abdominal lateral h-9 on segments IV-VII spine-like,
 dendritic on segment VIII; paddle with apical and
 subapical hairs----- Subfamily Anophelinae
- Abdominal lateral h-9 on segments IV-VII usually weak
 and hair-like, and branched on segment VIII; paddle
 hairs if present apical----- Subfamily Culicinae, 3
- 3(2). Paddle small, lacking apical hair, the margin usually
 smooth----- Tribe Sabethini
- Paddle large, apical hairs usually present, the margin
 fringed or serrated----- Tribe Culicini, 4
- 4(3). Respiratory trumpet modified for piercing or attachment
 to water plants----- 5
- Respiratory trumpet simple, not modified----- 6

- 5(4). Hair 1 (float hair) of abdominal segment I large,
 dendritic or with paddle pointed at tip-- Ficalbia (Mimomyia)
 Hair 1 (float hair) of abdominal segment I reduced to a
 minute seta; the paddle notched or rounded at tip----- 7
- 6(4). Respiratory trumpet long and slender; the paddle usually
 elongate and narrow, with fringe or serrated margin-----
 ----- Ficalbia (Ravenalites and Etorleptiomyia)
 Respiratory trumpet short and rarely long; the paddle
 short and broad----- 8
- 7(5). Abdominal setae small and inconspicuous, the posterior
 margin of terga finely serrated; paddle deeply
 serrated, the apex notched-- Coquillettidia (Coquillettidia)
 Abdominal setae strong and some are spine-like, the
 posterior margin of terga smooth; paddle finely
 serrated, the apex rounded-----
 ----- Mansonia (Mansonioides)
- 8(6). Hair 1 of abdominal segments III-VII single; h-9 on
 segment VIII weak; paddle with one long apical hair-----
 ----- Heizmannia Ludlow
 Hair 1 of abdominal segments III-VII many branched; h-9
 well developed with many branches----- 9
- 9(8). Paddle deeply emarginate at apex of midrib with one long,
 thickened apical hair; h-9 on segments VII-VIII with two
 or three strong branches----- Aedeomyia Theobald
 Paddle not as deeply emarginate, with simple or branched
 apical hairs; h-9 on segments VII-VIII varied----- 10

serrated; h-9 on segment VII weak, h-9 on segment
VIII with many branches----- Aedes (part)

KEY TO SUBFAMILIES, TRIBES AND GENERA

(LARVA)

1. Siphon absent; clypeal h-1 well developed; body
dorsally with well developed palmate or lanceolate
hairs and median sclerotized tergal plates-----
----- Subfamily Anophelinae
Siphon present; clypeal h-1 small, sometimes not
distinct; body without palmate hairs and tergal plates---- 2
- 2(1). Mouth brushes reduced to about 10 lamellae with hooked
tips; thorax with strongly sclerotized plates bearing
thick spinose bristles; abdominal segment VIII
without comb teeth but with large lateral plates
bearing two strong bristles----- Subfamily Toxorhynchitinae
Mouth brushes composed of numerous fine hairs (except
in Aedes (Mucidus) and Culex (Lutzia) which are
modified for predacity); thorax without heavy
sclerotized plates; abdominal segment VIII with comb
teeth, with or without lateral plates-----
----- Subfamily Culicinae, 3
- 3(2). Ventral brush (h-4) of anal segment composed of a
single pair of hairs; siphon with one or two rows
of pecten teeth and several pairs of hair tufts
present----- Tribe Sabethini

- Ventral brush (h-4) composed of two to several pairs of
hairs; siphon with a single row of pecten teeth and
one or more pairs of hair tufts present--- Tribe Culicini, 4
- 4(3). Siphon modified for piercing plant tissues----- 5
Siphon not modified for piercing----- 6
- 5(4). Head h-4, 5 & 6 conspicuously long, with many plumose
branches; antenna long and jointed, spiculate
basally; siphon with one or two pecten teeth-----
----- Ficalbia (Mimomyia)
- Head h-4, 5 & 6 very short, consisting of branched
tufts, and not reaching anterior margin of head;
antenna short and smooth; siphon lacking pecten
teeth----- 7
- 6(4). Siphon with only one pair of hair tufts----- 8
Siphon with four or more pairs of hair tufts---- Culex Linnaeus
- 7(5). Saddle with a row of ventral hairs; with at most two
rod-like, blunt comb teeth; flagellar portion of
antenna comparatively short and rigid-----
----- Mansonia (Mansonioides)
- Saddle without ventral hairs but with short scattered
accessory hairs; comb teeth more than two, may be
sharply pointed spines or scale-like; flagellar
portion of antenna longer and flexible-----
----- Coquillettidia (Coquillettidia)
- 8(6). Antenna greatly enlarged, strongly curved and hairy;
siphon and anal segment hairy----- Aedeomyia Theobald

- Antenna slender, may be smooth or spiculate; siphon
and anal segment smooth----- 9
- 9(8). Antenna jointed and freely articulated, except in
Ficalbia (Ficalbia); spiculate basally; siphon with
one or two pecten teeth, the valves with spines or
hooks----- Ficalbia (Ficalbia, Etorleptiomyia & Ravenalites)
Antenna simple, not jointed; siphon with or without
pecten teeth, the valve lacking hooks----- 10
- 10(9). Siphon short, about as long as broad, lacking pecten
teeth----- Armigeres Theobald
Siphon elongate usually with pecten teeth----- 11
- 11(10). Abdominal segments VII-VIII with sclerotized dorsal
plates; siphon lacking pecten teeth-- Orthopodomyia Theobald
Abdominal segment VII lacking plate, segment VIII
usually with lateral plate bearing comb teeth----- 12
- 12(11). Siphon tuft arising very near base of siphon, the pecten
teeth long and pointed; abdominal segment VIII
lacking lateral plate----- Hodgesia Theobald
Siphon tuft arising at about middle or beyond last apical
pecten tooth----- 13
- 13(12). Segment VIII with large sclerotized plate bearing comb
teeth; pecten teeth mostly scale-like-----
----- Uranotaenia F. Lynch-Arribalzaga
Segment VIII lacking sclerotized plate, and with rows of
comb teeth; pecten teeth spine-like-----14

- 14(13). Comb teeth arranged in a triangular patch; mouth
brushes stout and pectinate----- Aedes (part)
Comb teeth arranged in irregular rows; mouth brushes
simple or pectinate----- 15
- 15(14). Comb teeth simple without lateral denticles or fringe;
mouth brushes pectinate; head h-5 & 6 single-----
----- Zeugomyia Leicester
Comb teeth mostly fringed laterally or scale-like;
mouth brushes simple; head h-5 & 6 strongly developed
with many branches----- Heizmannia Ludlow

Genus FICALBIA Theobald

Ficalbia Theobald, 1903. Monogr. Cul. 3: 296. Type species:

Uranotaenia minima Theobald. By subsequent designation
(Brunetti, 1914).

Ingramia Edwards, 1912. Bull. ent. Res. 3: 43. Type species:

Mimomyia malfeyti Newstead. By original designation.

Mattingly (1957a) and Mattingly & Grjebine (1958) gave full systematic treatment of the genus and recognized 10 species and infra-specific forms in 4 subgenera of the Indo-malayan Area: Etorleptiomyia Theobald, Mimomyia Theobald, Ficalbia s. str. and Ravenalites Doucet. Six species in all subgenera are present in the Philippines: (Ficalbia) ludlowae Brunetti, (Mimomyia) chamberlaini (Ludlow) and (M.) hybrida (Leicester), (Etorleptiomyia) elegans (Taylor) and (E.) luzonensis (Ludlow), and (Ravenalites) deguzmanae Mattingly.

The genus Ficalbia is fairly easily recognizable by the characters of the alula which is bare in Mimomyia and with a patch of broad scales in Ravenalites, fringed with narrow scales in Ficalbia and Etorleptiomyia. They are further distinguished by having the squama fringed with long setae except in Ravenalites with few broad scales which are sometimes lost by rubbing. The resemblance to Coquillettidia and Mansonia is suggested by the modification of the larval siphon and pupal respiratory trumpets of some Mimomyia for piercing plant tissues and the long second joint of the larval antennae.

Other distinguishing characters of the genus are as follows:

Proboscis swollen apically; spiracular and postspiracular bristles

absent; dorsocentral bristles well developed except in Mimomyia; lower mesepimeral bristles absent; ♀ palpi short and not more than 1/3 the length of proboscis; ♂ palpi longer than proboscis; wing scales broad, the anal vein reaching well beyond level of fork Cu; claws simple; pulvilli absent; ♀ buccopharyngeal armature lacking, and with one or three spermathecae. ♂ sidepiece with subapical lobe, the basal lobe poorly developed; clasper simple and slender; claspette absent; aedeagus simple. Pupae with respiratory trumpets longer and narrower than in most genera, the paddles elongate and very varied; abdominal h-1 on segment I reduced in Etorleptiomyia and Ravenalites. Larvae with exceptionally long frontal hairs; the pecten teeth much reduced, with at most 4 teeth and sometimes absent.

Distribution:

Ethiopian and Oriental regions, and through the Australasian region (New Guinea, New Britain, the Solomons and Queensland).

Habitats and relation to disease:

The breeding places are varied but usually in organic containers or in ground water with abundant vegetation except subgenus Ravenalites which breeds in tree holes and plant axils. The eggs are laid in clusters and attached to aquatic plants. Some species have been known to enter houses to bite man (Mattingly, 1957b).

Key to species (Adult)

1. Wing with broad pale and dark scales; postspiracular area
with a patch of scales; squama fringed with fine setae-----
----- (Etorleptiomyia) 2

- Wing scales dark; postspiracular area bare; squama fringed or
with scales----- 3
2. Abdominal terga largely pale with conspicuous median dark
stripe dorsally; hind tarsomere II with two well separated
dark spots; proboscis narrowly dark apically-- luzonensis (Ludlow)
Abdominal terga largely dark, with small patches of pale
scales dorsally; hind tarsomere II with broad dark band;
proboscis broadly dark apically----- elegans (Taylor)
3. Alula bare, squama fringed with setae; cell R_2 shorter than
stem vein R_{2+3} and equal in length to cell M_2 ----- (Mimomyia) 4
Alula and squama fringed or with scales; cell R_2 varied----- 5
4. Mesonotum dark brown, the integument yellow along lateral
margin and with patch of golden setae above wing base; hind
tarsomere V completely pale----- chamberlaini (Ludlow)
Mesonotum uniformly dark; legs dark, unbanded-- hybrida (Leicester)
5. Alula with a patch of broad scales and squama with few
scales which are sometimes lost by rubbing; cell R_2
about 1/3 longer than stem vein R_{2+3} -----
----- (Ravenalites) deguzmanae Mattingly
Alula and squama fringed with long setae; cell R_2 about 1/2
longer than stem vein R_{2+3} ----- (Ficalbia) ludlowae Brunetti

Key to known larvae

1. Antenna with the apical joint freely articulated; the distal
margin or dorsal plate (saddle) spinose----- 2
Antenna entire, not jointed; the distal margin of dorsal
plate smooth----- Ficalbia s. str.

2. Apical and subapical hairs of antenna branched; the thoracic
and abdominal setae dense and strongly stellate-----
----- (Ravenalites) deguzmanae Mattingly
Apical and subapical hairs of antenna simple and single;
thoracic and abdominal setae not stellate----- 3
3. Siphon modified for piercing; the second joint of antenna
greatly elongated----- (Mimomyia) hybrida (Leicester)
Siphon not modified; the second joint of antenna short----- 4
4. Siphon with one or two pecten teeth; clypeal h-1 slender and
simple----- (Mimomyia) chamberlaini (Ludlow)
Siphon lacking pecten teeth; clypeal h-1 with basal lateral
spine----- (Etorleptomyia) luzonensis (Ludlow)

Larvae of F. ludlowae unknown, and F. elegans not available.

Subgenus FICALBIA s. str.

Subgenus Ficalbia s. str. is the least known of the four subgenera in the Oriental region and only two species are known to occur in this area. F. ludlowae Brunetti has been reported only from the Philippines, and its occurrence in Java is doubtful. The subgeneric description here is as given for the species; the distinguishing characters are as mentioned in the key.

Distribution:

West Africa to Hongkong.

Habitats:

Ground pools and swamp edges, usually with abundant vegetation but sometimes without (Mattingly, 1957a).

Ficalbia (Ficalbia) ludlowae Brunetti

Ludlowia minima Ludlow, 1907. Canad. Ent. 39: 413 (♂♀, preoccupied).

Type loc: Cudarangan, Mindanao (U. S. National Museum).

Ficalbia ludlowi Brunetti, 1920. Rec. Indian Mus. 17: 173 (nom. nov.

for minima Ludlow non Theobald, 1910); Bohart, 1945. USNavmed 580, p. 39 (key, resurr. from syn. with hybrida, subgenus Mimomyia).

Ficalbia (Ficalbia) ludlowae Brunetti. Mattingly, 1957. Cul. Mosq.

Indomalayan Area I, p. 29 (♀, transfer to subgenus Ficalbia);

Stone & Knight, 1957. J. Wash. Acad. Sci. 47(6): 197 (♀ lectotype).

The following brief description is based on ♀ lectotype; the larva and pupa are unknown. Flagellomere I of antenna very long, about four times as long as the second. Vertex with yellowish decumbent scales,

few upright brown scales confined to nape. Scutellum with narrow scales. Mesonotal and pleural integument dark brown, scales lost. Alula and squama fringed with setae. Legs dark, the apices of femora and tibiae pale somewhat golden. Tergites with narrow pale basal band, broadening into basal lateral spots; one large spermatheca. (Note on type specimen: portion of foreleg and abdomen mounted on slide, half pair of fore, mid, and hind legs lost, one antenna, wing and both palpi missing, thoracic scales rubbed off).

Material examined:

♀ lectotype, Cudarangan, Mindanao, January, C. S. Ludlow.

Recorded distribution:

Mindanao; the record from Java is doubtful.

Habitats:

The early stages and breeding places are unknown.

Subgenus MIMOMYIA Theobald

Mimomyia Theobald, 1903. Monogr. Cul. 3:304. Type species: Mimomyia splendens Theobald. By monotypy.

Ludlowia Theobald, 1907. Monogr. Cul. 4:193. Type species: Mimomyia chamberlaini Ludlow. By subsequent designation (Brunetti, 1914).

Conopomyia Leicester, 1908. Cul. Malaya 3: 113. Type species: Conopomyia metallica Leicester. By subsequent designation (Brunetti, 1914).

For complete synonymy see Stone, Knight & Starcke (1959, p. 97).

Mattingly (1957a) recognized four species and named infraspecific forms of subgenus Mimomyia from the Indomalayan area. The Philippine species included are F. chamberlaini (Ludlow) and F. hybrida (Leicester). The subgenus is characterized by the following: Flagellomere I of ♀ antenna about twice as long as second. Acrostichal bristles absent; postspiracular area bare. Squama fringed with setae; alula bare; cell R_2 shorter than stem vein R_{2+3} and equal in length to cell M_2 (fig. 8). Three ♀ spermathecae present; ♂ aedeagus lightly sclerotized. Pupal respiratory trumpet not as long as in other subgenera; paddle broad, ovate, the distal margin strongly serrated, with one apical hair; abdominal h-1 of segment I large and serrated, with one apical hair; abdominal h-1 of segment I large and branched. Larva with antennal joints freely articulated, the terminal and subterminal setae single; siphon with one to three pecten teeth.

Ficalbia (Mimomyia) hybrida (Leicester)

Conopomyia hybrida Leicester, 1908. Cul. Malaya 3: 115 (♂♀). Type

loc: Kuala Lumpur, Malaya (British (Nat. Hist.) Museum).

Ficalbia (Mimomyia) hybrida (Leicester). Mattingly, 1957. Cul. Mosq.

Indomalayan Area I, p. 38 (♂♀, P, L, fig., key); Mattingly &

Grjebine, 1958. Mem. Inst. Sc. Madagascar 9: 277 (♂ lectotype).

A very different species from other members of the Ficalbia by the modified respiratory trumpet of the pupa and by the modified siphon and antenna of the larva. The adult differs from F. chamberlaini by the following (based on a single ♀ specimen):

♀. Head: Vertex pale, the scales mostly decumbent with few upright brown ones confined to nape. Palpus very short, about 1/8 the length of proboscis. Thorax: Mesonotal scales mostly dark brown with few golden scales on prescutellar area; mesonotal bristles lacking; anterior pronotal lobe with a row of dark brown bristles; posterior pronotal area with scattered narrow scales. Wing: Cell R₂ shorter than stem vein R₂₊₃ and equal in length to cell M₂. Legs: Mainly dark, venter of femora and tibiae extensively pale. Abdomen: Terga dark brown with narrow pale basal band; sterna mostly pale.

♂ and pupa. Not available for description.

Larva. Clypeal h-1 elongate and simple; head h-4 weak, 4-6 short branches, h-5, 6 & 7 well developed, with 6-14 long pilose branches; antenna spinose at basal segment, the second segment freely articulate and greatly elongated, the apical and subapical hairs single. Thoracic and abdominal lateral hairs well developed; comb teeth few in a single

row, simple and pointed; siphon modified for piercing, with one or two pecten teeth in some specimens; anal segment long with the saddle complete, the distal edge spinose, and one very long lateral h-1.

Material examined:

Series of larvae (large "tangle"), Agricultural School, Munoz, Nueva Ecija, Luzon, 8.VI.1945 (D. F. Bray); ♀ (as Ludlowia minima Ludlow), Cudarangan, Mindanao.

Recorded distribution:

Mindanao (as Ludlowia minima), India, Ceylon, Assam, Thailand, Malaya, Sumatra, Java, Celebes, Borneo, Tonkin, Dutch New Guinea.

Habitats:

The larvae are found in ground pools, always with Pistia.

Ficalbia (Mimomyia) chamberlaini (Ludlow) (figs. 19-24)

Mimomyia chamberlaini Ludlow, 1904. Canad. Ent. 36: 297 (♂). Type loc:

Bayambang, Pangasinan, Luzon (British (Nat. Hist.) Museum).

Ficalbia (Mimomyia) chamberlaini (Ludlow). Bohart, 1945. USNavmed 580,

p. 38 (key); Mattingly, 1957. Cul. Mosq. Indomalayan Area I, p. 31

(♂♀, P, L, fig., key).

Easily recognizable by the dark brown mesonotum, with yellow integument along lateral margin and patch of golden setae above wing base in the adult; unlike F. hybrida the larval siphon is not modified and clypeal h-1 is slender and simple.

♀. Head: Vertex largely covered with yellowish brown scales and few upright brown scales. Palpus short, about 1/6 the length of proboscis; proboscis broadly dark apically. Thorax: Mesonotum dark

brown, the integument yellow along lateral margin and with patch of yellow setae above wing base; pleural integument yellowish and anterior pronotal lobe with a row of strong bristles. Wing: Cell R_2 shorter than stem vein R_{2+3} and equal in length with cell M_2 ; alula bare; squama fringed with setae. Legs: Mostly dark brown with venter of femora yellowish; hind tarsomere V pale. Abdomen: Terga dark brown with purplish tinge, no definite pale basal band; sterna mostly pale or yellowish.

♂. Coloration as in ♀. Palpus longer than proboscis by 1/2 the length of terminal segment, the terminal segment swollen and dark at apical 1/2. Proboscis narrowly dark at tip and labella. Genitalia: Sidepiece elongate, the basal lobe with two strong bristles and few short setae; clasper long and slender; aedeagus very poorly sclerotized; paraproct sclerotized distally, the tip hooked-like; tergum IX with three strong bristles on each lobe.

Pupa. Not described; the respiratory trumpet, metanotum and terminal segment are as in figures 22-24.

Larva (figs. 19-21). Clypeal h-1 slender and simple; head h-4 weak, with 2-4 short branches, h-5 & 6 with 4-8 long, pilose branches; h-7 strongly developed, with 12 or more long, pilose branches. Antenna spinose at basal segment, the second joint freely articulated, smooth and short, the apical and subapical hairs single. Thoracic and abdominal lateral hairs well developed. Comb teeth long and fringed (fig. 21). Siphon with two pecten teeth, not modified; anal segment with saddle spiculate, the distal margin strongly spinose.

Material examined:

Series of larvae, Philippine Is. APO 72, 1.II.1945; Agr. School, Munoz, Nueva Ecija, 8.XI.1945; Natividad, San Manuel & Tayug, Pangasinan, 9-27.III.1945 (D. F. Bray); ♂♂♀ San Jose, Mindoro, 1.X.1945 (E. S. Ross); Rizal, 18.XII.1945 (19th MGL); ♀ Luzon, 7.V.1945 (32 MSU); ♀♂ Leyte, 11.I.1945 (K. V. Krombein); ♀♀ Calawan, Laguna, 19.III.1930.

Habitats:

The larvae have been collected in irrigation ditches with algae and vegetation, river banks, fish ponds and watertank. Nothing is known of the biting habits of the adults.

Recorded distribution:

Luzon; India, Burma, Ceylon, Thailand, Sumatra, Java, Celebes, Tonkin, New Guinea, Queensland.

Subgenus ETORLEPTIOMYIA Theobald

Etorleptiomyia Theobald, 1904. Rept. Wellcome trop. Res. Lab. 1: 71.

Type species: Etorleptiomyia mediolineata Theobald. By monotypy.

O'Reillia Ludlow, 1905. Canad. Ent. 37: 101. Type species: O'Reillia luzonensis Ludlow. By monotypy.

Dixomyia Taylor, 1914. Trans. R. ent. Soc. Lond. 1913 (4): 702. Type species: Dixomyia elegans Taylor. By monotypy.

Luzonus Stone & Bohart, 1944. Proc. ent. Soc. Wash. 56(8): 212 (Aedes).
Type species: Aedes (Luzonus) clavirostris Stone & Bohart. By original designation.

Only two Philippine species are included in this subgenus, namely: elegans (Taylor) and luzonensis (Ludlow). They are characterized as follows: Flagellomere I of ♀ antenna about 1/2 longer than flagellomere II. Dorsocentral bristles present; supraalar bristles well developed; scutellar scales broad; postspiracular area with a patch of broad scales. Wing with broad contrasting pale and dark scales; alula with few broad scales (they may be lost in some specimens), and squama fringed with fine setae. Tarsi banded. ♀ with one spermatheca. ♂ proboscis strongly swollen apically; palpus about 3/5 the length of proboscis. Pupal respiratory trumpet very long and slender, with a transverse slit; paddle narrow and elongate, pointed apically, the margin deeply serrated; abdominal h-1 undeveloped, reduced to a single hair; other abdominal hairs long and branched. Larva with the joints of antenna freely articulated, the apical and subapical hairs single; abdominal segment VIII with a row of fringed comb teeth; siphon long,

tapered apically, the spines on valves bifid or trifid, no pecten teeth; anal segment with large saddle complete.

Distribution:

West Africa to Okinawa, the Solomon Is. and northern Queensland.

Habitats and relation to disease:

Breeding places are ground pools and swamp edges, usually with abundant vegetation. Almost nothing is known about adult bionomics.

Ficalbia (Etorleptiomyia) elegans (Taylor)

Dixomyia elegans Taylor, 1914. Trans. R. ent. Soc. Lond. 1913: 703 (♀).

Type loc: Townsville, Queensland, Australia (School of Public Hlth. & Trop. Med., Univ. Sydney, Australia).

Ficalbia (Etorleptiomyia) elegans (Taylor). Knight & Chamberlain, 1948.

Proc. helm. Soc. Wash. 15: 15 (P, fig.); Mattingly, 1957. Cul.

Mosq. Indomalayan Area I, p. 46 (♂♀, P, L, key, fig.).

This species closely resembles F. luzonensis. It differs mainly by the characters mentioned in the key. F. elegans is further differentiated by the following:

♀. (Based on a single specimen). Head: Vertex with narrow decumbent and upright pale scales, and a patch of dark narrow scales on both sides; palpus dark with few pale scales at tip, about 1/5 the length of proboscis; proboscis dark at basal 1/5, the area before broadly dark apex mostly pale with scattered dark scales, conspicuously swollen apically. Thorax: Mesonotum with patches of narrow dark brown and pale scales; scutellar scales broad, pale on distal portion of midlobe, all dark on lateral lobes; pleural integument dark on anterior and pronotal

lobes and postspiracular area; small patches of pale scales on postspiracular area, anterior pronotal and lower posterior pronotal lobes and sternopleuron. Wing: Speckled, the scales broad and asymmetrical; cell R_2 long, about 4-1/2 times stem vein R_{2+3} . Legs: Femora mostly dark; tibiae heavily speckled; tarsi banded: tarsomere I with two dark bands, tarsomeres II-V each with single broad dark band. Abdomen: Mainly dark, with small basal and lateral patches of pale scales dorsally.

♂, larva and pupa. Not available for description.

Material examined:

♀ Kabakan, Mindanao, V.1945 (R. Staples).

Recorded distribution:

Mindanao; Thailand, Malaya, Sumatra, New Guinea, New Britain, Solomon Is., Queensland.

Habitats:

Mattingly (1957) recorded the breeding places as follows: cattle hoof prints with decaying vegetation at edge of swamps, in company with F. chamberlaini var. metallica; fresh water hole; dam and swampy area.

Ficalbia (Etorleptomyia) luzonensis (Ludlow) (figs. 25-30)

O'Reillia luzonensis Ludlow, 1905. Canad. Ent. 37: 101 (♀). Type loc:

Bayambang, Pangasinan, Luzon (U. S. National Museum).

Aedes (Luzonus) clavirostris Stone & Bohart, 1944. Proc. ent. Soc.

Wash. 46: 212 (♂♀). Type loc: Camp Nichols, Rizal, Luzon

(U. S. National Museum); Stone, 1945. Proc. ent. Soc. Wash.

47: 39 (synonymy).

Ficalbia (Etorleptiomyia) luzonensis (Ludlow). Bohart, 1945. USNavmed 580, p. 38 (key); Mattingly, 1957. Cul. Mosq. Indomalayan Area I, p. 42 (♂♀, P, L, fig., key).

Like Ficalbia elegans, F. luzonensis is easily recognizable by the speckled wing and banded tarsi. However, it can be differentiated by the dark median longitudinal stripe on dorsum of abdomen in the adult, and by the structure of comb teeth and clypeal spines in the larva. F. luzonensis has single row of comb teeth each with strongly developed median denticle, and the clypeal spines are strongly barbed; elegans has a double row of comb teeth and uniformly fringed, and the clypeal spines are simple.

♀. Head: Vertex with pale narrow decumbent scales, a patch of dark scales on each and upright scales pale and broad at apex, the base dark; palpus dark except pale tip, about 1/6 the length of proboscis; proboscis dark at basal 1/6, mostly yellowish speckled with dark scales, narrowly dark apically. Thorax: Mesonotum covered with narrow dark brown and pale scales, the pale scales concentrated on the median area spreading to the sides and backward to wing base; scutellar lobes covered with broad pale and dark scales; pleuron with patches of pale scales on postspiracular area and across sternopleuron, anterior and posterior pronotal lobes, few pale scales on lower sternopleuron just above mid coxa. Wing: Conspicuously pale and dark spotted, the scales broad and asymmetrical; cell R_2 about four times as long as stem vein R_{2+3} ; alula with few narrow scales (may be rubbed off in some specimens), squama fringed with long setae. Legs: Femora mainly dark with pale speckling; tibiae heavily speckled; tarsomeres banded or with dark

spots: tarsomere I with subapical dark spot; mid and hind tarsomere II with two well defined dark bands, one broad dark band on each of tarsomeres III-V and all of fore tarsomeres. Abdomen: Mainly yellow with lateral small patches of dark scales and median dark stripe dorsally; sterna mostly yellow with small median dark patches on apical 1/2 and few scattered dark scales on sides.

♂. Coloration as in ♀. Proboscis strongly swollen apically and largely dark at this portion; palpus 3/5 length of proboscis, narrowly dark apically. Genitalia as in figure 25. Sidepiece elongate, broader at base, the basal lobe with few short setae and two strong, long bristles; clasper slender, narrowed apically and with a large, blunt apical spine; aedeagus poorly sclerotized; paraproct sclerotized distally with two large curved and two or three small teeth; four or five cercal setae; tergum IX with a group of 4-6 long bristles on each side.

Pupa. Not described; the respiratory trumpet and metanotum are as in figures 28 & 29.

Larva (figs. 26-27). Clypeal spine long and strongly barbed; head h-4 short, tufts of 5-6 strong uneven branches; h-5, 6 & 7 well developed and equally long, with 4-5 pilose branches. Antenna spinose, the spines denser and stronger below antennal shaft and freely articulated at joint; antennal shaft h-1 strongly developed with 10-12 long, pilose branches; the apical and subapical hairs long and single. Abdominal segment VIII with a row of 10-14 comb teeth, the teeth elongate, each with lateral fringed and strongly developed median denticle. Siphon elongate, markedly tapering and slightly swollen at level of siphon tuft, the base narrowly dark; no pecten teeth; siphon tuft with 3 long

branches, submedian in position; valve with bifid apical spine; anal segment with saddle spinose, the spines stronger dorsally and along distal margin; lateral h-1 single, extremely long and pilose.

Material examined:

♀♀ Luzon, 7.X.1963 (W. F. Pippin); ♂♀ Luzon, 4.V.1945 (32 MSU); ♂ Camp Nichols, Rizal, 29.I.1923 (Pvt. Carraway); ♂ Kabakan, Mindanao, V.1945 (R. Staples); ♀ Camp Stotsenberg, Pampanga, Luzon, 18.X.1922; ♂♀ San Jose, Mindoro, 10.IV.1945 (E. S. Ross); larva, Urdaneta, Pangasinan 11.XII.1945 (D. F. Bray).

Recorded distribution:

Luzon, Mindanao; India, Ceylon, Thailand, Malaya, Java, Borneo, Tonkin, Hongkong, Taiwan, Okinawa.

Habitats:

The larvae have been collected in tin cans, roadside ditches, and foul sago palm trough.

Subgenus RAVENALITES Doucet

Ravenalites Doucet, in Mattingly, 1957. Cul. Mosq. Indomalayan Area I, p. 2 (type designation). Type species: Ravenalites roubaudi Doucet. By original designation. Doucet, 1950. Mem. Inst. Sci. Madagascar A4: 47 (orig. descr.; invalid, since no type species was selected).

Dasymyia Leicester, 1908. Cul. Malaya 3: 102 (non Egger 1858). Type species: Dasymyia fusca Leicester. By monotypy.

At present nine species are recognized in this subgenus, of which only one (F. deguzmanae Mattingly) is known from the Philippines. Subgenus Ravenalites is apparently limited in distribution and is confined to the Indomalayan area and Malagasy region (Mattingly 1957a). It is briefly characterized as follows: Flagellomere I of ♀ antenna $1/2 - 1/4$ longer than the second. Dorsocentral bristles well developed; acrostichals present; scutellar scales broad; postspiracular area bare; wing scales mostly large and broad; squama fringed with few broad scales which are sometimes lost by rubbing; alula with a patch of broad scales. ♀ spermatheca single. ♂ palpus strongly swollen, about $3/5$ the length of proboscis; aedeagus lightly sclerotized. Larva and pupa are as described and figured for the species.

Distribution:

Indomalayan region (F. fusca (Leicester) & F. deguzmanae Mattingly); Madagascar and Andaman Is.

Habitats:

The larvae breed in cut bamboo, tree holes and bamboo stumps (Oriental species), and axils of Ravenala, Pandanus & Typhonodorum (Madagascan species, Mattingly 1957a).

Ficalbia (Ravenalites) deguzmanae Mattingly (figs. 31-37)

Ficalbia (Ravenalites) deguzmanae Mattingly, 1957. Cul. Mosq.

Indomalayan Area I, p. 53 (♂♀, P, L, key, fig.). Type loc:
Llavac, Sierra Madre Range, Infanta, Quezon, Luzon (British
(Nat. Hist.) Museum).

This species is easily distinguished from other Philippine Ficalbia by the presence of a patch of dark, broad scales on the alula in the adult; the strongly developed stellate body setae in the larva, and the spinose respiratory trumpet and very narrow, deeply serrated paddle of the pupa. F. deguzmanae rather closely resembles F. fusca (Leicester). It differs mainly by the following:

♀. Head: Vertex dark, with pale tipped upright scales confined to nape, and patch of broad silvery scales on both sides. Torus of antenna with patch of silvery scales on inner dorsal portion; proboscis and palpus dark, palpus about 1/4 the length of proboscis. Thorax: Mesonotal and pleural integument uniformly dark, the mesonotal bristles strongly developed; upper sternopleuron with a large patch of silvery scales; few silvery scales on upper mesepimeron; postspiracular area bare; anterior and posterior pronotal lobes each with a row of strong bristles. Wing: Scales dark and broad; cell R₂ about 1/3 longer than

its stem vein R_{2+3} ; alula with a patch of broad dark scales, with few broad scales on squama sometimes rubbed off. Legs: Uniformly dark, except pale hind tarsal segments four and five and apical 1/2 of third. Abdomen: Terga and sterna completely dark.

♂. Coloration as in ♀. Palpus 3/5 the length of proboscis. Genitalia as in figure 31. Sidepiece with basal lobe bearing three outstanding strong bristles; clasper slender, swollen at base, with sclerotized apical spine; aedeagus poorly sclerotized; paraproct sclerotized distally with one large, hooked tooth; three cercal setae present; tergum IX with a group of long bristles.

Pupa (figs. 35-37). Respiratory trumpet very long and slender, the tracheoid area dark and densely spinose, the apical portion unpigmented, the cleftspiral and the edges held together by fine cross stiches (fig. 36); abdominal h-1 small on segment I, with 2 or 3 long and well developed branches on other segments; h-9 strongly developed, with expanded base bearing 14-18 pilose branches; paddles very narrow and strongly serrated (fig. 35).

Larva (figs. 32-34). Clypeal spine with long spines or barbs on inner side; head h-4 short tufted, the branches pilose; h-5, 6 & 7 with long, pilose branches; antenna covered with long and short setae below shaft h-1, freely articulated, the apical and subapical hairs branched (fig. 32). Thoracic and abdominal setae strongly stellate and more numerous. A patch of comb teeth on abdominal segment VIII, the teeth expanded apically and divided into 4-5 strong points (fig. 34). Siphon narrowly elongate, the base dark ringed and spiculate basally; no pecten teeth; siphon tuft with 4 pilose branches, submedian in position.

Saddle dark pigmented, densely spinose, the spines longer along distal margin; lateral h-1 strongly developed, with 3-5 pilose branches.

Material examined:

♂♂♀♀ (paratype series) Gattaran, Cagayan, Luzon, 10.VII.1945 (D. Bray); Baguio, Luzon, 10.VIII.1945 (MSU-24); Lagarian and Beto, Dansalan, Lanao, Mindanao, 25.IV.1946 (S. A. Edgar, J. Enke, E. Guttierrez, and A. Corcega); Surigao, Mindanao, 24.VIII.1931 (W. V. King); E slope Mt. McKinley, Davao, 19.VIII & 9.IX.1946 (Heymeman & H. Hoogstraal); ♂♀ San Jose, Mindoro, 7.II.1945 (E. S. Ross); Calacad, Cagayan, Luzon, 22.II.1963 (L. E. Rozeboom).

Recorded distribution:

Luzon, Negros, Mindanao; the occurrence from Andaman Is. and Malaya is doubtful.

Habitats:

The larvae were collected in tree holes, log holes, bamboo stumps, in deeply shaded forest and one ♀ reared from muddy pond.

Genus MANSONIA Blanchard

Mansonia Blanchard, 1901. C. R. Soc. Biol. Paris 53: 1046. Type species: Culex titillans Walker. By original designation. On the Official List of Generic Names in Zoology, 1959, Int. Comm. Zool. Nomencl., Opinion 550.

Panoplites Theobald, 1900. Rept. Coll. Mosq. Brit. Mus., p. 5 (non Gould, 1853). Type species: Culex titillans Walker. An automatically fixed type of a replacement name.

Belkin (1962) formed a separate tribe Mansonini for the genus Mansonia in which he recognized four subgenera; Ronderos & Bachmann (1963) also proposed Mansonini and divided the genus into two genera: Mansonia, with subgenera Mansonia and Mansonioides Theobald, and Coquillettidia Dyar, with subgenera Coquillettidia and Rhynchotaenia Brethes. As here treated, I recognized the genera and subgenera proposed by Ronderos & Bachmann.

Four species in the subgenus Mansonioides are present in the Philippines: annulata Leicester, annulifera (Theobald), dives (Schiner) and uniformis (Theobald). Subgenus Mansonia is not known in the Philippines.

The generic account here is as described for Mansonioides. It is distinguished by the presence of postspiracular bristles; the broad and asymmetrical wing scales; the ♀ tergum VIII with a row of teeth; the cerci expanded and curved, rounded apically; the postgenital plate cleft; and with two large spermathecae. ♂ palpi with minute terminal segments, turned upwards and lacking hair tufts. The larvae have the flagellar

portion of the antennae comparatively short and rigid. The pupal respiratory trumpets have no line of weakness and do not break off, the apical margins of abdominal terga are smooth, and some of the abdominal setae are spine-like.

Distribution:

Mansonia (Mansonioides) is mainly Oriental, with few species from Ethiopia, Australia and tropical Africa; Mansonia (Mansonia) is confined in the Neotropical and Nearctic regions.

Habitats and relation to disease:

The Mansonia (Mansonioides) mosquitoes are the main vectors of filariasis due to Brugia malayi in many Southeast Asian countries; also reported vectors of Dirofilaria immitis of dogs; and are attracted to a wide range of vertebrate hosts including man, cattle, goats, dogs and birds. The larvae and pupae are attached to roots of aquatic plants in forest swamps (Wharton, 1962).

Subgenus MANSONIOIDES Theobald

Mansonioides Theobald, 1907. Monogr. Cul. 4: 498. Type species:

Mansonioides septemguttata Theobald. By monotypy.

The members of this subgenus have characteristic speckled appearance; the legs are banded or spotted, and the wings speckled, with broad and asymmetrical scales (fig. 9). Mesonotum variously marked, with well defined white spots or with irregular pattern of longitudinal lines of golden scales; pleuron with patches of broad white scales; postspiracular bristles always absent; the ♀ tergite VIII with a row of teeth. The clasper of ♂ genitalia is short and irregular in shape; sidepiece short and thick; the claspette is strongly developed, bearing one or more spines, and aedeagus usually with median projection.

Key to species (Adult)

1. Mesonotum with well defined round white spots----- 2
 Mesonotum lacking round spots but with irregular pattern of
 longitudinal lines of golden scales----- 3
2. With four round spots on mesonotum, and broad white scales on
 mid lobe of scutellum and narrow scales on the lateral lobes;
 comb teeth arrangement: 8.5.8 or 6.7.6, the outer teeth
 widely spaced----- annulifera (Theobald)
- With two round spots on mesonotum, and narrow scales on all
 scutellar lobes; tergite VIII comb teeth arrangement:
 4.1.8.1.4 or 5.1.10.1.5----- dives (Schiner)

3. Hind femur with three well defined pale bands; mesonotal pattern irregular, almost uniformly scattered golden narrow scales; tergite VIII comb teeth arrangement: 4.7.4 or 6.7.6-----
----- annulata Leicester
- Hind femur with five dorsal white spots not forming complete bands; mesonotal pattern of two longitudinal pale stripes; tergite VIII comb teeth arrangement: 4.1.7.1.4 or 5.1.7.1.5, with detached tooth----- uniformis (Theobald)

Mansonia (Mansonioides) annulata Leicester (fig. 49)

Mansonia annulata Leicester, 1908. Cul. Malaya 3(3): 174 (♀). Type loc: Kuala Lumpur (Selangor), Malaya (British (Nat. Hist.) Museum); Bonne-Wepster, 1954. Spec. Publ. R. Trop. Inst. Amsterdam 111: 46 (♂♀).

Mansonia (Mansonioides) annulata Leicester. Dyar & Shannon, 1925. Insec. Inscit. Menst. 13(4-6): 84 (listed); Edwards, 1929. Not. ent. 9: 2 (listed, Taeniorhynchus); Bohart, 1945. USNavmed 580, p. 41 (key); Wharton, 1962. Inst. Med. Res. F. Malaya Bull. no. 11, p. 15 (A, L, P, E, biol., fig., key, rel. to filariasis).

Easily recognizable by the irregular pattern of golden scales on mesonotum and three pale bands on hind femur; the ♂ genitalia has a characteristic crooked shape.

♀. Head: Vertex mostly covered with golden narrow decumbent and brown upright scales; proboscis with a broad pale band. Thorax: mesonotum without definite markings but with irregular pattern of golden narrow scales; scutellar lobes with narrow golden and brown scales;

pleuron with broad white scales on upper sternopleuron, and a row of six bristles on mid mesepimeron. Wing: Speckled. Legs: Mid and hind femora with three well defined white bands; five bands on fore femur; all tarsal segments with pale narrow bases, the first tarsal segment with a median white band. Abdomen: Terga dark with few white scales at apico-lateral corners; sternum pale basally; tergum VIII with comb teeth arrangement: 4.7.4 or 6.7.6, the outer row of teeth spaced far apart and subequal, the median row with the middle tooth outstanding as in figure 49.

♂. Genitalia as figured and described by Wharton (1962) from Malaya. Sidepiece short, the basal lobe bears three spines, two at the apex, one blunt and the other sharp, and a small third difficult to see; clasper broad and crooked basally, then tapers gradually towards apex.

Larva and pupa. Not available for description.

Material examined:

♀♀ Ludlow Barracks, Mindanao, 9.VI.1911 (J. C. Gregory); ♀♀ Ft. Pikit, Cotabato, 23.VI.1907 (C. H. Halliday).

Recorded distribution:

Mindanao; Sumatra, Borneo, Malaya.

Habitats:

The larvae breed in edge of forest swamps; M. annulata was reported as a good host for semi-periodic Brugia malayi and animal parasite B. pahangi in Malaya.

Mansonia (Mansonioides) annulifera (Theobald) (figs. 39, 48)

Panoplites annulifera Theobald, 1901. Monogr. Cul. 2: 183 (♀). Type
loc: Madras and Quilon, Travancore, India (British (Nat. Hist.)
Museum).

Taeniorhynchus (Mansonioides) annuliferus Theobald. Edwards, 1922.

Indian J. Med. Res. 10: 469 (syn., listed); Edwards, 1929.

Not. Ent. 9: 3 (listed).

Mansonia (Mansonioides) annulifers (Theobald). Giles, 1904. J. Trop.

Med. 7: 365 (listed); Ludlow, 1905. Canad. Ent. 37: 134 (listed);

Banks, 1906. Philip. J. Sci. 1: 989 (listed); Bezzi, 1913.

Philip. J. Sci. D8: 307 (listed, as Mansonioides); Dyar & Shannon,

1925. Insec. Inscit. Menst. 8: 181 (listed); Bohart, 1945.

USNavmed 580, p. 41 (key, ♂ gen. fig.); Carter, 1950. Ceylon J.

Sci. 24: 23 (♂♀, L, biol.); Burton, 1959. Indian J. Malar. 13

(bionomics); Wharton, 1962. Bull. Inst. Med. res. F. Malaya

no. 11, p. 16 (A, L, P, E, fig., key, biol.).

This species is readily recognizable by the mesonotal markings with four silvery spots, and the white scaling on scutellum; the ♂ clasper is particularly distinctive being divided into two arms.

♀. Head: Vertex covered with narrow decumbent and upright golden scales, silvery scales around eye margin and broad white scales laterally. Thorax: Mesonotum uniformly golden with four distinct silvery spots; midlobe scutellum with white broad scales and narrow scales on lateral lobes; pleuron with patches of white broad scales on upper mesepimeron and sternopleuron, a small patch on lower

sternopleuron; posterior pronotal lobe with narrow silvery scales.

Wing: Speckled brown and pale scales. Legs: Mid and hind femora with five complete pale bands; four bands on tibiae; tarsi white scaled at basal 1/2, the first segment with median white band. Abdomen: Terga I-IV dark, with few lateral white scales, V-VI extensively white scaled laterally, VIII mostly white; comb teeth arrangement as follows: 6.7.6 or 8.5.8, the outer set of teeth widely spaced as in figure 48.

♂. Genitalia as in figure 39. Sidepiece broad with several long and short bristles, the basal lobe unsclerotized with three large teeth; clasper distinctive, divided into two arms, one arm smooth and slender, the other stout and thumblike with short setae; aedeagus broad, rounded apically with a small median projection; paraprocts sclerotized apically bearing 6-7 sharp teeth; one cercal seta present; parameres small.

Larva and pupa. Not available for description.

Material examined:

♀♀ San Fabian, Batangas, 8, 11, & 20.II.1945 (A. B. Gurney);
♂♂♀ Maugit, Batangas, 12.I.1932; ♀♀ Reina Regente; Ludlow Bks., Parang, Cotabato; ♂♂♀ Cudarangan, Mindanao, IX.1906; Ft. Pikit, 31.V.1907;
♂♂♀ Camp Elridge, Los Banos, Laguna; Camp Stotsenberg, Pampanga; Ft. McKinley, Rizal.

Recorded distribution:

Mt. Province, Mindanao; Thailand, Malaya, Singapore, Assam, India, New Guinea.

Habitats:

The ♀♀ fed to a large extent on man, and was reported as an important vector of Brugia malayi in many areas in India (Wharton, 1962).

Mansonia (Mansonioides) dives (Schiner) (fig. 50)

Culex dives Schiner, 1868. Reise Novara Zool. Theil. Dipt. 2: 31.

(nom. nov. for annulipes Walker, non Meigen 1830).

Culex annulipes Walker, 1857. Proc. Linn. Soc. Lond. 1: 6(♀). Type

loc: Singapore (British (Nat. Hist.) Museum); Banks, 1906.

Philip. J. Sci. 1: 989 (listed; Mansonia); Bezzi, 1913. Philip.

J. Sci. D8(4): 307. (listed; Mansonioides).

Taeniorhynchus (Mansonioides) annulipes Walker. Edwards, 1929. Not.

ent. 9: 3 (listed).

Mansonia (Mansonioides) annulipes Walker. Edwards, 1922. Indian J.

med. res. 10: 469 (listed); Edwards, 1929. Not. Ent. 9: 3

(listed).

Mansonia (Mansonioides) longipalpis(v. d. Wulp). Barraud, 1934. Fauna

Brit. India, Dipt. 5:128 (♂♀, key, fig.); Bohart, 1945. USNavmed

580, p. 42 (key).

Culex longipalpis v. d. Wulp, 1881. Bijd. Fauna Midden. Sumatra, Dipt.

p. 9 (♀). Type loc: Alahan panjang, near Soeroelangoen, Sumatra

(Leyden Museum); Stone 1956(57). Proc. Ent. Soc. Wash. 58: 336

(tax. syn.).

Mansonia (Mansonioides) dives (Schiner). Stone, 1956(57). Proc. Ent.

Soc. Wash. 58: 336. (tax.); Wharton, 1962. Bull. Inst. Med. Res.

Malaya Bull. no. 11, p. 20 (♂♀, L, P, E, biol., fig., key, rel. to filariasis).

This species has been reported in the Philippines as M. annulipes (Walker) and until recently as M. longipalpis (v. d. Wulp). Stone (1956)

drew attention to the change in nomenclature and concluded that M. dives (Schiner) is the correct name. M. dives is very difficult to distinguish from M. bonneae Edwards; however, they can be separated by the ♂ aedeagus having a long, serrated anterior median extension in dives.

♀. Dark speckled mosquito with two distinct round pale spots on mesonotum. Head: Vertex mostly covered with dark brown upright and few decumbent scales, and a well defined line of narrow pale scales around eye margin. Thorax: Mesonotum with patches of narrow pale scales at anterior border continuing posteriorly to wing base, with two round spots, a small patch of pale scales above wing base and prescutellar area; scutellar lobes with narrow pale scales; pleuron with patches of broad white scales on upper and lower sternopleuron, and three middle mesepimeral bristles. Wing: Speckled. Legs: Femora and tibiae spotted, with more or less five bands; tarsi with basal white spots. Abdomen: Terga mostly dark with few scattered lateral pale scales, more conspicuous at posterior segments; sterna speckled, tergum VIII with comb teeth arrangement as follows: 4.1.8.1.4 or 5.1.10.1.5 as in figure 50 with a detached tooth.

♂. Genitalia as figured and described by Wharton (1962). Clasper small, expanded at middle and greatly narrowed at apex; basal lobe of sidepiece stout with one large hooked spine, and one small seta; aedeagus with a long median extension distally, the margin serrated.

Larva and pupa. Not available for description.

Material examined:

♀♀ San Jose, Mindoro, 9.I.1945 (E. S. Ross); ♀♀ San Francisco, 10Km SE, Agusan, 23.IX, 1.Xii.1959 (L. W. Quate, at light).

Recorded distribution:

Philippines; Borneo, Malaya, India, Indonesia, Hainan Is., Vietnam, New Guinea, Bismarck Archipelago, Australia, Assam.

Habitats:

The larvae breed in forest swamps among rootlets and pneumatophores of tree, rattans and palms. The ♀♀ are indoor and outdoor biters, and reported as vector of Brugia malayi in some parts of Indonesia, and swamp forest areas of Malaya, and probably Borneo and Thailand (Wharton, 1962).

Mansonia (Mansonioides) uniformis (Theobald) (figs. 42-47)

Panoplites uniformis Theobald, 1901. Monogr. Cul. 2: 180 (♀). Type loc: Quilon, Travancore, India (British (Nat. Hist.) Museum).

Mansonia uniformis (Theobald). Ludlow, 1905. Canad. Ent. 37: 134 (listed); Banks, 1906. Philip. J. Sci. 1: 989. (listed, dist.); Bezzi, 1913. Philip. J. Sci. D8(4): 307. (listed, as Mansonioides); Dyar, 1920. Insec. Insci. Menst. 8: 181 (key, listed); Bick, 1949. Nat. Hist. Misc. 41: 2 (listed); Baisas, 1957. Philip. J. Sci. 86(1): 118 (rel. to filariasis).

Mansonia (Mansonioides) uniformis Theobald. Bohart, 1945. USNavmed 580, p. 42 (♂ gen. fig., key); Knight & Chamberlain, 1948. Proc. Helm. Soc. Wash. 15(1): 16 (P, fig.); La Casse & Yamaguti, 1950. Mosq. Japan & Korea, p. 66 (♂♀, P, L, fig.); Burton, 1959. Indian J.

Malariology 13 (bionomics); Wharton, 1962. Bull. Inst. Med. Res.

Malaya 11, p. 24 (♂♀, P, L, key, fig., biol., rel. to filariasis).

Taeniorhynchus (Mansonioides) uniformis Theobald. Edwards, 1929.

Not. ent. 9: 3 (listed); Carter, 1950. Ceylon J. Sci. B24: 14

(♂♀, P, L, E, biol.).

Very similar to M. indiana Edwards in general habitus from which uniformis can be distinguished by the two longitudinal lateral stripes on mesonotum; the ♂ clasper is very broad, abruptly bent and narrowed apically, and the basal lobe of sidepiece bears a rod-like spine, notched at tip.

♀. Head: Vertex covered with coarse decumbent and upright scales, and narrow golden scales around eye margin joining the broad white scales at sides; proboscis with broad median white band, the apex speckled. Thorax: Mesonotum with two lateral longitudinal lines of narrow golden scales, similar marked scales on prescutellar area continuing to midlobe of scutellum; pleuron with patches of broad white scales on upper and lower sternopleuron and upper mesepimeron. Wing: Speckled. Legs: Hind femur with five dorsal white spots, the venter white basally; mid and fore femora, and all of tibiae variously marked; tarsi with complete basal white bands. Abdomen: Terga scales mostly dark with well defined dorsal white spots on segments I-III, VII mostly white; sterna predominantly white; tergum VIII comb teeth arrangement as follows: 4.1.7.1.4 or 5.1.7.1.5, with a detached tooth as in figure 51.

♂. Genitalia as in figure 42. Sidepiece elongate, projecting apically with a row of stout and long bristles, the basal lobe stout and

bears a rod-like spine emarginate at tip; clasper broad from base to apical 1/3, then abruptly bent and narrowed apically, with short sub-apical setae; aedeagus elongate, rounded apically, with two median toothed projections; paraprocts shorter than aedeagus, the sclerotized apex with a row of 6-8 small teeth; four cercal setae present; parameres small.

Larva (figs. 43-45). Clypeal h-1 long and curved; head h-4 & 5 with weak and short branches; h-6 & 7 dendritic, the branches plumose apically, h-7 more developed. Antenna slender and spiculate, shaft h-1 dendritic, the branches pectinate (pilose), h-2 & 3 removed from apex and longer than distal portion of antenna. Thoracic and abdominal hairs weak, the integument smooth. Abdominal segment VIII lacking sclerotized plate, with two slender, rod-like blunt spines. Siphon short, with pointed and serrated valve; siphon tuft with two long branches. Anal segment cylindrical, the saddle spiculate and caudal margin smooth; lateral h-1 weak.

Pupa (figs. 46-47). Cephalothorax smooth, the hairs inconspicuous. Respiratory trumpet arising on prominent tubercle, curved and pointed apically, the trachoid at basal 1/3. Abdominal integument reticulate and with spicules; h-9 minute and removed from apico-lateral margin segments I-VII, strong and thickened; all other hairs minute. Paddle narrow with strong midrib, the margin serrated; paddle hair lacking.

Material examined:

♀♀ San Jose, Mindoro, 12.I.1945 (E. S. Ross); ♂♂♀♀ San Fabian, Pangasinan, 20.III.1945 (A. B. Gurney); ♀♀ Alabang, Rizal; Camp Elridge, Los Banos, Laguna; 31.V.1920, 20.X.1917; ♀♀ Pettit Barracks, Zamboanga,

15.XII.1923 (Abernking); ♂♂♀♀ Cotabato, Mindanao, IX.1906 (C. H. Halliday, in house); ♀♀ Pto. Princesa, Palawan; ♂♂♀♀ Tala, Rizal, 21.XI.1959, V.1938 (Philip. Dept. Hlth.); ♀♀♂♂ San Antonio, Samar 4, 7 & 8.III.1944 (J. H. Paullus); Camp Daraga, Albay; Mangarin and Caminawit Pt., Mindoro. ♂♂♀♀ Ft. MdKinley, Rizal, 9.III.1920 (J. M. Hewitt); ♀♀ Manila, 14.XII.1900.

Recorded distribution:

Mt. Province, Sorsogon, Leyte, Laguna, Manila, Rizal; Ethiopian, Oriental and Australian regions, east to Solomon Is., Japan and Ryukyu-Retto.

Habitats:

The larvae breed in open swamps and pools with thick vegetation and attach to a wide variety of aquatic and semi-aquatic plants particularly open swamp grasses, Isachne and Panicum. The adults were collected in carabao baited traps, and bit outdoors in late afternoon and early evening. Baisas (1957) found uniformis with high infection rate of non-infective stage of microfilaria larvae in Sorsogon, Luzon; Wharton (1962) reported the species as a good host for semi-periodic and periodic Brugia malayi of swamp forest regions and coastal rice plains in Malaya.

Genus COQUILLETTIDIA Dyar

Coquillettidia Dyar, 1905. Proc. ent. Soc. Wash. 7: 47. Type species:

Culex perturbans Walker. By original designation. Ronderos & Bachmann, 1963. Rev. Soc. Ent. Argentina 25: 48 (resurr. from subgenus status).

The genus Coquillettidia as discussed earlier is composed of subgenera Coquillettidia and Rhynchotaenia. Four species in the subgenus Coquillettidia are known in the Philippines: aureosquammata (Ludlow), crassipes (v. d. Wulp), nigrosignata (Edwards) & ochracea (Theobald). Subgenus Rhynchotaenia is confined to the Neotropical region.

Coquillettidia is readily differentiated from Mansonia (Mansonioides) by the absence of postspiracular bristles, and by the narrow wing scales (fig. 10); the ♀ tergite VIII lacks teeth; cerci narrow and spatulate, with truncate apical margins; three spermathecae; ♂ palpi turned downwards, with apical long hairs and the terminal segment is long, equal in length to basal segment. The flagellar portion of the larval antennae is flexible and much longer than Mansonioides larvae. The pupal respiratory trumpets are very long and cylindrical, and with a line of weakness which breaks off when the pupa detaches from the plant; abdominal setae small and inconspicuous and the posterior margins of terga are finely serrated.

Distribution:

The genus is distributed much over the world: Rhynchotaenia is mainly Neotropical; Coquillettidia in the Nearctic, Palearctic,

Australasian, Ethiopian and Oriental region.

Habitats and relation to disease:

Mosquitoes of the Coquillettidia are not good hosts for the semi-periodic Brugia malayi in Malaya; most species feed on a wide range of animal hosts, but few feed on man and a large percentage feed on avian hosts; the larvae were observed resting on the under surface of leaves of plants 1-3 ft. from the ground in forest swamps (Wharton, 1962).

Key to species (Adult)

1. Dark metallic species, the mesonotum with pale scales on
 anterior 2/3----- aureosquammata (Ludlow)
 Yellow or yellowish brown species----- 2
2. Mesonotum with dark longitudinal lines and four large brown
 spots above wing base, pleuron with three longitudinal brown
 bands----- nigrosignata (Edwards)
 Mesonotum and pleuron yellow, lacking dark markings----- 3
3. Wing and abdominal tergum scales mostly yellow-----
 ----- ochracea (Theobald)
 Wing and abdominal tergum scales dark, purplish-----
 ----- crassipes (v. d. Wulp)

Subgenus COQUILLETIDIA Dyar

Coquillettidia Dyar, 1905. Proc. ent. Soc. Wash. 7: 47. Type species:

Culex perturbans Walker. By original designation.

The distinguishing features of the subgenus Coquillettidia are as given in the generic description. It can be further recognized by the almost uniform yellow or purplish color, and the legs and wing lack conspicuous markings. The clasper of the ♂ genitalia is variously developed, usually expanded distally.

Coquillettidia (Coquillettidia) aureosquammata (Ludlow) (fig. 38)

Taeniorhynchus (?) aureosquammatus Ludlow, 1909. Canad. Ent.

41: 234 (♀). Type loc: Parang (Cotabato), Mindanao (U. S. National Museum); Theobald, 1910. Monogr. Cul. 5: 425 (♀, redescr.); Bezzi, 1913. Philip. J. Sci. D8(4): 307 (listed); Edwards, 1929. Not. ent. 9: 3 (listed); Stone & Knight, 1957. J. Wash. Acad. Sci. 47(6): 198 (♀lectotype).

Taeniorhynchus pagei Ludlow, 1910 in Theobald, 1910. Monogr. Cul.

5: 618 (♂♀). Type loc: Parang (Cotabato), Mindanao (U. S. National Museum); Bezzi, 1913. Philip. J. Sci. D8(4): 307 (listed).

Mansonia (Coquillettidia) aureosquammata (Ludlow). Dyar and Shannon,

1925. Insec. Insci. Menst. 13: 84 (listed, syn.); Bohart, 1945. USNavmed 580, p. 43 (key, ♂ gen. fig.); Wharton, 1962. Inst. Med. Res. Fed. Malaya Bull. no. 11, p. 5 (A, gen., fig., key, L, P, E).

Coquillettidia (Coquillettidia) aureosquammata (Ludlow). Ronderos & Bachmann, 1963. Rev. Ent. Argentina 25: 50.

M. aureosquammata is not readily recognizable as a member of the *Coquillettidia* because of its dark metallic appearance, not yellow. It is distinguishable, however, by the covering of pale narrow scales on anterior 2/3 of mesonotum, and the ♂ clasper has a large membranous expansion, and the sidepiece has a row of strong setae.

♀. Head: Vertex with narrow, decumbent golden and few brown upright scales; palpus and proboscis dark. Thorax: Mesonotum covered with narrow curved golden scales on anterior 2/3, a line of similar scales on prescutellum and few scattered pale scales above wing base; pleuron with patches of broad white scales on lower sternopleuron and upper mesepimeron. Wing: All scales dark brown. Legs: Mostly dark brown, the venter of femora pale at basal 1/2 to 2/3. Abdomen: Dark purplish dorsally, with apico-lateral white patches on terga II-VII, and a complete basal pale band on VIII; sternites pale at basal 1/2.

♂. Genitalia as in figure 38. Sidepiece short and broad, with two rows of long and strong setae at apical 1/2, the basal lobe with one long, rod-like spine and one slender seta; clasper particularly distinct, curved and with a large subapical membranous extension; aedeagus small, rounded distally; paraproct with 5-6 apical teeth; 5 cercal setae present.

Larva and pupa. Not available for description.

Material examined:

♀ lectotype (USNM), Parang, Mindanao, Oct. (Page); ♂♀ Ludlow Barracks, Mindanao.

Recorded distribution:

Known only from type locality; subsequently reported from Malaya and Sumatra.

Habitats:

Forest swamp breeder associated with other species of Coquillettidia.

Coquillettidia (Coquillettidia) crassipes (van der Wulp) (fig. 40)

Culex crassipes van der Wulp, 1881. Bijdr. Fauna Midden-Sumatra, Dipt. p. 9 (♀). Type loc: Soeroelangoen (Benkoelen), Sumatra (State Museum of Natural Hist. Leyden, Neth.).

Stegomyia crassipes van der Wulp. Giles, 1904. J. Trop. Med. 7: 367 (listed); Banks, 1906. Philip. J. Sci. 1: 984 (listed, syn., dist.); Bezzi, 1913. Philip. J. Sci. D8(4): 306 (listed, distr.).

Mansonia (Coquillettidia) diaeretus Dyar, 1920. Insec. Inscit. Menst. 8: 181 (♀). Type loc: Los Banos, Laguna (U. S. National Museum); Edwards, 1929. Not. ent. 9: 2 (listed, Taeniorhynchus); Bohart, 1945. USNavmed 580, p. 43 (syn.); Stone & Knight, 1957. J. Wash. Acad. Sci. 47(6): 198 (♀ lectotype).

Taeniorhynchus brevicellulus Theobald, 1901. Monogr. Cul. 2: 212 (♀♂). Type loc: Selangor, Malaya, and Thayetmyo (Magwe), Burma (British (Nat. Hist.) Museum); Edwards, 1929. Not. ent. 9: 2 (syn.).

Chrysoconops pygmaeus Theobald, 1908. Rec. Indian Mus. 2: 300 (♀). Type loc: Sylhet, Assam (British (Nat. Hist.) Museum).

Chrysoconops fuscopteron Theobald, 1911. Tijdschr. Ent. 54: 239 (♀). Type loc: Digoel River (Western), New Guinea (Rijksmuseum, Amsterdam, Netherlands).

Mansonia (Coquilleltidia) crassipes (van der Wulp). Bohart, 1945.

USNavmed 580, p. 43 (syn., key, ♂ gen. fig.); Bonne-Wepster, 1954.

Spec. Publ. R. Trop. Inst. Amsterdam 111: 40 (♀♂, L, fig.);

Wharton, 1962. Inst. Med. Res. F. Malaya Bull. no. 11, p. 6

(A, L, P, E, biol. fig. key).

Coquilleltidia (Coquilleltidia) crassipes (van der Wulp). Ronderos &

Bachmann, 1963. Rev. Soc. Ent. Argentina 25: 50.

A yellowish brown species with purplish proboscis, legs, wings and abdomen; the clasper of ♂ genitalia is particularly characteristic in being curved and enlarged at both ends with a median spine-like process.

♀. Head: Vertex sparsely covered with narrow curved and upright yellowish scales. Thorax: Mesonotum with sparse yellowish scales; pleuron with patches of silvery broad scales on lower sternopleuron and upper mesepimeron; with one bristle on middle mesepimeron. Legs: Mainly dark, purplish, but the femora are yellowish at the base. Abdomen: scaling quite variable, but mostly purplish, and in some specimens with yellow scaling on terga.

♂. Coloration as in ♀. Genitalia as in figure 40. Sidepiece elongate with numerous long hairs and patch of short bristles on inner distal portion, the basal lobe with one long, rod-like spine and one slender seta; clasper strongly curved, enlarged at both ends, and with a median spine-like process; aedeagus rounded distally, constricted near base; paraproct with three large apical teeth and few tiny ones, 4-5 cercal setae.

Larva and pupa. Not available for description.

Material examined:

♂♀ Lake Mainit, Surigao, 23.XI-1.XII.1959 (L. W. Quate, at light); ♂♀ San Jose, Mindoro, 19.IV.1945 (E. S. Ross); ♂♀ Parang, Fort Pikit, Cotabato 6.V.1945 (J. H. Paullus); ♀ Los Banos, Laguna, 1.I.1919; ♀♂ Pettit Barracks, Zamboanga, 15 & 28.II.1923 (Pvt. Visaya); ♀ Ludlow Barracks, 21.VI.1914 (J. C. Gregory); 26.VI.1923 (Capt. Rick); ♂ Infanta, Tayabas (Quezon).

Recorded distribution:

Laguna; Malaya, India, Assam, Borneo, Yap Group, New Guinea, Caroline Is., Ryukyu-Retto, Burma, Ceylon, Thailand.

Habitats:

The ♀ host preference is avian blood, and the larvae are commonly attached to Isachne and Panicum grasses in open swamps in Malaya (Wharton, 1962).

Coquillettidia (Coquillettidia) nigrosignata (Edwards) (fig. 41).

Taeniorhynchus nigrosignatus, Edwards, 1917. Bull. ent. Res. 7: 224

(nom. nov. for T. conopas Theobald); Stone, Knight & Starcke, 1959.

Cat. Mosq. World, Thomas Say Found. vol. 6: 102 (♀; type loc: several localities in Malaya & Formosa, lost).

Taeniorhynchus conopas Theobald, 1901. Monogr. Cul. 2: 202 (♂♀). Type

loc: Perak, Selangor, & Straits Settlement, Malaya & Formosa (British (Nat. Hist.) Museum).

Taeniorhynchus (Coquillettidia) giblini (Taylor) of Bonne-Wepster, 1930.

Meded. Dienst. Volksg. Ned. Ind. 3: 394 (♂♀, key, ♂ gen. fig.).

Mansonia (Coquillettidia) giblini (Taylor). Bohart, 1945. USNavmed
580, p. 43 (♂ gen. fig., key).

Mansonia (Coquillettidia) nigrosignata (Edwards). Wharton, 1962. Inst.
Med. Res. Fed. Malaya Bull. 11: 7 (♂♀, L, P, resurr. from syn.
with giblini).

Coquillettidia (Coquillettidia) giblini (Taylor). Ronderos & Bachmann,
1963. Rev. Soc. Ent. Argentina 24: 50.

Wharton (1962) resurrected nigrosignata from synonymy with giblini on the basis of pleural and abdominal tergum markings, and on the structure of ♂ clasper: the Taylor type series of giblini has less extensive dark markings and no dark scales on dorsum of abdomen, whereas the Oriental specimens are darker and have dorsal and apical dark bands. The type ♂ genitalia cannot be identified and his differentiation is based on specimens from New Guinea and New Britain. It differs from the Oriental specimens by having more expanded apex and distinct collar on the clasper. I have examined ♀♀ specimens from the Papua and they certainly have no dark apical bands on dorsum of abdomen, only apico-lateral spots present on III-VI; the Papua specimens are predominantly yellow or golden. The Philippine specimens agree with Theobald's (1901) description of T. conopas, and with a ♀ specimen (Selangor, A. L. Butler, 28.10.1899) examined by Dr. Stone at the British Museum; he noted that Theobald's description is good except: black tip of labella very narrow, the thorax is yellow with a pair of weakly indicated dark lines on scutum, three brown spots above and anterior to wing base, and three dark stripes across pleuron, the bottom one touching tops of mid and hind coxae. They also agree with Bonne-Wepster's (1930) description of

giblini from Sumatra and Celebes, and with ♂♂ identified as giblini from Malaya.

♀. A yellowish brown species with dark brown markings on mesonotum, pleuron and abdomen. Head: Vertex covered with narrow, yellow decumbent and long brown upright scales; proboscis yellowish, the apex brown. Thorax: Mesonotum with two longitudinal dark stripes, and four large dark spots above and in front of wing base, these spots may be continuous forming one or two large patches; pleuron with three longitudinal dark stripes, the last stripe touching mid and hind coxae; lateral lobes of scutellum dark. Wing: Scales yellowish brown, the bases of costa and radius dark scaled. Legs: Banded and speckled with dark purplish scales; femora dark at apices; tibiae with apical and basal dark bands, and the tarsal segments with broad apical dark bands. Abdomen: Terga with narrow apical dark bands on II-VI, and dark apico-lateral spot on VI; sterna mostly yellowish, the apices brown.

♂. Coloration as in ♀. Genitalia as in figure 41. Sidepiece elongate and with numerous long setae at outer apical 1/2, the basal lobe with one long, rod-like spine blunt apically and one long seta; clasper slender at basal 1/2 then expanded apically with large membranous wing; aedeagus ovate, not connected distally, the margin strongly serrate; paraprocts with 4-5 strong teeth and 3-4 cercal setae.

Larva and pupa. No Philippine specimens available for study.

Material examined:

♀♀ Siasi, Siasi Is. (Sulu Archipelago); ♂♂♀♀ Tawi-Tawi, Tarakan, N. Batu-Batu, 22, 23 & 25-29.IX.1961 (Noona Dan Exp. 1961-62).

Coquillettidia (Coquillettidia) ochracea (Theobald)

Taeniorhynchus ochraceus Theobald. 1903. Monogr. Cul. 3: 263 (♀).

Type loc: Kuala Lumpur (Selangor), Malaya (British Museum);

Edwards, 1922. Indian J. Med. Res. 10: 469 (listed, syn.);

Edwards, 1929. Not. ent. 9: 2 (listed, syn.).

Mansonia (Coquillettidia) ochracea (Theobald). Bohart, 1945. USNavmed

580, p. 43 (key, ♂ gen., fig., syn.); La Casse & Yamaguti, 1950.

Mosq. fauna Japan & Korea, p. 72 (♂♀, P, L, fig.); Wharton, 1962.

Inst. Med. Res. F. Malaya Bull. no. 11, p. 10 (A, P, L, E, fig.,

biol. key).

Mansonia chrysogona Knab, 1909. Ent. News 20: 386 (♀♂). Type loc:

Parang, Cotabato, Mindanao (U. S. National Museum); Bezzi, 1913.

Philip. J. Sci. D8(4): 307 (listed, Mansonioides). Stone &

Knight, 1957. J. Wash. Acad. Sci. 47(6): 198 (♂ lectotype).

Coquillettidia (Coquillettidia) ochracea (Theobald). Ronderos &

Bachmann, 1963. Rev. Soc. Ent. Argentina 25: 50.

M. ochracea is distinguished from other species in being almost completely yellow or golden, and the ♂ clasper has a distinct elbow, and strongly swollen at this portion.

♀. Head: Vertex with narrow curved golden scales, and upright bronzy scales. Thorax: Mesonotum covered with golden or bronzy scales; pleuron with few broad yellow on lower sternopleuron, and two middle mesepimeral bristles. Legs: Mostly golden or yellow and speckled with brown scales, the femora dark at apices, and hind tibia with basal and

apical dark markings. Abdomen: Mostly yellow, the apico-lateral margins of terga II-V with dark markings.

♂. Similar to ♀ in coloration. Sidepiece elongate; clasper elbowed or bent at right angle and strongly swollen at this portion, then tapers to a blunt tip, the basal lobe with one rod-like spine and one slender seta; paraproct with 5-6 apical teeth, two teeth much longer than the others, 4-5 cercal setae; aedeagus more or less elongate, constricted near base.

Larva and pupa. No Philippine material available for description.

Material examined:

♀♀ Tacloban, Leyte, 10.V.1945 (E. S. Ross); ♀♀ Cotabato, Mindanao; ♂♂♀♀ San Antonio, Samar, XI.1944; Ludlow Barracks, IV.1911 (J. C. Gregory).

Recorded distribution:

Cotabato; India through Southeast Asia and north to Japan.

Habitats:

Wharton (1962) reported that this species has limited contact with man and was not involved in filarial transmission; ♀♀ engorged was collected resting on leaf in Pandanus swamp by E. S. Ross.

Genus URANOTAENIA F. Lynch Arribalzaga

Uranotaenia F. Lynch Arribalzaga, 1891. Rev. Mus. La Plata 1: 375;

2: 163. Type species: Uranotaenis pulcherrima F. Lynch

Arribalzaga. By subsequent designation (Neveu-Lemaire 1902).

Anisocheleomyia Theobald, 1905. Entomologist 38: 52. Type species:

Anisocheleomyia nivipes Theobald. By subsequent designation

(Brunetti 1914).

Pseudouranotaenia Theobald, 1905. J. Econ. Biol. 1: 33. Type species:

Pseudouranotaenia rowlandi Theobald. By monotypy.

Pseudoficalbia Theobald, 1911. Rep. Vet. Res. S. Africa 1: 272. Type

species: Ficalbia inornata Theobald. By monotypy.

Pseudoficalbia Theobald, 1912. Trans. Linn. Soc. London (Zool.) (2)15:

89. Type species: Pseudoficalbia pandani Theobald. By

subsequent designation (Edwards 1932).

The affinities of Uranotaenia with other genera are not well understood. Edwards (1932) associated Uranotaenia with Hodgesia and Zeugomyia in his Uranotaenia group of the Culicini. Belkin (1962) erected tribe Uranotaeniini for Uranotaenia, and considered Hodgesia as constituting a separate tribe and Zeugomyia as a member of tribe Aedini. The striking superficial characters of adult ornamentation have largely been used to separate groups of species within the genus. However, the characters possessed by the larvae and pupae may be useful in delineating a natural classification of the genus. It is evident (Belkin, 1953 & 1962) that Uranotaenia is a complex genus, and it

probably will be necessary in the future to recognize several subgenera rather than having all species groups in one supposedly homogeneous genus.

The adults are small, delicate and ornamented or unornamented mosquitoes; distinguished by the clear wing membrane, the microtrichia not visible; cell R_2 very short or small, shorter than stem vein and cell M_2 ; anal vein short and curved apically, always ending before level of fork Cu; alula bare or with few broad scales, and squama bare (fig. 11). Palpi of both sexes very short. Dorsocentral bristles strongly developed, the acrostichal weak. Postspiracular bristles absent; usually one spiracular bristle and one lower mesepimeral present. ♂ fore tibiae modified and with outstanding tuft bristles; ♀ legs unmodified. Tarsal claws simple. ♀ with one large spermatheca, and undeveloped buccopharyngeal armature. ♂ aedeagus with two lateral sclerotizations or plates bearing variously developed teeth; parameres well developed, and the basal lobe of sidepiece bears strong bristles.

The larvae are easily differentiated by the development of head hairs in some species; these are h-5 & 6 thickened or flattened, simple in other species; also the apical hairs of the antenna may be flattened, blade-like or leaf-like; segment VIII with large sclerotized plate; pecten teeth usually scale-like.

The pupae are particularly distinctive by having a more developed h-1 on abdominal segment IX than in other genera, and the greatly expanded or broader inner margin of paddle.

Fifteen species are known to occur in the Philippines: annandalei Barraud, arguellesi Baisas, argyroterarsis Leicester, clara Dyar &

Shannon, heiseri Baisas, lagunensis Baisas, lateralis Ludlow, ludlowae Dyar & Shannon, mendiolai Baisas, nivea Leicester, philippinensis Delfinado, pylei Baisas, rossi Delfinado, testacea Theobald, tubanguii Baisas.

Distribution:

The genus is confined chiefly to tropical regions; not known to occur in New Zealand, New Caledonia and several small oceanic islands.

Habitats and relation to disease:

The larvae have been collected in ground pools in swamps and marshes, stream margins and temporary ground pools; a large number of species are found in tree holes, bamboo stumps and rockholes. Adults apparently do not feed on man.

Key to species (Adult)

- | | | |
|-------|--|----|
| 1. | Pleuron with lines of bluish white scales----- | 2 |
| | Pleuron uniformly brown lacking white lines----- | 3 |
| 2(1). | Hind tarsus dark----- | 5 |
| | Hind tarsus white on segments III-V----- | 8 |
| 3(1). | Abdominal terga with white basal bands (broader in ♂ than | |
| | in ♀----- <u>lagunensis</u> Baisas | |
| | Abdominal terga dark, unbanded----- | 4 |
| 4(3). | Mesonotum with anterior border of pale narrow scales----- | |
| | ----- <u>tubanguii</u> Baisas | |
| | Mesonotum lacking pale border, unornamented species----- | 13 |
| 5(2). | Wing veins white scaled at base; narrow white line present | |

- in front of wing base, and across pleuron; may be
 lacking on mesonotum in front of wing base----- 7
- 6(5). Abdominal terga I-IV white dorsally, V with complete
 apical band, VI-VII dark; the bases of radius, cubitus
 and anal vein white scaled----- arguellesi Baisas
 Abdominal terga dark, lacking white markings; only base
 of radius white scaled----- heiseri Baisas
- 7(5). Mesonotum with narrow white line in front of wing base;
 ♂ fore tarsomere I peculiarly developed, with basal
 tuft hairs; the hind tibia with apical tuft bristles-----
 ----- lateralis Ludlow
 Mesonotum lacking white line; ♂ fore tarsomere I and hind
 tibia not developed as above----- annandalei Barraud
- 8(2). Mesonotum with white line in front of wing base; the
 bases of radius, cubitus and anal vein white scaled----- 9
 Mesonotum lacking white line; the wing veins dark-----
 ----- testacea Theobald
- 9(8). Abdominal terga dark; the anterior margin of mesonotum
 dark----- 10
 Abdominal terga I-IV with median white patches, V-VI with
 complete apical band; the anterior margin of mesonotum
 with pale scales----- 11
- 10(9). Fore tibia of ♂ with apical hair tuft; first fore
 tarsomere with a row of long hairs; the hind tibia
 lacking outstanding hairs----- 12

- Fore tibia and tarsus of ♂ lacking hair tuft; the hind
 tibia peculiarly developed and with curled outstanding
 hairs----- argyrotarsis Leicester
- 11(9). Wing with extensive white markings; femora dark-----
 ----- nivea Leicester
- Wing dark, only radius white scaled at basal third; mid
 and hind femora each with a row of white scales-----
 ----- mendiolai Baisas
- 12(10). First fore tarsomere of ♂ with a row of stiff hairs,
 lacking on second segment; hind tarsomeres IV-V and
 apical half of III white----- ludlowae Dyar & Shannon
- First fore tarsomere of ♂ lacking hairs, present on
 second segment; hind tarsomeres III-V and tip of II
 white----- clara Dyar & Shannon
- 13(4). Pleural integument reddish brown, with extensive patches
 of translucent scales----- 14
- Pleural integument uniformly brown, with few pale scales
 on mesepimeron----- pylei Baisas
- 14(13). Large patches of translucent scales present on
 sternopleuron and mesepimeron, and only a few pale
 scales on anterior and posterior pronotal lobes-----
 ----- rossi Delfinado
- Lacking large patches of translucent scales, only few
 translucent scales on posterior pronotal and broad pale
 scales on anterior pronotal lobes-- philippinensis Delfinado

Key to species (Larva)

1. Head h-5 & 6 greatly developed, flattened and thickened---- 2
 Head h-5 & 6 simple and unmodified----- 10
- 2(1). Antenna with apical hairs modified, either blade-like
 or leaf-like----- 3
 Antenna with apical hairs simple and unmodified----- 5
- 3(2). Comb plate complete dorsally; antenna smooth, lacking
 spicules; the apical hairs broadly leaf-like-----
 ----- annandalei Barraud
 Comb plate separated dorsally; antenna dark, spiculate;
 the apical hairs not as broad, blade-like----- 4
- 4(3). Head h-4 long and slender; h-7 double; saddle h-1 of anal
 segment weak, with 5-6 short branches-- clara Dyar & Shannon
 Head h-4 short and stout; h-7 strong, with 3 stout branches;
 saddle h-1 of anal segment stellate with 9-11 branches---
 ----- ludlowae Dyar & Shannon
- 5(2). Antennal shaft h-1 branched, with 5-6 long branches-----
 ----- testacea Theobald
 Antennal shaft h-1 single and short----- 6
- 6(5). Antenna smooth, shaft h-1 inserted at basal 1/3; lateral
 h-6 double on abdominal segments I-II, h-7 single on
 I-II----- lateralis Ludlow
 Antenna spiculate, shaft h-1 median or submedian in posi-
 tion; abdominal lateral h-6 & 7 variously developed----- 7

- 7(6). Head h-4 usually with 2 long branches; antennal shaft
 h-1 inserted midway from base; abdominal lateral h-6
 double on segments I-II, h-7 single----- nivea Leicester
 Head h-4 weak with 3-4 short branches; antennal shaft h-1
 submedian; lateral h-6 & 7 on segments I-II variously
 developed----- 8
- 8(7). Siphon dark at basal 1/2; lateral h-6 with 3 branches, h-7
 single on segment I; h-6 & 7 both single on II-----
 ----- heiseri Baisas
arguellesi Baisas
 Siphon uniformly pale; lateral h-6 branched, h-7 single
 on segments I-II----- 9
- 9(8). Lateral h-6 double and unequal on segments I-II-----
 ----- argyrotarsis Leicester
 Lateral h-6 with 3 unequal branches----- mendiolai Baisas
- 10(1). Thorax and abdomen covered with strong stellate hairs;
 head h-5 & 6 single----- pylei Baisas
 Thorax and abdomen with weak stellate hairs; head h-5 & 6
 usually branched----- 11
- 11(10). Comb plate complete dorsally; pecten and comb teeth
 sharply pointed----- philippinensis Delfinado
 Comb plate separated dorsally; pecten teeth scale-like,
 comb teeth pointed with lateral fringe----- 12
- 12(11). Antenna spiculate; head h-5 & 6 single and stout-----
 ----- lagunensis Baisas

developed on segment VIII, h-2 weak to minute-----

----- philippinensis Delfinado

Paddle with one long hair; abdominal h-9 on segment VIII

weak, h-2 spine-like----- pilei Baisas

8(6). Abdominal h-2 minute, h-9 on segment VIII dendritic;

paddle with one short hair----- annandalei Barraud

Abdominal h-2 well developed, h-9 on segment VIII with 4-6

weak branches; paddle with two unequal hairs-----

----- lagunensis Baisas

Pupae of heiseri, ludlowae, nivea, and rossi unknown; no PI specimens of lateralis available for study.

Uranotaenia annandalei Barraud (figs. 52-58)

Uranotaenia annandalei Barraud, 1926. Indian J. Med. Res. 14: 343 (♂♀).

Type loc: Golaghat, Assam, India (British Museum); Baisas, 1935.

Philip. J. Sci. 57(1): 64. (A, L, ♂ gen., fig., key); Bohart,

1945. USNavmed 580, p. 33 (L, key, distr.); Edwards, 1932.

Bull. ent. Res. 23: 559 (L, fig.).

This species markedly differs from other ornamented members of the genus by the unique structure of the ♂ genitalia, and by the marked development of the apical hairs of antenna of the larva. The larva can be associated with the group having developed head h-5 & 6, and the adult with those having white line on pleuron and dark tarsus.

♀. Head: Vertex dark brown, a broad band of silvery white scales present around eye margin. Thorax: Mesonotum brown, lacking line of

white scales in front of wing base; pleuron with a narrow line of white scales across sternopleuron continuing to anterior pronotal lobe, and a dark integumental line parallel to white line across sternopleuron and mesepimeron. Wing: Entirely brown. Legs: Completely brown, with few silvery white scales on mid coxae. Abdomen: Terga dark, unmarked; sternites pale.

♂. Essentially similar to ♀ except for the sexual differences. Genitalia as in figure 52. Sidepiece short, the basal lobe with few hairs; clasper small, swollen at base narrowing towards apex, bearing few short setae; aedeagus unique, appearing as two broad lateral plates, with short small bases; each plate with two recurved, lateral teeth at rounded apical margin; parameres large, rod-like.

Pupa (figs. 56-58). Cephalothoracic hair C-8 well developed with expanded basal stem bearing 5 long branches, C-9 poorly developed. Respiratory trumpet short and slender, lacking slit, dark pigmented; the trachoid reaching to about 2/3 the length of trumpet. Metanotal hairs C-10, 11 & 12 equally developed and branched apically. Abdominal h-5 on segments IV-VI with 2-3 long branches reaching apex of the following tergum; h-1 on segments VI-VII greatly reduced to a single or double thin hair; lateral h-9 on segment VIII short, dendritic. Paddle with strong midrib and sharp serrations diminishing towards base, the internal serrations uneven; one short paddle hair present.

Larva (figs. 53-55). Clypeal h-1 flattened, long and straight. Head h-5 & 6 well developed, flattened and fringed laterally; h-4 short and single, rather weak; h-7 long, with 3 branches. Antenna smooth, the apical hairs modified: h-4 & 6 blade-like and flattened; h-2 broader and

leaf-like, inserted at about midway from base of antenna; antennal shaft h-1 small and simple, subapical. Abdominal h-6 with 3 branches, h-7 single on segment I; h-6 & 7 double on segment II. Comb plate large and connected dorsally, with 4-6 large and well differentiated teeth having lateral fringe at basal 1/2. Siphon slender, nearly straight and uniformly pigmented, the siphon tuft stellate; pecten teeth extending to about 1/2 the length of siphon, the last tooth at level of tuft, the teeth narrowed at base and expanded to fringed apex. Saddle long, the caudal margin with few short, heavy spines; saddle h-1 single and short. Comb plate, siphon and saddle surfaces imbricate.

Material examined:

♂♀ San Jose, Mindoro, 3.III.1945 (E. S. Ross); ♀♂ Titunod Creek, Kolambugan, Lanao, 9.V.1931 (W. V. King); ♀♀ Parang, Cotabato, 2.VI.1945 (J. H. Paullus).

Recorded distribution:

Baguio; Laguna; India, Nepal, Burma, China, Formosa, Ryukyu Is., Okinawa.

Habitats:

The larvae breed in forest streams, shaded residual pools in rocky jungle creeks, old scummy pools on forest floor and jungle swamps. The habitats of the adults are unknown.

Uranotaenia argyrotarsis Leicester (figs. 68-72)

Uranotaenia argyrotarsis Leicester, 1908. Cul. Malaya 3: 214 (♂♀).

Type loc: Gombak Road, Kuala Lumpur (British (Nat. Hist.)

Museum); Dyar & Shannon, 1925. Insec. Inscit. Menst. 13: 68

(listed); Baisas, 1935. Philip. J. Sci. 57(1): 65 (♂, L, key, fig.); Bohart, 1945. USNavmed 580, p. 34 (key); Knight & Chamberlain, 1948. Proc. Helm. Soc. Wash. 15: 14 (P, fig.).

Pseudouranotaenia parangensis Ludlow, 1909. Canad. ent. 41: 24 (♀).

Type loc: Parang, Mindanao (U. S. National Museum). Ludlow in Theobald, 1910. Monogr. Cul. 5: 524 (Descr.); Bezzi, 1913.

Philip. J. Sci. D8(4): 307 (listed) Dyar & Shannon, 1925. Insec. Inscit. Menst. 13: 68 (syn.) Penn, 1949. Pacific Sci. 3: 33 (P).

A distinct species on the basis of the peculiar development of the base of hind tibia of ♂, but can be associated with the species having white lines on the pleuron and mesonotum, and white hind tarsomeres. However, the larva and pupa are difficult to differentiate from arguellesi Baisas and mendiolai Baisas.

♂. Head: Vertex dark brown with bluish sheen; a broad band of bluish white scales present around eye margin narrowing in front. Thorax: Mesonotum brown, with a short narrow line of white scales in front of wing base; pleuron with narrow line of white scales across sternopleuron continuing to anterior pronotal lobe and posteriorly to white integumental patch across mesepimeron. Wing: With white scales at bases of radius, cubitus and anal vein. Legs: Mostly dark; hind tarsomeres III-V completely white; mid tarsomeres IV-V pale (whitish); hind tibia bent at base, with one short and straight, and two long, curled bristles. Abdomen: Terga entirely dark. Genitalia as in figure 66. Basal lobe of sidepiece small, with short bristles; clasper stout, nearly straight; aedeagus with lateral plates bearing two large

curved teeth, the apical tooth projecting laterad, the median tooth mesad; parameres almost straight and weakly sclerotized at mid portion.

♀. No Philippine specimens are available for study.

Pupa. (figs. 70-72). Respiratory trumpet uniformly dark and slender, slightly widening towards opening, with distinct transverse slit; the trachoid extending to more than 1/2 the length of trumpet. Cephalothoracic hair C-8 long, with 5-7 branches; C-9 weak, with 5 branches. Metanotal hairs C-10 & 12 equally developed and branched, C-11 single. Abdominal h-5 with 2-3 long branches on segments IV-VII reaching apex of the following segment; h-1 reduced to 3-5 weak branches on segments III-VII; h-9 long and double. Paddle with prominent midrib, the external margin with uniform serrations, uneven along internal margin; one small paddle hair present.

Larva (figs. 67-69). Clypeal h-1 long and pointed; head h-5 & 6 modified, flattened and minutely spiculate; h-4 with 3 long branches; h-7 longer than h-4 and with 5 branches. Antenna uniformly dark and spiculate, the apical hairs unmodified; shaft h-1 small and submedian in position. Abdominal lateral h-6 with 2 unequal branches on segments I & II, h-7 single. Comb plate separated, with 7-9 large and pointed teeth, fringed laterally, the median teeth longer. Siphon slightly swollen at mid portion and narrowing towards valve, with distinct imbrications at basal 1/2; siphon tuft stellate; pecten extending to mid portion of siphon, the teeth narrow and with short lateral and apical fringe. Saddle long and the surface imbricate, the caudal margin with uneven sharp spicules; saddle h-1 weakly stellate, with 4-5 branches.

Material examined:

San Jose, Mindoro, 9.III.1945 (E. S. Ross); Calicoan Is., 1/2 mi. NW of N'goles.

Recorded distribution:

Palawan; Cotabato; Malaya, Molluccas, New Guinea, Bismarck Arch., Solomon Is.

Habitats:

The larvae breed in forest streams, tree holes and shaded temporary ground pools, leafy forest swamps. The biting habits of the adults are not known.

Uranotaenia arguellesi Baisas (figs. 59-65)

Uranotaenia arguellesi Baisas, 1935. Philip. J. Sci. 57(1): 68 (A, ♂ gen., L, fig., key). Type loc: Calawan, Laguna (lost); Bohart, 1945. USNavmed 580, p. 33 (key, syn.).

This species resembles heiseri Baisas by the dark hind tarsomeres and by the thoracic and wing ornamentation. It is distinguished, however, by the white scaling of the abdominal terga I-IV. These are completely dark in heiseri.

♀. Head: Vertex with dark appressed scales, lacking narrow upright scales, a band of white scales around eye margin narrowing in front. Thorax: Mesonotum brown, with a short narrow line of white scales in front of wing base; pleuron with a narrow line of white scales across sternopleuron and anterior pronotal lobe, and few white scales on lower sternopleuron. Wing: White scaled at base of radius and translucent scales present at basal 1/3 of cubitus and anal vein. Legs:

Mostly dark, with few pale scales on coxae. Abdomen: Terga I-IV white dorsally, V with complete apical band, VI-VII dark.

♂. As in ♀ except for the usual sexual differences. Genitalia as in figure 62. Basal lobe of sidepiece with four long bristles; clasper short and stubby, with short setae at apical 1/3; the lateral plates of aedeagus each with two sets of teeth as follows: two short apical, and four large curved teeth all directed laterad; parameres small.

Pupa (figs. 59-61). Cephalothoracic hairs C-8 & 9 well developed, dendritic with C-9 more strongly developed than C-8. Respiratory trumpet small and slender, slightly wider at opening, with long transverse slit; the trachoid dark, extending to mid portion of trumpet, the surface uniformly imbricate. Metanotal hairs C-10, 11 & 12 dendritic, each with 8 and 4-6 long branches respectively. Abdominal h-5 with 8 long branches on segments IV-VII; h-9 with 5 long branches. Paddle with strong midrib, the internal and external margins serrated; one short paddle hair present.

Larva (figs. 63-65). Clypeal h-1 slender and pointed; head h-5 & 6 modified, flattened and barbed; h-4 short, with 3-4 weak branches; h-7 with 4 long and strong branches. Antenna dark, spiculate; the apical hairs simple, unmodified; antenna; shaft h-1 short, single and submedian in position. Abdominal lateral h-6 with 3 branches, and h-7 single on segments I-II, both single on segment II. Comb plate separated dorsally, with 8-10 unequal and pointed teeth with fine lateral fringe; the margin of plate dark and the surface imbricate. Siphon slightly expanded at level of tuft, dark at mid portion and with

imbricate surface; pecten teeth broad with lateral and apical fringe extending to mid portion of siphon; siphon tuft stellate with 10-12 branches located midway from base. Saddle long, the caudal margin with sharp uneven spicules saddle h-1 with 4-5 branches.

Material examined:

♂♂♀♀ San Jose, Mindoro, 25.XII.1944 (E. S. Ross); ♂♂ Tacloban, Leyte, 28.X.1944 (E. S. Ross); ♀♀ La Union, Luzon, 9.III.-VI.26.1945 (A. B. Gurney).

Recorded distribution:

Laguna.

Habitats:

The larvae breed in grassy ponds, semi-stagnant ponds and brooks, semi-open forested marshes with many leaves in water, clear and shaded jungle creeks, and impounded and clear vegetated water. The biting habits of the adults are unknown.

Uranotaenia clara Dyar & Shannon (figs. 73-79)

Uranotaenia clara Dyar & Shannon, 1925. Insec. Inscit. Menst. 13:68

(♂♀). Type loc: Ludlow Barracks, Mindanao (U. S. National Museum); Edwards, 1929. Not. Ent. 9: 2 (listed); Belkin, 1953. Pacific Sci. 7: 340 (♂ as clarae, resurr. from syn. with ludlowae Dyar & Shannon); Stone & Knight, 1957. J. Wash. Acad. Sci. 46(6): 200 (♂ lectotype).

Uranotaenia delae Baisas, 1935. Philip. J. Sci. 57(1): 73 (♀, L, fig.,

key). Type loc: Salimbao, Cotabato (lost); Bohart, 1945.

USNavmed 580, p. 34 (key); Belkin, 1953. Pacific Sci. 7: 340

(♂, syn.).

Belkin (1953) resurrected clara from synonymy with ludlowae Dyar and Shannon, and treated delae Baisas as a synonym of clara. U. delae was apparently described from a ♂ rather than ♀. U. clara is distinguished by the presence of hair tufts at apex of fore tibia, and a row of stiff hairs in addition to long basal fringe on second fore tarsomere of ♂. In this respect, it resembles ludlowae, and fimbriata King and Hoogstraal from New Guinea in having similar apical hair tufts on fore tibia. U. ludlowae, however, lacks the first tarsal hairs, while fimbriata have both first and second tarsomeres with rows of stiff hairs and heavy fringed. The larvae of ludlowae and clara are distinguishable by the characters mentioned in the key.

♂. Head: Vertex dark with slightly bluish tinge; a broad band of white scales around eye margin. Thorax: Mesonotum dark brown, with a short narrow line of white scales in front of wing base reaching posterior margin of posterior pronotal lobe; pleuron with patches of white scales across sternopleuron and anterior pronotal lobe. Wing: Mainly dark, with white scales at bases of radius, cubitus and anal vein. Legs: Hind tarsomeres III-V and tip of segment II white; fore tibia with apical hair tuft; second fore tarsomere with a row of long stiff hairs and longer basal fringe, these hairs or fringe lacking on first tarsomere. Abdomen: Terga dark; sternites pale. Genitalia as in figure 76. Basal lobe of sidepiece bearing a group of 6-7 short and long bristles; clasper short and stubby, slightly expanded toward apex, with short apical setae; aedeagus with lateral plates each bearing a strongly hooked

tooth, and a smaller median tooth directed mesad; parameres large, sclerotized and swollen at mid portion.

♀. No Philippine material is available for study.

Pupa (figs. 73-75). Cephalothoracic hair C-8 unusually developed, with one extremely long, thick hair and short thin ones laterally; C-9 with short basal stem expanded, bearing 11-12 long branches.

Respiratory trumpet long and slender, widening towards opening; with long transverse slit; the trachoid dark, extending to more than 1/2 the length of trumpet, the portion between trachoid and opening light pigmented and smooth. Metanotal hairs C-10, 11 & 12 variously developed. Abdominal h-5 equally developed on segments IV-VII; h-9 with slender basal stem bearing 5-7 branches; h-4 & h-9 on segment VIII both dendritic and equally developed.

Larva (figs. 77-79). Clypeal h-1 long and nearly straight; head h-5 & 6 flattened, with fine barbed and sharply pointed tips; h-4 single, long and stout; h-7 double, developed as in h-4. Antenna dark with large spicules; the apical hairs flattened and blade-like; antennal shaft h-1 small and inconspicuous, submedian in position. Abdominal lateral h-6 long and single, h-7 with 3 branches on segments I & II. Comb plate large, separated dorsally, the surface imbricate; with about 8 strongly pointed teeth, having short lateral fringe, the median teeth longer. Siphon straight and stout, the surface almost smooth; pecten teeth long and narrow, with long apical and short lateral fringe at one side; the teeth extending to more than 1/2 the length of siphon; siphon tuft branched located at mid portion. Saddle large, dark

dorsally and the surface imbricate; caudal margin with sharp, small and large spicules; saddle h-1 short, with 5-6 branches.

Material examined:

♂♂ San Jose, Mindoro, 1.I.1945 (E. S. Ross); ♂♂ Parang, Cotabato, 2.VI.1945 (J. H. Paullus); ♂♂ Ludlow Barracks, Parang, Cotabato.

Recorded distribution:

Cotabato.

Habitats:

The larvae breed in fresh water marshes, dark and shaded swamp forest, and residual ground pools. Nothing is known of the biting habits of the adults.

Uranotaenia heiseri Baisas

Uranotaenia heiseri Baisas, 1935. Philip. J. Sci. 57(1): 72 (♀, L, fig., key). Type loc: Parang, Cotabato (lost); Bohart, 1945. USNavmed 580, p. 35 (key).

This species is very similar to arguellesi Baisas from which it differs by having completely dark abdominal terga, and white scales at basal 1/3 of radius. The larva can be readily separated from other species but difficult to differentiate from arguellesi.

♀. Head: Vertex with dark appressed scales, the narrow upright scales absent; with a band of white scales along eye margin. Thorax: Mesonotum brown, with a short line of white scales in front of wing base reaching before posterior pronotal lobe; pleuron with a narrow white line across sternopleuron continuing to anterior pronotal lobe, and mesepimeron with a pale integumental spot opposite the end of white

line. Wing: Mostly dark except for white scales on basal 1/3 of radius.
Legs: Mostly dark with some white scales on coxae. Abdomen: Tergites entirely dark; sternites pale.

♂, pupa unknown.

Larva (after Baisas, 1935 description and figures). Head h-5 & 6 flattened and spinous laterally; h-7 with 3 strong branches. Antenna spiculate, the apical hairs simple, unmodified; antennal shaft h-1 small, situated at basal 1/4. Abdominal lateral h-6 & 6 on segments I & II developed. Comb plate with 6-7 pointed and fringed teeth (he did not mention whether the comb plate is connected or separated dorsally). Siphon with 11 pecten teeth, shorter and more expanded at apices than in other species; siphon tuft with 12 branches located opposite the most distal pecten tooth.

Material examined:

♀♀ Kabakan, Mindanao, V.1945 (R. Staples).

Recorded distribution:

Known only from type locality: Cotabato.

Habitats:

The larvae have been collected in fresh water swamps. Nothing is known of the habits of the adults.

Uranotaenia lagunensis Baisas (figs. 80-83)

Uranotaenia lagunensis Baisas, 1935. Philip. J. Sci. 57(1): 70 (A,

♂ gen., L, fig., key). Type loc: College of Agriculture, Los Banos, Laguna (lost); Bohart, 1945. USNavmed 580, p. 35 (key).

This species is readily differentiated from other unornamented Uranotaenia by the basal white bands on abdominal terga I-VI in ♀, and I-VIII in ♂. The larva has the head h-5 & 6 less modified and shows marked individual variations in the branching of abdominal hairs, the size and shape of siphon, and the presence of spicules along caudal margin of saddle. These variations are particularly noticeable among specimens breeding in forest swamps and hoof prints. There is less variation in the pupa. Like the members of the pylei group, it has translucent pale scales on sternopleuron.

♀. Head: Vertex with pale brown appressed and dark brown upright scales; the pale scales around eye margin not forming a distinct band. Thorax: Mesonotum uniformly brown, lacking white scaling; pleuron brown with patches of translucent scales on upper and lower sternopleuron, and few pale scales on anterior pronotal lobe. Wing: Uniformly brown. Legs: Entirely brown. Abdomen: With narrow basal white bands on terga I-VI, dark on VII-VIII; sterna pale.

♂. Coloration as in ♀ except for broader basal white bands on terga I-VIII. Genitalia as in figure 80. Basal lobe of sidepiece with groups of well differentiated bristles; clasper slender, the base swollen, with short setae at apical 1/3; aedeagus with lateral plates bearing two subequal short teeth directed upwards, and two curved lateral teeth; parameres broadly swollen except at both ends.

Pupa. Cephalothoracic hairs C-8 & 9 with 6-8 weak branches, weaker in C-9. Respiratory trumpet short, light pigmented and widest at opening; the trachoid dark and near base; lacking slit and the surface uniformly imbricate. Metanotal hairs C-10, 11 & 12 variously developed:

C-10 & 12 either forked or dendritic, C-11 usually single. Abdominal h-5 branched on segments IV-VII; h-9 with 4-6 weak branches on VIII; h-1 reduced to 5 weak branches. Paddle margin serrated, the serrations deeper and stronger at apex; two unequal paddle hairs present.

Larva (figs. 81-83). Clypeal h-1 short and stout; head h-5 & 6 single and stout but not flattened; h-4 with 3-4 short branches; h-7 well developed with 5-8 long branches arising from a flattened base. Antenna spiculate, light pigmented; antennal shaft h-1 single, subapical in position, the apical hairs simple. Abdominal lateral h-6 double, and h-7 single on segments I-II. Comb plate separated dorsally, with 10-12 long and pointed teeth, finely fringed laterally. Siphon slender, almost straight or with slight median expansion; the pecten teeth short and with apical fringe, extending to more than 1/2 the length of siphon; siphon tuft with 6-8 long branches inserted at mid portion of siphon. Saddle short and broad, with few spicules along caudal margin; saddle h-1 with 2 strong barbed branches. Comb plate, siphon and saddle lightly sclerotized, the surfaces imbricate.

Material examined:

♂♂♀♀ San Jose, Mindoro, 30.I & 22.II.1945 (E. S. Ross); ♀♀ Burgos, Mt. Province, 6.VI.1945 (A. B. Gurney); ♀♀ Los Banos, Laguna (A. E. Woodworth); ♂♂♀♀ lot 372, Bataan, VII.1931 (W. V. King); ♂♀ Kidapawan, Cotabato, 10.VII.1957 (F. E. Baisas).

Recorded distribution:

Bataan, Laguna, Palawan.

Habitats:

The larvae breed in hoof prints in the jungle, forest swamps and

rockholes in forest creeks. Nothing is known of the habits of the adult.

Uranotaenia lateralis Ludlow (figs. 84-87)

Uranotaenia caeruleocephala var. lateralis Ludlow, 1905. Canad. Ent.

37: 385 (♀). Type loc: Cotabato, Mindanao (U. S. National Museum).

Uranotaenia caeruleocephala Theobald. Bezzi, 1913. Philip. J. Sci.

D8(4): 307 (listed).

Uranotaenia innotata Dyar & Shannon, 1925. Insec. Inscit. Menst. 13: 69

(♀). Type loc: Camp Nichols, Rizal (U. S. National Museum); Edwards, 1929. Not. ent. 9: 2 (listed); Bohart, 1945. USNavmed 580, p. 34 (syn. with atra Theobald).

Uranotaenia atra Theobald. Dyar & Shannon, 1925. Insec. Inscit. Menst.

13: 69 (listed); Baisas, 1935. Philip. J. Sci. 57(1): 65 (A, L, fig., key); Bohart, 1945. USNavmed 580, p. 34 (key); Belkin, 1953. Pacific Sci. 7: 324 (♂♀, L, P, fig., key, taxonomy).

Uranotaenia lateralis Ludlow. Banks, 1906. Philip. J. Sci. 1(9): 990

(to sp. status); Theobald, 1910. Monogr. Cul. 5: 506 (descr., Cotabato); Bezzi, 1913. Philip. J. Sci. D8(4): 307 (listed); Stone, 1957. Ann. Ent. Soc. Amer. 50(2): 173 (resurr. from syn. with atra ♀ lectotype); Belkin, 1962. Mosq. S. Pacific 1: 170 (taxonomy). For complete synonymy see Stone, et al (1959: 114).

The Philippine form of this species has been described under the name atra Theobald in which lateralis Ludlow was a synonym. Stone (1957) resurrected lateralis from synonymy with atra, and restricted the

application of atra to species formerly known as nigerrima Taylor in Australia, and that lateralis should replace atra of authors.

U. lateralis is readily distinguished by the presence of apical hair tufts on hind tibia, and by the peculiar development of first fore tarsomere of ♂. The thickened, flattened head h-5 & 6 of the larva relates it to other species having similar development and unmodified apical hairs of antenna.

♀. Head: Vertex dark brown with bluish tinge and band of bluish white scales around eye margin widening in front. Thorax: Mesonotum with short narrow line of bluish scales in front of wing base; pleuron with broad patches of bluish white scales across sternopleuron and anterior pronotal lobe; few white scales on lower sternopleuron. Wing: All scales dark. Legs: Completely dark, lacking specialized hair tufts. Abdomen: Terga dark with lateral white patches on segments II-VII; sterna mostly pale.

♂. Similar to ♀ except for the usual sexual differences. Legs modified; hind tibia with apical and subapical specialized hair tufts; first fore tarsal segment short and excavated, with basal hair tufts; the second segment with a row of long sub-basal bristles. Genitalia as in figure 84. Basal lobe of sidepiece with a group of 6-8 strong bristles; clasper short and stubby, slightly swollen towards apex; with short and strong apical setae; aedeagus with the lateral plates each bearing one long apical and one short, curved subapical teeth, and one large recurved submedian tooth with two smaller teeth; parameres short.

Pupa. No Philippine specimens are available for study.

Larva (figs. 85-87). Clypeal h-1 short and stout; head h-5 & 6 flattened, barbed and sharply pointed; h-4 with 3 weak branches; h-7 with 4 long branches. Antenna smooth and dark pigmented; antennal shaft h-1 small and situated at basal 1/3, the apical hairs unmodified. Abdominal lateral h-6 double, h-7 single on segments I-II. Comb plate large, nearly meeting dorsally, the surface imbricate; with 7-9 short, pointed teeth, fringed laterally; the median teeth not differentiated. Siphon slender, almost straight and slightly narrowed at apex, conspicuously imbricate; pecten teeth elongate with short lateral and long apical fringe; siphon tuft stellate and situated at level of last pecten tooth at mid portion of siphon. Saddle long with short uneven spicules at caudal margin, h-1 with 6-8 short branches.

Material examined:

♂♂ San Jose, Mindoro, 15.I.1945; ♀♀ Tacloban, Leyte, X.1945 (all coll. by E. S. Ross); ♂♂ Kolasi, Kolambugan, Lanao, 7.V.1931 (W. V. King); ♀♂ Caminawit Pt., Jinamoc Is.; ♀♂♂ Camp Eldridge, Los Banos, Laguna.

Recorded distribution:

Cotabato, Rizal, Palawan, Bulacan, Laguna; India, Ceylon, Andaman Is., Malaya, Thailand, Indonesia, New Guinea, Australia, Solomon Is., Bismarck Archipelago, Borneo.

Habitats:

The larvae have been breeding in forest streams, grassy puddles and brackish nipa palm swamps; also reported breeding in crabholes and stagnant pools or swamps with nipa palms. Nothing is known of the habits of the adults.

Uranotaenia ludlowae Dyar & Shannon

Uranotaenia ludlowae Dyar & Shannon, 1925. Insec. Inscit. Menst. 13: 68

(♀). Type loc: Ludlow Barracks, Mindanao (U. S. National Museum); Edwards, 1929. Not. ent. 9: 2 (listed); Baisas, 1935. Philip. J. Sci. 57(1): 66 (♀, L, fig., key); Bohart, 1945. USNavmed 580, p. 35 (key); Stone & Knight, 1957. J. Wash. Acad. Sci. 47(6): 200 (♀ lectotype).

Uranotaenia reyi Baisas, 1935. Philip. J. Sci. 57(1): 74 (♀, fig., key). Type loc: Simoay, Cotabato (lost); Bohart, 1945. USNavmed 580, p. 36 (key); King & Hoogstraal, 1946(47). Ann. Ent. Soc. Amer. 39(4): 592 (♂); Belkin, 1953. Pacific Sic. 7: 340 (♂).

New Synonymy.

The original description of reyi Baisas was apparently based on a ♂ specimen rather than a ♀. It is differentiated by the presence of long hair tufts on fore tibia and first fore tarsal segment. Except for this modification of the ♂ fore leg, reyi does not differ from ludlowae, which has only been described from a ♀. Also, on the basis of larval chaetotaxy, I have not been able to separate the two species. Both were found breeding in the same habitats.

♀. Head: Vertex mostly covered with appressed, bluish white and few upright brown scales. Thorax: Mesonotum brown, with narrow short line of bluish white scales in front of wing base to before margin of posterior pronotal lobe; pleuron with broader bluish white line across sternopleuron and anterior pronotal lobe. Wing: With few white scales at extreme bases of radius and anal vein, and basal 1/2 of stem of

cubitus. Legs: Lacking conspicuous hair tufts; hind tarsomeres IV-V and apical 1/2 of segment III completely white. Abdomen: Terga entirely dark; sterna pale with translucent scales.

♂ (Based on adult description of reyi Baisas, 1935). Essentially as in ♀ ludlowae except for the modification of the foreleg. Fore tibia with apical long hair tufts; the first fore tarsomere with numerous long hairs basally. The genitalia are not described.

Larva (After Baisas, 1935 descriptions and figures of ludlowae and reyi). Clypeal h-1 elongate and pointed; head h-5 & 6 flattened and barbed, h-4 single and stout, h-7 with 3 stout branches. Antenna spiculate, the apical hairs flattened and blade-like; antennal shaft h-1 small and located at mid portion. Abdominal lateral h-6 & 7 well developed on segments I & II. Comb plate with 8-10 fringed teeth (he did not mention whether the plate is complete or separated). Siphon with 11-12 fringed pecten teeth; siphon tuft with 11-16 branches and situated opposite the second distal tooth. Saddle h-1 stellate.

Pupa: Unknown.

Material examined:

♀♀ Ludlow Barracks, Parang, Cotabato.

Recorded distribution:

Cotabato, Laguna.

Habitats:

The larvae have been collected in clear pools or marshes. The habits of the adults are not known.

Uranotaenia mendiolai Baisas (figs. 94-100)

Uranotaenia mendiolai Baisas, 1935. Philip. J. Sci. 57(1): 71 (A, ♂ gen., L, fig., key). Type loc: College of Agriculture, Los Banos, Laguna (lost); Bohart, 1945. USNavmed 580, p. 35 (key).

U. mendiolai can be easily distinguished from other ornamented Uranotaenia by having the mesonotal white line continuing from wing base to anterior margin of mesonotum, and row of white scales on mid and hind femora. The ♂ aedeagus is distinctive with five well differentiated teeth on each lateral plate. The larva has modified head h-5 & 6, and simple apical hairs of antenna.

♀. Head: Vertex dark, mostly covered with appressed scales; the broad white scales around eye margin forming conspicuous tuft in front. Thorax: Mesonotum with line of broad white scales from front of wing base continuing as narrow white line to anterior margin; pleuron with narrow white line across sternopleuron onto anterior pronotal lobe, few white scales on lower sternopleuron and coxae. Wing: Mostly dark except for white basal 1/3 of radius. Legs: Marked, the mid and hind femora each with a row of white scales at basal 1/2; hind tarsomeres IV-V pale but not decidedly white; coxae with small patches of white scales. Abdomen: Terga II-IV with large median white patches; complete narrow apical bands on V-VI, VII entirely dark, VIII somewhat pale; sterna dark scaled.

♂. Coloration as in ♀. Genitalia as in figure 94. Basal lobe of sidepiece with one strong and many weaker bristles; clasper short and stubby, with short apical setae; aedeagus with lateral plates each

bearing five well differentiated teeth: two apical small teeth, with one tooth directed upwards; two large and curved laterad; one largest and bent mesad; parameres slender and curved.

Pupa. Not described; the distinguishing characters are as mentioned in the key and as in figures 98-100.

Larva (figs. 95-97). Clypeal h-1 slender and straight; head h-5 & 6 flattened and barbed; h-5 & h-7 each with 3-4 branches, the branches on h-7 stronger. Antenna dark and spiculate; antennal shaft h-1 short, submedian in position; the apical hairs simple. Abdominal lateral h-6 with 3 branches and h-7 single on segments I-II. Comb plate large, separated dorsally, with 7 pointed teeth, with fine lateral fringe at basal 1/2, the median teeth longer; the surface imbricate. Siphon stout and swollen at mid portion; the pecten teeth broad with lateral and apical fringe, the distal tooth not reaching mid portion of siphon; siphon tuft stellate situated halfway from base of siphon. Saddle long, the caudal margin with fine spicules; saddle h-1 with 5-6 strong branches.

Material examined:

♂♂♀♀ San Jose, Mindoro, 9.III, & 26.IV.1945 (E. S. Ross); ♂♂♀♀ Olangapo Rd., Zambales; Atimonan, Quezon (Tayabas); Kabakan, Kolambugan, Lanao.

Recorded distribution:

Bataan, Laguna.

Habitats:

The larvae were collected in rock holes in forest creeks, along

stagnated clear edges of creeks and shaded pools in jungle. The habits of the adults are not known.

Uranotaenia nivea Leicester (figs. 88-91)

Uranotaenia nivea Leicester, 1908. Cul. Malaya 3: 211 (♂). Type loc:

Kuala Lumpur, Malaya (British (Nat. Hist.) Museum); Bohart, 1945.

USNavmed 580, p. 36 (to sp. status).

Pseudouranotaenia triangulata Ludlow, 1908. Canad. Ent. 40(9): 331 (♂).

Type loc: Reina Regente (Cotabato), Mindanao (U. S. National

Museum); Bezzi, 1913. Philip. J. Sci. D8(4): 307 (listed);

Edwards, 1913. Bull. ent. Res. 4: 238 (syn. with nivipes

Theobald); Edwards, 1929. Not. ent. 9: 2 (syn. with nivipes).

This species is distinct from other ornamented *Uranotaenia* by the extensive white scaling of the mesonotum and wings. It is quite similar to mendiolai Baisas by having similar mesonotal pattern but the white scaling is not as extensive as in nivea. The larva has modified head h-5 & 6, and simple apical hairs of the antenna.

♀. Head: Vertex covered with dull white appressed scales, no upright scales, the white scales around eye margin continued as tuft of narrow scales in front. Thorax: Mesonotum with extensive white scaling from anterior border and posteriorly to wing base; pleuron with white scales across sternopleuron continuing to anterior pronotal lobe, and posteriorly to bare white integument across mesepimeron. Wing: Extensively white, with the dark areas on costa and radius, and across the wing from stem of vein R to apical half of cubitus. Legs: Hind tarsal segments IV-V and apex of III entirely white. Abdomen: Terga

I-VII with apical white band, and median white patches on I-IV.

♂ (Based on type specimen of triangulata). Ornamentation essentially similar to ♀. Genitalia as in figure 88 and very similar to argyrotarsis. Basal lobe of sidepiece small, with four strong bristles; clasper nearly straight with short setae at distal 1/2 and slender apical spine; lateral plate narrowly connected, each plate with two large hooked processes or spines; parameres slender and swollen at mid portion.

Pupa. Unknown.

Larva (figs. 89-91). Clypeal h-1 long, slender and curved; head h-5 & 6 flattened and barbed apically; h-4 with 2 long and weak branches; h-7 with 4-5 strong and long branches. Antenna dark pigmented, the spicules rather indistinct at basal 1/2; antennal shaft h-1 small and weak, situated at mid portion from base; the apical hairs simple. Abdominal lateral h-6 double, h-7 single on segments I-II; the stellate hairs short but stronger. Comb plate large, separated dorsally, with 6-7 unequal, pointed teeth and finely fringed at base, the median teeth longer. Siphon long and slender, almost straight; pecten teeth elongate, with apical and lateral fringe, extending to basal 1/4 of siphon; siphon tuft with 5-6 branches, submedian in position. Saddle long, the caudal margin with long spicules; saddle h-1 stellate, with 10 weak branches.

Material examined:

♀♀ San Jose, Mindoro, 30.I.1945 (E. S. Ross); ♀♀ Fort Pikit, Kabakan, Parang; Ludlow Barracks, Cotabato, Mindanao; ♂ Reina Regente, Cotabato, Feb., (C. S. Ludlow).

Recorded distribution:

Cotabato; Malaya.

Uranotaenia philippinensis Delfinado (figs. 101-106)

Uranotaenia philippinensis Delfinado, 1965. J. Med. Ent. 3: (♂♀, L, P, fig). Type loc: San Jose, Mindoro (California Academy of Sciences).

A uniformly brown species lacking ornamentation; the larva has simple frontal head hairs and, the pupal respiratory trumpet lacks the transverse slit. The larva resembles quadrimaculata Edwards in the development of the comb plate and pecten teeth. It differs, however, in having well developed stellate saddle h-1 which is single or double in quadrimaculata. Also, the adult lacks the dark integumental spots on mesonotum, and the structure of the ♂ genitalia is distinctive.

♀. Head: Vertex with dark irridescent green and brown upright scales, and broad translucent scales around eye margin. Thorax: Mesonotum uniformly brown, lacking white scaling; pleuron with broad pale scales on anterior pronotal lobe, and few translucent scales on posterior pronotal lobe and sternopleuron. Wing: Brown, the scales blackish on costa and radius. Legs: All brown. Abdomen: Entirely brown.

♂. Genitalia as in figure 103. Basal lobe of sidepiece with a group of long and short bristles, the long bristles stronger and thicker, clasper swollen at base and narrowed to apical 1/3, with short apical setae; aedeagus with lateral plates, each bearing two sets of teeth as follows: a pair of straight, blunt teeth directed upwards, and

3-4 curved pointed teeth laterad; parameres large and greatly swollen except distally.

Pupa (figs. 101-102). Cephalothoracic hair C-8 with 3-4 well developed branches, C-9 short and single. Respiratory trumpet short, lacking slit, the base narrow and expanded from mid portion to wide opening; the trachoid extending to basal 1/3. Metanotal hairs C-10, 11 & 12 all single and equally developed. Abdominal hairs mostly short; h-5 strong and single; h-9 on segment VIII well developed, with 2 strong branches arising from a common base. Paddle with sharp and deep serrations, strong and prominent midrib; two unequal long apical hairs.

Larva (figs. 104-106). Clypeal h-1 long and curved inward; head hairs simple: h-4 single, h-5 & 6 double or single, h-7 single and poorly developed. Antenna smooth, the apical hairs short and simple; antennal shaft h-1 single and subapical. Abdominal lateral h-7 & 6 double on segments I-VI, well developed and decreasing in length towards posterior segments. Comb plate narrowly connected dorsally, bearing 4-6 long pointed teeth. Siphon stout and nearly straight, with 4-7 simple and pointed teeth, some teeth with few fine serrations at base; siphon tuft strongly stellate. Saddle short and small, the caudal margin smooth; lateral h-1 stellate with 4-6 strong branches.

Material examined:

♂♂♀♀ San Jose, Mindoro, 15 & 30.I.1945; ♀♀ 9.III & 13.VII.1945; ♂♂ 15.II & 9.III.1945 (all collected by E. S. Ross); ♂♂♀♀ K98 Creek, Kkbakan, Mindanao, 22.V.1945 (R. Staples); ♀♀ Parang, Cotabato, 22.V.1945 (J. H. Paullus); ♀ Ludlow Barracks, Mindanao, 9.VI.1911

(J. G. Gregory); ♀ Burgos, Mt. Province, 6.VI.1945 (A. B. Gurney);
 ♂♂♀♀ San Francisco 10km SE, Agusan, 12.XI.1959 (L. W. Quate).

Uranotaenia pylei Baisas

Uranotaenia pylei Baisas, 1946. Mon. Bull. Bur. Hlth., Manila 22(1): 45
 (A, ♂ gen., L, P, fig.). Type loc: Llavac, Laguna (lost).

A uniformly brown species, lacking white markings. The adults are difficult to differentiate from other species of unornamented Uranotaenia. However, the ♂ aedeagus is distinctive, and the larva is particularly distinct by having strong stellate hair tufts on abdomen and thorax, and simple head h-5 & 6. This characteristic development is also found in rossi Delfinado, although the stellate hair tufts on abdomen and thorax are not as strongly developed as in pylei.

♀. Head: Vertex brown, mixed with pale appressed, and narrow upright scales, lacking white band around eye margin. Thorax: Mesonotum brown and unmarked; pleuron uniformly brown, with few scattered pale scales. Wing: Brown, no white scales. Legs: Completely brown. Abdomen: Uniformly brown.

♂. Coloration as in ♀. Genitalia: Basal lobe of sidepiece with a row of short and long bristles, the median bristles longer; clasper tapering to apex, with short setae at apical 1/3; aedeagus weakly sclerotized at base and mid portion, the lateral plates each with two recurved and pointed teeth, and one extremely large tooth arising from apex and bent mesad; parameres weakly sclerotized, swollen at base.

Pupa (After Baisas, 1935 description and figures). Respiratory trumpet short, gradually widening towards opening and lacking transverse

slit. Metanotal hairs C-10, 11 & 12 branched. Abdominal h-2 single and spine-like on segments II-VII, that on VIII branched; h-5 on segments IV-VII single and extremely long, exceeding the lengths of two segments; h-9 with 3-4 long branches on segment VIII, short and single on other segments. Paddle margin serrated, one long paddle hair present.

Larva (After Baisas, 1935 description and figures). Clypeal h-1 stout, short and club-like; head h-5 & 6 long and slender, h-4 & h-7 branched, the branches of h-7 stronger and longer. Antenna short and smooth; antennal shaft h-7 small and subapical, the apical hairs simple. Thorax and abdomen with developed stellate hair tufts. Abdominal lateral h-6 double, h-7 single and stout on segments I & II. Comb plate large, spiculate with 38-45 long teeth, fringed laterally and arranged along caudal margin of plate (he did not state whether the comb plate is separated or complete dorsally). Siphon short and stout, spiculate; pecten teeth elongate and fringed; siphon tuft with 4-5 weak branches and subapical in position. Saddle small and short, spiculate, with long serrated teeth along caudal margin; saddle h-1 with 2 long branches.

Material examined:

♂♂♀♀ Kidapawan, Cotabato, 3.VIII. & 10.IX.1957 (F. E. Baisas).

Recorded distribution:

Laguna.

Habitats:

The larvae breed in tree holes. Habits of the adults are unknown.

Uranotaenia rossi Delfinado (fig. 92)

Uranotaenia rossi Delfinado, 1965. J. Med. Ent. 2: (♂, gen., fig.).

Type loc: San Jose, Mindoro (California Academy of Sciences).

Unornamented brown species lacking pale scales on the mesonotum. It can be easily recognized by the large patches of translucent scales on sternopleuron and mesepimeron, and the characteristic structure of the ♂ genitalia.

♀. Head: Vertex with dark iridescent green appressed and brown upright scales; pale scales around eye margin. Thorax: Mesonotum reddish brown, lacking pale scales; pleural integument reddish brown, with patches of translucent scales on sternopleuron and mesepimeron; few scales present on anterior and posterior pronotal lobes. Wings: Brown, the scales on costa and radius blackish. Legs: All brown. Abdomen: Brown, lacking pale markings, the scales on the terga with greenish tinge.

♂. Genitalia as in figure 92. Basal lobe of sidepiece with a group of 4-5 long bristles, and a row of short setae; claspers slender and swollen at base narrowing towards apex with short apical setae; aedeagus with lateral plates, each bearing one long, pointed tooth and a short, broad process, and an additional curved tooth directed mesad; parameres large and swollen except distally.

Larva and Pupa. Unknown.

Material examined:

♂♂♀♀ San Jose, Mindoro, 21, 22, 28.II.1945 & I.1945 (E. S. Ross).
Collected in jungle while under bark of tree.

Recorded distribution:

Known only from type locality: Mindoro.

Uranotaenia testacea Theobald (figs. 107-113)

Uranotaenia testacea Theobald, 1905. Ann. Hist. Nat. Mus. Hung. 3: 113

(♀). Type loc: Singapore (Magyar Nemzeti Mus., Budapest, Hungary); Edwards, 1922. Indian J. Med. Res. 10: 460 (listed); Baisas, 1935. Philip. J. Sci. 57(1): 67 (♂ gen., fig., key); Bohart, 1945. USNavmed 580, p. 36. (key); Edwards, 1929. Not. ent. 9: 2 (listed).

Uranotaenia falcipes Banks, 1906. Philip. J. Sci. 1: 1004 (♂♀). Type loc: Camp 320, Rizal (non-existence); Bezzi, 1913. Philip. J. Sci. D8(4): 307 (listed); Senior-White, 1923. Cat. Indian Insec. pt. 2: 47 (syn.); Bohart, 1945. USNavmed 580, p. 56 (syn.).

A uniformly brown species, lacking mesonotal white scaling and dark wings. It can be readily distinguished by the characteristic structure of the ♂ aedeagus with broad lateral plates and poorly developed teeth. The larva has the head h-5 & 6 modified and h-4 shows slight modification, and it is particularly distinct by having the antennal shaft h-1 branched. The pupa has very long respiratory trumpet and difficult to differentiate from clara Dyar & Shannon.

♀. Head: Vertex with dark appressed and upright scales, a border of bluish white scales around eye margin broadening at sides. Thorax: Mesonotum uniformly brown, lacking white scaling; pleuron with silvery white scales across sternopleuron, the anterior pronotal lobe mostly covered with silvery scales. Wing: Entirely dark scaled. Legs: Hind tarsal segments III-V completely white scaled. Abdomen: Terga dark; sterna paler.

♂. Coloration as in ♀. Genitalia as in figure 107. Basal lobe of sidepiece with three strong bristles; clasper short and slightly swollen at basal 1/2, with long apical setae; aedeagus with broad lateral plates, each bearing four small teeth and one curved tooth; parameres long and slender, rod-like.

Pupa (figs. 111-113). Cephalothoracic hair C-8 with 5 weak branches, C-9 with long stem and 4-branched apically. Respiratory trumpet very long and slender, much wider at opening; trachoid dark, extending to more than 1/2 the length of trumpet; the surface smooth from end of trachoid to before opening; a transverse slit present. Metanotal hairs C-10, 11 & 12 varied, more or less equally developed, with long and short stem bearing 4-6 weak branches. Abdominal h-5 dendritic and developed as h-1; h-4 weak and single, usually branched apically; h-9 dendritic on segment VIII. Paddle midrib strong, the apical margin pointed and sharply serrated; one paddle hair present.

Larva (figs. 108-110). Clypeal h-1 elongate and curved; head h-5 & 6 flattened and barbed apically; h-4 single and slightly flattened but not as developed as h-5 & 6; h-7 with 8 long and strong branches. Antenna spiculate; antennal shaft h-1 branched, with 5-6 long branches; the apical hairs simple. Abdomen with well developed stellate hairs. Abdominal lateral h-6 with 2-3 branches, h-7 single and stout on segments I-II. Comb plate large, separated dorsally, with 10-12 long, pointed and finely fringed teeth. Siphon long and slender, darker basally; the siphon tuft submedian in position; the pecten teeth with long apical and short lateral fringe, extending to base of siphon tuft.

Saddle long, the caudal margin with strong spicules; saddle h-1 with 4-5 strong branches, the surface imbricate.

Material examined:

♀♀♂♂ San Jose, Mindoro, 9.III.1945 (E. S. Ross); ♀♀ Kidapawan, Cotabato, 10.IX.1957 (F. E. Baisas); ♂♂♀♀ Rizal.

Recorded distribution:

Manila, Rizal, Bulacan; Malaya, Thailand.

Habitats:

The larvae breed in forest streams, muddy creeks and hoof prints in jungle, and shaded rock pools with abundant surface litter and scum. The habits of the adults are not known.

Uranotaenia tubanguii Baisas (figs. 114-120)

Uranotaenia tubanguii Baisas, 1935. Philip. J. Sci. 57(1): 69 (A, L, ♂ gen., fig., key). Type Loc: Kolambugan, Lanao (lost); Bohart, 1945. USNavmed 580, p. 37 (L, key).

A uniformly brown species distinguishable by the pale anterior margin of mesonotum. The pupa is particularly distinct by having the paddle margin fringe instead of the usual serration. It is so far the only known species having this characteristic. The presence of translucent scales on sternopleuron in the adult, and the simple h-5 & 6 in the larva relates tubanguii with the pylei group.

♀. Head: Vertex with dark appressed and upright scales, a band of pale broad scales around eye margin continuing to a broad lateral patch at the side. Thorax: Mesonotum brown covered with coarse narrow

scales, the anterior margin bordered with pale scales continued posteriorly as a narrow line to front of wing base; pleuron uniformly brown, with translucent scales on sternopleuron. Wing: All scales dark. Legs & abdomen: Entirely dark, lacking coloration.

♂. Coloration as in ♀. Genitalia as in figure 117. Basal lobe of sidepiece with a group of four strong bristles; clasper slender, swollen at base and tapering towards apex, with short setae at apical $1/3$; aedeagus with lateral plates each bearing one large apical tooth, and another small tooth bent mesad; parameres very broad except distally.

Pupa (figs. 114-116). Cephalothoracic hair C-8 with 6-8 branches arising from two stems, C-9 long and single, forked apically. Respiratory trumpet small and slender, swollen at mid portion narrowing towards opening; transverse slit absent; trachoid extending to basal $1/4$; the surface uniformly imbricate. Metanotal hairs C-10, 11 & 12 all single and forked apically with C-10 shortest and C-12 twice as long as C-11. Abdominal h-5 single and much longer on segments IV-V; h-1 greatly reduced, missing on IX; h-9 with 4-5 branches on VIII. Paddle with strong midrib and filamentous fringe; one paddle hair inconspicuous.

Larva (figs. 118-120). Clypeal h-1 minute and difficult to see; head hairs poorly developed: h-4 short and single, h-5 with 6-8 short tuft branches, h-6 & 7 simple and long, subequal in length. Antenna dark and smooth; antennal shaft h-1 long and single, subapical in position, the apical hairs simple. Abdominal lateral h-6 & 7 both of segments I-II both single. Comb plate large, separated dorsally and with 7-8 large pointed teeth. Siphon long, slightly swollen at level of

tuft then narrowed apically; pecten teeth short, with apical and lateral fringe, extending below base of siphon; siphon tuft with 3 long branches. Saddle rather short, with caudal margin lacking pointed teeth but with flattened comb-like teeth; saddle h-1 long and single but weak.

Material examined:

♂♂♀♀ San Jose, Mindoro, 25.VI.1945 (E. S. Ross); ♂♂♀♀ San Francisco, 10km SE, Agusan, 17.XI.1959 (L. W. Quate); ♀♀ Paysawani, Bataan, 3.VII.1931 (W. V. King); ♂♂♀♀ Baguio; Calicoan Is., Fabrica, Negros Occ.; Matanao, Sta. Cruz, Davao; Tayabas; ♀♀ Madum, Davao, 16.IX.1946 (Werner); ♂♂♀ Mt. Banahoa 2000 ft., Tayabas (Quezon), 28.XII.1945 (J. Enke).

Recorded distribution:

Lanao, Laguna.

Habitats:

The larvae have been collected in tree holes in jungle and cut bamboo. The habits of the adults are not known.

Uranotaenia bimaculata Leicester (fig. 93)

Uranotaenia bimaculata Leicester, 1908. Cul. Malaya 3: 226 (♂♀). Type loc: The Gap, Kuala Lumpur (British (Nat. Hist.) Museum); Stone, Knight & Starcke, 1959. Mosq. Cat. World, Thomas Say Found. 6: 110 (listed).

This species is of doubtful occurrence in the Philippines, but known to occur in Malaya, India, Thailand, China, Japan, Ryukyu Retto and Formosa.

♂ lectotype designated by Dr. P. F. Mattingly (in correspondence April 28, 1964) with the following data: "By edge of stream in jungle, the Gap, 16/4/04." He remounted and figured the ♂ genitalia of a paratype and stated that there is discrepancy in La Casse & Yamaguti's (1950) figure of the Japanese specimen. It did not show the basal lobe on the sidepiece and in their description it is not prominent.

Uranotaenia pygmaea Theobald

Uranotaenia pygmaea Theobald, 1910. Monogr. Cul. 2: 254 (♀). Type loc: Burpengary, Queensland, Australia (British (Nat. Hist.) Museum); Dyar & Shannon, 1925. Insec. Inscit. Menst. 13: 69 (listed, Mindanao & Laguna); Edwards, 1929. Not. ent. 9: 2 (listed); Bohart, 1945. USNavmed 580, p. 33 (pygmaea of Dyar & Shannon as syn. of arguellesi Baisas).

The occurrence of this species is doubtful, although it has been reported in literature. I have not seen specimens from the Philippines. U. pygmaea is apparently confined to Australia.

NOMEN NUDUM

Uranotaenia simplex Baisas & Catipon, 1958. Philip. J. Sci. 87(1): 54; Stone, 1963. Proc. ent. Soc. Wash. 65(2): 136.

Genus HODGESIA Theobald

Hodgesia Theobald, 1904. J. Trop. Med. 7: 17. Type species: Hodgesia sanguinae Theobald. By monotypy.

Belkin (1962) placed this genus in a separate monotypic tribe Hodgesiini. The adults show resemblances to Uranotaenia and Zeugomyia in the development of the anal vein and the absence of scales or hairs on the alula and squama. The larvae have unique characters and can be easily differentiated. There are 9 described species in the genus, 2 of which are present in the Philippines.

The members of this genus are very small mosquitoes with silvery markings and distinctive outstanding wing scales. ♂ and ♀ with very short palpi and sparsely plumose antennae; the clypeus greatly swollen. Acrostichal bristles absent, the dorsocentral bristles few but strongly developed. Spiracular bristles absent, and postspiracular bristles usually absent. Wing (fig. 12) with outstanding vein scales in distal half narrow and emarginate at tip; cell R_2 about as long as or longer than stem vein, the anal vein short and curved apically, ending before level of fork of cubitus; the margins of squama and alula bare. Claws small and simple. ♀ with one large spermatheca; the buccopharyngeal armature not developed. ♂ genitalia distinct by having a lobe-like projection at apex of sidepiece, and very simple aedeagus.

The larvae are easily distinguished by having the siphon tuft inserted near base of siphon, and the abdominal segment VIII lacks sclerotized comb plate.

The pupae are readily recognized from other genera by the widely separated respiratory trumpets, each with a long process arising from base.

The two species recorded for the Philippines are: malayi Leicester and quasisanguinae Leicester.

Distribution:

Hodgesia is confined to the Old World tropics: Africa, India, Indomalayan area; New Guinea and northern Australia, and the Solomons.

Habitats and relation to disease:

The immature stages are usually found in swamps and marshes, and small pools in marshy areas, in water with dense vegetation. The biting habits of most species are poorly known.

Key to species (Adult)

1. Abdominal terga completely dark, lacking silvery patches;

hind tibia about as long as first tarsomere----- malayi Leicester

Abdominal terga with silvery lateral patches on segments

I-III and V-VI, the silvery patch on V extending dorsally;

hind tibia shorter than first tarsomere-- quasisanguinae Leicester

Hodgesia malayi Leicester (figs. 121-125)

Hodgesia malayi Leicester, 1908. Cul. Malaya 3(3): 231 (♂♀). Type loc:

Kuala Lumpur, Malaya (British (Nat. Hist.) Museum); Dyar and

Shannon, 1925. Insec. Inscit. Menst. 13(4-6): 70 (listed, syn.);

Barraud, 1934. Fauna British India 5: 54; Edwards, 1929. Not.

ent. 9: 2 (listed, syn.) (♂♀, L, fig., syn.); Bohart, 1945.

USNavmed 580, p. 30 (key).

Hodgesia ampyx Dyar, 1920. Ins. Insc. Menst. 8: 176 (♀). Type loc:
 College of Agriculture, Los Banos, Laguna (U. S. National Museum);
 Edwards, 1922. Indian J. Med. Res. 10: 461 (listed, distr.);
 Bohart, 1945. USNavmed 580, p. 30 (syn.); Borel, 1930. Monogr.
 Coll. Soc. Pat. exot. 3: 136 (♂♀ L); Stone & Knight, 1957. J.
 Wash. Acad. Sci. 47(6): 197 (♀lectotype).

This species is easily differentiated from quasisanguinae Leicester by the unmarked abdomen of the adult.

♀. Head: Vertex and sides of head with flat silvery scales; strong orbital bristles; nape black. Thorax: Mesonotum dark; acrostichal bristles lacking; dorsocentrals few, but developed; supraalars strongly developed; anterior pronotal lobe rather large, with patch of silvery scales; with patches of silvery scales on upper and lower sternopleuron and upper mesepimeron. Wing: Entirely dark with outstanding narrow vein scales at distal half; cell R₂ and cell M₂ long, subequal to stem veins. Legs: Dark with short stiff bristles on tibiae; fore and mid femora pale beneath at basal half; hind femur extensively pale beneath; hind tibia about as long as first tarsomere coxa with patches of silvery scales. Abdomen: Completely dark, lacking ornamentation.

♂. Essentially as in ♀. Genitalia as in figure 121 and as described and figured for the genus. Sidepiece short, lacking basal lobe but with apical sternal projection or lobe bearing long bristles; clasper slender and long, swollen at base; the tip slightly hooked and pointed, with one subapical long seta; aedeagus very simple with long sclerotized processes curved mesad, swollen basally and tapering toward

tip; parameres not differentiated; paraprocts elongate, tapering to thin, slender tip, with small subapical processes.

Pupa (fig. 125). Cephalothoracic hairs C-8 & 9 both with 5-6 long, but weak branches. Respiratory trumpet short, expanded at apical half and narrowed towards opening; the surface reticulate, lacking trachoid; with long, hairy thickening arising from base, about as long as the trumpet. Metanotal hairs C-10 & 12 each with 2-3 long branches, C-11 short, spine-like and mostly short and weak, except for well developed h-1 on segment I; h-9 minute, long and weak on segment VIII; h-1 single and minute on segments III-IX. Paddle lightly sclerotized, margin finely serrated; and with rather strong midrib; one long, thickened paddle seta present.

Larva (figs. 122-124). Head uniformly brown. Clypeal h-1 long, slender and pointed; head h-4 double, weak and short; h-6 single, strong and very long; h-5 & 7 each with 5-6 rather weak branches. Antenna long, spiculate, dark at both ends; shaft h-1 subapical, stellate; the apical hairs long, thickened and barbed. Abdominal hairs mostly long; lateral h-6 and 7 long, well developed on most segments; h-7 double on segments I and II; h-6 with 5 branches on segment I, 3 branches on segment II. Segment VIII lacking sclerotized plate; with a row of long 8-12 teeth, with fine lateral and apical fringe. Siphon small, short, the surface imbricate; pecten teeth long and slender with fringe, the teeth shorter at base and gradually increasing in length to last distal tooth, the longest tooth more than twice as long as basal tooth; extending to 0.7 of siphon; siphon tuft long and stellate, inserted at

base. Saddle large, cylindrical, and the surface imbricate, lacking caudal marginal spicules; saddle h-1 strongly developed and trifold.

Material examined:

♂♀ San Jose, Mindoro, I.30.1945 (E. S. Ross); ♂♀ Titunod Creek, Kolambugan, Lanao, V.9.1931 (W. V. King); ♀♀ Sta Rosa, Leyte, XI.13.1944 (E. S. Ross and F. Skinner).

Recorded distribution:

Los Banos, Laguna; Malaya, Ceylon, India, Molluccas, Indochina.

Habitats:

The larvae breed in shaded jungle brook, prefer residual pools, mud banks among eroded roots in water and emergent tree trunks, forest marsh (Ross). Habits of adult unknown.

Hodgesia quasisanguinae Leicester

Hodgesia quasisanguinae Leicester, 1908. Cul. Malaya 3(3): 230 (♀).

Type loc: Kuala Lumpur, Malaya (British (Nat. Hist.) Museum); Edwards, 1922. Indian J. Med. Res. 10: 260 (listed); Edwards, 1929. Not. ent. 9: 2 (listed, syn.); Bohart, 1945. USNavmed 580, p. 31 (key).

Hodgesia niveocaputis Ludlow, 1911. Psyche, Camb. Mass. 18: 130 (♀).

Type loc: Pikit, Malabang (Lanao), Mindanao (U. S. National Museum); Bezzi, 1913. Philip. J. Sci. D8(4): 307 (listed); Dyar and Shannon, 1925. Insc. Inscit. Menst. 13(4-6): 70 (syn., listed); Stone & Knight, 1957. J. Wash. Acad. Sci. 47(6): 198 (♀ lectotype).

Hodgesia triangulatus Taylor, 1914. Trans. R. ent. Soc. Lond. 1914: 204

(♀). Type loc: Lakekamu Gold Field, Papua, New Guinea (lost).

A distinct species easily differentiated from malayi Leicester by the abdominal ornamentation, and the markedly short hind tibia. Because of the similar body ornamentation it resembles solomonis Belkin from Guadalcanal. However, solomonis differs in having a distinct mesonotal pattern.

♀. Head: Vertex and sides extensively silvery; strong orbital bristles. Thorax: Mesonotum dark, somewhat shining, with strong dorsocentral and supraalar bristles; lacking acrostichals; anterior pronotal lobe large, with a patch of silvery scales; with large patches of silvery scales on upper and lower sternopleuron and portion of upper mesepimeron; integument of metapleuron shining silvery. Wing: Entirely dark, the outstanding narrow scales confined at distal half; cells R₂ and M₂ subequal, about as long as stem veins. Legs: Mostly dark; fore and hind femora pale beneath basal third; first fore tarsal segment with few silvery scales at base; hind femur extensively silvery; hind tibia distinctly shorter than first tarsal segment; coxa with patches of silvery scales. Abdomen: Terga with lateral patches of silvery scales on segments I-III, and V-VI; IV completely dark; silvery patch on VI extending dorsally but not complete; sterna pale.

♂, larva and pupa. Unknown.

Material examined:

♀♀ San Jose, Mindoro, 9.I-II-21 & III-9-1945 (E. S. Ross); ♀♀ San Francisco 10km SE, Agusan, Mindanao, 17.XI.1959 (L. W. Quate).

Recorded distribution:

Lanao, Mindanao, Malaya, New Guinea, Celebes, Moluccas.

Habitats:

The ♀♀ caught biting man in jungle.

Hodgesia sanguinae Theobald

Hodgesia sanguinae Theobald, 1904. J. Trop. Med. 7: 17 (♀). Type loc:

Entebbe, Uganda, Africa (British (Nat. Hist.) Museum); Banks,
1906. Philip. J. Sci. 1: 991 (listed); Theobald, 1910. Monogr.
Cul. 5: 544 (descr., Camp Stotsenberg, Pamp.).

This is apparently a misidentification, and has been erroneously recorded in the Philippines. This species is known only to occur in Uganda, Africa.

Genus ZEUGNOMYIA Leicester

Zeugnomyia Leicester, 1908. Cul. Malaya 3L231. Type species:

Zeugnomyia gracilis Leicester. By monotypy.

Like Hodgesia, Zeugnomyia can be associated with the Uranotaenia on the basis of wing venation and thoracic chaetotaxy of the adults. However, the larvae show characteristic features suggesting relationships with the Aedes and Armigeres (the pectinate hairs of the mouth brushes) and Belkin (1962) placed Zeugnomyia in the tribe Aedini.

Only four species have been described in the genus, and these are apparently confined to Malaya and the Philippines: aguilari Baisas & Feliciano, fajardoi Baisas & Feliciano, gracilis Leicester and lawtoni Baisas. Although the adults are easily distinguished from those of other genera, the differentiation within species is difficult except by the characters of the ♂ genitalia.

The adults are conspicuously ornamented with flat silvery scales on pleuron, mesonotum and abdomen. Palpi very short in both sexes; proboscis long and slender, about as long as length of body. Dorsocentral bristles absent; postspiracular and spiracular bristles absent; one lower mesepimeral bristle present. Cell R_2 shorter than stem vein; anal vein only slightly beyond level of fork Cu; alula bare and squama fringed with short bristles (fig. 13). Claws of ♀ simple and the buccopharyngeal armature not developed; claws of fore and mid legs of ♂ unequal; the pulvilli absent. ♂ genitalia markedly distinctive within species; clasper comparatively short and small; sidepiece with

subapical and basal lobes bearing well differentiated and modified setae; aedeagus simple; claspette well developed as in Aedes.

The immatures (figs. 127-132) can be easily confused with those of Aedes and Armigeres. The larvae have thick and mostly pectinate mouth brushes; the abdominal segment VIII lacks sclerotized plate and with a row of comb teeth; the anal segment is short with small saddle bearing long spines along posterior margin. The pupae have paddles with long filamentous fringe, and one apical hair.

Distribution:

The genus is apparently confined to Malaya and the Philippines.

Habitats and relation to disease:

The larvae are found breeding in water in fallen forest leaves, axils of anahaw palm, tree holes and cut bamboo; Edwards & Given (1928) reported the larva of Z. gracilis as predaceous on Aedes jugraensis and Uranotaenia obscura; and the ♀ adult was reported as vicious human biters in Malaya by Leicester. Nothing about its disease relation.

Key to species (male)

1. Lateral lobes of scutellum always dark, the midlobe with
 silvery scales or all dark in some specimens-- gracilis Leicester
 Lateral lobes of scutellum always with silvery scales,
 the midlobe dark----- 2
2. Sidepiece with two strong bristles on apical lobe; the
 claspette stout bearing a row of five short flattened
 setae----- fajardoi Baisas

Sidepiece with a row of five to six strong bristles and a
 patch of short bristles on inner mesal margin; the claspette
 not as above----- 3

3. Claspette divided apically, each bearing a group of
 flattened setae----- lawtoni Baisas

Claspette not divided but expanded apically with a row of
 14-16 curved flattened setae----- aguilari Baisas

Zeugnomys fajardoi Baisas & Feliciano (fig. 134)

Zeugnomys fajardoi Baisas & Feliciano, 1953. Fieldiana: Zool. 33(3):
 172 (♂, ♂ gen., fig.). Type loc: Mt. Apo 3600 ft., Davao (U. S.
 National Museum).

Z. fajardoi can be easily distinguished from other members of
Zeugnomys by the structure of the claspette bearing only five short
 flattened setae, and by the well differentiated setae on the basal lobes
 of the sidepiece.

♂. Head: Vertex mainly dark with broad band of silvery scales
 around eye margin; torus of antenna with patch of silvery scales on
 inner dorsal surface. Thorax: Mesonotum dark, with strong supraalar
 bristles; in front of supraalar bristles and wing base is a large patch
 of silvery scales continuing downward through paratergite, postspiracu-
 lar area and sternopleuron to mid coxa; midlobe of scutellum dark, the
 lateral lobes with silvery scales; patch of silvery scales on dorsum of
 anterior pronotal lobe. Wing: Dark; anal vein extending a little
 beyond fork Cu; alula bare, squama fringed with short bristles. Legs:
 Mainly dark except femora; the hind femur extensively pale ventrally,

the fore and mid femora with line of bluish white scales running from base to apex. Abdomen: Terga with lateral white patches continuing as narrow basal white band on IV-VII; silvery patches covering lateral sides of II-III; sterna with basal silvery bands on I-VII.

♂. Genitalia as in figure 134. Sidepiece with two strong bristles on apical lobe the two basal lobes bearing well differentiated and modified setae: two strong, rod-like on one lobe and few, short broad setae and two long, blade-like with serrated tips on the other; clasper short and slender with a long subapical spine; claspette stout bearing a row of five short flattened setae; aedeagus simple; terga IX with four to five short setae on each side.

Material examined:

♂ (paratype), Mt. Apo, Davao, Mindanao, 15.IX.1946
(H. Hoogstraal).

Habitats:

The larvae were collected in a tree hole and trough in a log in original forest at 3600 ft.

Zeugomyia aguilar Baisas & Feliciano (fig. 133)

Zeugomyia aguilar Baisas & Feliciano, 1953. Fieldiana: Zool. 33(3):

164 (♂♀, P, L, fig.). Type loc: Mt. Apo, 2900 ft., Davao (U. S. National Museum).

Essentially similar to lawtoni Baisas and fajardoi Baisas & Feliciano in general habitus from which aguilar can only be differentiated by the characters of the ♂ genitalia.

♂ genitalia as in figure 133. Sidepiece broad, the apical lobe with a row of six strong bristles and a small patch of short bristles on inner mesal margin, the two well differentiated basal lobes bearing long modified setae as follows: one lobe with a long, rod-like seta broadened at apex; the other lobe bears two long and broadly flattened, and four additional short flattened setae at base; clasper short and small with strong subapical spine and four to five short setae; claspette large and expanded apically with a row of 14-16 curved flattened setae; aedeagus simple but heavily sclerotized; tergite IX with 10-12 long setae on each side.

Material examined:

♂♂♀♀ (paratype series), Mt. Apo, Davao, Mindanao, 17.VIII.1965 (H. Hoogstraal).

Habitats:

The larvae were collected in a tin can at 2900-3000 ft.

Zeugomyia lawtoni Baisas (figs. 126-132)

Zeugomyia lawtoni Baisas, 1946. Mon. Bull. Bur. Hlth. Manila 22(2): 27

(♂♀, ♂ gen., L, P, fig.). Type loc: Wenes, Calinan, Davao, Mindanao (U. S. National Museum); Baisas & Feliciano, 1953. Fieldiana: Zool. 33(3): 162 (♂ gen., fig.).

Z. lawtoni like fajardoi and aguilari can only be differentiated by the structure of the ♂ genitalia. It is similar to aguilari by having a row of five strong bristles on apical lobe and patch of short bristles on inner mesal margin of sidepiece. However, it can be distinguished by the development of the claspette and modified setae on

basal lobes of sidepiece. The clasper is short and stubby, with subapical spines and setae; claspette divided apically each bearing a group of long, flattened setae; one basal lobe of sidepiece bears a broadly flattened, one narrow blade-like, and seven flattened setae subequal in length; the other lobe with a large, flattened seta (fig. 126); aedeagus simple; terga IX with four setae on each side.

Material examined:

♂ (holotype), and ♀♀ paratype series, Wenes, Calinan, Davao, 11.V.1946 (H. Hoogstraal, J. W. Enke & P. Feliciano); ♀ Llavac, Infanta, Quezon, 17.V.1941 (B. Crisostomo).

Habitats:

The larvae were collected breeding in water in fallen abaca (Musa textilis) leaves and in axils of Anahaw palm; a ♀ was caught in a mosquito trap in the jungle.

Zeugnomomyia gracilis Leicester

Zeugnomomyia gracilis Leicester, 1908. Cul. Malaya 3: 232 (♂♀). Type

loc: Kuala Lumpur (Selangor), Jugra, Malaya (British (Nat. Hist.) Museum); Edwards & Given, 1928. Bull. ent. Res. 18: 339 (L, biol.); Bohart, 1945. USNavmed 580, p. 25 (listed).

The occurrence of this species in the Philippines was reported by Bohart (1945) based on a single ♀ specimen from Laguna in the collection of the U. S. National Museum; however, I have not been able to find this specimen for redescription. A brief differentiation of the species given here is based on ♀♀ Malayan specimens; no ♂ has been available for study. Z. gracilis markedly differs from other species by having dark

lateral lobes on scutellum, the midlobe with silvery scales or entirely dark in some specimens, and the lateral patches on the abdomen usually not extended dorsally, in some specimens few silvery scales appearing on terga V-VII; all coxae white scaled at surface; fore and mid femora with inconspicuous white line ventrally, the hind femur not as extensively pale as in other species.

Material examined:

♀♀ Ulu Gombak, 20.II.1958; Lower Perak, Bukit Tuggal, Malaya,
13.II.1958.

Habitats:

The larvae breed in water collected in fallen forest leaves and associated with Aedes jugraensis and Uranotaenia obscura; Edwards & Given (1928) reported Z. gracilis as predaceous on these two species.

Genus ORTHOPODOMYIA Theobald

Orthopodomyia Theobald, 1904. Entomologist 37: 236. Type species:

Orthopodomyia albipes Leicester. By monotypy.

Bancroftia Lutz, in Bourroul, 1904. Mosq. do Brasil 40: 59. Type

species: Bancroftia albicosta Lutz. By monotypy.

Pneumaculex Dyar, 1905. Proc. ent. Soc. Wash. 7: 46. Type species:

Culex signifer Coquillett. By original designation.

Newsteadina Theobald, 1909. Ann. trop. Med. Parasit. 2: 297. Type

species: Culex arboricollis Charmoy. By original designation.

Thomasina Newstead & Carter, 1911. Ann. trop. Med. Parasit. 4: 553.

Type species: Mansonia longipalpis Newstead & Carter. By original description.

The relationships of the genus Orthopodomyia with other genera cannot be definitely determined. Knight and Mattingly (1950) divided the Orthopodomyia group A of Edwards (1932) into three subgroups mainly on the basis of wing markings as follows: anopheloides, arboricollis, and fascipes. Five species are recognized in the anopheloides subgroup from the Philippines: andamanensis Barraud, anopheloides (Giles), maculipes Theobald, madrensis Baisas and mcgregori (Banks). They can be easily separated by the hind tarsal and proboscis markings, although variations in these characters may be too extensive for diagnostic value. The ♂ genitalia has not proven useful for species diagnosis. The larvae appear to have characters of diagnostic value, but with the limited number of specimens available for study it has not been possible to assess the ranges of variation for each species. The shape of trumpets and paddles

may be useful in separating some species, but as yet no important diagnostic character has been found.

Except for madrensis, the members of the anopheloides subgroup appear to belong in a monophyletic group of largely or entirely allopatric species.

The adults are distinguished from other genera by the marked or spotted wings. ♀ palpus short, about 1/2 the length of proboscis, and ♂ palpus about 3/4 the length of proboscis. Dorsocentral and acrostichal bristles well developed; spiracular and postspiracular bristles absent. First tarsomere of fore legs markedly longer than last four together; claws simple, those of ♂ unequal, the larger claw toothed. Wing (fig. 14) with prominent costal white spots as follows: basal, pre-humeral, humeral, subcostal, sectoral, presectoral, preapical and apical; the margins of squama and alula fringed. ♀ with three spermathecae, the buccopharyngeal armature undeveloped. ♂ genitalia with basal lobe of sidepiece bearing 4-6 spines and tergum VIII with a truncate prolongation medially on the posterior margin.

The pupae lack special modification and can be differentiated from other genera by the angular shape of the paddle with thickened basal outer margin and one paddle hair present. So far no diagnostic characters have been found which will separate the Philippine species.

The larvae are mahogany red in color and all sclerotized areas are darkly pigmented. Abdominal segments VII-VIII covered with sclerotized plates, incomplete ventrally (these plates are lacking in the early stages); the comb teeth are borne on the posterior emargination of plate on segment VIII, consisting of 12-32 alternating large and small teeth,

4. Proboscis pale scaling yellow----- madrensis Baisas
 Proboscis pale scaling white----- maculipes Theobald

Orthopodomyia maculipes Theobald

Orthopodomyia maculipes Theobald, 1910. Monogr. Cul. 5: 470 (♀). Type
 loc: Andaman Is. (British (Nat. Hist.) Museum). Knight &
 Mattingly, 1950. Proc. ent. Soc. Wash. 52(1): 15 (♂♀, P, L, key,
 fig.).

Only one ♀ specimen from Palawan has been available for study.
 This species is essentially similar to anopheloides in general habitus.
 Proboscis dark, with a broad white band on apical half and a white
 dorsal spot between apex and white band; palpus 1/2 the length of
 proboscis, dark with few median and apical white scales. Wing markings
 as in anopheloides. Mid tarsi markedly pale at joints, segments IV-V
 white. Hind tarsomere II white at apical 1/4, segment III white with a
 broad subapical dark band, segments IV-V completely white. Terga
 largely dark, with white lateral patches visible dorsally on V-VI, a
 complete band on VII; sterna mostly dark with narrow basal bands and
 lateral white patches on segments I-II.

♂, larva and pupa. No Philippine specimens are available for
 study.

Material examined:

♀ Irahuan River, Palawan, VI-45 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Palawan; Andaman Is., Malaya, Java.

Habitats:

The larvae have been collected from bamboo stumps, tree holes and wooden bucket.

Orthopodomyia andamanensis Barraud

Orthopodomyia anopheloides var. andamanensis Barraud, 1934. Fauna Brit.

India, Dipt. 5: 102 (♂♀). Type loc: Andaman Is. (British (Nat. Hist.) Museum). Knight & Mattingly, 1950. Proc. ent. Soc. Wash. 52(1): 15 (♂♀, P, L, key, fig., to sp. status).

Orthopodomyia mcgregori (Banks)

Kertezia mcgregori Banks, 1909. Philip. J. Sci. 4: 548 (♂). Type loc: Basilan Is. (2 lost).

Orthopodomyia mcgregori (Banks). Edwards, 1932. Gen. Insec. fasc. 194: 108 (syn. with albipes); Bohart, 1945. USNavmed 580, p. 37 (syn.); Knight & Chamberlain, 1948. Proc. helm. Soc. Wash. 15: 15 (P, fig.); Knight & Mattingly, 1950. Proc. Ent. Soc. Wash. 52(1): 13 (♂, P, L, resurr. from syn. with albipes).

Orthopodomyia albipes Leicester

Orthopodomyia albipes Leicester, in Theobald, 1904. Ent. 37: 237 (♂♀).

Type loc: Kuala Lumpur, Malaya (British (Nat. Hist.) Museum); Bohart, 1945. USNavmed 580, p. 37 (listed); Knight & Mattingly, 1950. Proc. Ent. Soc. Wash. 52(1): 16 (♂♀, L, P, key, fig.).

There are no Philippine specimens available for study of the three species mentioned above, and I especially doubt the presence of albipes

in the Philippines which was reported by Bohart (1945) from the same type locality (Basilan) as mcgregori. It seems likely that albipes has been confused with mcgregori.

Orthopodomyia anopheloides (Giles)(figs. 141-147)

Mansonia anopheloides Giles, 1903. in Wyville Thomson, J. trop. Med.

6: 315 (♂♀, L). Type loc: Dehra Dun, India (British (Nat. Hist.) Museum).

Orthopodomyia anopheloides (Giles). Knight & Mattingly, 1950. Proc.

ent. Soc. Wash. 50(1): 7 (♂♀, P, L, key, tax., fig.).

Orthopodomyia manganus Baisas, 1946. Mon. Bull. Bur. Hlth. Manila

22(1): 35 (♂♀, L, P). Type loc: Llavac, Laguna (lost). Knight & Mattingly, 1950, Proc. ent. Soc. Wash. 50(1): 7 (syn.).

Orthopodomyia nigratarsis Leicester, 1908. Cul. Malaya 3: 177 (♂♀,

albipes var.). Type loc: Pangkor Laut (Perak), Malaya (non-existence). Barraud, 1934. Fauna Brit. India, Diptera 5: 99 (syn.).

Orthopodomyia nipponica La Casse & Yamaguti, 1948. Mosq. Fauna Japan &

Korea, p. 264 (♂♀, P, L). Type loc: Kyoto, Honshu, Japan (U. S. National Museum). Knight & Mattingly, 1950. Proc. ent. Soc. Wash. 50(1): 7 (syn.).

This species can be easily differentiated from other members of the anopheloides subgroup by the completely white hind tarsomere V, and by segments III-IV each having a subapical dark band. The larva and pupa lack striking characters to readily separate them from other species.

♂. Head: Vertex covered with pale narrow appressed and upright scales, those at the nape brown. Torus of antenna with scattered narrow pale scales, the first and second flagellar segments with elongate white scales and hairs. Palpus $3/4$ the length of proboscis, with a median white band on leg segment and few white scales at apices; the terminal segment all white. Proboscis dark at basal $3/4$ with white narrow median band, the subapical white band sometimes reaching apex laterally and ventrally. Thorax: Mesonotum mostly covered with narrow pale scales; scutellar lobes all covered with pale narrow elongate scales, and brown apical bristles. Wing: Costal spots variable, the base usually pale, humeral and presectoral white spots variable in size or absent, the preapical white spot sometimes lacking. Legs: Femora and tibiae speckled, marked with dark apical bands; the tibiae paler ventrally. Fore and mid tarsi all dark, with joints of mid tarsi paler. Hind tarsal segment V all white; segments III & IV white, each with a subapical narrow dark band; segment II dark with white band at apical third; first segment dark, with both ends pale. Abdomen: Terga mostly dark with few white lateral scales, and narrow white basal band on VI; sterna dark, with narrow white basal bands or lateral patches on basal three segments. Genitalia as in figure 143. Basal lobe of sidepiece with a group of 4-5 spines; clasper slender with setae mostly at apical third, with one stout apical spine. Tergite VIII with truncate posterior prolongation, the posterior margin finely serrated or irregular (fig. 144).

♀. Coloration as in ♂ except as follows: Proboscis dark, white scaled at apical half and with a dorsal white spot between white band

and apex; antenna with elongate pale scales on first flagellar segment; palpus 1/2 the length of proboscis, with few median and apical white scales.

Pupa (figs. 141-142). The chaetotaxy is strikingly similar to madrensis. Respiratory trumpet lightly pigmented around margin of opening; metanotal hairs C-10, 11 & 12 rather weakly developed and with fewer branches; abdominal h-1 on segment II with thicker base and many fine branches; paddle margin not strikingly angular, almost rounded.

Larva (figs. 145-147). Head dark with pale ocular area. Clypeal h-1 slender, long; head h-4, 6 & 7 conspicuously long, with 4-6 plumose branches, branches of h-4 shorter. Antenna uniformly dark, swollen sub-basally and narrowed toward apex; shaft h-1 with 4-5 branches not reaching apical hairs, inserted at basal 1/4. Meso- & Metathoracic hairs arising on prominent tubercle. Abdominal lateral h-6 on segments I and II with 4-5 plumose branches not modified; segments VII and VIII each with a sclerotized plate incomplete ventrally; comb teeth consist of 28-30 large and small teeth, the large teeth with median spines longer and stouter, the small teeth with fine lateral fringe and spinose apically with the median point longest; siphon stout and narrowed apically, siphon tuft with 8-10 plumose branches and inserted just below middle from base. Anal segment with plate complete and darkly pigmented dorsally; lateral h-1 with 2 (or more) weak branches; the narrow basal ring separated dorsally and ventrally.

Material examined:

♂♀ San Jose, Mindoro, 20.I.45; ♂, 7.II.45, bred out from tree holes with very "dense water" (E. S. Ross); ♀ Baguio, Mt. Province,

25.VIII.45 (S. E. Shields); ♂ Negros Oriental, Cuernos de Negros, 337 m,
14.VII.64 (M. D. Delfinado).

Recorded distribution:

Laguna (as type series of manganus Baisas), Baguio; India, Assam,
Malaya, China, Japan, Ceylon.

Habitats:

The larvae have been collected from tree holes, bamboo stumps,
stone bowls and garden tanks. Nothing is known about the biting habits
of the adults.

Orthopodomyia madreensis Baisas

Orthopodomyia madreensis Baisas, 1964. Mon. Bull. Bur. Hlth. Manila

22(1): 41 (♂♀, P, L). Type loc: Llavac, Laguna (lost); Knight &
Mattingly, 1950. Proc. ent. Soc. Wash. 52(1): 17 (♂♀, L, P, key,
fig.).

A distinct species on the basis of yellow scaling on the proboscis,
the white hind tarsomeres IV-V and the subapical dark band on segment
III. The larva is particularly distinct from other species because of
the development of the lateral h-6 on abdominal segments I-II. The pupa
is difficult to differentiate, appearing similar to anopheloides.

♀. Head: Vertex covered with upright brown and pale appressed
narrow scales. Torus of antenna with narrow pale scales on outer
dorsal surface and elongate pale scales on first flagellar segment.
Palpus 1/2 the length of proboscis, dark with some golden scales at
joints, and few white scales at tip of terminal segment. Proboscis dark
at basal half; apical half and labellum golden and separated by a dark

dorsal spot. Thorax: Mesonotum with anterior $2/3$ pale scaled; with dark patches on scutal area; prescutellar area mostly dark and with groups of elongate pale scales and bristles on scutellar lobes. Pleuron with patches of broad white scales. Fore coxa and propleuron all white scaled. Wing: Costal white spots variable with the exception of subcostal, preapical and apical white spots; variation as follows: prehumeral area dark, the base pale with few dark scales; or pale up to and beyond humeral crossvein. Legs: All femora and tibiae speckled with golden and dark scales, with subapical white and dark apical spots. Hind tarsomeres IV & V completely white (some specimens have hind tarsomeres III-V all white); hind tarsus III white with narrow subapical dark band, segment II dark at apical $1/5$ - $1/6$, segment I dark; fore and mid tarsus III dark medially, I & II pale at apices. Abdomen: Terga mostly dark with two median spots on VI-VII, and white basal lateral patches visible dorsally on VII-VIII; sterna dark (Baisas, 1946 stated that the sterna are "sholly white scaled" and Knight & Mattingly, 1950 used the same abdominal sterna markings to delimit madrensis). However, in a series of specimens bred out, the sterna are mostly dark and speckled, with white scales or white basal patches, segments VII-VIII are dark.

♂. General coloration as in ♀. Proboscis mostly golden, dark basally, the dark apical ring near labellum. Palpus short, $4/5$ the length of proboscis; dark with median pale ring on long segment and pale apices, the terminal segment pale scaled. Torus of antenna with few scattered pale scales; the basal flagellar segments with pale elongate scales and hairs. Leg coloration as in ♀ except fore tibia golden on

inner side and apices of femora darker. Terga dark, with two median small pale spots on IV-VII and few pale scales basally; lateral white patches visible dorsally on V-VII; sterna speckled, with patches of white scales basally and along margin. Genitalia: Basal lobe of sidepiece with 5-6 spines, strong bristles on inner mesal margin of sidepiece; clasper slender, with concentration of short setae on apex, one stout apical spine. Tergum VIII with posterior prolongation emarginate, the margin serrated or toothed.

Pupa. Cephalothoracic hairs conspicuously long, but weak branches; respiratory trumpet dark pigmented and short gradually widened toward opening; reticulate, the trachoid not distinct. Metanotal hairs C-10 & 12 with 5-6 long branches with C-12 longer, C-11 single, finely plumose toward tip. Abdominal h-1 on segment II with many fine branches, gradually reduced to 2 weak, short branches on segment VII; h-5 conspicuously long, with 3 branches on IV, usually single on V-VI; lateral h-9 minute on segments II-VI, well developed on segments VII-VIII, with 10-16 plumose branches; h-4 long and single on segment VIII; paddle angular in shape with outer margin thickened; with one short apical hair finely branched at tip.

Larva. Head with contrasting light and dark areas; clypeal h-1 long and slender; head h-4 with 6 short branches, h-5 & 6 each with 5-6 long branches, h-7 with 7 branches; all hairs plumose. Antenna darkly pigmented, smooth and slender with base slightly swollen, narrowed apically, shaft h-1 with 6 long branches reaching apical hairs, inserted at basal $1/4$. Meso & metathoracic hairs arising from prominent tubercles. Abdominal lateral h-6 on segments I & II strongly developed

into thickened 4-5 branches, each branch finely plumose at basal half; abdominal segments VII-VIII each with sclerotized plate incomplete ventrally; comb teeth on VIII consist of 28-32 large and small teeth, with a series of small teeth on outer side, then alternating 1 large and 2 small teeth; large teeth greatly expanded apically with central spines longer and stouter; the small teeth fringed laterally and apically. Siphon stout, narrowed toward apex, dark pigmented except the apex; siphon tuft with 8-10 plumose branches and inserted halfway from base. Anal plate complete, the posterior margin smooth; lateral h-1 with 2-4 weak branches, the narrow basal ring separated dorsally and ventrally.

Material examined:

♂♂♀♀ Camarines Sur, Mt. Isarog 670 m., bred out from tree fern stumps and a tin can container, and tree fern stumps in association with species of Aedes, Uranotaenia and Armigeres. Nothing is known about the biting habits of the adults.

Genus AEDEOMYIA Theobald

Aedeomyia Theobald, 1901. J. Trop. Med. 4: 235 (July 15); Monogr. Cul.

1: 98 and 2: 218 (Nov. 28). Type species: Aedes squamipenna F.

Lynch Arribalzaga. By subsequent designation (Brunetti 1914).

Aedeomyia Giles, 1902. Handbook Gnats, 2nd ed: 478, (emend.)

Lepiothauma Enderlein, 1923. Wein Ent. Ztg. 40: 25. Type species:

Lepiothauma furfurea Enderlein. By original designation.

The genus *Aedeomyia* is unique among the Culicini because of the flagellar segments of ♀ antenna and the comb-like structure of the tip of ♂ clasper, and Belkin (1962) placed it in a distinct tribe *Aedeomyiini*. At present the genus consists of six species, of which only one is known in the Philippines.

The adults are highly ornamented mosquitoes with dense covering of brown, white and yellow broad scales; the wings, body and legs are speckled. ♀ antenna with very short hairs, the flagellar segments short and thick; thickly plumose in the ♂, and the last two flagellomeres are long and thickened, lacking hairs. Terminal segment of palpi large and flattened. Clypeus greatly swollen. Mesonotum with greatly developed dorsocentral bristles, and weak acrostichals. Spiracular and post-spiracular bristles absent. Wing (fig. 15) with vein scales broad, the margins of alula and squama with scales. Femora comparatively short with dense tuft scales at apex. Claws simple. ♀ with one large spermatheca, and undeveloped buccopharyngeal armature. ♂ genitalia very characteristic by having a comb-like structure at tip of clasper.

The larvae are easily recognized by the greatly enlarged antenna, hairy siphon and anal segment.

The pupae can be differentiated by the deeply emarginate apex of the paddle, bearing one long and strong hair.

Aedeomyia is represented in the Philippines by one species:
catasticta Knab.

Distribution:

Only 2 species have wide distributions: catasticta Knab, in the Australasian, Indomalayan and Oriental regions, and the South Pacific; squamipenna (F. Lynch Arribalzaga), from Mexico to South America; africana Neveu-Lemaire and furfurea (Enderlein), equatorial Africa; venustipes (Skuse), New South Wales; pauliani Grjebine, Madagascar.

Habitats and relation to disease:

The larvae and pupae of Aedeomyia are reported found chiefly in dense swamps and in more or less permanent ground pools with dense growth of squatic plants, and less commonly along river margins. Nothing is known about the biting habits of the adults; Mattingly (1949) reported africana to be attracted to human bait, other species apparently are not attracted to man.

Aedeomyia catasticta Knab (figs 135-140)

Aedeomyia catasticta Knab, 1909. Ent. News 20: 387 (♀). Type loc:

Samal, Bataan (U. S. National Museum); Dyar, 1920. Ins. Insc.

Menst. 8: 184 (key, listed); Edwards, 1929. Notulae Ent. 9: 2

(syn. with venustipes Skuse); Bohart, 1945. USNavmed 580, p. 44

(syn.); Knight & Chamberlain, 1948. Proc. Helm. Soc. Wash. 15: 15

(P, fig.); Coher, 1948 (1949). Ent. Amer. 28: 107; Stone & Knight, 1957. J. Wash. Acad. Sci. 47(6): 196 (♀ lectotype).

The color pattern of the wing and abdominal terga is variable and the clasper appears to have more teeth in the comb-like structure. The white spots of the wings may be reduced, and the proximal terga may be dark except for the irregular patches of lateral pale scales resembling the coloration of venustipes (Skuse).

♀. Essentially described for the genus. Head: Clypeus with a median line of pale scales. Proboscis rather short, stout and bent upward, with broad median and subapical white bands, and a narrow white band immediately below the median band. Thorax: Mesonotum speckled, marked with a broad, median yellow scale; pleuron with patches of pale scales on stp, mep, and apn covered with pale scales and a row of long bristles. Legs: Speckled and spotted; comparatively short; femora short and thick, with dense tuft scales at apex; fore and mid tarsomeres with small white spots; hind tarsus with broad white bands. Abdomen: Speckled and with distinct yellow apical spots on terga II-VI.

♂. Genitalia as in figure 135. Sidepiece large the basal lobe with a group of 6-7 stout, spine-like bristles; clasper short and slender with very characteristic short, comb-like structures at tip; aedeagus simple, broadly rounded apically, narrowing anteriorly to small base; parameres undeveloped, not differentiated; paraprocts not developed.

Pupa (figs. 139-140). Cephalothorax with mid-dorsal ridge moderately developed, very light pigmented; cephalothoracic hair C-6 small, branched, poorly developed; C-8 branched, weakly stellate; C-9 single, small. Respiratory trumpet arising on large tubercle; narrow at

base, widening to opening; the trachoid dark to about 0.35 and the surface reticulate from trachoid to apex; lacking slit. Metanotal hairs C-10 strongly stellate; C-11 weak, single, forked apically; C-12 weakly branched. Abdominal hairs variously developed; h-1 weakly dendritic; h-2 on segments II-VII weakly spine-like, progressively decreasing in length to VII; h-5 single on segments IV-VII, strongly developed; h-9 single on segments III-VI, strong spine-like; on VII-VIII bifid or trifid; h-1 minute on segment IX. Paddle very lightly pigmented with dark area where strong midrib disappears; caudal margin not differentiated; outer margin smooth, thickened from base gradually disappearing posteriorly; one long, thick, barbed paddle seta present.

Larva (figs. 136-138). Head mostly pale. Clypeal h-1 small, slender head h-7 strongly developed, and the branches pectinate at basal half; h-4 weakly stellate, simple branches; h-6 dendritic, pectinate; h-5 with strong, pectinate branches. Antenna long, curved, hairy; shaft h-1 with long, pectinate branches; 3 long, strong, pectinate setae at tip. Integument of thorax and abdomen covered with short tiny hairs; lateral hairs strongly developed and pectinate. Abdominal h-6 single on segments I-II; h-7 with 5-6 branches on segments I and II; segment VIII with small sclerotized plate bearing 14-15 unusually long teeth. Siphon slender and hairy with small acus; curved spine and stellate tuft at valve (or tip); the siphon tuft with 5-6 pectinate branches, inserted at 0.7; lacking pecten teeth. Saddle stout, hairy, dorsal hairs longer; saddle h-1 with 3 strong branches.

Material examined:

♂♂♀ San Jose, Mindoro, I.11.1945; ♂♂ II.10.1945 (all collected by

E. S. Ross); ♀ Parang, Cotabato, III.3.1945 (J. H. Paullus); ♂♂♀♀
Ludlow Barracks, Parang, Cotabato; Camp Nichols, Rizal; Hagonoy,
Bulacan; Samal, Bataan; San Fabian, Pangasinan; (Camp) Daraga, Albay;
Camp MacGrath, Batangas; Naguilian, La Union; Dansalan, Lanao; Camp del
Monte, Bukidnon; Caminawit Pt., Mindoro; Los Negros, Visayas.

Recorded distribution:

Bataan, Cotabato, Laguna, Palawan; Oriental region, New Guinea,
Australia, Solomon Is., Fiji, Marianas and the Caroline Is.

Habitats:

Larvae breed in algae of marshy ponds, irrigation reservoirs;
along the grassy banks of small coastal lagoons in full sunlight, and
anchored in masses of algae within dense vegetation.

Genus HEIZMANNIA Ludlow

Heizmannia Ludlow, 1905. Canad. Ent. 37: 130. Type species:

Heizmannia scintillans Ludlow. By monotypy. Macdonald & Traub, 1960. Stud. Inst. Med. Res. F. Malaya no. 29, p. 101 (ecology).

Bolbodeomyia Theobald, 1910. Rec. Indian Mus. 4: 31. Type species:

Bolbodeomyia complex Theobald. By monotypy.

Heizmannia Brunetti, 1914. Rec. Indian Mus. 10: 61 (emend).

For a full systematic treatment of the genus refer to Mattingly (1957). The generic account given here is as figured and described for H. scintillans Ludlow. It is easily recognizable by its dark appearance, the unusually large, wedge-shaped anterior pronotal lobes, and by the presence of setae on postnotum. The ♀ has three subequal spermathecae, and undeveloped buccopharyngeal armature with a tiny median tooth. The genus shows resemblance to the Neotropical Sabethini and to the genus Haemogogus. It differs from the sabethine genera by lacking spiracular bristles or scales, and from Haemagogus by having a patch of broad or moderately broad decumbent scales on the alula, and by the presence of a lower mesepimeral bristle. Also, Haemagogus is restricted entirely to the Neotropical region. Heizmannia is represented in the Philippines by only one species: scintillans Ludlow.

Distribution:

Mainly Oriental, and through the Australasian region; found up to 7000 ft. in the Himalayas.

Habitats and relation to disease:

♀♀ have been taken biting in forest in Malaya, and it appears that

the genus is largely restricted to forest area; the recorded hosts include man, dog and horse; the immatures have been reported from tree holes and bamboo stumps (Mattingly, 1957b).

Heizmannia scintillans Ludlow

Heizmannia scintillans Ludlow, 1905. Canad. Ent. 37: 130 (♀). Type loc: Camp Stotsenberg Angeles Pampanga (U. S. National Museum); Banks, 1906. Philip. J. Sci. 1: 991. (listed); Dyar and Shannon, 1925. Ins. Insc. Menst. 13(4-6): 73 (listed); Edwards, 1929. Not. ent. 9: 2 (listed); Bohart, 1945. USNavmed 580, p. 44 (A, listed); Mattingly, 1957. Cul. Mosq. Indomalayan area II, p. 28 (♂♀, L, P, fig., key, syn.).

Dendromyia scintillans Ludlow. Bezzi, 1913. Philip. J. Sci. D8(4): 307. (listed); Theobald, 1907. Monogr. Cul. 4: 604 (♀, syn.).

Wyeomyia funerea Leicester, 1908. Cul. Malaya 3(3): 252 (♀). Type loc: 6 mi. from Kuala Lumpur (Selangor), Malaya (British (Nat. Hist.) Museum); Mattingly, 1957b. Cul. Mosq. Indomalayan area II, p. 28 (syn.).

Heizmannia pilosa Brug, 1931. Tijdschr. Ent. 74: 245 (♂, P, L). Type loc: Dermajoe near Benkoelen, Sumatra (British (Nat. Hist.) Museum); Mattingly, 1957b. Cul. Mosq. Indomalayan area II, p. 28 (syn.).

This species is the type of the genus, and has been known only from the unique ♀ holotype in the U. S. National Museum. However, Mattingly (1957) synonymized H. pilosa with scintillans, and gave

descriptions of the ♂, larva and pupa based on type material from Sumatra and a specimen from Singapore.

♀. Head: Vertex dark, shiny, with median and lateral white patches, lacking erect narrow scales, strong orbital bristles. Palp very short. Proboscis slightly swollen apically; antenna sparsely plumose. Thorax: Mesonotum covered with broad, dark and shiny scales; acrostichal and dorsocentral bristles absent; scutellum with broad scales on all lobes; postnotum with a group of short bristles; anterior pronotal lobe unusually large, wedge-shaped with anterior white patch and four strong bristles; posterior pronotal lobe with few dark scales. Pleuron mostly covered with broad white scales. Wing: Cell R_2 about twice as long as its stem. Squama fringed with hairs, alula with a patch of scales (fig. 16). Legs: Dark except for hind tibia which is pale anteriorly to about basal fourth. Abdomen: With white lateral patches as follows: tergite I white laterally from base to posterior edge; II with large basal triangle reaching posteriorly to edge; III-VI with similar triangle but the apex not reaching posterior edge, usually shorter on V & VI; VII with narrow white basal band; VIII entirely dark; sterna I & II completely white; III-VI with narrow white basal bands; VII-VIII dark.

♂, larva and pupa. No Philippine specimens are available for study.

Material examined:

♀♀ San Jose, Mindoro, 1.II.1945 (E. S. Ross); ♀♀ Km 608, Cagayan Prov., Luzon, 1945; ♀♀ Puerto Princesa, Palawan, 19.IX.1945 (biting day,

rain forest). ♀♀ Misamis Oriental: Minalwang; 26-29.III.61. H.
Torrevillas Bishop.

Recorded distribution:

Dansalan Forest, Lanao (Mattingly); Angeles, Pampanga (Ludlow).
Borneo, Sumatra, Singapore, Malaya.

Habitats:

A tree hole breeder; ♀♀ (H. funera) attacking man and dog in Ulu
Gombak and day biting in rain forest in Palawan.

Genus ARMIGERES Theobald

Armigeres Theobald, 1901. J. Trop. Med. 4: 235 (July 15); Monogr. Cul.

1: 98, 322 (Nov. 23). Type species: Culex obturbans Walker. By subsequent designation (Brunetti, 1914). Macdonald and Traub, 1960. Stud. Inst. Med. Res. Fed. Malaya Bull. 29: 103 (ecology).

Desvoidya Blanchard, 1901. C. R. Soc. Biol. Paris 53: 1046 (Dec. 6).

Type species: Culex obturbans Walker. An automatically fixed type of a replacement name. Theobald, 1903. Monogr. Cul. 3: 134 (as Desvoidea lapsus).

Blanchardiomyia Brunetti, 1912. Rec. Indian Mus. 4: 440. Type species:

Culex obturbans Walker. An automatically fixed type of a replacement name.

Neosquamomyia Taylor, 1914. Trans. R. ent. Soc. Lond. 1914: 186. Type

species: Neosquamomyia breinli Taylor. By monotypy.

The genus Armigeres is classified with the Aedes group of Edwards (1932), Macdonald (1960) and Belkin (1962) which includes Aedes, Heizmannia and Zeugnomys as well as non-Philippine genera Ayurakitia, Eretmapodites, Haemagogus, Opifex, Psorophora and Udaya. Belkin (1962) recognized the group as a tribe and placed the 10 genera in Aedini.

The adults can be recognized from those of related genera by the following: Torus and first flagellar segment of antenna with broad, white and black scales; proboscis dark and curved downward. Mesonotum lacking acrostichal and dorsocentral bristles; spiracular bristles absent; postspiracular area with bristles and scales. Margin of squama and alula fringed with narrow scales. Fore tarsal claws of ♀ almost

always toothed; pulvilli absent. Twelve species are here recognized in two subgenera from the Philippines: Armigeres Theobald and Leicesteria Theobald. They are easily separated by the presence of postspiracular bristles, one or two lower mesepimeral bristles, and short ♀ palpus in Armigeres; the postspiracular bristles are absent in Leicesteria. Also the ♀ Leicesteria has relatively long palpus, usually 1/2 the length of proboscis.

Although the larvae can be easily distinguished from those of other genera, no simple character is known for the separation of the two subgenera, except Armigeres flavus which has large ventral plate in addition to dorsal plate on anal segment; also a similar development is noticeable in A. magnus both species in the subgenus Leicesteria. The following features are distinguishing characters: Antenna smooth and short, shaft h-1 weak, single or branched apically; clypeal h-1 long and slender; the mouthbrushes pectinate; frontal head hairs weak; comb teeth variable in number, the teeth finely fringed; siphon short and stout, siphon tuft weak, usually single, lacking pecten teeth; anal segment with small dorsal plate (saddle).

The pupae are easily distinguished by having the paddle margin always with long, filamentous fringe and one apical hair; the respiratory trumpet short and broad distally. However, like the larvae no characters are known which will separate the two subgenera.

Distribution:

The genus Armigeres is primarily Oriental in distribution but is widespread and well represented in the Indomalayan and Australasian regions. The subgenus Leicesteria is present in Ceylon, India, Burma,

Yunnan, Indochina, Thailand, Malaya, through the Malay Archipelago eastwards to Ceram and northwards to the Philippines, Hong Kong, China and Taiwan.

The subgenus Armigeres is represented in all of these countries and also extends farther east, as far as northern Australia and the Solomon Islands and north to Japan.

Habitats and relation to disease:

Macdonald and Traub (1960), and Macdonald (1960) gave full accounts of the ecology of the Leicesteria and Armigeres in Malaya, and Belkin (1962) gave an excellent account of the species which occur in the South Pacific (see under subgeneric discussion).

Key to Subgenera and species of Armigeres

(Adult)

1. Postspiracular area lacking bristles but with patch
of white and black scales; ♀ palpus long, from 1/2-
3/4 the length of proboscis; lower mesepimeral
bristles present or absent-- Subgenus Leicesteria Theobald, 2
Postspiracular area with bristles and patch of scales;
♀ palpus short, at most 1/4 the length of proboscis;
one or two lower mesepimeral bristles present-----
----- Subgenus Armigeres Theobald, 5
2. Lower mesepimeral bristles always present; with one or
three setae on lower postnotum----- flavus (Leicester)
Lower mesepimeral bristle always absent; hind tibia

- slightly longer than fore tibia and equal in length
with mid tibia; postnotum lacking setae----- 3
- 3(2). Tergites II-V with median basal yellow patches, and complete bands on VI-VIII; hind tarsus with white, narrow, basal rings----- magnus (Theobald)
Tergites uniformly dark, without dorsal markings; hind tarsus entirely dark----- 4
- 4(2). Propleural-fore coxal scale patch with one large median dark spot on coxa; ♂ clasper slender with a group of five spines at apex----- digitatus (Edwards)
Propleural-fore coxal scale patch with two dark spots between white scales; ♂ clasper expanded apically with 10-11 teeth----- omissus (Edwards)
- 5(1). Clypeus bare----- 6
Clypeus with lateral patches of white scales-----
----- malayi (Theobald)
- 6(5). Sterna mostly white scaled----- 7
Sterna with apical dark bands----- 9
- 7(6). Sternum VII dark with white apical band----- 8
Sternum VII all dark; ♂ clasper expanded distally with short setae, 16-18 teeth and 5-6 long dorsal setae-----
----- apoensis Bohart & Farner
- 8(7). ♂ clasper greatly expanded distally with dense long setae, 24-27 teeth and 10-11 dorsal setae; basal lobe of sidepiece with three blunt spines----- manalangi Baisas

- ♂ clasper expanded medially, lacking dense setae, with
18-20 teeth; basal lobe of sidepiece with two sharp
spines----- baisasi Stone & Thurman
- 9(6). Sternum VII dark with apical or subapical white band----- 10
Sternum VII all dark; basal lobe of sidepiece lacking
spines but with dense short bristles----- setifer n. sp.
- 10(9). ♂ aedeagus rounded distally, crenulate; the sidepiece
lacking patch of thickened setae----- 11
♂ aedeagus divided with pointed apices directed outwardly,
the sidepiece with inner apical patch of thickened
setae----- aureolineatus (Leicester)
- 11(10). ♂ sidepiece with a row of spoon-like setae and numerous
setae on inner margin----- ejercitoi Baisas
♂ sidepiece with two or three spines on basal lobe-----
----- joloensis (Ludlow)

Key to known larvae

1. Anal segment with sclerotized ventral plate in addition
to large dorsal plate or saddle----- 2
Anal segment without ventral plate, the dorsal plate
comparatively small----- 3
- 2(1). Ventral plate on anal segment large, occupying bottom
half of the segment----- flavus (Leicester)
Ventral plate very small, occupying bases of and area
just proximal to ventral brush----- magnus (Theobald)

- 3(1). Abdominal segments I-IV or II-IV with patches of fine
 spicules----- digitatus (Edwards)
 Abdominal segments smooth without spicules----- 4
- 4(3). Comb teeth finely fringed or with sharp points apically---- 5
 Comb teeth simple and pointed----- malayi (Theobald)
- 5(4). Comb teeth expanded apically into sharp points-----
 ----- omissus (Edwards)
 Comb teeth with the apices rounded or pointed and
 finely fringed----- 6
- 6(5). Prothoracic h-1 & 2 single, with h-1 longer than h-2, h-3
 with 3 short, weak branches----- baisasi Stone & Thurman
 Prothoracic h-1 & 2 double, with h-1 much longer than h-2,
 h-3 with 3 short, weak branches----- manalangi Baisas

Larvae of the following species are unknown: apoensis Bohart & Farner,
ejercitoi Baisas, joloensis (Ludlow) and setifer n. sp.

Subgenus ARMIGERES Theobald

Armigeres Theobald, 1901. J. Trop. Med. 4: 235 (July 15); Monogr. Cul. 1: 98, 322 (Nov. 23). Type species: Culex obturbans Walker. By subsequent designation (Brunetti, 1914). Macdonald & Traub, 1960. Stud. Inst. Med. Res. Fed. Malaya Bull. 29: 103 (ecology).

Desvoidya Blanchard, 1901. C. R. Soc. Biol. Paris 53: 1046 (Dec. 6). Type species: Culex obturbans Walker. An automatically fixed type of a replacement name. Theobald, 1903. Monogr. Cul. 3: 134 (as Desvoidea lapsus).

Blanchardiomyia Brunetti, 1912. Rec. Indian Mus. 4: 440. Type species: Culex obturbans Walker. An automatically fixed type of a replacement name.

Neosquamomyia Taylor, 1914. Trans. R. ent. Soc. Lond. 1914: 186. Type species: Neosquamomyia breinli Taylor. By monotypy.

The main features of the subgenus Armigeres are as follows: ♀ palpus short, at most 1/4 the length of proboscis; the ♂ palpus longer than proboscis by 1/2-3/4 the length of the terminal segment. Clypeus bare or with lateral white scales. Mesonotum bordered with pale scales; pleuron with patches of white scales; postspiracular area with white scales and always with bristles; always one lower mesepimeral bristle present. Hind tibia longer or equal in length with fore and mid tibiae. Alula and squama fringed (fig. 17). ♀ with three unequal spermathecae and undeveloped buccopharyngeal armature. The ♂ genitalia is distinctive for each species and clearly defined from members of the Leicesteria by the shape of the clasper and number of teeth, and by the

structure of the aedeagus. Eight species are included in this subgenus from the Philippines: apoensis Bohart & Farner, aureolineatus (Leicester), baisasi Stone & Thurman, ejercitoi Baisas, joloensis (Ludlow), malayi (Theobald), manalangi Baisas and setifer n. sp.

Distribution:

As discussed in the genus.

Habitats and relation to disease:

The larvae of most species are commonly found in tin cans, cut bamboo, coconut shells and tree holes; the ♀♀ were collected biting during the daytime. None of the species is known to transmit filariasis.

Armigeres (Armigeres) apoensis Bohart & Farner (fig. 148)

Armigeres apoensis Bohart & Farner, 1944. Proc. Biol. Soc. Wash. 57: 69

(♀♂). Type loc: Sibulan River, Mt. Apo, 7000-8000 ft., Mindanao (Mus. Comp. Zool., Harvard Cambridge).

Armigeres (Armigeres) apoensis Bohart & Farner. Bohart, 1945. USNavmed 580, p. 47 (A, key, ♂ fig.).

On the basis of the ♂ genitalic characters, A. apoensis closely resembles A. manalangi Baisas or A. aureolineatus (Leicester), from which it can be readily separated by the completely dark sternites VII-VIII as well as by other characters mentioned in the key.

♂. Head: Vertex dark with small median and large lateral white patches, few dark upright scales on nape, and narrow border of white scales around the eyes. Palpus longer than proboscis by about 1/2 the length of terminal segment. Thorax: Mesonotum covered with narrow dark

brown scales, with pale median spot on prescutellum extending as white streak onto mid-lobe of scutellum; anterior pronotal lobe and posterior pronotal area white scaled; postspiracular area white scaled and with 4-5 bristles; one lower mesepimeral bristle present; propleuron all white scaled. Legs: Venter of femora white lined from base to apex, white scaling more extensive on hind femur. Abdomen: Terga metallic black with small white triangular lateral patches; sterna IV-VI all white, VII entirely dark. Genitalia as in figure 148. Sidepiece with three stout blunt spines on basal lobe, and inner apical patch of fine setae; clasper expanded apically with short setae, 16-18 blunt teeth and four to five long dorsal setae; aedeagus rounded distally, the margin crenulate.

♀. Not available for description.

Larva and pupa. Unknown.

Material examined:

♂ Sibulan River, Mt. Apo 7000-8000 ft., Mindanao; 31.VIII.?

(C. S. Clagg).

Recorded distribution:

Known only from type locality.

Habitats:

Unknown.

Armigeres (Armigeres) aureolineatus (Leicester)(fig. 149)

Desvoidya aureolineata Leicester, 1908. Cul. Malaya 3: 79 (♀). Type

loc: Ampang (Selangor), Malaya (British (Nat. Hist.) Museum).

Armigeres (Armigeres) aureolineatus (Leicester). Senior-White, 1927.

Spolia Zeylanica Bl4: 67, pl. vii (L, fig.); Barraud, 1934.
Fauna Brit. India 5: 319 (♂ gen. fig., L); Bohart & Farner, 1944.
Proc. Biol. Soc. Wash. 57: 70 (♂ gen.); Thurman, 1959. Univ.
 Maryland Agr. Expt. Sta. Bull. A100: 83 (A, L, ♂ gen. fig., key).

Previously known from Malaya, Ceylon, Thailand, Indochina, China and Borneo; the record for the Philippines is based on a series of specimens collected by the Noona Dan Expedition in southern Palawan. The specimens are in too poor condition to give a complete description and only the ♂ genitalia is described here (fig. 149). Sidepiece elongate with three sharp pointed spines on basal lobe, and with inner apical patch of thickened golden setae (this patch of setae is easily visible in pinned specimens); clasper short, triangular in shape and bears 15-16 blunt teeth, the teeth are quite widely spaced; aedeagus divided into two sclerotized plates with pointed apices directed outwardly; tergite IX with two rows of weak setae on each lobe.

A. aureolineatus appears related to A. manalangi or A. apoensis Bohart & Farner by the shape of the clasper and the presence of inner apical setae on the sidepiece, but aureolineatus is easily differentiated by the structure of the aedeagus.

Material examined:

11 ♂ Palawan: Mantalingajan, Pinigisan 600m., 7.IX.1961, Noona Dan Expd. 1961-62.

Armigeres (Armigeres) baisasi Stone & Thurman (figs. 151-154)

Armigeres (Armigeres) baisasi Stone & Thurman, 1958. J. Wash. Acad. Sci.

48(7): 240 (♂♀, fig.). Type loc: Abuyog, Leyte (U. S. National Museum); Thurman, 1958. J. Wash. Acad. Sci. 48(12): 392 (tax.).
Armigeres (Armigeres) kuchingensis Edwards, Baisas, 1935. Philip. J. Sci. 56(4): 488 (♀♂ gen., fig.); Bohart, 1945. USNavmed 580, p. 49 (syn. with obturbans); Thurman, 1958. J. Wash. Acad. Sci. 48(12): 389 (revalidated); Stone and Thurman, 1958. J. Wash. Acad. Sci. 48(7): 240 (resurrected from syn. with obturbans, ♂ gen. fig.).

Baisas (1935) described and figured this species as A. kuchingensis, and Bohart (1945) listed as a synonym of A. obturbans. Stone & Thurman (1958) considered kuchingensis to be a valid species and distinct from obturbans, and stated that obturbans does not occur in the Philippines. However, the occurrence of kuchingensis in the Philippines is doubtful. This species Baisas called kuchingensis was described as A. baisasi by Stone & Thurman (1958). Although it is similar to kuchingensis in general appearance the ♀ of both species can be separated by the presence of a subapical white band in kuchingensis, this band being apical in baisasi. The ♂ genitalia of baisasi has short clasper not reaching spines of basal lobe and has two or three dorsal setae on apical third; two sharp spines on basal lobe of sidepiece, and the aedeagus is very distinctive. The pupa is easily recognizable by the characteristic shape of the respiratory trumpet and the strong development of h-9 on VII-VIII; the larvae has the comb teeth fringed apically.

♀. Head: Vertex mostly covered with white scales, few scattered brown scales laterally and medially and upright scales at nape. Palpus short, 1/4 the length of proboscis. Thorax: Mesonotum covered with

dark brown scales, broad white mesonotal border and white medial spot on prescutellum extending onto midlobe of scutellum, the posterior scales broad; anterior pronotal lobe, posterior pronotal area and propleuron all white scaled; postspiracular area with white scales and few bristles; one lower mesepimeral bristle present. Legs: Hind femur extensively white ventrally, with dark longitudinal dorsal stripe; fore coxa white. Abdomen: Terga dark with small lateral white markings on segments I-VII, somewhat triangular on IV-V; sterna I-VI all white, VII dark with apical white band.

♂. Coloration as in ♀. Palpus longer than proboscis by 1/2 the length of terminal segment. Tergite VIII with basal white spot, the lateral white markings forming straight line on tergites II-III or II-IV in some specimens, slight convexity in IV-VI. Genitalia as in figure 151. Basal lobe of sidepiece with two sharp spines and one seta curving toward sidepiece; clasper short, expanded medially, not reaching base of spines of basal lobe when pressed against sidepiece, with 18-20 teeth and two or three dorsal setae on apical 1/3; aedeagus rounded distally, the margin crenulate.

Pupa (figs. 153-154). Respiratory trumpet about twice as long as wide, the surface reticulate, with distinct trachoid at base and the margin of opening with a lobe-like projection. Metanotal C-10 & 12 each with 5-6 weak branches, C-11 single and strong; abdominal h-5 short branched tuft on segments IV-V, single and very long on IV-V; h-9 minute on II-VI, VII with 2-3 strong branches; paddle with long fringe, the apical hair long and simple.

Larva (fig. 152). Clypeal h-1 long and slender arising from a small tubercle; head h-4 & 5 branched, h-6 single, h-7 with 2-4 long branches. Antenna smooth, shaft h-1 minute, inserted halfway from base, the apical hairs very short. Prothoracic h-1 & 2 single, with h-1 longer than h-2, h-3 with 3 short branches. Segment VIII with 10-14 comb teeth, fringed apically. Siphon tuft short and inconspicuous, subapical in position; anal segment with small dorsal plate, lateral h-1 inconspicuous tuft of 4-5 branches.

Material examined:

♂♀ San Jose, Mindoro; 18.VII.1945; 24.I.1945 (E. S. Ross); collected from tin can, Alocasia, bamboo; ♂♀ Mahaplag, Leyte; 7-11.VII.1964; reared from coconut shell; ♂♀ Mt. Isarog 2500 ft., Camarines Sur; 22-24.IX.1964; collected as pupae from tree fern stump; Camp Lookout, cuernos de Negros, Negros Oriental; 14.VII.1964; reared from fallen coconut fruit; ♂♀ College, Laguna; 15-17.IX.1964 (all collected by M. D. Delfinado); collected from tin can & bamboo stumps; ♂♀ Baguio, Luzon; 10.VIII.1945; Naguilian, La Union; San Fernando, La Union; 2-26.VIII.1945 (S. E. Shields); ♂♀ Batubot & Carlatan, La Union; 9-19.VI.1945; San Fabian, Pangasinan; 29.VII.1945, 12.V.1945 (A. B. Gurney); ♀♀ Fort Pikit, Cotabato (Sgt. Spray); ♀♀ Parang, Cotabato; 26.V.1945 (J. H. Paullus); ♂♀ Mt. Banahao, Lucban (Tayabas) Quezon; 28.XII.1948, reared from cut bamboo; ♂♀ Mt. Talinis, Misamis Oriental 29.XII.1960 (H. Torrevillas) collected from coconuts.

Recorded distribution:

Widely distributed in the Philippines but not recorded elsewhere. Mt. Province, La Union, Pampanga, Pangasinan, Laguna, Quezon, Leyte,

Samar, Calicoan Is., Lanao, Davao, Cotabato & Jolo.

Habitats:

The larvae breed in bamboo joints, tree holes, coconut shells, fallen coconut leaf sheath, tin cans, Alocasia axils and tree fern stumps. Nothing is known of the adult biting habits.

Armigeres (Armigeres) ejercitoi Baisas (fig. 150)

Armigeres (Armigeres) ejercitoi Baisas, 1935. Philip. J. Sci. 56(4):

486 (♂♀). Type loc: Kolambugan, Lanao (lost); Bohart, 1945.

USNavmed 580, p. 47 (key, ♂ gen. fig.).

Easily distinguished from other members of the Armigeres by the unique structure of the ♂ genitalia with a row of spoon-like setae on inner margin of sidepiece.

♀. Head: Vertex largely dark with greenish tinge, faint median white spot and border of white scales around eye margin. Palpus 1/4 the length of proboscis. Thorax: With broad white mesonotal border, the white patch on prescutellum continuing onto midlobe of scutellum; anterior pronotal lobe and posterior pronotal area all white, propleuron white; postspiracular area white with 2-3 bristles; one lower mesepimeral bristle present. Legs: Fore and mid femora with ventral white streak running its entire length; hind femur extensively pale; fore coxa with a median dark spot. Abdomen: Terga all dark, the white lateral markings forming straight line on segments II-III, rounded on IV-VII; sterna white with narrow apical dark bands on IV-VI, VIII dark with narrow white apical band.

♂. Coloration as in ♀. Genitalia as in figure 150. Sidepiece lacking basal lobe but with a row of seven spoon-like setae and numerous fine setae on inner margin; clasper short, expanded apically, hairy and with 8-11 blunt teeth; aedeagus rounded distally, the margin crenulate.

Larva and pupa. Not known.

Material examined:

♂♂♀♀ Minalwang & Bal-ason, Misamis Oriental, 5.IV.1960;
26-29.III.1961 (H. Torrevillas); ♂♂♀♀ Mt. McKinley, Davao, 19.IX.1946;
Daragawan, Cotabato, 30.IV.1946 (H. Hoogstraal, J. Enke & D. Corcega);
♂♀ San Francisco, Agusan 10 km. SE, 12.XI.1959 (L. W. Quate); ♂ Baguio,
Luzon, 7.IX.1945 (S. E. Shields).

Recorded distribution:

Known only from type locality.

Habitats:

The larvae have been collected from tree holes and coconut husks in second growth forest, partly shaded at 3400 ft. elevation.

Armigeres (Armigeres) joloensis (Ludlow) (fig. 156)

Desvoidea fusca var. joloensis Ludlow, 1904. Canad. ent. 36(1): 236

(♀♂). Type loc: Jolo, Jolo (U. S. National Museum); Theobald, 1907. Monogr. Cul. 4: 165 (listed, as Desvoidya); 1910. Monogr. Cul. 5: 143 (to sp. status); Banks, 1906. Philip. J. Sci. 1: 983 (listed); Bezzi, 1913. Philip. J. Sci. D8(4): 306 (listed, as Blanchardiomyia); Stone & Knight, 1955. J. Wash. Acad. Sci. 45(9): 282 (♂ lectotype).

Armigeres (Armigeres) joloensis (Ludlow). Stone and Thurman, 1958.

J. Wash. Acad. Sci. 48(7): 243 (♂, resurr. from syn. with obturbans); Thurman, 1958. J. Wash. Acad. Sci. 48(12): 389 (revalidated). See discussion.

A. joloensis (Ludlow) was described as a variety of Desvoidea fusca Theobald, which is currently a synonym of A. malayi Theobald. Edwards (1932) and Bohart (1945) listed it as a synonym of A. obturbans. Stone and Thurman (1958) considered joloensis to be a valid species and distinct from obturbans (having a long clasper which when pressed against the sidepiece, reaches basal lobe). Thurman (1958) further concluded that obturbans of Bohart (1945) et auctorum (Banks, 1913; Dyar and Shannon, 1925; Bick, 1949) reported from the Philippines includes joloensis and kuchingensis, if the latter species occur in the Philippines, and considered obturbans as nomen dubium.

A. joloensis closely resembles subalbatus (Coquillett) in general habitus, and can only be separated by the details of the ♂ genitalia.

♀. Head: Vertex with markings variable: dark with median white spot, lateral white patches and narrow border of white scales; or covered with scales, the dark scales scattered medially and laterally. Palpus short, 1/5 - 1/4 the length of proboscis. Thorax: Mesonotum with broad white border from wing base to front, the white spot on pre-scutellar area continuing onto midlobe of scutellum, the posterior scales broad; anterior pronotal lobe and posterior pronotal area and propleuron all white scaled; postspiracular area white scaled with 3-4 bristles; one lower mesepimeral bristle present. Legs: Hind femur with

dark dorsal stripe and extensively white ventrally. Fore coxa white, appearing with a dark spot on some specimens. Abdomen: Terga metallic dark brown, with small dorsal white spot on VIII, the lateral white markings on I-II forming a straight line, triangular or rounded on III-VII; sternites I-II all white, III-VI with apical dark band decreasing in width (in some specimens the white markings are more extensive); VII dark with subapical white band.

♂. Coloration as in ♀. Palpus longer than proboscis by 1/2 the length of the terminal segment. Genitalia as in figure 156. Basal lobe with two curved spines, flattened apically; clasper slender, long, reaching the base of the spines when pressed against the sidepiece, with 20-22 teeth, lacking dorsal setae; aedeagus broad distally, the margin crenulate; tergite IX with short setae on each lobe.

Larva and pupa. Not available for description.

Material examined:

♂♂♀♀ Bacnotan; Batubot; San Fernando, La Union; 9.VII.1945; Tagudin, Ilocos Sur; 10.VII.1945; San Fabian, Pangasinan; 29.VI.1945 (all collected by A. B. Gurney); ♀♀ Los Banos, Laguna; 16.II.1915; 13.X.1920, from coconut (P. Almazan & C. B. Ewing); Mt. Makiling, Laguna; 13.XII.1945, reared from tin can; ♂♂♀♀ Ginoog, Oriental Misamis; XII.1930 (W. V. King); ♀♀ Catubig; San Antonio, Samar; 18.XI.1944 (J. H. Paullus); ♂♂♀♀ Samar, "elephant ear" (F. F. Bibby); ♂♂♀♀ Mt. Banahaw, Lukban (Tayabas), Quezon, cut bamboos; ♀♀ San Lucas, Bulacan; 10.V.1953; ♂♂ San Jose, Mindoro; 18.VII.1945; Carigara, Leyte; 16.XI.1947 (E. S. Ross); ♀♀ Philippine Is. (C. S. Ludlow); ♀♀ Angeles, Pampanga (Dr. Whitmore); ♂♂♀♀ Abuyog; Palo, Leyte, reared from coconut shell; ♂♂♀♀

Puerto Princesa, Palawan, reared from elephant ear axils, shaded tin cans, depression in freshly cut tree trunk, biting daytime in jungle; Darawagan, Cotabato, reared coconut husks; Dansalan, Lanao, cut bamboo (all USNM collection); ♀♂♂ Tawi-Tawi, Tarawakan, N. Batu-batu, 20-26.X & 1, 5-7 & 12.1961; Palawan, Mantalingan, Pinigisan & Tagembung, 2, 6-11 & 19.IX.1961; ♂♂♀♀ Brooke's Point, Uring-uring, 5.IX. & 14.VIII; Sapamoro, Curuan district, Mindanao, 17.XII.1961 (Noona Dan Expedition).

Recorded distribution:

Has been reported only from type locality.

Habitats:

The ♀♀ were collected biting during the daytime in the jungle; they breed in coconut shells, tin cans, cut bamboo and "elephant ear axils."

Armigeres (Armigeres) malayi (Theobald) (figs. 161-164)

Uranotaenia malayi Theobald, 1901. Monogr. Cul. 2: 258 (♀). Type loc: Mang Jungle, Selangor, Malaya (British Museum).

Armigeres (Armigeres) malayi (Theobald). Edwards, 1917. Bull. ent.

Res. 7: 207 (♂); Edwards, 1922. Indian J. Med. Res. 10: 463

(listed, syn., dist.); Dyar & Shannon, 1925. Insec. Insci. Menst.

13(4-6): 73 (listed, syn.); Edwards, 1929. Not. ent. 9: 2

(listed); Bick, 1949. Nat. Hist. Misc. 41: 2 (listed); Knight &

Chamberlain, 1948. Proc. helm. Soc. Wash. 15: 10 (P, fig.).

Armigeres (Armigeres) russelli Baisas, 1935. Philip. J. Sci. 56(4): 490 (♀♀, fig.). Type loc: Masiit, Calawan, Laguna (lost); Bohart,

1945. USNavmed 580, p. 47 (key, fig., syn.).

Desvoidea fusca Theobald, 1903. Monogr. Cul. 3: 135 (♀♂, L). Type
loc: Kuala Lumpur (Jugra), Malaya (British (Nat. Hist.) Museum);
Banks, 1906. Philip. J. Sci. 1: 983 (listed, Desvoidya lapsus);
Bezzi, 1913. Philip. J. Sci. D8(4): 306 (listed,
Blanchardiomyia).

Except for the strong development of h-9 on segments VII-VIII of the pupa, and the normal thoracic hairs of the larva, A. malayi superficially resembles A. breinli (Taylor) from New Guinea. The adult is easily recognized because it is the only known Philippine species of the subgenus Armigeres having patches of white scales on the clypeus.

♀. Head: Vertex dark with small median spot, narrow border of white scales widening laterally and upright brown scales on nape. Clypeus with lateral patches of white scales. Palpus about 1/4 the length of proboscis. Thorax: Mesonotum covered with brown narrow scales, narrow mesonotal border and few narrow pale scales on prescutellum, the posterior pale scales broad on scutellar lobes; anterior pronotal lobe dark scaled on upper half; posterior pronotal area all white; postspiracular area white with 2-3 bristles; one lower mesepimeral bristle present; propleuron white. Legs: Femora white ventrally, the hind pair extensively white. Abdomen: Terga dark brown with lateral white patch visible dorsally on VII; sterna I-VII all white.

♂. Coloration as in ♀. Palpus longer than proboscis by 1/2 the length of terminal segment; the lateral markings on tergites I-IV forming straight line, with slight convexity on V-VII. Genitalia as in figure 161. Sidepiece with dense long setae on inner margin, the basal

lobe with six sharp spines, the inner spine largest, two times longer than other spines; clasper short, expanded apically, with 15-16 teeth on apical 1/2, the apical tooth longest; aedeagus narrowly elongate and divided, with pointed apices directed upwards; tergite IX with group of setae on each lobe.

Pupa (figs. 163-164). Respiratory trumpet narrow, about three times longer than wide, reticulate and the trachoid confined to base, the margin of opening straight. Metanotal hair C-10 & 12 each with 5-6 long, thin branches, C-11 long and well developed; abdominal h-5 short inconspicuous tuft on II-III, single and very long on IV-V; h-9 minute on II-VI and with 8-10 strong branches on VII-VIII. Paddle with long filamentous fringe; one long paddle hair present.

Larva (fig. 162). Clypeal h-1 slender and arising from a small tubercle; head h-4 & 5 with 6-14 branches, h-6 single and short, h-7 single. Antenna smooth, slender, shaft h-1 minute and located halfway from the base, the apical hairs short. Prothoracic h-1 long and double, h-2 & 3 single. Abdominal lateral hairs long and developed; segment VII with 5-8 pointed comb teeth, some teeth with few basal serrations; siphon broad, siphon tuft small and inconspicuous, sub-apical; anal segment with small dorsal plate.

Material examined:

♀♀♂♂ Carigara, Leyte; 16.XI.1944 (E. S. Ross), larvae collected from coconut husks; ♂♂♀♀ Siasi, Siasi Is., Sulu; 26.VIII.1958 (H. E. Miliron), larvae from fallen coconut sepal; ♂♂♀♀ Mahaplag, Leyte; 11.VII.1964; Camp Lookout, Cuernos de Negros, Negros Oriental; 15-16.VII.1964 (all reared from coconut shells by M. D. Delfinado);

♀♀ San Lucas, Bulacan; 10.VI.1953; ♂ Los Banos, Laguna; 16.II.1915;
 ♀ San Antonio, Samar; 6.XII.1945 (J. H. Paullus); ♂♂♀♀ Puerto Princesa;
 Leyte Gulf; Camp Nichols, Rizal; Calicoan Is., from stagnant water in
 shaded coconut shell; Gingoog, Or. Misamis; Lasang, Davao, reared from
 shaded coconut husks; Darawagan, Cotabato (all USNM collection).

Recorded distribution:

Samar, Leyte, Pampanga, Laguna (as russelli Baisas), Mindanao;
 Malaya, Thailand, China, Indonesia, New Guinea, Assam, India, Sarawak.

Habitats:

The larvae breed in tree holes, bamboo stumps, coconut shells and
 axils of fallen areca palm leaves; nothing is known of the ♀ biting
 habits.

Armigeres (Armigeres) manalangi Baisas (figs. 157-160)

Armigeres (Armigeres) manalangi Baisas, 1935. Philip. J. Sci. 56(4):

492 (♂♀). Type loc: Tungkong Manga, San Jose, Bulacan (lost);

Bohart & Farner, 1944. Proc. Biol. Soc. Wash. 57: 70 (♂ gen.);

Bohart, 1945. USNavmed 580, p. 48 (key, ♂ gen. fig.).

On the basis of the ♂ genitalic characters, A. manalangi resembles
A. apoensis and A. aureolineatus. It can be distinguished by the
 presence of a pale median line on mesonotum extending onto midlobe of
 scutellum; the other two species have sublateral lines in addition to
 median line. A. manalangi is further differentiated by the following:

♀. Head: Vertex dark small median white spot, large lateral
 white patches and narrow border of white scales around eye margin.

Palpus about 1/4 the length of proboscis. Thorax: Mesonotum covered

with narrow brown scales, with a median pale line extending onto mid-lobe of scutellum, the posterior scales broad; upper 1/2 of anterior pronotal lobe dark; posterior pronotal area white, propleuron white; postspiracular area white with 5-6 bristles; one lower mesepimeral bristle present. Legs: Femora white ventrally, the hind pair extensively pale; fore coxa white. Abdomen: Terga dark brown, with white lateral patches on I-II forming straight line, rounded on II-VI; sterna I-VI all white, VII dark with white apical band.

♂. Similar to ♀ in coloration. Palpus slightly longer than proboscis. Genitalia as in figure 157. Basal lobe of sidepiece with three strong blunt spines and groups of long setae on inner apical 1/2, those at the apex stronger; clasper greatly expanded apically, with dense long setae and 24-27 teeth, 10-11 long dorsal setae; aedeagus rounded distally, the margin crenulate.

Pupa (figs. 159-160). Respiratory trumpet short, about as wide as long and reticulate, the trachoid confined to base and margin of opening almost straight. Metanotal C-10 & C-12 both branched, C-11 long and single, thickened. Most of abdominal hairs are missing on the single specimen studied and it is impossible to give an adequate description. Paddle with filamentous fringe, one apical hair missing.

Larva (fig. 158). Clypeal h-1 long and slender arising from a small tubercle; head h-4 short branched tuft, h-5 with 2-5 long branches, h-6 single, h-7 double. Antenna smooth, shaft h-1 inserted halfway from the base, the apical setae very short. Prothoracic h-1 double, h-2 double, short and weak, h-3 with branches. Segment VIII with 8-12 comb teeth, scale-like, pointed apically and finely fringed, some teeth appear

smooth. Siphon tuft small with 2-3 weak branches, subapical in position; anal segment with small dorsal plate.

Material examined:

♀♀♂♂ San Jose, Mindoro, 1-2.VII.1945 (E. S. Ross); ♂♂ Mt. Empagatao, Mindanao, 9.IV.1960 (H. Torrevillas).

Recorded distribution:

Bulacan, Laguna.

Habitats:

The larvae have been collected in bamboo stumps in small number.

Armigeres (Armigeres) setifer n. sp. (fig. 155)

Although the specimens are in too poor a condition to give a complete description of the species, the ♂ genitalia are particularly distinctive and have not been described. The basal lobe of sidepiece lacks spines but has dense short bristles; the clasper is stout bearing long teeth, and the abdominal sternum VII is all black. On the basis of ♂ genitalic characters, A. setifer resembles Armigeres confusus Edwards from Malaya, but the basal lobe is strongly prominent and the bristles are stronger than in setifer, also the clasper is slender and the teeth are not as long. Further differentiating characters are as follows: Propleural-coxal scale patch all white; anterior pronotal lobe black with bluish tinge on inner dorsal surface, white scales below; postspiracular area white scaled with three bristles; abdomen with white lateral patches appearing rounded and not visible dorsally; the ♀ sternum markings are as follows: II all white, III black with few white scales basally, IV-VI with apical black bands decreasing in width: 1/2

of IV, 1/3 of V, 1/4 of VI; the ♂ first four segments are not visible and only sterna V-VI apical black markings could be seen: 1/3 of V and 1/4 of VI; sternum VII in both sexes all black. ♂ genitalia as in figure 155. Sidepiece quite broad, the basal lobe lacking spines but with dense short bristles; clasper short and stout bearing 19-20 long, blunt teeth, the median and apical teeth longer; aedeagus broad, rounded distally and the margin crenulate; tergum IX with weak bristles on each lobe. Holotype: ♂ Palawan: Mantalingajan, Pinigisan 600 m., 7.IX.1961. Noona Dan Expedition 1961-62 (Zoologisk Museum, Copenhagen, Denmark). Paratype: ♀, same data as holotype, except 6.IX.1961 (USNM).

Subgenus LEICESTERIA Theobald

Leicesteria Theobald, 1904. Entomologist 37: 211. Type species:

Leicesteria longipalpis Theobald. By monotypy.

Brevirhynchus Theobald, 1908. Rec. Indian Mus. 2: 293. Type species:

Brevirhynchus magnus Theobald. By monotypy.

Chaetomyia Leicester, 1908. Cul. Malaya 3: 100. Type species:

Chaetomyia flava Leicester. By monotypy.

Leicesteriomyia Brunetti, 1912. Rec. Indian Mus. 4: 452 (nom. nov. for

Chaetomyia Leicester, 1908, pre-occupied). Type species:

Chaetomyia flava Leicester. An automatically fixed type of a replacement name. Macdonald, 1960. Stud. Inst. Med. Res. Fed. Malaya Bull. 29: 111 (syn. with Leicesteria).

The members of the subgenus Leicesteria are principally characterized by the following: ♀ palpus long, from 1/2 - 3/4 the length of proboscis; ♂ palpus longer than proboscis by 1/2 - 3/4 the length of terminal segment. Thorax appearing compressed laterally and produced anteriorly, with mesonotal border of white or yellowish scales; postspiracular area without bristles but covered with dark and pale scales; no lower mesepimeral bristles (except in A. flavus with 1-3 bristles). Hind tibia longer than fore tibia and equal in length with mid tibia. Alula fringed with narrow scales, squama with fine setae. ♀ with three unequal spermathecae, undeveloped buccopharyngeal armature. The ♂ genitalia is fairly simple and distinctive for each species; the number of spines on the basal lobe of sidepiece and the shape of clasper and number of teeth are useful diagnostic characters.

Four species are included in this subgenus from the Philippines: digitatus (Edwards), flavus (Leicester), magnus (Theobald) and omissus (Edwards).

Distribution:

As discussed in the genus.

Habitats and relation to disease:

The ♀♀ of most species have an unusual egg laying habit. The eggs are attached on the hind legs holding between the tibia and first tarsal segment before depositing them on water; they bite principally during the day and feed readily on man; breed in hollow internodes of dead and living bamboo in lowland and dipterocarp forests, but absent from primary forests (Macdonald & Traub, 1960 & Macdonald, 1960). It is possible that some species of Leicesteria may play a part in the transmission of animal filariasis in Malaya.

Armigeres (Leicesteria) digitatus Edwards (figs. 165-168)

Leicesteria digitata Edwards, 1914. Bull. ent. Res. 4: 262 (♂♀, key, ♂ gen. fig.). Type loc: Ulu Gombak (Selangor), Malaya (British (Nat. Hist.) Museum).

Armigeres (Leicesteria) digitatus (Edwards). Edwards, 1922. Indian J. Med. Res. 10: 464 (listed, distr.); Dyar and Shannon, 1925. Insec. Insci. Menst. 13(4-6): 74 (listed); Edwards, 1929. Not. ent. 9: 2 (listed); Barraud, 1934. F. Brit. India 5: 330 (♀♂, key, fig.); Baisas, 1935. Philip. J. Sci. 56(4): 493 (♀♂, gen. fig., as degitatus lapsus); Bohart, 1945. USNavmed 580, p. 49 (A,

♂ gen. fig.); Macdonald, 1960. Stud. Inst. Med. Res. Fed. Malaya Bull. 29: 131 (♀♂, L, biol., key, fig.).

A. digitatus is distinctive because of the structure of the ♂ clasper, and by having the larval integument with patches of fine spicules on the abdomen.

♀. Head: Vertex with few median white scales and two lateral white patches. Torus of antenna mainly white scaled. Palpus more than 1/2 the length of proboscis. Clypeus bare. Thorax: Mesonotum slightly produced anteriorly, with a border of broad white scales from wing root to front margin; posterior pronotal lobe with broad white scales below and dark or pale scales above; anterior pronotal and propleuron white scaled; mesepimeral scale patch extends to lower suture. Legs: Fore coxa white scaled with one large dark spot. Abdomen: Terga dark with white lateral patches visible dorsally on III-VII; sterna extensively white with clear dark apices.

♂. Coloration as in ♀. Palpus longer than proboscis by about 1/2 the length of terminal segment; posterior pronotal lobe scaling variable may be black and white or entirely white. Genitalia as in figure 165. Basal lobe of sidepiece with 6-8 pointed spines grouped roughly in double rows; clasper slender, of uniform width throughout its length, with a group of five strong spines at apex.

Pupa (figs. 167-168). Cephalothoracic hairs weak and very short; respiratory trumpet small, narrow, reticulate and the trachoid indistinct. Metanotal h-10 & 12 branched, C-11 single, strong; h-9 on segments VII & VIII strongly developed. Abdominal hairs mostly weak and

short except h-3 & 5 which are long and strong. Paddle with strong mid-rib and long, fringed, with one apical hair.

Larva (fig. 166). Clypeal h-1 slender on prominent tubercle; h-4 & 6 branched, h-5 single, h-7 with 3 pilose branches. Abdominal integument with fine spicules on segments I-IV. Comb teeth arranged in irregular rows, the teeth scale-like divided apically into many points, the central point strongest. Siphon small, siphon tuft single and inserted halfway from base. Anal segment with small dorsal plate or saddle. Siphon and saddle lightly sclerotized.

Material examined:

♂♂♀ Dansalan, Lanao, 26.IV.1946 (J. Enke, E. Guttierrez, A. Corcega); San Jose, Mindoro, I.1945 (E. S. Ross); Bal-ason, Misamis Oriental, 5.IV.1960 (H. Torre Villas).

Recorded distribution:

Negros Occidental, Laguna; Malaya, Thailand, Sumatra, Java, India.

Habitats:

The larvae have been collected in tree holes and bamboo joints; from both living and dead bamboo at heights ranging from 1m. to 12m. Nothing is known of ♀ biting habits.

Armigeres (Leicesteria) flavus (Leicester) (figs. 169-173)

Chaetomyia flava Leicester, 1908. Cul. Malaya 3: 101 (♂♀). Type loc:

Ulu Klang Jungle, Kuala Lumpur, Malaya (British (Nat. Hist.) Museum).

Leicesteria apicalis Theobald, 1908. Rec. Indian Mus. 2: 291 (♀♂).

Type loc: Lushai Hills, Assam (India) (Indian Museum, Calcutta).

Brevirhynchus apicalis Theobald, 1910. Rec. Indian Mus. 4: 7 (♀). Type

loc: Sylhet, Assam (India) (Indian Museum, Calcutta).

Armigeres (Leicesteria) flavus (Leicester). Baisas, 1935. Philip. J.

Sci. 56(4): 493 (♀♂, fig.); Bohart, 1945. USNavmed 580, p. 49 (A,

key, fig.); Edwards, 1914. Bull. ent. Res. 4: 258 (♀♂, fig.);

Macdonald, 1960. Stud. Inst. Med. Res. Fed. Malaya Bull. 29,

p. 116 (♀♂, L, biol., key, fig; ♀ lectotype from "Bamboo, Ulu

Klang Jungle, 8 miles from Kuala Lumpur, 25/9/03").

Armigeres (Leicesteriomyia) flavus (Leicester). Thurman, 1959. Univ.

Maryland Agri. Expt. Sta. Bull. A100: 76 (revalidated).

Thurman (1959) recognized the subgenus Leicesteriomyia Brunetti for A. flavus. A. flavus as here recognized belongs in the subgenus Leicesteria as treated by Edwards (1914), Baisas (1935), Bohart (1945) and Macdonald (1960). The main features which distinguish it are the presence of setae on lower postnotum and 1-3 bristles on lower mesepimeron, and the short hind tibia; also the larva has an additional ventral plate on anal segment. Like other members of the Leicesteria the ♀ has an unusual egg-laying habit. Other characteristics are as follows:

♀. Head: Vertex with patches of pale scales between dark scales, pale upright scales on nape. Palpus a little less than 1/2 the length of proboscis. Torus and first flagellar segment of antenna with pale scales. Thorax: Mesonotum covered with brown scales, border of pale and brown scales from wing base to front; anterior pronotal lobe with brown scales above, pale below; posterior pronotal area mostly pale; postspiracular area covered with dark and pale scales; lower mesepimeron with 1-3 bristles; propleuron white. Legs: Femora extensively pale;

fore and mid coxae with dark spot; hind tibia markedly shorter than fore and mid tibiae. Abdomen: Terga with median yellowish-white patches at apices and white lateral patches; sterna all white with few scattered brownish scales on posterior segments.

♂. Coloration as in ♀. Palpus about as long as proboscis or slightly longer, narrowly pale at joints. Genitalia as in figure 169. Basal lobe of sidepiece with three blunt spines and fine setae; clasper slender, slightly expanded apically and with 5-6 long blunt spines (teeth); aedeagus crenulate at distal 1/2; tergite IX with a group of strong setae on each lobe.

Pupa (figs. 171-173), based on Malayan specimens). Respiratory trumpet large, about twice as long as broad, the surface reticulate, trachoid indistinct. Metanotal h-10 & 12 branched, C-11 single. Abdominal hairs small and weak except h-3 & 5 which are very long and well developed; h-9 well developed and dendritic on segments VII-VIII; paddle finely fringed and with strong midrib.

Larva (fig. 170, based on Malayan specimens). Clypeal h-1 long and slender, arising on a prominent tubercle; head h-4 & 5 branched, h-6 single, h-7 with 2 branches. Antenna slender, shaft h-1 small, submedial in position, the apical hairs very short. Prothoracic h-1 single, h-2 double, h-3 with 3 short branches. Comb teeth arranged in irregular rows, scale-like, the apices expanded into many thin points. Siphon large, siphon tuft single, subapical; anal segment with a large dorsal plate and an additional ventral plate occupying bottom 1/3 of the segment.

Material examined:

♂♀ Mt. Banahaw, Lucban, Tayabas (Quezon), 28.XII.1945 (J. Enke).

Recorded distribution:

Laguna; Burma, Thailand, Malaya, Sumatra, Java, Borneo, Formosa, China, Indochina.

Habitats:

This species breeds mainly in bamboo stumps, fallen split bamboo and tree holes; the egg mass is attached to and held between both hind legs, the eggs lying in an angle formed by each tibia and first tarsomere. The ♀♀ are day biters, but the preferred host is unknown.

Armigeres (Leicesteria) magnus (Theobald) (figs. 174-178)

Brevirhynchus magnus Theobald, 1908. Rec. Indian Mus. 2: 293 (♀♂).

Type loc: Sylhet, Assam (India) (Indian Museum, Calcutta); Dyar and Shannon, 1925, Insec. Inscit. Menst. 13(4-6) (listed, as magna).

Armigeres (Leicesteria) magnus (Theobald). Edwards, 1914. Bull. ent.

res. 4: 259 (♂ fig., as magna); Edwards, 1922. Indian J. Med.

Res. 10: 463 (listed); Edwards, 1929. Not. ent. 9: 2 (listed,

magna); Barraud, 1934. Fauna Brit. India 5: 324 (♀♂ L, fig.,

key); Baisas, 1935. Philip. J. Sci. 56(4): 494 (♀♂, fig.);

Bohart, 1945. USNavmed 580, p. 49 (A, L, ♂ gen. fig.); Macdonald,

1960. Stud. Inst. Med. Res. Fed. Malaya Bull. 29: 117 (♀♂ L,

biol., fig. key).

Leicesteria annulitarsis Leicester, 1908. Stud. Inst. Med. Res. Fed.

Malay States 3(3): 99 (♂).

Toxorhynchites rectirostris (Giles ms) in Theobald, 1910. Monogr. Cul.

5: 214 (♀). Type loc: Philippine Islands (British (Nat. Hist.) Museum); Stone, Knight and Starcke, 1959. Cat. Mosq. World, Thomas Say Found. vol. 6: 288 (nom. nudum).

Easily distinguished by the basal yellowish markings on abdominal terga, and the expanded ♂ clasper bearing 9-10 teeth in the adult; the larva has a small ventral plate on anal segment.

♀. Head: Vertex dark with two white lateral patches and few upright scales on the nape. Palps about 3/4 the length of proboscis; torus of antenna with pale and dark scales on inner surface; clypeus bare. Thorax: Mesonotum dark with few pale scales on prescutellar area; border of white scales broad in front of wing root and narrowed over posterior pronotal area; anterior pronotal lobe mostly white scaled; posterior pronotal lobe dark scaled above, white below; propleuron white; the scale patch on lower mesepimeron extending posteriorly to suture. Legs: Femora and sometimes tibiae pale ventrally; pale narrow rings present at bases of tarsal segments; fore and mid coxae with large dark scale patch. Abdomen: Terga dark, with median yellowish scale patch on II-V, these markings as broad basal bands on VI-VIII and sometimes on V in some specimens; the ends of white lateral patches on I-VII plainly visible from dorsal view; sterna mostly white with narrow apical dark bands on III-VI.

♂. Coloration as in ♀. Palps with basal pale narrow rings on distal two segments, longer than proboscis by about the length of last segment; the apical dark bands on sternites broader. Genitalia as in figure 174. Basal lobe of sidepiece with four pointed spines; clasper

expanded distally bearing about 9-10 teeth, the outer tooth longer; aedeagus broad and smooth distally, with strong lateral teeth; tergum IX with a group of weak setae on each side.

Pupa (figs. 176-178). Cephalothoracic hairs weak; respiratory trumpet short, about as long as wide; reticulate and without slit; trachoid indistinct. Metanotal hairs long, subequal in length; C-10 & 12 weak, single or double, C-11 single and thickened. Abdominal h-1 on segment II extremely long; h-3 & h-5 single and very long on segments I-III and I-V, respectively; h-9 strongly developed on VII-VIII, minute on other segments; paddle with long filamentous fringe, strong midrib, the apical hair missing in the specimen examined.

Larva (fig. 175). Clypeal h-1 slender, arising on a small tubercle; h-4 & 5 short branched, h-6 & 7 single. Antenna smooth, shaft h-1 small, subapical in position, the apical hairs short and simple. Prothoracic h-1 & 2 single, h-3 double. Comb teeth few, scale-like, the apices expanded into fine points. Siphon about as long as broad, siphon tuft subapical, with three weak short branches. Anal segment with an additional ventral plate occupying bases of and area proximal to ventral brush; lateral h-1 not seen.

Material examined:

♀♀♂♂ San Jose, Mindoro, 17.V.1945 (E. S. Ross); ♂♀ Batangas, Batangas; ♀♀♂♂ San Fernando, Legleg, Masupe & Saragosa, La Union, 14.VIII.1945 (A. B. Gurney).

Recorded distribution:

Luzon, Mindanao; Ceylon, India, Burma, Thailand, Malaya, Java, Borneo, Hongkong, Formosa, Indochina.

Habitats:

The larvae were collected in tree holes and bamboo joints; the ♀♀ bite freely during the day in bamboo groves.

Armigeres (Leicesteria) omissus (Edwards) (figs. 179-183)

Leicesteria omissa Edwards, 1914. Bull. ent. Res. 5: 76 (♂♀, L). Type loc: Colombo, Peradeniya, Ceylon (British (Nat. Hist.) Museum).

Armigeres (Leicesteria) omissus (Edwards). Thurman, 1959. Univ.

Maryland Agr. Expt. Sta. Bull. A100: 102 (A, L, ♂ gen. fig., key); Macdonald, 1960. Stud. Inst. Med. Res. Fed. Malaya Bull. 29: 126 (♂♀, L, ♂ gen. fig., key).

This is apparently the first record for this species in the Philippines; previously known from Ceylon, India, Thailand, Taiwan and Malaya. The occurrence of A. omissus is based on two specimens collected in Mindoro by Dr. E. S. Ross of the California Academy of Sciences. It is distinguished by having two dark spots on propleural-fore coxal scale patch, and the sidepiece of ♂ genitalia is densely covered with broad scales basally and setae on inner mesal margin. A. omissus is further characterized by the following:

♀. Head: Vertex dark with median and lateral white patches, few pale upright scales on nape. Palpus about 1/2 the length of proboscis; the first flagellar segment of antenna white scaled, torus with white and dark scales on inner dorsal surface. Thorax: Compressed laterally and slightly produced anteriorly; mesonotal scales dark with a border of white scales; white scales also present on midlobe of scutellum, the lateral lobes all dark; anterior pronotal lobe mostly white; posterior

pronotal lobe with white scales below, brownish scales above; mostly brownish scales on postspiracular area; the lower mesepimeral scale patch extends to suture, almost occupying the entire sclerite; propleural-fore coxal scale patch with two dark spots between white scales. Legs: Dark, the femora extensively pale ventrally. Abdomen: Terga dark, the white lateral markings extending dorsally but not forming complete bands; sterna white with narrow dark apices.

♂. Color markings as in ♀. Proboscis extensively pale scaled ventrally. Genitalia as in figure 179. Sidepiece densely covered with broad scales basally and setae on inner mesal margin, the basal lobe with three sharp spines, the longest spine twice as long as shortest spine; clasper expanded distally, bearing 10-11 teeth and one small outer seta, the distal teeth longest; aedeagus expanded and rounded distally, finely crenulate, the teeth curving dorsad; tergum IX with a group of weak setae on each side.

Pupa (figs. 181-183). Cephalothoracic hairs weak; respiratory trumpet short, about three times as wide as long, the surface reticulate with fairly distinct trachoid at base. Metanotal h-10 branched, C-11 & 12 single. Abdominal h-5 single on segments II-V; h-9 minute and removed from corners on II-V, strong and single on VI, with 2-3 strong branches on VII & VIII; paddle with long filamentous fringe, strong midrib and one short apical hair.

Larva (fig. 180). Clypeal h-1 slender, arising from a small tubercle; head h-4 & 5 branched, h-6 single, h-7 with 2-3 pilose branches. Antenna smooth, the shaft h-1 inserted midway from base, single, the apical hairs very short. Abdominal segment VIII with 7-9

comb teeth branched apically into thin points or teeth, the central tooth most prominent; siphon about as long as broad, siphon tuft long, single, inserted at about middle; anal segment with small dorsal plate, lateral h-1 small with 4-5 branches.

Material examined:

♂♀ San Jose, Mindoro, 14.VI.1945 (E. S. Ross, in bamboo).

Doubtful Occurrence

Armigeres (Armigeres) subalbatus (Coquillett)

Culex subalbatus Coquillett, 1898. Proc. U. S. Nat. Mus. 21: 302 (♀). Type loc: Japan (U. S. National Museum).

Culex panalectros Giles, 1901. J. Bombay Nat. Hist. Soc. 13: 608 (A).

Type loc: Calcutta (West Bengal), India (British (Nat. Hist.) Museum); Banks, 1906. Philip. J. Sci. 1: 983 (listed, Desvoidya); Bezzi, 1913. Philip. J. Sci. D8(4): 306 (listed, Blanchardiomyia); Giles, 1904. J. trop. Med. 7: 368 (listed, Stegomyia); Theobald, 1910. Monogr. Cul. 5: 142 (listed, Desvoidya).

Armigeres (Armigeres) panalectoris (Giles). Stone, Knight & Starcke, 1959. Cat. Mosq. World, Thomas Say Found. 6: 214 (syn. with subalbatus).

The occurrence of this species (as A. panalectoris in litt.) in the Philippines is uncertain. Although there are ♀♀ specimens in the U. S. National Museum collection resembling A. subalbatus, no definite identification can be made until the ♂ genitalia has been studied. Thurman (1958) discussed the identity of the species in what might be

called the subalbatus complex, but the identification of the ♀ still presents a problem.

Nomen Nudum

Toxorhynchites rectirostris Giles ms in Theobald, 1910. Monogr. Cul.

5: 214 (♀). Type loc: Philippine Is. (British (Nat. Hist.)
Museum); Edwards, 1914. Bull. Ent. Res. 4:259 (syn. with magna);
Stone, Knight & Starcke, 1959. Cat. Mosq. World, Thomas Say
Found. 6: 288 (nom. nud.).

Nomen Dubium

Stegomyia striocrura Giles, 1904. J. trop. Med. 7: 367 (A). Type loc:
Philippine Is. (non-existence); Edwards, 1932. Genera Insect. f.
194, p. 186 (syn. with ? magnus); Banks, 1906. Philip. J. Sci.
1: 985 (listed); Theobald, 1910. Monogr. Cul. 5: 185 (listed).

Genus CULEX Linnaeus

Culex Linnaeus, 1758. Syst. Nat. 10th Ed. 1: 602. Type species: Culex pipiens Linnaeus. By subsequent designation (Latreille, 1810).

For synonymy see under subgenus.

The genus Culex, with 45 recognized species and subspecies in the Philippines is the largest genus (next to Aedes) in the tribe Culicini. It includes 6 subgenera: the widespread subgenera Culex, Lutzia, Neoculex, and the Old World subgenera Culiciomyia, Lophoceraomyia and Mochthogenes.

The genus is particularly distinctive in the development of pulvilli, and the buccopharyngeal armature of the ♀. ♂ sidepiece always with developed subapical lobe bearing specialized setae or appendages; the phallosome with complex lateral plate, and the paraproct crown bears spines or teeth although reduced in some species. Cell R_2 always longer than stem vein R_{2+3} ; alula fringed with narrow scales and squama with long hairs. Pleural scales reduced or absent; postspiracular and spiracular bristles absent; lower mesepimeral bristles present or absent. Three subequal ♀ spermathecae.

Pupal respiratory trumpet always with distinct tracheoid; slit sometimes present; abdominal h-9 on segment VII well developed and far removed from posterior corner, dorsal in position; more developed on VIII, ventral in insertion, rarely near posterior corner; paddle varied, usually with two apical hairs.

Larva with head h-16 & 17 present in Lophoceraomyia, Mochthogenes and Culiciomyia; antenna varied, always with spicules, shaft h-1 many

branched. Prothoracic h-1, 2 & 3 always on common prominent tubercle, varied; comb teeth always numerous or very few in some species. Siphon varied, pecten teeth well developed, acus always present, with three or more pairs of tufts; saddle complete, distal edge or margin usually without strong spicules; three to six pairs of ventral brush.

Distribution:

The genus *Culex* is almost worldwide in distribution.

Habitats and relation to disease:

Most species are generally ground water breeders, although some are found breeding in leaf axils of plants, tree holes, rockholes and crabholes. Several species, primarily of the subgenus *Culex*, are closely associated with man and attack human and other mammalian hosts, others feed on birds. Some species are involved in the transmission of human and animal filariasis and encephalitis.

Key to Subgenera (Adult)

1. Lower mesepimeral bristles always present, about six or more in number----- *Lutzia* Theobald
 Lower mesepimeral bristles present or absent, if present
 not more than two----- 2
2. Proboscis with median pale band, the tarsomeres with narrow basal rings; no lower mesepimeral bristle----- *Culex* (part)
 Proboscis and tarsomeres dark, unbanded; one or two lower mesepimeral bristles present----- 3
3. ♂ palpus longer than or as long as proboscis----- 4
 ♂ palpus shorter than proboscis----- 6

4. ♂ antenna with specialized setae on flagellomeres V-X; wing
scales scanty and confined towards apex-- Lophoceraomyia Theobald
♂ antenna simple; wing scales denser----- 5
5. Long segment of ♂ palpus with a row of flattened setae; clasper
with a crest of spines before tip----- Culiciomyia Theobald
Long segment of ♂ palpus without flattened setae; clasper
without spiny crest----- (Neoculex) nematoides Dyar & Shannon
Culex (part)
6. ♂ palpus 1/2 or 3/4 the length of proboscis, appearing twisted
apically; lateral plate of phallosome broad and conical,
with many small teeth on distal portion-----
----- (Neoculex) brevipalpis (Giles)
♂ palpus 1/6 or 1/8 the length of proboscis; the lateral plate
of phallosome varied----- Mochthogenes Edwards

Key to Subgenera (Larva)

1. Head h-5, 6 & 7 all single, h-4 branched; antenna smooth;
mouthbrushes pectinate----- Lutzia Theobald
Head h-5, 6 & 7 branched, h-4 usually single; mouthbrushes
not pectinate; antenna spinose----- 2
2. Dorsal brush 2 & 3 both single; with three or four pairs of
ventral brush; pecten teeth fringed or with lateral
denticles----- 3
Dorsal brush 2 branched, 3 single; with four to six pairs of
ventral brush; pecten teeth always with lateral denticles----- 4

Subgenus LUTZIA Theobald

Lutzia Theobald, 1903. Monogr. Cul. 3: 155. Type species: Culex
bigotii Bellardi. By monotypy.

Jamesia Christophers, 1906. Sci. Mem. Med. Sanit. Dept. India 25: 12
(non Jeckel 1861). Type species: Culex concolor Robineau-
Desvoidy. By subsequent designation (Edwards 1922, as Culex
fuscus Wiedemann).

Only two species are presently recognized in this subgenus from the Philippines: Culex halifaxii and C. fuscus Wiedemann. Although no specific differences have been found in the larvae and pupae, the adults can be easily separated by the structure of the ♂ aedeagus and ornamentation of the abdominal terga which are fairly constant.

Subgenus Lutzia is readily recognized from other members of the genus by the presence of six or more bristles on lower mesepimeron; the ♀ bucco-pharyngeal armature is well developed; the larva has stout and pectinate mouthbrushes, finely spiculate thoracic and abdominal integument, and heavily spiculate frontal area, siphon and anal segment; the anal segment with both dorsal brush 2 & 3 single, eight pairs of branched ventral brushes; the pupa has very broad, finely spiculate paddle, the abdominal h-9 far removed from corners.

Distribution:

Widespread in Africa, Oriental, Indomalayan and Australian regions; one species (Culex halifaxii) occurs in the Solomon Is.

Habitats and relation to disease:

Predominantly ground pool breeders, but some species have been

collected from tree holes, and artificial containers; the larvae of all species are predaceous, mostly on other mosquito larvae. The ♀ seldom attack man, and none of the species seem to be involved in disease transmission.

Key to species (Adult)

1. Abdominal terga mostly or completely dark scaled; the lateral plate of ♂ genitalia with a prominent toothed process (fig. 190)----- halifaxii Theobald
- Abdominal terga brown with narrow apical band of golden scales on II-IV, 1/2 of V and all of VI-VIII completely covered with golden scales; the lateral plate of ♂ genitalia with a row of 3-5 small teeth (fig. 184)-----
----- fuscanus Wiedemann

Culex (Lutzia) fuscanus Wiedemann (figs. 184-189)

Culex fuscanus Wiedemann, 1820. Dipt. Exot. p. 9 (♂♀). Type loc: India (Naturhistorisches Museum, Wien).

Culex (Lutzia) fuscanus Wiedemann. Barraud, 1934. Fauna Brit. India Dipt. 5: 341 (♂♀, L, ♂ gen. fig., key); Bohart, 1945. USNavmed 580, p. 68 (key, ♂ gen. fig.); Bohart, 1956(1957). Ins. Micronesia 12: 75 (♂ gen. fig., key); T'an, 1945. Sinensia 16: 46 (L).

Culex concolor Robineau-Desvoidy, 1827. Mem. Soc. Hist. nat. Paris 3: 405 (♂). Type loc: none designated (non-extant). Banks, 1906. Philip. J. Sic. 1: 986 (listed); Bezzi, 1913. Philip. J.

Sci. D8: 307 (listed); Theobald, 1910. Monogr. Cul. 5: 394 (listed); Giles, 1904. J. Trop. Med. 7: 368 (listed); Senior-White, 1923. Cat. Indian Ins. pt. 2: 101 (listed).

A large brown mosquito easily recognizable by the extensive golden or yellow scales on abdominal terga, and by the markedly simple lateral plate of ♂ genitalia with three or five small teeth.

♀. Head: Vertex covered with narrow decumbent pale and dark upright scales, a border of narrow pale scales around eye margin continuing to patch of broad white scales at sides. Palpus about 1/4 the length of proboscis, with few scattered white scales; proboscis broadly pale medianly but not clearly defined. Thorax: Mesonotum covered with brown and pale scales, with concentration of pale scales on prescutellar area and scutellar lobes; sternopleuron with patches of broad white scales; lower mesepimeron with 8-10 bristles. Wing: Cell R₂ about twice as long as stem vein R₂₊₃. Legs: Brown, speckled, the femora largely pale ventrally. Abdomen: Terga brown with narrow band of golden or yellow scales on apices of II-IV, apical 1/2 of V and all of VI-VIII completely covered with golden scales (the extent of golden scaling on V is quite variable, may be as narrow apical band); sterna largely pale with few scattered brown scales.

♂. Coloration as in ♀ except for narrower pale band on proboscis; cell R₂ only slightly longer than stem vein R₂₊₃. Genitalia as in figure 184. Sidepiece with subapical lobe bearing three heavy spine-like setae and two weak bristles; clasper short and narrow, the apical spine expanded at tip, three or four dorsal setae scattered at apical 1/3; aedeagus simple; the lateral plate simple, pointed distally, with a

row of three or five small teeth medianly; basal sternal process curved and slender; paraproct crown composed of numerous sharp and blunt spines, four cercal setae present; tergum IX narrow, with no defined lobe but with a row of bristles on each side.

Pupa (figs. 188-189). Respiratory trumpet elongate, widening towards opening, lacking slit, trachoid extending to basal 1/4, the surface mostly reticulate. Metanotal C-10 branched, C-11 single, strong, C-12 single, weakly developed and widely separated from C-10 & 11. Abdominal and thoracic hairs mostly weak and simple, dorsum of integument with characteristic reticulate pattern and finely spiculate; posterior margin of segment VIII with prominent postero-lateral lobe; h-9 well developed and far removed from corners; paddle broad and notched apically, spiculate.

Larva (figs. 185-187). Clypeal h-1 small and slender; mouth-brushes stout and pectinate; frontal surface spiculate, h-4 small and weakly branched apically, h-5, 6 & 7 all single and extremely long; antenna small, smooth; shaft h-1 weak, submedian in position, the apical hairs simple, unbranched. Thoracic and abdominal hairs well developed, arising on prominent tubercle, the integument finely spiculate, other hairs comparatively weak. Comb teeth roughly arranged in a triangular patch, the teeth slightly expanded apically into thin points, the median point stronger. Siphon and saddle of anal segment heavily spiculate; the siphon narrowly dark at base and apex, with a row of graduated pecten teeth, the teeth mostly barbed except the most distal tooth which is large and simple; anal segment with dorsal hair or brush single.

Material examined:

♂♂♀♀ Balaon, Banga, Agtipad, Bacnotan & Camansi, La Union, 4.IV., 13-30.V.1945 (all collected by A. B. Gurney); Tala, Rizal, 11.V.1952 (F. E. Baisas); Lake Mainit, Surigao 23.XI-1.XII.1959 (L. W. Quate); San Jose, Mindodo, 8.II.1945 (E. S. Ross); Calawan, Laguna, 7.III.1930, 8.I.1935; Pettit Barracks (Parang, Cotabato), 15.IX.1925 (Pvt. Fabrigo); 8.V.1945 (J. H. Paullus); Manila, II.1930 (M. B. Mitzmain); Camp Gregg, Pangasinan; Osmena, Samar, 1945; Jolo, Jolo Is. 1945; Pasonanca, Zamboanga, IX.1945; Balsahan River, Bacungan, Iwahig & Puerto Princesa, Palawan, VII.1945; Subic Bay, Zambales, VIII.1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Pampanga, Zamboanga, Cotabato, Manila, Pangasinan, Rizal, Laguna, Samar, Corregidor; India, Ceylon, Andaman Is., Burma, Thailand, Malaya, Sumatra, Java, Borneo, Indochina, Formosa, USSR, Korea, Japan, Palau Is., Caroline Is.

Habitats:

The larvae have been collected in natural pools, shallow wells and domestic collections of water; reared from sunken drum containing taro plant (Bohart 1956); the adult seldom attack man.

Culex (Lutzia) halifaxii Theobald (fig. 190)

Culex halifaxii Theobald, 1903. Monogr. Cul. 3: 231 (♀). Type loc:

Dindings (Straits Settlements), Malaya (British (Nat. Hist.) Museum).

- Culex (Lutzia) halifaxii Theobald. Edwards, 1922. Indian J. Med. res. 10: 470 (listed); Senior-White, 1923. Cat. Indian Ins. pt. 2: 107 (listed); Dyar & Shannon, 1925. Insec. Inscit. Mens. 13: 84 (listed); Barraud, 1934. Fauna Brit. India, Dipt. 5: 344 (♂ gen. fig., key); Bohart, 1945. USNavmed 580, p. 68 (key, ♂ gen. fig.); Knight & Chamberlain, 1948. Proc. Helm. Soc. Wash. 15: 18 (P, fig.).
- Culex ? aureopunctis Ludlow, 1910. Canad. Ent. 42: 195 (♀). Type loc: Cotabato, Mindanao (U. S. National Museum); Bezzi, 1913. Philip. J. Sci. D8: 307 (listed); Dyar & Shannon, 1925. Insec. Inscit. Mens. 13: 84 (syn.).
- Culex multimaculosus Leicester, 1908. Cul. Malaya 3: 155 (♂♀). Type loc: Malaya (British (Nat. Hist.) Museum).

This species can be readily differentiated from C. fuscanus and from its closely related species C. vorax Edwards by the entirely dark abdominal terga and by the structure of the lateral plate of ♂ genitalia having a prominent median toothed process.

♀. Head: Vertex covered with narrow decumbent pale and brown upright scales, pale narrow scales around eye margin continuing to small patch of broad white scales at sides. Palpus dark, about 1/5 the length of proboscis; proboscis dark in some specimens or with indefinite pale median band more distinct ventrally. Thorax: Mesonotum mostly brown with patches of pale scales; pleuron with patches of white broad scales on upper sternopleuron and mesepimeron; a row of broad scales and bristles on lower sternopleuron just above mid coxa; lower mesepimeron with 7-8 bristles. Wing: Cell R₂ about 1/3 longer than stem vein R₂₊₃

and slightly longer than cell M₂. Legs: Mostly brown, femora and tibiae speckled, the venter of hind and mid femora white scaled at basal 1/2, tip of hind tibia with a small patch of white scales. Abdomen: Terga completely dark scaled, except VIII with narrow basal band and lateral patches of pale scales; sterna mostly pale scaled, V-VII with narrow apical or subapical dark band in some specimens.

♂. Coloration as in ♀, except proboscis which is narrowly pale, or all dark. Genitalia as in figure 190. Sidepiece with subapical lobe bearing four heavy, spine-like setae and two weak bristles; clasper short, narrowed apically, with the apical spine expanded at tip and three long dorsal setae; aedeagus simple; the lateral plate slender and pointed distally, with prominent median toothed process bearing 5-6 strong teeth; basal sternal process curved and slender; paraproct crown composed of numerous blunt spines with six cercal setae; tergum IX narrow, with definite lobe bearing strong bristles.

Pupa and larva. Very similar to C. fuscatus in most details and I am unable to find differences which will separate these two species.

Material examined:

♂♂♀♀ San Jose, Mindoro, 30.I.1945 (E. S. Ross, in jungle); Lake Minit, Surigao, Mindanao, 23.XI-1.XII.1959; San Francisco, Agusan 10Km Se, 12.XI.1959 (L. W. Quate); Calawan, Laguna, 7.III.1930; Sohoton Spring & Osmena, Samar, 1945; Jolo, Jolo Is. 1945; Irahuan River, Palawan, 1945; Cape Melville, Balabac Is. VI.1945; Culion Is., VI.1945; Pasonanca, Zamboanga, IX.1945; San Ramon, Mindanao, IX.1945; Subic Bay, Zambales, VII.1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Cotabato (as aureopunctis Ludlow), Samar, Pampanga; Malaya, India, Ceylon, Thailand, Indonesia, New Guinea, Bismarck Archipelago, Solomon Is., Australia.

Habitats:

The larvae have been collected in rock pools, rice fields, small ponds, roadside ditches, jungle pools, water barrels and other water containers about habitation (Barraud, 1930; Knight & Chamberlain, 1948). Nothing is known of the ♀ biting habit.

Erroneously recorded

Culex (Lutzia) tigripes Grandpre & Charmoy

Culex tigripes Grandpre & Charmoy, 1900 (1901). Les Moustiques, p. 6 (♂♀). Type loc: Mauritius (Museum National d'Histoire Naturelle, Paris). Banks, 1906. Philip. J. Sci. 1: 988 (listed); Bezzi, 1913. Philip. J. Sci. D8: 307 (listed); Theobald, 1910. Monogr. Cul. 5: 392 (listed); Senior-White, 1923. Cat. Indian Ins. pt. 2: 109 (listed).

This species is apparently erroneously recorded from the Philippines. It is known to occur only in the Ethiopian region.

Subgenus LOPHOCERAOMYIA Theobald

Lophoceraomyia Theobald, 1905. J. Bombay nat. Hist. Soc. 16: 245

(April 15). Type species: Lophoceraomyia uniformis Theobald. By monotypy. Stone & Bohart, 1944. Proc. ent. Soc. Wash. 46: 219 (priority). Colles, 1965. J. Med. ent. 2: 261 (tax., key).

Lophoceratomyia Theobald, 1905. Ann. hist. nat. Mus. Hung. 3: 93 (June, lapsus).

Philodendromyia Theobald, 1907. Monogr. Cul. 4: 623. Type species:

Philodendromyia barkerii Theobald. By monotypy.

Cyathomyia de Meijere, 1910. Ann. bot. Gdn. Buitenzorg (Bogor, Java),

Suppl. 3: 921. Type species: Cyathomyia jenseni de Meijere. By monotypy.

The members of the subgenus Lophoceraomyia are readily recognizable by the marked modifications of the ♂ antenna* and the characteristic features of the genitalia; but the ♀♀ of most species cannot be distinguished from closely related forms, and the immatures show no good subgeneric characters. Separation of the species, therefore, is based mainly on ♂ characters. On the basis of ♂ genitalia, Lophoceraomyia is most closely related to Culiciomyia; the larvae, however, show close relationship to Mochthogenes.

Fourteen species are recorded here from the Philippines, of which 3 are new records and one is described as new; C. josephinae Baisas is

* In the descriptions which follow, I refer to the first flagellar segment as flagellomere I; the segments bearing specialized setae are then flagellomere V, VI, etc.

resurrected from synonymy with fraudatrix (Theobald), which probably does not occur in the Philippines.

The Philippine species of Lophoceraomyia can be conveniently placed in two well defined groups of Edwards (1932): Group B or fraudatrix group, and Group C or mammilifer group. The fraudatrix group is characterized by the following: ♂ antenna with smooth torus, lacking protruberance; palpus with basal finger-like process; proboscis with dorsal or lateral setae; the lateral plate of phallosome with distal process and no denticles; subapical lobe of sidepiece usually with two broad leaves. Included species: cinctellus Edwards, gibbulus n. sp., fulleri (Ludlow), josephinae Baisas, infantulus Edwards, macdonaldi Colless, pachecoi Baisas, reidi Colless, rubithoracis (Leicester) and uniformis (Theobald). The mammilifer group has ♂ antenna with protruberance on inner side of torus; palpus without basal finger-like process; proboscis without dorsal setae; the lateral plate of phallosome with spiny apex, several denticles and basal or median process; subapical lobe with one broad leaf. Included species: lavatae Stone & Bohart, mammilifer (Leicester), mindanaoensis Baisas and minor (Leicester).

Distribution:

Oriental, Indomalayan and Australian regions, and extending north up to Japan, eastern China and the South Pacific.

Habitats and relation to disease:

The larvae are found in a wide variety of habitats: ground water, tree holes, bamboo stumps, palm axils, rock pools and pitcher plants.

Adults of some species are known to attack man in forest, but wild birds are probably the hosts preferred (Colless, 1959).

Key to species (♂♂)

1. Torus of antenna with a protuberance or process on inner surface; palpus without basal finger-like process; the lateral plate of phallosome with spiny apex, several denticles and basal or median process; subapical lobe with one broad leaf; (mammilifer group)----- 2
- Torus of antenna simple; palpus with finger-like process at base; the lateral plate of phallosome with distal process, no denticles; subapical lobe usually with two leaves; (fraudatrix group)----- 5
- 2(1). Antenna without specialized setae on flagellomere V, reduced on flagellomeres VI-VIII----- lavatae Stone & Bohart
- Antenna with specialized setae or bristles on flagellomeres V-IX----- 3
- 3(2). Lateral plate of phallosome with toothed median process; specialized setae on flagellomeres V-VIII-----
----- mindanaoensis Baisas
- Lateral plate with simple, curved basal process; specialized setae on flagellomeres V-IX----- 4
- 4(3). Flagellomere V with three long, flattened setae or blades and a series of short heavy bristles; clasper with a group of spines forming crest near apex-----
----- mammilifer (Leicester)

- Flagellomere V without flattened setae but with four or
 five short bristles; clasper simple----- minor (Leicester)
- 5(1). Abdominal terga with pale basal bands----- 6
 Abdominal terga completely dark----- 7
- 6(5). Antenna with specialized setae confined to flagellomeres
 VII & VIII----- infantulus Edwards
 Antenna with specialized setae on flagellomeres V-X-----
 ----- cinctellus Edwards
- 7(5). Antenna with heavy short bristles on each flagellomeres
 I-IV, normal on V, specialized setae on VI-IX; side-
 piece with markedly prominent subapical lobe; only
 one bristle present----- gibbulus n. sp.
 Antenna not as above, usually with specialized setae on
 flagellomeres V-X; subapical lobe not as prominent;
 with a row or patch of bristles on sidepiece----- 8
- 8(7). Clasper markedly swollen distally; palpus with two
 basal finger-like processes----- 9
 Clasper slender, tapered distally; palpus with a small
 basal process----- 11
- 9(8). Sidepiece with a patch of long bristles----- fulleri (Ludlow)
 Sidepiece with a row of 3-4 long curved bristles----- 10
- 10(9). Subapical lobe with 3 stout rods, 1 markedly expanded
 distally; flagellomere V with 4 flattened setae pro-
 gressively shorter and with pointed tips followed by
 4 longer, hyaline bristles----- reidi Colless

- Subapical lobe with 3 stout similar rods; flagellomere V with a series of long flattened setae, the tips rounded gradually becoming pointed to long acuminate, no hyaline bristles----- macdonaldi Colless
- 11(8). Paraproct crown not developed, rudimentary, with few minute spines; the lateral plate with long slender pointed process distally----- rubithoracis (Leicester)
- Paraproct crown with well developed teeth or spines; the lateral plate not as above----- 12
- 12(11). Subapical lobe with 2 broad leaves; a row of 5-6 long bristles on sidepiece; flagellomere V with 3-4 long narrow blades----- pachecoi Baisas
- Subapical lobe with 1 narrow leaf; a row of 3 bristles; flagellomere V with a set of long flattened setae, with broadly rounded tips and a series of long bristles all about equal in length----- josephinae Baisas

C. uniformis not included in the key; no ♂ available for study.

Culex (Lophoceraomyia) cinctellus Edwards (fig. 207)

Culex (Lophoceraomyia) cinctellus Edwards, 1922. Indian J. med. Res.

10: 287 (♂, gen. fig., nom. nov. for taeniata Leicester, non Wiedemann, 1928); Edwards & Given, 1928. Bull. ent. Res. 18: 353 (? L); Barraud, 1934. Fauna Brit. India, Dipt. 5: 366 (♂♀, L, key, fig.); Mattingly, 1949. Proc. R. ent. Soc. Lond. B 18: 226 (? L); Colless, 1965. J. Med. ent. 2: 277 (♂♀, L, fig., key).

Lophoceratomyia taeniata Leicester, 1908. Cul. Malaya 3: 127 (♂). Type

loc: Kuala Lumpur, Malaya, ♂ lectotype designated by Colless, 1965 (British (Nat. Hist.) Museum).

The occurrence of cinctellus in the Philippines was recently recorded from Manila by Colless (1965); additional ♂ specimens were found in the U. S. National Museum collection from Leyte and Samar. It is easily recognizable by the banded abdomen; otherwise it cannot be separated from fulleri, although Edwards (1922) mentioned some minor differences in the genitalia. It is possible that the two are conspecific, but final decision must wait until the immatures of both have been thoroughly studied. C. cinctellus is further characterized by the following: ♂ palpus longer than proboscis by the length of terminal segment, distal two segments hairy, with a small finger-like process at base; proboscis with dorsal setae. Torus of antenna simple; specialized setae on flagellomeres V-X as follows: three or five brown flattened setae on V; short thickened twisted comb tufts on VI-VII; longer twisted comb tufts on VIII; four flattened setae with acuminate tips and few strong bristles on IX, and four strong bristles on X. Genitalia as in figure 207. Appendages of subapical lobe as follows: three stout rods, two of which with bent tips and one expanded distally; two broad leaves, and four short stout setae; a patch of long bristles on inner mesal portion; lateral plate of phallosome curved, with pointed apex directed upwards; clasper swollen distally; paraproct crown with few short spines; three or four cercal setae.

♀, pupa and larva. Not available for description.

Material examined:

♂ San Antonio, Samar, 8.XII.1944 (J. H. Paullus); ♂ Dulag, Leyte, 21.X.1944 (Pepper); ♂ Jolo, Jolo Is., 1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Manila; Malaya, India, Sumatra, Java, Borneo, Hainan Is., Ceylon ?, Ryukyu Retto.

Habitats:

The larvae are quite rare but have been found in shaded ground water pools in or near forest; the adults are largely bird-feeders but occasionally bite man (Colless, 1959), and are quite commonly taken resting among vegetation in forest or more open areas, but are rarely taken with mammalian baits (Colless, 1965).

Culex (Lophoceraomyia) fulleri (Ludlow)

Oculiomyia fulleri Ludlow, 1909. Canad. ent. 41: 97 (♀). Type loc:

Parang (Cotabato), Mindanao (U. S. National Museum); Theobald, 1910. Monogr. Cul. 5: 478 (listed); Bezzi, 1913. Philip. J. Sci. D8: 307 (listed); Dyar & Shannon, 1925. Insec. Inscit. Mens. 13: 85 (listed).

Culex (Lophoceraomyia) fulleri (Ludlow). Bohart, 1945. USNavmed 580, p. 74 (♂ gen. fig., key); Bick, 1949. Nat. Hist. Misc. 41: 2 (listed); Stone & Knight, 1957. J. Wash. Acad. Sci. 47(2): 50 (♀ leucotype).

♂. The characters of the antenna and genitalia are very similar to cinctellus from which fulleri cannot be separated; the specialized

setae on flagellomere V are also variable as in cintellus mentioned by Colless (1965). However, fulleri has the abdomen entirely dark and has two small finger-like processes at base of palpus; further study of the material, with immatures, would be required to delimit the species. Unfortunately, the pupa and larva are not known, and the ♀ cannot be associated with certainty; it has pale basal lateral patches on abdominal terga, and the sterna is entirely pale.

Material examined:

♂♂♀♀ Parang, Cotabato, 21-26.V.1945 (J. H. Paullus); ♂♂♀♀ Ludlow Barracks, Parang, Mindanao, July; ♂ Jolo, Jolo Is., 1945 (Rozeboom, Knight & Laffoon); ♂♂ San Francisco, Agusan, 12.XI.1959 (L. W. Quate).

Recorded distribution:

Leyte, Cotabato, (Tayabas) Quezon.

Habitats:

Unknown.

Culex (Lophoceraomyia) gibbulus n. sp. (fig. 208)

Although this species is based only on two ♂ specimens, the genitalia and antenna are particularly distinctive. The antenna lacks specialized setae or bristles on flagellomere V; the subapical lobe of sidepiece is markedly prominent and there is no apparent leaf appendage; only one bristle is present on basal third of sidepiece. The lateral plate of the phallosome is of the usual fraudatrix group type.

♂. Head: Vertex with pale broad scales around eye margin; palpus slender, about as long as proboscis with very small basal process, few hairs on distal two segments; proboscis with few short lateral hairs.

Torus of antenna simple; with short heavy bristles on flagellomeres I-IV, none or normal on V, specialized setae on VI-IX as follows: long twisted comb tuft on VI; short twisted comb tuft and two flattened curved setae on VII; a group of five longer setae on VIII; four narrow blades and three heavy bristles on IX, and three heavy bristles on X.

Thorax: Propleuron and upper sternopleuron with few broad scales; one lower mesepimeral bristle present. Wing: Vein scales scanty; cell R_2 about as long as or slightly longer than stem vein R_{2+3} . Legs: All brown. Abdomen: Tergal and sternal scales all brown. Genitalia as in figure 208. Sidepiece with markedly prominent subapical lobe, the appendages borne on two tubercles: a) three rods, one stouter and with rounded apex, b) four or five short curved blades and one longer straight narrow blade; only one bristle present on basal third; clasper slender and curved distally, with one subapical seta and flattened apical spine; the lateral plate of phallosome curved, with tapered distal process; paraproct with a large lobe, the crown composed of strong outer teeth and sharp short inner spines; three or four cercal setae present.

♀, pupa and larva. Unknown.

Holotype:

♂ San Jose, Mindoro, 9.III.1945 (E. S. Ross), in the U. S. National Museum, Washington, D. C.; ♂ paratype, Uring-Uring, Brooke's Point, Palawan, 15.IX.1961 (Noona Dan Expd. 1961-62), in the Zoologisk Museum, Copenhagen, Denmark.

Culex (Lophoceraomyia) infantulus Edwards (fig. 211)

Culex (Lophoceratomyia) infantulus Edwards, 1922. Indian J. med. Res.

10: 287 (♂). Type loc: Hongkong (British (Nat. Hist.) Museum);

Baisas, 1935. Philip. J. Sci. 57: 174 (A, ♂ gen. ant. fig.).

Culex (Lophoceraomyia) infantulus Edwards. Bohart, 1945. USNavmed 580,

p. 75 (♂); Bohart & Ingram, 1946. USNavmed 1055, p. 73 (♂, P, L, E, fig.).

Easily recognizable by the reduced specialized setae on flagellomeres VII & VIII, the pale band on abdominal terga and by the characters of ♂ genitalia.

♂. Palpus slender, longer than proboscis by 1/2 the length of proboscis, with few hairs and small finger-like process at base. Torus of antenna smooth; specialized setae confined on flagellomeres VII & VIII as follows: two or three short thickened setae on VII, four or five longer and flattened setae on VIII. Abdomen with pale narrow basal band on tergum. Genitalia as in figure 211. Appendages of subapical lobe few and simple: two straight rods, one blade and three short setae; clasper short and slender; lateral plate broad and rounded distally, bearing an outcurved horn-like process with reticulate surface; paraproct crown with few short lateral spines; two cercal setae.

♀. Not available for description; pupal and larval case skins of ♂ not definitely associated.

Pupa and larva. Not described.

Material examined:

♂♂ San Jose, Mindoro, I. 1945, 16.III.1945 (E. S. Ross); ♂♂

Pasonanca, Zamboanga, 1945 (Rozeboom, Knight & Laffoon); ♂ Palo Leyte, 15.XII.1945; ♂ Parang, Cotabato, 30.IV.1945.

Recorded distribution:

Bulacan, Laguna; China, Japan, Ryukyu-Retto, India, Ceylon, Nepal, Maldive Is., Thailand, Indochina, Java.

Habitats:

The larvae have been found in seepage pools, stream pools with much vegetation and rock pools, forest creeks; adults were collected resting on damp vegetation and rocks along streams; nothing is known of ♀ biting habits.

Culex (Lophoceraomyia) josephinae Baisas (figs. 209-210)

Culex (Lophoceratomyia) josephinae Baisas, 1935. Philip. J. Sci. 57:

172 (A, ♂ gen., ant. fig.). Type loc: Del Carmen, Pampanga (lost); Bohart, 1945. USNavmed 580, p. 74 (synonymy with fraudatrix).

Culex (Lophoceraomyia) fraudatrix (Theobald) of Bohart, 1945. USNavmed 580, p. 74 (in part).

Bohart (1945) treated josephinae as a synonym of fraudatrix (Theobald). However, on re-examination of a series of specimens in the U. S. National Museum collection, the ♂♂ differed from fraudatrix auct. or variatus (Leicester) of Colless from Malaya by having a set of flattened setae with broadly rounded tips and a series of long bristles all about equal in length on flagellomere V, and the lateral plate of phallosome with small hooked process distally. Bohart's figures of the

structures of ♂ antenna and genitalia, and Baisas' description and figure of the antenna of fraudatrix are for the most part applicable to josephinae and macdonaldi Colless from Malaya, respectively. I consider C. josephinae to be a valid species and distinct from fraudatrix or variatus, and that fraudatrix probably does not occur in the Philippines. C. josephinae has a number of characteristic features in the ♂ genitalia and antenna, but otherwise resembles variatus. It is further differentiated by the following: ♂ palpus longer than proboscis by almost the length of distal two segments, these segments hairy and dark, the base with a small finger-like process. Torus of antenna simple; specialized setae on flagellomeres V-IX as follows: a set of long flattened setae with broadly rounded tips and a series of bristles all about equal in length on V (fig. 210); short and long twisted comb tufts on VI & VII; longer twisted tuft on VIII; three or four long narrow blades or strong bristles on IX, and two stronger bristles on X. Genitalia as in figure 209. Subapical lobe with three stout rods, a narrow leaf, three short stout setae and two longer blades; a row of three long bristles on inner mesal portion; clasper tapered distally; lateral plate of phallosome with small hooked process distally and few small spines at base which may be lacking in some specimens; paraproct crown composed of few short spines; two cercal setae.

♀. Very similar to others in the fraudatrix group and cannot be associated with certainty. The pupa and larva are not known.

Material examined:

♂♂ Sta. Rosa, Leyte, IX.1944; San Jose, Mindoro, 27.I.1945 (E. S. Ross, marsh & swamp puddles); ♂♂ San Antonio, Samar, 12.I.1945; Parang,

Cotabato, 26.V.1945 (J. H. Paullus); ♂♂ San Francisco, Agusan, 10km SE, 12.XI.1959 (L. W. Quate); ♂♂♀♀ Osmena and Calotons, Samar, V.1945 (Rozeboom, Knight & Laffoon); ♂ Kabakan, Mindanao (R. Staples), ♂ Los Banos, Laguna, XI.1921 (F. X. Williams).

Recorded distribution:

The adults have been reared from larvae collected from clear river slough; habits unknown.

Culex (Lophoceraomyia) lavatae Stone & Bohart (fig. 212)

Culex (Lophoceraomyia) lavatae Stone & Bohart, 1944. Proc. ent. Soc.

Wash. 46:220 (♂, gen., ant., fig.). Type loc: Los Banos, Laguna (U. S. National Museum). Bohart, 1945. USNavmed 580, p. 75 (key, ♂ gen., ant. fig.).

Culex fidelis Dyar, 1920. Insec. Inscit. Mens. 8: 180 (in part).

The absence of specialized setae on flagellomere V of the ♂ antenna, and the long blade-like basal process of the lateral plate of the phallosome distinguish lavatae from other members of the group.

♂. Palpus slender, about as long as proboscis, with few hairs on distal two segments. Torus of antenna with a protuberance on inner surface; specialized setae on flagellomeres VI-VIII as follows: four thickened setae on VI; three flattened setae and short bristles on VII, and a tuft of four long flattened setae on VIII. Genitalia as in figure 212. Subapical lobe of sidepiece with three slender rods, two with bent tips; one narrow leaf, one long seta and three narrow blades; a row of 4-6 long bristles on inner mid portion; clasper tapered distally, with one subapical seta and a small apical blunt spine;

lateral plate of phallosome armed with strong denticles, spiny apex and long blade-like process arising from base; paraproct crown composed of strong outer teeth and few inner spines; three cercal setae present.

Pupa and larva. Unknown; a series of ♀♀ in the U. S. National Museum collection provisionally referred to lavatae, with buccopharyngeal armature.

Material examined:

♀♀♂♂ Baguio, Luzon, 29.VIII.1945 (S. E. Shields); Bacnotan, La Union, 13.VI.1945 (A. B. Gurney); ♂ San Jose, Mindoro, 21.I.1945; 17.V.1945 (treeholes, E. S. Ross); ♂ type, Los Banos, Laguna, 28.VII.1915. ♂♀♀ Calacad Mt. Prov., 22.II.1945 (L. Rozeboom); Pasonanca, Zamboanga, 1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Known only from type locality: Laguna.

Habitats:

The adults have been reared from larvae collected in tree holes by Dr. Ross.

Culex (Lophoceraomyia) macdonaldi Colless (figs. 218-221)

Culex (Lophoceraomyia) macdonaldi Colless, 1965. J. Med. ent. 2: 276

(♂♀, L, fig., key). Type loc: Singapore (Australian National Insect Collection, Canberra).

Culex (Lophoceraomyia) fraudatrix (Theobald) of Baisas, 1935. Philip.

J. Sci. 57: 173 (in part).

The ♂ of this species can be readily identified by the long

finger-like processes at the base of palpus, and by the characteristic broad setae on flagellomere V of antenna.

♂. Palpus longer than proboscis by 1/2 the length of terminal segment, the distal two segments hairy; proboscis with dorsal setae. Torus of antenna smooth; specialized setae on flagellomeres V-X as follows: a series of long flattened setae with rounded tips gradually becoming pointed to long acuminate tips on V (fig. 218); longer twisted comb tuft on VI; one set of short comb tuft and few longer flattened setae on VII; a group of longer curved tufts on VIII; three long narrow blades and short thick bristles on IX, and three long thick bristles on X. Genitalia as in figure 219. Subapical lobe with three stout rods; two leaves, one larger and broader than others, four short flattened setae, one with serrated tip; a row of three long bristles on inner mesal portion; clasper long and swollen distally; lateral plate simple, with tapered recurved distal process; paraproct crown with few short spines, a large blunt process; three cercal setae.

♀. Not available for description.

Pupa (based on a ♂ cast skin provisionally referred to macdonaldi). Respiratory trumpet (fig. 220) long and very slender throughout its entire length, with a short slit, the tracheoid extending to midportion. Metanotal C-10 & 11 long and double, C-12 with 3 weak branches. Abdominal h-1 gradually reduced towards distal segment; h-5 stronger on segments IV-VI; h-9 with 3 branches on VII and far removed from corner, with 5 dendritic branches on VIII. Paddle with very strong midrib, infuscated at apex; two apical hairs, one of which is branched.

Larva (based on ♂ cast skin as above). Clypeal h-1 spine-like; head h-4 with 3 or 4 weak branches, h-5 & 6 both long and 2-branched, h-7 with 5 branches; h-16 & 17 present. Antenna spinose, infuscated at base and distal portion beyond insertion of shaft h-1, subapical hairs strong. Prothoracic h-3 with 2 or 3 short pilose branches, h-1 & 2 both single (fig. 221). Comb teeth arranged in a triangular patch, each tooth fringed apically. Siphon slender and tapered, with slight apical and median infuscation, narrowly dark at base and apex, four pairs of branched tufts, pecten teeth with 1-2 stronger basal spines. Saddle finely spiculate, lateral h-1 with 4 weak branches; dorsal brush 2 with 3 short accessory setae, 3 single; six pairs of ventral brushes.

Material examined:

♂♂ San Jose, Mindoro, 9.II.-19.IV.1945 (E. S. Ross).

Recorded distribution:

Previously described from Singapore, also reported from Assam, India; this is a new record for the Philippines.

Habitats:

The larvae have been taken breeding in clear fresh water, just above tidal limits; the adults were taken resting among vegetation in the tidal zone. Nothing is known of the ♀ biting habits (Colless, 1965).

Culex (Lophoceraomyia) mammilifer (Leicester) (figs. 222-227)

Lophoceraomyia mammilifer Leicester, 1908. Cul. Malaya 3: 128 (♂♀).

Type loc: Raub (Pahang) & Kuala Lumpur, Malaya (British (Nat. Hist.) Museum); ♂ lectotype designated by Colless, 1965.

Culex (Lophoceratomyia) mammilifer Leicester. Baisas, 1935. Philip. J.

Sci. 57: 174 (♂, gen., ant. fig.).

Culex (Lophoceraomyia) mammilifer (Leicester). Barraud, 1934. Fauna

Brit. India 5: 374 (♂♀, L, ant. ♂ gen. fig.); Bohart, 1945.

USNavmed 580, p. 75 (L); Mattingly, 1949. Proc. R. ent. Soc.

Lond. 18: 227 (L, key); Colless, 1965. J. Med. ent. 2: 287 (♂♀,

L, fig., key).

The ♂ is readily recognizable by the presence of long, flattened setae and short bristles on flagellomere V of antenna, and by the structures of genitalia; the ♀ like others in the mammilifer group cannot be identified with certainty.

♂. Palpus slender, longer than proboscis by about 1/2 the length of terminal segment, with few hairs. Torus of antenna with protuberance on inner side; specialized setae on flagellomeres V-IX as follows: V with three long flattened setae or blades and five short heavy bristles (fig. 223); VI-VII each with comb tuft of long twisted setae; similar comb tuft on VIII but longer and more flattened; IX with heavier straight bristles. Genitalia as in figure 222. Subapical lobe with three rods, one longer and pointed than the others; one narrow blade; one small broad leaf, and few short bristles; a row of six long bristles on inner mid portion; clasper with a group of small spines forming crest near apex; lateral plate of phallosome with few denticles and median curved process, spiny apex; paraproct crown composed of stronger and larger spines; two or three cercal setae.

♀. Not described here.

Pupa (based on cast skin of ♂). Respiratory trumpet long (fig. 224), narrow, with long slit, tracheoid extending beyond mid portion. Metanotal C-10 & 11 long and double, C-12 with 4 branches. Abdominal h-1 becoming progressively weak to 4 branches on segment VII; h-5 long and double on V-VI; h-9 on VII short tuft and far removed from corner, 6-8 long pilose branches on VIII. Paddle smooth, midrib and outer margin, two short unequal apical hairs present.

Larva (based on cast skin of ♂, figs. 225-227). Clypeal h-1 spine-like; head h-4 single, short and weak, h-5 & 6 with 2 long pilose branches, h-7 with 6 shorter pilose branches; h-16 & 17 absent. Antenna spinose, unicolorous, slender, shaft h-1 at more than 3/4 from base, subapical h-2 & 3 long and heavy. Prothoracic h-1, 2 & 3 all single, with h-3 very short. Abdominal integument with few scattered minute spines. Comb teeth arranged in a large triangular patch, each tooth elongate and fringed apically; siphon tapered distally, narrowly dark at base and apex, with three pairs of short branched tufts. Dorsal brush 2 with short accessory setae, 3 single; saddle spiculate distally, lateral h-1 with 3 weak branches, six pairs of ventral brushes.

Material examined:

♂♂ San Jose, Mindoro, 12.I.-9.III.1945 (E. S. Ross); San Francisco, Agusan, 12.XI.1959 (L. W. Quate); Osmena, Samar, VIII.1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Laguna, Palawan; Malaya, India, Ceylon, Burma, Andaman Is., Borneo, Sumatra.

Habitats:

The larvae are quite common in container habitats, particularly in axils of Nipa palms, ground pools with much decaying vegetation and heavily shaded by forest, and near tidal zone in Malaya. The adults may be swept from foliage in forest, both inland and along the coast, rarely, if ever, attack man (Colless, 1965).

Culex (Lophoceraomyia) mindanaoensis Baisas

Culex (Lophoceratomyia) mindanaoensis Baisas, 1935. Philip. J. Sci.

57: 168 (♂, gen., ant. fig.). Type loc: Cotabato, Mindanao (lost); Bohart, 1945. USNavmed 580, p. 76 (listed).

No specimens of this species are available for study; it has been known only from type locality. According to Baisas' figures and description, mindanaoensis has prominence on torus of antenna, specialized setae on flagellomeres (6-9) V-VIII; the lateral plate of phallosome has several denticles, spiny apex and toothed median process.

Culex (Lophoceraomyia) minor (Leicester) (figs. 213-214)

Lophoceratomyia minor Leicester, 1908. Cul. Malaya 3: 126 (♂). Type

loc: Kuala Lumpur, Malaya (British (Nat. Hist.) Museum); ♂ lectotype designated by Colless, 1965.

Culex (Lophoceratomyia) nolledoi Baisas, 1935. Philip. J. Sci. 57: 170

(A, ♂ gen., ant. fig.). Type loc: Kolambugan, Lanao (lost); Bohart, 1945. USNavmed 580, p. 76 (♂ gen., fig., key); Colless, 1965. J. Med. ent. 2: 289 (synonymy).

This species closely resembles most of the species in the mammilifer group, but the ♂ can be recognized by the characteristic features of the antenna and genitalia.

♂. Palpus slender, longer than proboscis by 1/2 the length of terminal segment, with few hairs. Torus of antenna with a protuberance; specialized setae and bristles on flagellomeres V-IX as follows: four or five short bristles on V (fig. 214); comb tuft of twisted flattened setae on VI; two groups of well differentiated comb tufts on VII; a group of longer curved setae on VIII, and three or four heavy bristles on IX. Genitalia as in figure 213. Appendages of subapical lobe as follows: three rods with bent and acuminate tips; one long and three short setae and one broad leaf; a row of 7-8 long bristles on inner portion; clasper small, tapered distally; lateral plate curved and with several denticles, spiny apex and a large curved process arising from base of plate; paraproct crown with two sets of strong spines; three cercal setae present.

♀. (based on paratype specimen of nolledoi). Vertex with narrow border of pale scales; dorsocentral bristles well developed; pleuron lacking scales, one lateral mesepimeral bristle present; legs brown with venter of femora extensively pale; sternum pale.

Pupa and larva. Not described here; one pupal cast skin in the U. S. National Museum collection not definitely associated with the adult.

Material examined:

♂ San Jose, Mindoro, 17.IV.1945 (E. S. Ross); ♂♂ Camarines Sur, Mt. Isarog 2000 ft., 20.IX.1963 (M. D. Delfinado); ♂ Kolambugan, Lanao;

Puerto Princesa, Palawan, 11.X.1945 (19th MGL); Sohoton, Samar, 1945;
Jolo, Jolo Is., 1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Bataan, Lanao; Malaya, India, Burma, Thailand, Indochina, China,
Ceylon ?, Ryukyu Retto.

Habitats:

The larvae are common in bamboo stumps, tree holes or rock holes
in forest streams; the adults are not definitely known to attack man,
through presumably the normal host is a forest animal (Colless, 1965).

Culex (Lophoceraomyia) pachecoi Baisas (figs. 215-216)

Culex (Lophoceratomyia) pachecoi Baisas, 1935. Philip. J. Sci. 57: 171

(A, ♂ gen. ant. fig.). Type loc: College of Agriculture, Los
Banos, Laguna (lost).

Culex (Lophoceraomyia) pachecoi Baisas. Bohart, 1945. USNavmed 580,
p. 76 (key, ♂ gen. fig.).

Readily recognizable by the characters mentioned in the key;
other distinguishing characters are as follows:

♂ (based on a single paratype specimen). Palpus longer than
proboscis by almost the length of terminal segment, the distal two
segments with long bristles, with small finger-like process at base.
Torus of antenna simple; specialized setae on flagellomeres V-X as
follows: three or four long narrow blades on V (fig. 216); twisted
comb tufts on VI & VII, and three flattened setae on VIII not well
differentiated from other setae; IX & X each with two longer narrower

blades. Genitalia as in figure 215. Subapical lobe with three stout rods, two broad leaves, and three short blades; a row of five or six long bristles on inner margin; clasper slender; lateral plate of phallosome simple, with curved and tapered distal process; paraproct crown composed of few sharp inner spines; three cercal setae present.

♀. Not thoroughly studied.

Pupa (cast skin of ♀ paratype). Respiratory trumpet long and narrow, the tracheoid extending $2/3$ from base, with a long slit. Metanotal C-10 & 11 both strong and double, C-12 with 4 short weak branches. Abdominal h-1 & 5 with weak short branches; h-9 on VII & VIII with 5 and 9 branches respectively, both removed from corners; paddle midrib and outer margin stronger, with two unequal apical hairs.

Larva (cast skin of ♀ paratype). Clypeal h-1 long and spine-like; head h-4 weak, single, forked distally; h-5 & 6 each with 2 stout long branches, h-7 with 6 long branches; h-16 & 17 absent. Antenna spinose, dark pigmented distally beyond insertion of shaft h-1, the base infuscated; subapical and apical setae stronger. Prothoracic h-1 short, h-2 & 3 very long, all single. Comb teeth fringed apically. Siphon tapered distally, narrowly dark at base and apex, spiculate, with five pairs of tufts, pecten with coarse lateral teeth. Saddle finely spiculate, with coarse spines distally; dorsal brush 2 with short accessory seta, 3 long, single; lateral h-1 small, with 2 weak branches; ventral brush 6 pairs.

Material examined:

♂♀, paratypes, Los Banos, Laguna, 3.XI.1934 (F. E. Baisas). ♂ Tawi-Tawi, Tarawakan, N. of Batu-Batu, 25.X.1961 (Noona Dan Exp.1961-62).

Recorded distribution:

Known only from type locality.

Habitats:

The adults have been reared from larvae collected in semistagnant edges of forest creeks.

Culex (Lophoceraomyia) reidi Colless (figs. 228-229)

Culex (Lophoceraomyia) reidi Colless, 1965. J. Med. ent. 2: 279 (♂♀, L, fig., key). Type loc: Singapore (West Coast Rd.) (Australian National Insect Collection, Canberra).

♂. Very similar to macdonaldi in general habitus. Palpus longer than proboscis by 1/2-3/4 the length of terminal segment, with two finger-like processes as in macdonaldi or fulleri; the distal two segments hairy; proboscis with few dorsal setae. Torus of antenna smooth; specialized setae on flagellomeres V-IX as follows: four brown flattened setae progressively shorter and with pointed tips followed by four longer hyaline bristles on V (fig. 228); twisted comb tufts on VI & VII; a group of longer curved comb tufts on VIII; and three long thick bristles on IX. Genitalia as in figure 229. Subapical lobe with three stout rods, one markedly expanded distally; two large leaves, one broader distally than the other and three or four short narrow blades; a row of four bristles on inner margin of sidepiece; lateral plate with strongly curved distal process; clasper markedly swollen towards apex; paraproct with large lobe, the crown with several short spines; three cercal setae.

♀, pupa and larva. Not available for description.

Material examined:

♂ Brooke's point, Uring-Uring, Palawan, 15.IX.1961 (Noona Dan Expd. 1961-62).

Recorded distribution:

Originally described from Singapore; this is the first record for the Philippines.

Habitats:

A coastal species; the ♀♀ have been attacking man under the shade of Nipa palms; the larvae are common in shaded pools of fresh or slightly brackish water and often found in the lower axils of Nipa palms in Malaya (Colless, 1965).

Culex (Lophoceraomyia) rubithoracis (Leicester) (fig. 217)

Lophoceratomyia rubithoracis Leicester, 1908. Cul. Malaya 3: 119 (♂♀).

Type loc: Kuala Lumpur (Selangor), Malaya, ♂ lectotype designated by Colless 1965 (British (Nat. Hist.) Museum).

Culex (Lophoceraomyia) rubithoracis (Leicester). in Dantis, 1947. Mon. Bull. Bur. Hlth. Manila 23: 255 (P, L); Mattingly, 1949. Proc. R. ent. Soc. Lond. B 18: 224 (L, key, fig.); La Casse & Yamaguti, 1950. Mosq. Fauna Japan & Korea, p. 191 (♂♀, L, P, fig.); Colless, 1965. J. Med. ent. 2: 281 (♂♀, L, fig., key).

The adults can be easily recognized by the reddish brown color of the thorax, by the characters of ♂ antenna and palpus, and by the absence of lower mesepimeral bristle in the ♀. The larva is distinctive because of the spiculate thoracic integument.

♂. Palpus longer than proboscis by the length of terminal segment, distal two segments with long bristles, small finger-like process at base. Torus of antenna smooth; specialized setae on flagellomeres VI-IX; V with three short heavy bristles; two sets of comb twisted setae on VI; a group of longer flattened setae on VII; three long, straight blade-like setae with acuminate tips on VIII; and three long heavy bristles on IX. Genitalia as in figure 217. Subapical lobe with three rods, one narrow leaf, a small leaflet, and three short spatulate setae; three long bristles on inner margin; lateral plate of phallosome with long slender curved pointed process distally; clasper slender; paraproct crown not developed, the apex with few minute spines laterally; two cercal setae.

♀, pupa and larva. Not available for description. According to Baisas' (in Dantis 1947) and Mattingly's (1949) descriptions, the larva is differentiated by having only the thoracic integument spiculate, the integument of the abdomen smooth except for few fine spicules on segment VIII; and from the figures of La Casse & Yamaguti (1950) the prothoracic h-1 & 2 both long and single, h-3 very short branched tuft.

Material examined:

♂ San Jose, Mindoro, 25.XII.1945 (E. S. Ross).

Recorded distribution:

Manila, Laguna; Malaya, India, Ceylon, Burma, Thailand, Sumatra, Java, Borneo, Formosa, Japan.

Habitats:

The adults come freely into houses apparently attracted by light, and are not known to bite man (Dantis, 1947). The larvae have been

collected in Japan almost entirely from fresh clean ground water such as large natural ponds, rice paddies, irrigation or drainage ditches and margins of slowly moving streams; and in clear grassy pools and forage paddies in Laguna and Manila.

Culex (Lophoceraomyia) uniformis Theobald (figs. 230-232)

Lophoceraomyia uniformis Theobald, 1905. J. Bombay nat. Hist. Soc.

16: 245 (♂♀). Type loc: Peradeniya, Ceylon (British (Nat. Hist.) Museum).

Culex (Lophoceratomyia) uniformis Theobald. Edwards, 1928. Bull. ent.

Res. 18: 276 (L, key); Barraud, 1934. Fauna Brit. India, Dipt.

5: 373 (♂♀, L, gen. fig., key); Penn, 1949. Pacific Sci. 3: 71

(P, fig.); Mattingly, 1949. Proc. R. ent. Soc. Lond. B 18: 226

(L, fig., key).

This species has not been previously recorded in the Philippines; the occurrence of uniformis is based on larvae collected from rockholes in Mt. Isarog River, Camarines Sur, and on larval and pupal cast skins of a ♀ collected from tree hole in Mindoro. No ♂ is available for description; the ♀ except for its dark appearance is difficult to separate from those of other members of the group.

Pupa. Respiratory trumpet slender, no slit, the tracheoid extending slightly beyond mid portion (fig. 232). Metanotal C-10 & 12 with 3-5 weak branches respectively, C-11 single and strong. Abdominal hairs quite weak except h-5 on segments IV-VI; h-9 on VII & VIII missing, far removed from corners. Paddles rather narrow, with very strong midrib; two apical hairs, one of which is branched.

Larva (figs. 230-231). Unique by having the thorax and abdomen both thickly covered with fine short bristles or spicules, and patches of spicules visible on venter of the head. Clypeal h-1 spine-like, with lateral denticles; head h-4 short and single, h-5 & 6 with 2 or 3 strong pilose branches, h-7 with 7 pilose branches; h-16 & 17 present. Antenna short, slender and straight, covered with longer spines at basal portion, slightly infuscated beyond insertion of shaft h-1, subapical and apical hairs strong. Prothoracic h-1 short, h-2 & 3 very long, pilose, all hairs single. Abdominal lateral h-6 strongly developed on segments I & II. Comb teeth arranged in a small square patch, each tooth fringed laterally with strong median point. Siphon tapered distally, finely spiculate at basal portion; narrowly dark at base and apex, with four pairs of branched tufts; pecten elongate with 2 or 3 lateral spines, distal tooth simple. Saddle small, strongly spinose along distal edge; dorsal brush 2 with 4 or 5 branches, brush 3 single; lateral h-1 weak, single; six pairs of ventral brush.

Material examined:

Larvae, San Jose Mindoro, tree hole, 30.V.1945 (E. S. Ross); Camarines Sur, Mt. Isarog River 2000 ft. rockholes, 21.IX.1963 (M. D. Delfinado).

Recorded distribution:

New record for the Philippines (Mindoro, Luzon); Ceylon, India, Hainan Is., New Guinea.

Habitats:

The larvae have been collected from bamboo stumps, tree holes and rock pools in jungle; nothing is known of the habits of adults.

Subgenus CULICIOMYIA Theobald

Trichorhynchus Theobald, 1905. J. Bombay Nat. Hist. Soc. 16: 241

(preoccupied, Balbiani 1887). Type species: Trichorhynchus fuscus Theobald. By monotypy.

Culiciomyia Theobald, 1907. Monogr. Cul. 4: 227. Type species:

Culiciomyia inornata Theobald. By subsequent designation (Edwards, 1912).

Neomelanoconion Theobald, 1907. Monogr. Cul. 4: 514. Type species:

Culex rima Theobald. By original designation.

Pectinopalpus Theobald, 1910. Ann. Mag. nat. Hist. (8)5: 375. Type

species: Pectinopalpus fuscus Theobald. By monotypy.

Trichorhynchomyia Brunetti, 1912. Rec. Indian Mus. 4: 477 (nom. nov.

for Trichorhynchus Theobald, non Balbiani 1887). Type species:

Trichorhynchus fuscus Theobald. An automatically fixed type of a replacement name.

Culiciomyia is represented in the Philippines by four widespread species: fragilis Ludlow, nigropunctatus Edwards, pallidothorax Theobald, spathifurca (Edwards), and one variable form provisionally referred to as papuensis (Taylor). The affinities of the subgenus with other members of the Culex are not clear, and the ♀♀ are very difficult to separate from those of Lophoceraomyia. The members of the subgenus are mainly characterized by the following: ♀ palpus usually 1/8 the length of proboscis; ♂ palpus longer than proboscis by 1/2 to entire length of terminal segment, hairy, the long segment with a row of translucent, lanceolate setae distally. Dorsocentral and prescutellar

bristles well developed; pleural integument greenish or light brown with dark markings, reduced or without scales, one or two lower mesepimeral bristles; alula fringed with narrow scales, squama fringed with fine, long hairs. ♂ clasper with outer crest of strong spicules or spines; the lateral process of phallosome pointed distally with several sharp teeth, the distal tooth largest. ♀ buccopharyngeal armature well developed. The pupae are difficult to distinguish from those of other subgenera, especially from those of subgenus Culex; the larvae are quite distinctive and easily recognizable, with four pairs of ventral brushes, the dorsal brush 2 and 3 both single, and the head h-16 & 17 present in some species.

Distribution:

Oriental, Indomalayan, Australian and Ethiopian with extensions as far as north Japan and Ryukyus, and the Solomon Is.

Habitats and relation to disease:

Several species have a wide range of habitats; have been found breeding in ground pools, tree holes, crabholes and artificial containers; none of the species have been reported to attack man.

Key to species (Adult)

1. Pleural integument greenish or light brown, with no dark markings; abdominal terga entirely brown----- 2
- Pleural integument and abdominal terga with dull or distinct markings----- 3
2. ♂ clasper divided into two appendages; the sidepiece expanded basally and abruptly narrowed distally----- spathifurca (Edwards)

♂ clasper not divided, curved and tapered distally; sidepiece
not expanded at base, lacking hairy apico-ventral lobe-----
----- fragilis Ludlow

3. Pleural integument with distinct dark stripe from anterior
pronotal lobe to upper mesepimeron and a shorter spot from
propleuron to sternopleuron; abdomen with clear pale basal
band on tergum; ♂ sidepiece with prominent hairy apico-
ventral process, the subapical lobe with a broad leaf-----
----- nigropunctatus Edwards

Pleural integument with indistinct markings or uniformly light
brown; abdominal tergum with dull pale basal band on distal
segments or entirely brown; ♂ sidepiece with conspicuous
hairy apico-ventral lobe but not as prominent as above,
the subapical lobe without a broad leaf----- papuensis (Taylor)*

*See discussion of species.

Key to larvae

1. Siphon swollen at mid portion, and with four pairs of tufts----- 2
Siphon long and slender, not swollen at mid portion, with
three pairs of tufts----- 3
2. Clypeal h-1 spine-like----- papuensis (Taylor)
Clypeal h-1 thin and slender----- pallidothorax Theobald
3. Siphon with a narrow membranous break at distal 1/3-----
----- nigropunctatus Edwards
Siphon complete, lacking membranous break----- 4

4. Siphon tuft branched; head with frontal area finely spiculate;
 h-16 & 17 present----- fragilis Ludlow
 Siphon tuft single; head with frontal area smooth; h-16 & 17
 absent----- spathifurca Edwards

Culex (Culiciomyia) fragilis Ludlow (figs. 234-238)

Culex fragilis Ludlow, 1903. J. New York Ent. Soc. 11: 142 (♂♀). Type
 loc: Oras, Samar (U. S. National Museum). Banks, 1906. Philip.
 J. Sci. 1: 987 (listed); Theobald, 1910. Monogr. Cul. 5: 365
 (listed); Bezzi, 1913. Philip. J. Sci. D8(4): 307 (listed); Dyar
 & Shannon, 1925. Inscit. Insc. Mens. 13: 85 (listed).

Culex (Culiciomyia) fragilis Ludlow. Edwards, 1922. Indian J. Med.
 Res. 10: 472 (listed); Barraud, 1934. Fauna Brit. India, Dipt.
 5: 385 (♂♀, ♂ gen. fig., key); Bohart, 1945. USNavmed 580, p. 76
 (♂ gen. fig., key); King & Hoogstraal, 1946. Proc. Biol. Soc.
 Wash. 59: 148 (♂ gen., L, fig.).

Culiciomyia inornata Theobald, 1907. Monogr. Cul. 4: 227 (♂♀). Type
 loc: Kuching, Sarawak, Borneo (British (Nat. Hist.) Museum).
 Edwards, 1922. Indian J. Med. Res. 10: 472 (syn.).

Culiciomyia ceylonica Theobald, 1907. Monogr. Cul. 4: 236 (♂♀). Type
 loc: Peradeniya & Maskeliya, Ceylon (British (Nat. Hist.)
 Museum). Edwards, 1922. Indian J. Med. Res. 10: 472 (syn.).

On the general appearance, the adult and larva of this species can
 be confused with C. spathifurca, but C. fragilis is easily differen-
 tiated by the details of ♂ genitalia and larval siphon.

♀. Head: Vertex with mostly brown decumbent and upright scales, few broad pale scales confined at sides. Palpus and proboscis dark brown; palpus about 1/8 the length of proboscis. Thorax: Mesonotal scales brown, few (2-3) dorsocentral and prescutellar bristles present, a row of strong prealar bristles; pleural integument greenish to light brown, with few translucent scales; one lower mesepimeral bristle. Wing: Cell R₂ about as long as or slightly longer than stem vein R₂₊₃, the scales denser at apical 1/2. Legs: All brown, venter of femora paler. Abdomen: Terga completely brown with bluish or greenish tinge; sterna brown.

♂. Coloration as in ♀. Palpus longer than proboscis by the whole length of terminal segment, hairy and dark, the long segment with a row of translucent lanceolate setae. Genitalia as in figure 238. Sidepiece with no hairy apico-ventral lobe, the apical lobe with differentiated appendages as follows: three rod-like, hooked tips, one broad leaf, two short lanceolate, one flattened and few slender bristles; clasper curved and tapered, with 2 basal and 2 apical setae, crest of several stronger spines; lateral plate with large and small teeth, the basal tooth largest; basal sternal process short and slender; paraproct crown composed of two groups of spines, with curved spine-like process in addition to rounded lobe, four cercal setae present.

Pupa. Respiratory trumpet slender, swollen at mid portion, the trachoid extending to basal 1/4, reticulate, lacking slit (fig. 237). Metanotal hairs all branched: C-10 with 8-10 long branches, C-11 double the branches stout, C-12 with 2 or 3 weak branches. Abdominal h-5 on segments IV-VI with 2 or 3 conspicuously long branches, h-9 on

VII-VIII dendritic, minute on other segments. Paddle smooth, with two small apical hairs.

Larva (figs. 234-236). Clypeal h-1 long and slender; frontal area finely spiculate; head h-4 single, h-5, 6 & 7 all branched, with 6-8 pilose branches; h-16 & 17 present as tiny spines. Antenna spinose, shaft h-1 many branched and inserted just above mid portion, the apical hairs all single. Prothoracic h-1, 2 & 3 all single. Thoracic and abdominal lateral hairs well developed, the branches pilose; dorsal abdominal h-1 on segments IV-VI strongly developed. Comb teeth arranged roughly in a triangular patch, the teeth elongate and ringed. Siphon cylindrical narrowly dark at base and apex, with 3 pairs of branched tufts and a row of pecten teeth on basal 1/3, the teeth serrated on one side. Anal segment with dorsal brush 2 & 3 both single, saddle finely spiculate, with coarse spines along distal margin, lateral h-1 single.

Material examined:

♂♂♀ San Francisco, Agusan SE 10km, 15.XI.1959 (C. M. Yoshimoto, in empty snail shell); ♂♀ Carigara & Jinamoc Is., Leyte, 16.XI.1944; San Jose, Mindoro, 12.I.1945 (E. S. Ross); ♂♂♀ Puerto Princesa, Palawan, 15.IX.1945, in coconut shell; Camansi & Santol, La Union, 15.VIII.1945 (A. B. Gurney); Parang, Cotabato, 2.VI.1945 (J. H. Paullus); Subic Bay, Zambales, 7.XII.1964 (R. T. Holway).

Recorded distribution:

Pampanga, Samar, Mindoro, Cotabato; India, Ceylon, Malaya, Borneo, Indonesia, Thailand, Bismarck Archipelago, New Guinea, Solomon Is.

Habitats:

The larvae have been collected mostly in artificial containers and coconut shells, others in ground pools and tree holes; the ♀♀ have not been known to bite man.

Culex (Culiciomyia) pallidothorax Theobald (figs. 239-242)

Culex pallidothorax Theobald, 1905. J. econ. Biol. 1: 32 (♂♀). Type loc: India (British (Nat. Hist.) Museum).

Culex (Culiciomyia) pallidothorax Theobald. Bohart & Ingram, 1946.

USNavmed 1055, p. 75 (♂♀, L, P, E fig., key); La Casse &

Yamaguti, 1950. Mosq. Fauna Japan & Korea, 182 (♂♀, P, L, fig.).

Culex albopleura Theobald, 1907. Monogr. Cul. 4: 456 (♀). Type loc: India (British (Nat. Hist.) Museum).

Culiciomyia annuloabdominalis Theobald, 1910. Monogr. Cul. 5: 236 (♂♀, fig.). Type loc: Peradeniya and Hakgala; Ceylon (non-extant).

This species is apparently the first record from the Philippines; the occurrence of C. pallidothorax is based only on the immatures collected in Mindoro, and no adults are available for description. The larva is easily recognizable by the development of prothoracic h-1, 2 & 3, the clypeal h-1 and by the siphon tufts; and the pupa is particularly distinctive by the granulose integument of cephalothorax and abdomen.

Pupa (based on a single cast skin with associated larval skin; the adult cannot be located). Respiratory trumpet elongate, narrowed basally, tracheoid at basal 1/3, no slit; integument on anterior portion or cephalothorax granulose. Metanotal hairs missing, mid portion of metanotum granulose or spinose. Abdominal integument granulose dorsally

on segments I-III, hairs rather weak except h-5 which is single or double and extremely long on segments III-V; h-9 with 3 short branches on VII, 8-9 dendritic branches on VIII. Paddle broad with finely serrated distal margin, two unequal small apical hairs.

Larva (figs. 239-242). Clypeal h-1 slender; head h-4 thin and single, h-5 & 6 double or 3-branched, h-7 with 8 shorter branches; h-16 & 17 present as tiny spicules and difficult to see. Antenna slender, spinose, shaft h-1 inserted at mid portion, subapical and apical hairs rather weak. Prothoracic h-1 & 3 double, h-2 single, equally developed, with h-1 & 2 longer. Comb teeth arranged in a triangular patch, each tooth elongated and with lateral and apical fringed. Siphon swollen, greatly narrowed distally, with four pairs of short branched tufts, pecten teeth with sharp deep serrations. Saddle spiculate, and with coarse spines distally; lateral h-1 double or 3-branched, dorsal brush 2 & 3 single.

Material examined:

Series of larvae, 1 pupal skin, San Jose, Mindoro, 10.IV.1945, leafy puddle (E. S. Ross).

Recorded distribution:

New record for the Philippines: Mindoro; India, Ceylon, Nepal, Burma, Thailand, Indochina, Malaya, China, Formosa, Ryukyu, Japan, Moluccas, New Guinea.

Habitats:

The recorded breeding places of this species are treeholes, bamboo, stream, rockpools, ground pools and artificial containers; the ♀ is not known to bite.

Culex (Culiciomyia) papuensis (Taylor) (figs. 243-247)

Melanoconion papuensis Taylor, 1914. Trans. R. ent. Soc. London 1914:

201 (♀). Type loc: Lakekamu Gold Field, Papua, New Guinea

(Univ. Sydney, Sch. Publ. Hlth. & Trop. Med., Sydney, Australia).

Culex (Culiciomyia) papuensis (Taylor). King & Hoogstraal, 1946. Proc.

Biol. Soc. Wash. 59: 146 (♂, L, fig., key); Penn, 1949. Pacific

Sci. 3: 73 (P); Laird, 1955. Bull. ent. Res. 46: 286 (L, tax.);

Belkin, 1962. Mosq. S. Pacific p. 130, figs. 130-33 (♂♀, L, P,

fig., key).

The Philippine forms (with dull pale basal bands on abdominal terga or with the abdomen entirely brown, and with the pleural integument faintly marked or uniformly light brown) are referred here provisionally to papuensis until more material is available and the entire species complex can be studied in detail. The Philippine papuensis also show considerable variation in the development of the leaflet on subapical lobe, and they agree with the figures and descriptions of both Belkin (1962, p. 146, fig. 3) from the Solomon Is. and King & Hoogstraal (1946, p. 146, fig. 3) from New Guinea and Papua. However, it should be noted that the ♂ genitalia of the Solomon Is. form does not agree with the figures of King & Hoogstraal. It is probable that more than one species is involved.

On the general appearance, the ♀ can be confused with C. fragilis Ludlow and the swollen larval siphon resembles C. pallidothorax Theobald. But pallidothorax differs by having clear pale basal band on abdominal tergum, and by the details of ♂ genitalia.

♀. Head: Vertex largely covered with brown decumbent and upright scales, pale broad scales around eye margin and sides. Palpus and proboscis dark. Thorax: Mesonotal scales mostly brown, few dorso-central and many strong prescutellar bristles present; pleural integument with considerable variation: greenish or brown with fairly distinct dark brown area from anterior pronotal lobe across upper sternopleuron and mesepimeron, and another dark area at anterior mid-portion of sternopleuron; or pleural integument uniformly light brown with indistinct markings; one lower mesepimeral bristle present. Wing: Cell R_2 about twice as long as stem vein R_{2+3} . Legs: All brown. Abdomen: Terga largely brown, the pale band indistinct; sterna light brown.

♂. Differing from ♀ coloration as follows: Vertex with denser pale scales mixed with narrow decumbent brown scales; pleural integument markings as in ♀; abdomen with dull pale band on tergum fairly constant on distal segments, although in some specimens the pale band is indistinct or lacking as in ♀. Palpus longer than proboscis by $\frac{3}{4}$ the length of terminal segment, hairy, the long segment with a row of translucent lanceolate setae. Genitalia as in figure 243. Sidepiece with conspicuous hairy apico-sternal lobe, the subapical lobe larger with four differentiated rod-like appendages; one small flattened lanceolate seta and a group of strong bristles; clasper curved and markedly tapered, the crest with three or four spines and few setae; lateral plate with large, sharp teeth and few small ones, the basal tooth largest; basal sternal process slender; paraproct crown

differentiated into two groups of spines, with small rounded lobe distally, and four or five cercal setae.

Pupa. The only material available for study are skin mounts from Palawan but the associated adults cannot be located. Although the associated larval skins can be identified as papuensis, the identification of the pupa is not certain.

Larva (figs. 244-247). Clypeal h-1 spine-like; head h-4 single and weak, h-5 & 6 with 2-3 long pilose branches, h-7 with 6-7 short pilose branches; h-16 & 17 absent. Antenna spinose, light pigmented, swollen basally then narrowed abruptly beyond insertion of shaft h-1, the apical hairs simple. Prothoracic h-1 & 3 branched, h-2 single. Comb teeth arranged in a triangular patch, the teeth finely fringed. Siphon strongly swollen at basal 1/2, narrowly dark at base and apex, with 4 pairs of branched siphon tufts, 4-5 pecten teeth. Saddle finely spiculate, few coarse spines on distal edge, dorsal brush 2 & 3 both single.

Material examined:

45 ♂♂♀♀ Mt. McKinley, Davao, E slope 5800 ft., 17.IX.1946 (Alcasid & Hoogstraal) muddy shaded ground pool with many leaves, mossy forest; 19.VII.1946 (Hoogstraal, hole in rotted banana stumps, 3000 ft.); 28.IX.1946 (Hoogstraal, small muddy pool in stream bed, 3000 ft.); 7.IX.1946 (Hoogstraal & Heynemann, reared from arboreal pitcher plants 20 ft. above ground, mossy forest 5800 ft.); series of larvae, Puerto Princesa, Palawan, 13.XII.1945, shaded ground pool (3rd MGL).

Distribution:

New Guinea, Bismarck Archipelago, Solomon Is.

Habitats:

The larvae have been collected in tree holes, artificial containers and ground pools, from putrid water in hollowed sago trunks, shaded or semi-shaded places and the water is either clear or filled with leaves. Nothing is known of the biting habits of the ♀.

Culex (Culiciomyia) nigropunctatus Edwards (figs. 248-250)

Culex (Culiciomyia) nigropunctatus Edwards, 1926. Bull. ent. Res.

17: 121 (nom. nov. for annulata Theobald, preoccupied, non Schrank, 1776). Barraud, 1934. Fauna Brit. India, Dipt. 5: 383 (♂♀, L, fig., key); Bohart, 1945. USNavmed 580, p. 77 (♂ gen. fig., key); Bick, 1949. Nat. Hist. Misc. 41: 2, 4 (listed).

Culiciomyia annulata Theobald, 1907. Monogr. Cul. 4: 230 (♂♀). Type loc: Kuching, Sarawak, Borneo (British (Nat. Hist.) Museum).

This species is easily differentiated from other Culiciomyia of the Philippines by the pleural markings and larval siphon. It resembles C. pallidothorax Theobald or C. pullus Theobald by having similar adult characters and by the larval siphon in pullus, but nigropunctatus is quite distinct in the ♂ genitalia. The Philippine nigropunctatus shows a great deal of variation in pleural markings and abdominal tergal pale scaling of the adults.

♀. Head: Vertex with brown narrow decumbent and upright scales, dense broad white scales around eye margin and sides. Palpus very short, about 1/8 the length of proboscis; proboscis and palpus brown. Thorax: Mesonotal scales light brown, dorsocentral bristles weak, prescutellars and prealars well developed; pleural integument light

brown, with dark spot across postspiracular area to upper mesepimeron, a smaller dark spot on propleuron to mid anterior portion of sternopleuron; the dark spot on upper mesepimeron is particularly distinctive; one lower mesepimeral bristle present. Wing: Cell R_1 slightly longer than stem vein R_{2+3} . Legs: Brown, the femora paler ventrally. Abdomen: Dark brown with pale basal band on tergum; sternum pale or brownish.

♂. Coloration as in ♀. Palpus longer than proboscis by the entire length of terminal segment, hairy, the long segment with a row of translucent setae. Genitalia as in figure 250. Sidepiece with a prominent, hairy apico-ventral process, subapical lobe with the following appendages: one stout, rod-like, one long and one short, both slender, one broad leaf and one relatively stout but short seta at the base of lobe, few short bristles; crest of clasper with a row of sharp spines, two long setae on basal 1/3 and one before apex; the lateral process with a row of sharp teeth, the basal tooth largest; basal sternal process curved and stout; paraproct crown differentiated into two groups of spines, a large rounded lobe distally, three cercal setae.

Pupa. Respiratory trumpet slender almost its entire length, no slit, the trachoid extending to before mid portion, the surface reticulate or knobby (fig. 248). Metanotal hairs all branched, C-10 with 6-7 branches, C-11 & 12 each with 2 and 3 branches respectively. Abdominal hairs relatively weak; h-9 on VII with 3 weak branches and with 6 branches on VIII. Paddle with outer portion finely serrated, two short apical hairs present.

Larva (fig. 249). Clypeal h-1 long and slender; head h-4 single, weak, h-5 & 6 with 3 stout long pilose branches, h-7 with 5-6 relatively stout pilose branches; h-16 & 17 present. Antenna spinose, swollen basally then narrowed abruptly beyond shaft h-1, the apical hairs all single and stout. Thoracic and abdominal hairs mostly well developed, the branches stout and pilose; prothoracic h-1, 2 & 3 all single. Comb teeth slightly expanded apically, fringed and arranged in a large triangular patch. Siphon elongate, narrowly dark at base and apex, with a narrow membranous break at distal 1/3, 3 pairs of tufts either double or single, few pecten teeth at basal 1/3. Anal segment with 4 pairs of ventral brushes, dorsal brush 2 & 3 both single, stout, saddle spiculate with coarse spines at distal edge, lateral h-1 single.

Material examined:

San Jose, Mindoro, 30.I.1945 (E. S. Ross); Bacnotan, San Fernando & Santol, La Union, 18.VI.1945, 23.V.1945; Burgos, Mt. Prov., 6.VI.1945 (A. B. Gurney); Kabakan, Mindanao, 14, 16, 18.V.1945 (R. Staples, in foxholes); Parang, Cotabato, 27-30.VI, 8, 26.V.1945 (J. H. Paullus); Abuyog, Leyte, XI.1944 (O. H. Graham); Jinamoc Is. & Leyte Gulf, 1944 (J. T. Medler); Luzon, 10.V.1945 (32 MSU); series of larvae, in tin can, Luzon (31st Gen. Hosp. 17th MSD); Jolo, 22.IX.1945; Zamboanga, 24.IX.1945; San Ramon, Mindanao, 20.X.1945 (Lily pond, grassy ground pools; Knight, Laffoon & Johnson); Iwahig Penal Colony, 18.V.1945 (coconut shell); Bacungan, Palawan (grassy pond), 27.V.1945 (Johnson et al); Osmena, Samar (in native canal), 9.IV.1945 (Laffoon).

Recorded distribution:

Leyte, Cotabato; Borneo, India, Ceylon, Thailand, Malaya, Sumatra, Java, Hainan Is., Ryukyu, Palau Is., Caroline Is., Formosa.

Habitats:

The larvae have been collected in rice fields, small shady pools, and occasionally in artificial containers; ♀ feed almost exclusively on birds in Singapore (Colless, 1959).

Culex (Culiciomyia) spathifurca (Edwards) (fig. 233)

Culiciomyia spathifurca Edwards, 1915. Bull. ent. Res. 5: 284 (♂).

Type loc: Kuching, Sarawak, Borneo (British (Nat. Hist.) Museum).

Culex (Culiciomyia) spathifurca (Edwards). Edwards, 1926. Bull. ent.

Res. 17: 120 (L); Stone, Knight & Starcke, 1959. Cat. Mosq.

World, Thomas Say Found. 6: 258 (listed, Phil.)

Culex (Culiciomyia) stylifurcatus Carter & Wijesundra, 1948. Ceylon J.

Sci. B23: 145 (♂♀, L, ♂ gen. fig.). Type loc: Ratmalana &

Palwatte Ganga River at Dinipitya, Ceylon (British (Nat. Hist.)

Museum). Mattingly, 1955. Bull. ent. Res. 46: 10 (syn.).

C. spathifurca is very similar to C. fragilis in general appearance from which it can be separated only by the structure of ♂ genitalia; the three pairs of fairly long, weak and single siphon tufts in the larva, and elongate pupal respiratory trumpet.

♀. Coloration as in fragilis except vertex which has denser pale scales. ♂ palpus longer than proboscis by 1/2 the length of terminal segment, and not as hairy, the long segment with few translucent lanceolate setae. ♂ genitalia as in figure 233, and markedly distinct

from other known species of the subgenus by the structure of the clasper and sidepiece. Sidepiece expanded basally and abruptly narrowed distally; four large appendages borne on three separate lobes and one broad leaf near apex of sidepiece; clasper divided at base into two: a large spiny appendage and a slender arm markedly tapered and smooth; lateral plate with several teeth, the basal tooth largest; basal sternal process short and stubby; paraproct crown composed of two differentiated groups of spines.

Pupa (based on Malayan specimens reared from hole at root of palm). Respiratory trumpet elongate, widened distally; trachoid extending to almost mid portion, the surface knobby, lacking slit. Metanotal hairs all branched and variously developed: C-10 with 8 branches, C-11 & 12 each with 2 stout and weak branches, respectively. Abdominal h-5 on segments IV-VI long and well developed; h-9 on VII-VIII dendritic and quite removed from corners; paddle smooth, with two unequal apical hairs.

Larva (based on Malayan specimens as above). Clypeal h-1 long and slender; frontal area smooth, head h-4 single, short and weak, h-5 & 6 with 3 pilose branches, h-7 with 6-8 comparatively short, pilose branches; h-16 & 17 absent. Antenna spinose, shaft h-1 inserted at about $3/4$ from base, the apical hairs all simple. Comb teeth arranged roughly in a triangular patch, the teeth elongate and fringed; siphon slender and narrowed distally, narrowly dark at base and apex; three pairs of fairly long and unbranched siphon tufts; pecten teeth extending to basal $1/4$, serrated at one side; saddle finely spiculate,

with coarse spines at distal edge; dorsal brush 2 & 3 both single,
lateral h-1 single.

Material examined:

♂♂♀ Abuyog & Jinamoc Is., Leyte; Calapan & Caminawit Pt., S. W.
Mindoro, 24.XII.1944; Calicoan Is., 1.I.1945; Parang, Cotabato,
27.IV.1945 (J. H. Paullus).

Recorded distribution:

Philippines; Borneo, Java, Singapore, Malaya, Thailand, Ceylon,
Maldives Is.

Habitats:

The adults were collected in cattle baited traps and crab holes
(as stylifurcatus), and feed almost exclusively on birds in Singapore
(Colless, 1959); the larvae were reared in pots of pure urine
(Edwards, 1926).

Subgenus NEOCULEX Dyar

Neoculex Dyar, 1905. Proc. ent. Soc. Wash. 7: 48. Type species:

Culex territans Walker. By original designation.

Maillotia Theobald, 1907. Monogr. Cul. 4: 274. Type species: Maillotia

pilofera Theobald. By monotypy.

Eumelanomyia Theobald, 1909. Colon. Rept. Misc. Ser. no. 237: 10; 1910.

Monogr. Cul. 5: 240. Type species: Eumelanomyia inconspicua

Theobald. By monotypy.

Protomelanoconion Theobald, 1910. Monogr. Cul. 5: 462. Type species:

Protomelanoconion fusca Theobald. By monotypy.

The subgenus Neoculex is apparently a very complex group as it contains several species which have few characters in common. It is mainly an Old World subgenus with extensions in the Nearctic and South Pacific. Only two species have been reported from the Philippines, one of which is uncertain in position.

Except for the ♀, Neoculex can be easily differentiated from Mochthogenes by the length of ♂ palpus, which is very short and small in Mochthogenes. Both genera have strongly developed dorsocentral, supraalar and prescutellar bristles, and the vertex is dark with pale scales confined at sides and around eye margin; the ♀ buccopharyngeal armature well developed. ♂ clasper simple; the lateral process of phallosome usually broad and with several small blunt teeth. The larva and pupa resemble those of Lophoceraomyia, lack head h-16 & 17 in the larva.

Distribution:

Predominantly an Old World genus but is represented by several species in the Nearctic region, New Caledonia and the Solomon Is.

Habitats and relation to disease:

The larvae have been collected in temporary and permanent ground waters, rockholes, treeholes, crabholes, and artificial containers. The ♀♀ do not attack man, although some species have been reported to feed on frogs and water rats in nature and have been fed on birds in the laboratory (Belkin, 1962, p. 239).

Neoculex (adult)

1. Abdominal tergum completely dark; ♂ palpus short, extending
 3/4 the length of proboscis, twisted or curved-----
 ----- brevipalpis (Giles)
 Abdominal tergum with clear narrow white apical band; ♂ palpus
 longer than proboscis by almost the length of last two
 segments, the longer segment without translucent lanceolate
 setae----- nematoides Dyar & Shannon*

*See discussion of the species

Culex (Neoculex) brevipalpis (Giles) (figs. 191-194, 206)

Stegomyia brevipalpis Giles, 1902. Handbook Gnats, 2nd ed., p. 384

(♂♀). Type loc: Shahjahanpur, India (British (Nat. Hist.)
 Museum).

Culex (Neoculex) brevipalpis (Giles). Barraud, 1934. Fauna Brit.

India, Dipt. 5: 348 (♂♀, L, ♂ gen. fig., key); Baisas, 1935.

Philip. J. Sci. 57: 177 (♂♀, ♂ gen. fig.); Bohart, 1945. USNavmed
580, p. 69 (key, ♂ gen. fig.); Bohart & Ingram, 1946. USNavmed
1055, p. 72 (♂♀, L, fig.).

Culex fidelis Dyar, 1920. Insec. Inscit. Mens. 8: 180 (♂). Type loc:
Los Banos, Laguna (U. S. National Museum); Edwards, 1922. Indian
J. Med. Res. 10: 472 (listed); Edwards, 1929. Not. Ent. 9: 4
(syn.); Stone & Bohart, 1944. Proc. Ent. Soc. Wash. 46(8): 220
(syn. in part; ♂ lectotype).

Culex longipes Theobald, 1901. Monogr. Cul. 2: 68 (♀). Type loc:
Singapore (British (Nat. Hist.) Museum).

Culex macropus Blanchard, 1905. Les Moustiques, p. 327 (nom. nov. for
longipes Theobald, non Fabricius, 1850).

Melanoconion uniformis Leicester, 1908. Cul. Malaya 3: 136 (♂♀). Type
loc: Malaya (British (Nat. Hist.) Museum).

Distinctive on the basis of ♂ palpus which is short and twisted,
and the well differentiated setae on subapical lobe of sidepiece; the
larva has very long and narrow siphon, with minute branched tuft.

♀. Head: Vertex dark, covered with decumbent and upright scales,
a border of pale scales around eye margin. Palpus very short, about 1/8
the length of proboscis; proboscis dark. Thorax: Mesonotum with
strongly developed dorsocentral, prescutellar and supraalar bristles;
pleuron almost bare, the integument greenish, lower mesepimeral
bristle not seen. Wing: Scales denser apically, cell R₂ slightly
longer than stem vein R₂₊₃. Legs: All dark, the venter of femora pale

at basal 1/2. Abdomen: Terga all dark scaled; sterna dark with few pale scales.

♂. Coloration similar to ♀. Palpus extending 3/4 the length of proboscis, twisted or curved. Genitalia as in figure 191. Appendages of subapical lobe as follows: three long, stout rods hooked at tips; three shorter setae and one blade; clasper short and narrow, the apical spine expanded at tip, with two or three setae; the lateral plate of phallosome broad, conical, with many small teeth on distal portion; basal process undeveloped; paraproct crown composed of few long sharp spines, with four small cercal setae; tergum IX with distinct lobe, each lobe bearing short and long bristles.

Pupa (fig. 206). Respiratory trumpet small and slender, dark pigmented, the trachoid confined at basal 1/3, the surface appearing knobby or minutely spiculate, lacking slit; metanotal C-10 with many short weak branches, C-11 stout and single, C-12 double. Abdominal h-5 on segments IV-V conspicuously developed, with 3 long branches; h-9 well developed on VII-VIII and far removed from corners, no distinct lobe on VIII; paddle smooth, the midrib and outer margin strong, one apical hair present.

Larva (figs. 192-194). Clypeal h-1 spine-like; head h-4 weak, single, h-5 & 6 with 2 or 3 long stout, pilose branches, h-7 with 8 short, pilose branches. Antenna spinose and swollen at mid portion below insertion of shaft h-1; shaft h-1 dendritic and many branches, the apical hairs long and simple. Thoracic and abdominal lateral hairs long and well developed, other hairs weak and inconspicuous. Comb teeth arranged in a large triangular patch, each tooth elongate and finely

fringed; siphon very long and narrow, with four or five pairs of minute siphonal tufts, the pecten teeth spine-like, finely fringed and confined to base; anal segment about as long as broad, saddle complete and spiculate, the dorsal brush 2 and 3 both single, lateral h-1 short, branched.

Material examined:

♂♂♀ Subic Bay, Zambales, VII.1945, cut bamboo (Rozeboom, Knight & Laffoon); San Jose, Mindoro, 21.II.1945, tree hole (E. S. Ross); Bacnotum, Camansi, Balaon, La Union, 15-18.VI.1945 (A. B. Gurney); Parang, Cotabato, 25.V.1945 (J. H. Paullus); Baguio, Mt. Prov., 10-26.VIII.1945 (S. E. Shields); Los Banos, Laguna, 28.VII.1945; Kabakan, Mindanao, V.1945 (R. Staples); Pasonanca, Zamboanga, IX.1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Laguna (as C. fidelis Dyar); India, Ceylon, Thailand, Indochina, China, Formosa, Ryukyu-Retto, Malaya, Indonesia, New Guinea, Bismarck Archipelago, Okinawa.

Habitats:

The larvae have been collected in tree holes, cut bamboo, water tanks and in forest streams. Nothing is known of the ♀ biting habits.

Culex (Neoculex ?) nematoides Dyar & Shannon

Culex nematoides Dyar & Shannon, 1925. Insec. Inscit. Mens. 13: 84

(♂♀). Type loc: 'Hagthorpe' (Mt. Prov. ?), Luzon (U. S. National Museum).

Culex (Neoculex ?) nematoides Dyar & Shannon. Edwards, 1932. Gen.

Insect. fasc. 194, p. 194.

Culex (Neoculex) nematoides Dyar & Shannon. Bohart, 1945. USNavmed

580, p. 73 (key); Stone & Knight, 1957. J. Wash. Acad. Sci.

47(2): 54 (♀ lectotype).

Edwards (1932) provisionally included C. nematoides in his Group A (Neoculex or apicalis group) having ♂ palpus longer than proboscis and hairy and, the abdominal terga with apical pale band. Since no specimens are available for study other than the type series (5 ♀♀, 1 ♂, and the ♂ abdomen is missing, the larva and pupa are unknown), I am following Edwards in retaining C. nematoides in Neoculex. The following redescription is based on type series.

♂. Head: Vertex mostly covered with pale decumbent scales, few upright brown scales and a patch of broad white scales at sides. Palpus very short, about 1/8 the length of proboscis; proboscis dark. Thorax: Mesonotal scales largely brown; with few acrostichals, one or two dorsocentrals and few prescutellars, the supraalar bristles strong; pleuron with patches of white broad scales on upper mesepimeron and sternopleuron just above mid coxa; one or two lower mesepimeral bristles present. Wing: Scales dense, cell R₂ about three times as long as stem vein R₂₊₃, and slightly longer than cell M₂. Legs: Dark or reddish brown, the femora and tibiae extensively pale ventrally. Abdomen: Terga brown, with clear narrow white apical band; sterna mostly pale with few brown scales on VI-VII.

♂ (Abdomen missing). Palpus longer than proboscis by almost the length of last two segments, very hairy, the long segment lacking a row

of translucent lanceolate setae; cell R_2 about twice as long as stem vein R_{2+3} .

Material examined:

Type series, 'Haghthorpe', 2-3/4 mi. So. of Hospital, 5.VIII.1922.

Recorded distribution:

Known only from type locality; I was not able to locate this place, probably in Mt. Province, Luzon.

Habitats:

Unknown.

Subgenus MOCHTHOGENES Edwards

Culex subgenus Mochthogenes Edwards, 1930. Bull. ent. Res. 21: 305.

Type species: Culex (Mochthogenes) malayi (Leicester). By original designation.

Edwards (1930) proposed subgenus Mochthogenes for the Old World species of Culex having very short ♂ palpus as in ♀, distinct acrostichals and strongly developed dorsocentral bristles; rather small dark species; ♂ antenna sometimes with less dense hairs, the clasper simple or forked; the larva and pupa are similar to Lophoceraomyia or Neoculex. ♀ buccopharyngeal armature well developed. As in Neoculex, Lophoceraomyia and Culiciomyia, species differentiation is mainly based on ♂ genitalia, larval and pupal characters in some species.

Seven endemic species are included in this subgenus from the Philippines, 4 of which are described as new; C. laureli Baisas is resurrected from synonymy with C. malayi (Leicester), which probably does not occur in the Philippines.

Distribution:

Oriental, Indomalayan, Ethiopian and Australasian regions, and the New Hebrides.

Habitats:

The larvae have been collected from tree holes, rockpools and ground pools; the adults have been found resting in tree trunks and moist stream banks. Nothing is known of the ♀ biting habits.

Key to species (♂♂)

1. Clasper forked; antenna densely plumose----- 2
- Clasper not forked; antenna usually sparsely plumose----- 3
- 2(1). Subapical lobe of sidepiece lacking broad leaf but with a
large appendage markedly swollen at base then abruptly
tapered; clasper stem long and slender, the main arm
arising distally----- laureli Baisas
- Subapical lobe with a large, broad leaf; clasper stem short
and stout, the main arm arising near base----- yeageri Baisas
- 3(1). Lateral plate elongate, with an outwardly curved process
near base; lower mesepimeral bristle absent-- uncinatus n. sp.
- Lateral plate broad and with denticles, lower mesepimeral
bristle present or absent----- 4
- 4(3). Lateral plate with several denticles, the basal portion
spinose; subapical lobe with two rods clubbed distally
and three broad leaflets; clasper greatly swollen at mid
portion; lower mesepimeral bristle present- latifolius n. sp.
- Lateral plate with few denticles confined to distal portion;
clasper at most broader basally----- 5
- 5(4). Subapical lobe small, bearing only three simple, long appen-
dages; lower mesepimeral bristle absent----- tricontus n. sp.
- Subapical lobe with complex and well differentiated
appendages----- 6
- 6(5). Subapical lobe with one large appendage, elbowed or curved
at mid portion and a row of four leaflets; no lower
mesepimeral bristle----- chiyutoi Baisas

Subapical lobe with two flattened and three slender blades
 in addition to three rods; lower mesepimeral bristle
 present----- culionicus n. sp.

Culex (Mochthogenes) chiyutoi Baisas (fig. 195)

Culex (Mochthogenes) chiyutoi Baisas, 1935. Philip. J. Sci. 57: 176

(♂♀, ♂ gen. fig.). Type loc: Kolambugan, Lanao, Mindanao
 (lost). Bohart, 1945. USNavmed 580, p. 73 (♂ gen. fig., key).

The ♂ of this species can be easily recognized by the large
 elbowed appendages and the row of four leaflets on the subapical lobe.

♂. Head: Vertex brown with dull pale scales around eye margin.
 Palpus short and thick, about 1/8 the length of proboscis. Antennal
 hairs sparse. Thorax: Mesonotal bristles well developed, no scales and
 lower mesepimeral bristle on pleuron. Wing: Cell R₂ three times as
 long as stem vein R₂₊₃, the scales dense distally. Legs: Brown, the
 coxae paler. Abdomen: Tergal scales dark brown; sternum brown.
 Genitalia as in figure 195. Clasper short, swollen at mid portion
 (straight and short in Baisas' figure); subapical lobe not pronounced,
 the main tubercle bearing three well differentiated appendages: one
 relatively broad from base to rounded tip, one narrower with bent tip
 and one large, elbowed at mid portion; a row of flattened leaflets and
 two or three bristles; lateral plate narrowed distally, with few large
 denticles at this portion; paraproct crown with large, blunt outer
 spines; three cercal setae.

♀. General appearance as in ♂.

Pupa. Respiratory trumpet small and slender at trachoid portion, wider distally, with indication of slit. Metanotal C-10 double and weak, C-11 single and stout, C-12 with 3 long, weak branches. Abdominal h-1 on segment III-V with 5-6 long, weak branches; h-5 single and well developed on III, double on IV-VI; h-9 on VII weak, with 3 short branches and far removed from corner; with 4-5 strong branches on VIII. Paddle midrib strong, broad, the outer margin rounded, two unequal, short apical hairs.

Larva. Clypeal h-1 spine-like; head hairs 4, 5 & 6 each with 2 long branches; h-4 weak and shorter than h-5, h-6 longest and most developed, h-7 with 6 strong branches. Antenna spinose and slender, the distal portion beyond base of shaft dark pigmented and narrower, subapical h-2 & 3 dark and heavy. Prothoracic h-1, 2 & 3 all single. Comb teeth arranged roughly in a triangular patch, each tooth fringed apically. Siphon narrowed distally, pecten teeth elongate and pectinate, the most distal tooth about six times the length of basal tooth; six pairs of tufts; dorsal valve with a pair of strong hooked setae. Dorsal brush 2 with a short accessory seta, 3 single; saddle spiculate distally, the edge lacking spines, lateral h-1 with 3 short, weak branches.

Material examined:

♂♂♀ Subic Bay, Olongapo, Zambales, VII.1945 (Rozeboom, Knight & Laffoon); ♂ paratype, Kolambugan, Lanao, 28.III.1934 (F. E. Baisas); ♂♂ Parang, Cotabato, 2.VI.1945.

Recorded distribution:

Known only from type locality.

Habitats:

The adults have been reared from larvae collected in tree holes and from small ground pools in Zambales (Rozeboom, Knight & Laffoon); habits of adults unknown.

Culex (Mochthogenes) culionicus n. sp. (fig. 196)

A very small species, distinguished by the structure of the ♂ genitalia, the lateral plate being very broad basally then narrowed and curved distally, smooth except for few indistinct denticles on apical curved portion; one lower mesepimeral bristle present.

♂. Head: Vertex brown with dense, broad, pale scales around eye margin and sides. Antenna sparsely plumose. Palpus about 1/8 the length of proboscis. Thorax: Mesonotal scales brown, the integument along anterior margin (prehumeral area) paler; acrostichals weak, dorsocentral few, prehumeral and prescutellar bristles well developed; pleuron light brown, no scales, one lower mesepimeral bristle. Wing: Vein scales coarser and more dense distally; cell R_2 about 2-1/2 times as long as stem vein R_{2+3} . Legs: Brown, paler at coxae and venter of hind femur. Abdomen: Tergal scales brown; sternum paler. Genitalia as in figure 196. Clasper short, broader basally; subapical lobe appendages borne on two tubercles: a) two stout and one slender rod, all hooked at tips, and b) two blade-like and two slender setae; lateral plate broad basally then abruptly narrowed and curved distally, no teeth except for few indistinct denticles at apical curved portion; no basal sternal process; paraproct crown mostly composed of large spines; two or three cercal setae.

♀. General appearance essentially as in ♂, the antenna less plumose.

Larva and pupa. Unknown.

Holotype: ♂ San Pedro, Culion Is., Palawan, 26.III.1947

(H. Hoogstraal); 1 ♀ paratype same data and locality as holotype. 2 ♂ same data as holotype & locality, with the genitalia missing are referred provisionally to culionicus. ♂ holotype and 1 ♀ paratype in the U. S. National Museum.

Culex (Mochthogenes) latifoliatus n. sp. (fig. 197)

This species superficially resembles tricontus n. sp. in general habitus but differs by having one lower mesepimeral bristle; the clasper greatly swollen at mid portion, the lateral plate with several denticles and basal spines; and the antenna densely plumose.

♂. Head: Vertex largely brown, with broad pale scales around eye margin and sides, narrow decumbent scales coarse and loosely arranged. Antenna densely plumose. Palpus 1/8 the length of proboscis. Thorax: Mesonotal scales brown and coarse, paler at prehumeral area; acrostichals short but well developed, dorsocentrals and supraalars strongly developed; pleuron with no scales, one lower mesepimeral bristle present. Wing: Vein scales dense, cell R_2 about 2-1/2 times as long as stem vein R_{2+3} . Legs: Brown, the coxae and venter of femora paler. Abdomen: Brown, the tergal scales darker. Genitalia as in figure 197, diagnostic characters as mentioned in the key. Clasper short and greatly swollen at mid portion; appendages of subapical lobe on two tubercles: a) three long rods, two which are expanded and

clubbed distally, and b) three broad leaflets and two slender flattened setae; lateral plate with several teeth from near base to apex, the basal portion spinose; paraproct crown composed of large outer and short inner spines, a large lobe distally; four cercal setae present.

♀. General appearance as in ♂, the antenna sparsely plumose.

Holotype: ♂ Molawin Creek, College, Laguna, 18.I.1935 (F. E. Baisas); ♂, 4 ♀♀ same data and locality as holotype. 1 ♀ quite damaged and 1 ♂ with genitalia missing; both have same data and locality as holotype--are provisionally referred to as latifoliatus. ♂ holotype and 2 ♀♀ paratypes in the U. S. National Museum; 1 ♂, 2 ♀♀ paratypes in the Bishop Museum, Honolulu.

Culex (Mochthogenes) laureli Baisas (figs. 201-205)

Culex (Mochthogenes) laureli Baisas, 1935. Philip. J. Sci. 57: 176 (♂, gen. fig. Type loc: Bukidnon, Mindanao (lost). Bohart, 1945. USNavmed 580, p. 73 (synonymy with malayi).

Bohart (1945) synonymized laureli with malayi on the basis of the forked ♂ clasper and basal band on abdominal tergum. I have examined a series of Philippine specimens determined as Culex (Mochthogenes) malayi (Leicester) in the U. S. National Museum collection, and the structure of ♂ genitalia and larval comb teeth certainly do not agree with those of malayi from India, Thailand and Malaya, and with descriptions and figures of Barraud (1934, p. 358), Brug (1939, p. 111) and Galliard and Ngu (1949, p. 502). C. laureli differs in the absence of a broad leaf on subapical lobe (this leaf is represented by a flattened appendage

markedly swollen at base then abruptly tapered) and the larval comb teeth which are uniformly elongate and fringed apically; the comb teeth in malayi are arranged in alternate long and short teeth, each tooth pointed and finely fringed laterally; also, the basal tergan banding is lacking in laureli. I consider C. laureli to be a valid species and distinct from malayi, which probably does not occur in the Philippines; laureli is a common species distributed over most of the islands.

♂. Head: Vertex with narrow and broad decumbent brown scales, upright scales on nape, dull pale scales around eye margin. Antenna densely plumose. Palpus at most $1/8$ the length of proboscis. Thorax: Brown, mesonotal bristles well developed; pleuron not scaled, one lower mesepimeral bristle present. Wing: Vein scales dense at distal $1/2$; cell R_2 twice as long as stem vein R_{2+3} . Legs: Brown. Abdomen: Tergum dark with greenish tinge; sternum brown. Genitalia as in figure 201. Clasper forked or divided, the stem long and slender with main arm arising distally; appendages of subapical lobe borne on three separate tubercles: a) three long rods, b) one flattened blade-like, one rod with flattened and serrated distal edge, and two short setae, c) one large appendage markedly swollen at base then abruptly tapered; no broad leaf; lateral plate broad basally, narrowed distally, the denticles confined to apical $1/2$; paraproct crown with large, long outer spines and short inner spines; two cercal setae.

♀. General habitus essentially as in ♂.

Pupa. Respiratory trumpet short, narrowed at basal $1/2$ or where trachoid ends then widened distally, with short slit (fig. 205). Metanotal hairs branched, relatively weak; C-10 with 4 branches, C-11 &

12 double; abdominal h-1 with many weak branches on segments III-VI; h-5 with 5-6 branches on III-IV, the branches longer and stronger on III, 2 heavier branches on V-VI. Integument reticulate, the distal segments dark pigmented; h-9 on VII with 4 weak branches and far removed from corners; well developed, dendritic on VIII and quite removed from corners. Paddle midrib strong, the outer margin almost straight, appearing narrow; two unequal apical hairs.

Larva (figs. 202-204). Clypeal h-1 spine-like; head hairs weak, h-4 short, bifid or trifid, h-5 with 3 weak branches, h-6 with 2 long heavy branches (longest and most conspicuous of frontal hairs), h-7 well developed with 6-8 heavy, pilose branches. Antenna spinose, swollen to base of shaft, narrowed and dark pigmented distally, subapical h-2 & 3 both single and heavy. Prothoracic h-1, 2 & 3 all simple. Comb teeth arranged in irregular rows, each tooth elongate, slightly expanded and fringed apically, usually with 2 or 3 pointed teeth; siphon tapered distally (some specimens have dark median band), with 6-7 pairs of tufts, pecten teeth serrate and increasing in length, the distal tooth about 5 times as long as basal tooth; dorsal valve with a pair of strong hooked setae. Dorsal brush 2 with a short accessory seta, 3 single; 6 pairs of ventral brush; saddle finely spinose distally, the edge lacking, lateral h-1 inconspicuous, with 4 short branches.

Material examined:

♂♂♀ San Jose, Mindoro, 15, 22.I., 5, 13, 22.II. (crabhole), 17.III., 25.XII.1944; Sta. Rosa, Leyte, 13.XI.1944 (all collected by E. S. Ross); Baguio, 26-29.VII.1945 (E. S. Shields); Leyte Gulf, 1945 (J. T. Medler); Pto. Princesa, Palawan, 21.IX.1945 (Bamboo roots in

stream); Leyte, 26.VII.1944 (K. V. Krombein); Kabakan, Filipino Ckr, & Katinduan Ckr., Mindanao, 12, 20, 27.IV.1945 (R. Staples); Balara, Quezon City, 7.IX.1935; Calawan, Laguna, 23.VI.1935 (F. E. Baisas); San Jose, Nueva Ecija, Luzon, VIII.1945; Osmena, Samar, VIII.1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Previously known only from type locality.

Habitats:

The larvae have been collected among vegetation along edges of rapidly flowing streams; stagnant pools, grassy pools and jungle brooks in Mindoro. Biting habits of ♀ unknown.

Culex (Mochthogenes) malayi (Leicester)

Aedes malayi Leicester, 1908. Cul. Malaya, p. 184 (♂♀). Type Loc:

Kuala Lumpur (Selangor), Malaya (British (Nat. Hist.) Museum).

Culex (Mochthogenes) malayi (Leicester). Barraud, 1934. Fauna Brit.

India, Dept. 5: 358 (♂♀, L, ♂ gen. fig.); Brug, 1939. Tijdschr.

Ent. 82: 111 (♂, L, fig.); Bohart, 1945. USNavmed 580, p. 73

(♂ gen. fig., key); Galliard & Ngu, 1949. Ann. Parasit. Num.

Comp. 24: 502 (♂, L, fig.).

This species probably does not occur in the Philippines.

Culex (Mochthogenes) tricontus n. sp. (fig. 198)

The single known ♂ of tricontus is rather badly damaged (the palpus missing) but its genitalia are distinct from other known

Mochthogenes from the Philippines. The single ♀ has not been definitely associated with ♂, but apparently is quite similar to latifoliatus. The diagnostic characters are as given in the key. It is further differentiated by the following:

♂. Head: Vertex brown with narrow clear border of pale scales around eye margin. Antenna sparsely plumose (palpus not seen). Thorax: Mesonotum light brown, the integument around prehumeral area paler; acrostichals developed, dorsocentrals missing, prescutellars well developed; no scales on pleuron, and no lower mesepimeral bristle. Wing: Vein scales coarse and dense, cell R_2 about 1-1/2 times as long as stem vein R_{2+3} . Legs: Brown, the venter of femora paler. Abdomen: Brown, genitalia as in figure 198. Subapical lobe small, bearing three long appendages: one blade-like and two stout rods with hooked tips; clasper tapered distally with a large apical spine; lateral plate elongate with few small denticles at apex; paraproct crown with four or five strong teeth and few short spines, and a large apical spine projecting inward; three cercal setae.

♀. Not definitely associated with ♂ from the same locality; although very similar to ♂ in general habitus, it is provisionally referred to this species until more material is available for study.

Holotype: ♂ Molawin Creek, College, Laguna, 18.I.1935 (F. E. Baisas). U. S. National Museum collection.

Culex (Mochthogenes) uncinatus n. sp. (fig. 199)

This species differs very distinctly from any other known species of Mochthogenes because of the structure of the ♂ genitalia, each

lateral plate consisting of an elongate process with an outwardly curved appendage arising from the base, and with a lobe-like indication of a basal sternal process.

♂. Head: Vertex mostly brown, with mixed narrow and broad decumbent and upright scales, indistinct pale scales around eye margin and sides. Antenna sparsely plumose. Palpus about 1/6 the length of proboscis. Thorax: Mesonotal scales brown, the acrostichals weak and indistinct, dorsocentrals developed but short, the prescutellars strong; pleuron lacking scales, integument light brown, no lower mesepimeral bristle. Wing: Cell R_2 only slightly longer than stem vein R_{2+3} , the vein scales coarser and more dense distally. Legs: Dark brown, the coxae and venter of femora paler. Abdomen: Tergal scales dark or reddish brown; sternum brown. Genitalia as in figure 199. Clasper slender, tapered distally; appendages of subapical lobe borne on two tubercles: a) three rods, two of which are hooked at the tips, and b) one blade-like and few slender bristles; lateral plate distinctive, lacking teeth, each consisting of an elongate process with an outwardly curved appendage arising from base; lobe-like indication of basal sternal process; paraproct crown of two differentiated groups of spines, and a strong spine distally; four cercal setae present.

♀. Essentially similar to ♂ in general habitus, the antenna less plumose.

Larva and Pupa. Unknown.

Holotype: ♂ Osmena, Samar, V.1945 (Rozeboom, Knight & Laffoon); 2 ♂♂, 1 ♀ paratypes, same data and locality as holotype. ♂ holotype and

1 ♂ paratype in the U. S. National Museum; 1 ♂, 1 ♀ paratypes in the Bishop Museum, Honolulu.

Culex (Mochthogenes) yeageri Baisas (fig. 200)

Culex (Mochthogenes) yeageri Baisas, 1935. Philip. J. Sci. 57: 175

(♂, gen. fig.). Type loc: Iwahig, Palawan (lost). Bohart, 1945.

USNavmed 580, p. 74 (♂ gen. fig., key).

C. yeageri resembles malayi and laureli in general habitus and by the forked ♂ clasper, and is differentiated from these mainly by the appendages of the subapical lobe of sidepiece. It is further differentiated by the following:

♂. Head: Vertex largely brown, with pale dull scales around eye margin broadening at sides. Antenna densely plumose. Palpus short and thick, less than 1/8 the length of proboscis. Thorax: Mesonotum with coarse scales, short acrostichals, and strong prescutellars; pleuron lacking scales, integument dark brown above, greenish below. Wing: Cell R_2 about twice as long as stem vein R_{2+3} . Legs: Brown. Abdomen: Tergal scales dark brown with bluish or greenish tinge (the apices appear pale in a paratype specimen); sternum brown. Genitalia as in figure 200. Clasper forked, the stem short and the main arm arising near base; appendages of subapical lobe borne on three tubercles: a) three rods with twisted tips and a row of four strong bristles outside tubercle, b) one large leaf, and c) two flattened blades, one of which is narrower; lateral plate broad basally, with irregular row of blunt denticles along inner margin; paraproct crown with strong outer spines; cercal setae not seen.

♀, pupa and larva. Unknown.

Material examined:

♂ paratype, Iwahig, Palawan. 7.VI.1934 (F. E. Baisas); ♂ Iwahig, Palawan, V.1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Known only from type locality.

Habitats:

The adults were reared from larvae collected in forest streams; nothing is known of adult habits.

Subgenus CULEX Linnaeus

Culex Linnaeus, 1758. Syst. Nat. 10th Ed. 1: 602. Type species:

Culex pipiens Linnaeus. By subsequent designation (Latreille, 1810).

Heteronycha F. Lynch Arribalzaga, 1891. Rev. Mus. La Plata 1: 373,

2: 155. Type species: Heteronycha dolosa F. Lynch Arribalzaga.
By monotypy.

Lasioconops Theobald, 1903. Monogr. Cul. 3: 235. Type species:

Lasioconops poecilipes Theobald. By monotypy.

Heptaphlebomyia Theobald, 1903. Monogr. Cul. 3: 336. Type species:

Heptaphlebomyia simplex Theobald. By monotypy.

Pseudoheptaphlebomyia Ventrillon, 1905. Bull. Mus. Hist. nat. Paris

11: 427. Type species: Pseudoheptaphlebomyia madagascariensis
Ventrillon.

Trichopronomyia Theobald, 1905. Ann. hist. Nat. Mus. Hung. 3: 98. Type

species: Trichopronomyia annulata Theobald.

Leucomyia Theobald, 1907. Monogr. Cul. 4: 372 (non Brauer &

Bergenstamm, 1891). Type species: Culex gelidus Theobald. By
original designation.

Aporoculex Theobald, 1907. Monogr. Cul. 4: 316. Type species:

Aporoculex punctipes Theobald. By monotypy.

Oculeomyia Theobald, 1907. Monogr. Cul. 4: 515. Type species:

Oculeomyia sarawaki Theobald. By monotypy.

Theobaldiomyia Brunetti, 1912. Rec. Indian Mus. 4: 462. Type species:

Culex gelidus Theobald. An automatically fixed type of a replace-
ment name.

Phalangomyia Dyar & Knab, 1914. Insec. Inscit. menst. 2: 58. Type

species: Phalangomyia debilis Dyar & Knab. By monotypy.

Laiomyia Izquierdo, 1916. Tesis. Col. Est. Puebla, p. 65. Type

species: Culex stigmatosoma Dyar. By subsequent designation (Edwards, 1932).

Culex, subgenus Transculicia Dyar, 1917 (1918). Insec. Inscit. menst.

5: 184. Type species: Culex (Transculicia) eleuthera Dyar. By monotypy.

Culex, subgenus Cacoculex Dyar, 1918. Insec. Inscit. menst. 6: 100.

Type species: Culex (Cacoculex) habilitator Dyar & Knab. By original designation.

The 14 recognized Philippine species of the subgenus Culex may be divided into two main "groups" of Edwards (1932): Group A (Lasioconops or sitiens-group)--those species with no lower mesepimeral bristle; proboscis with white or pale median band, and the tarsomeres I-III always with narrow pale basal rings; primarily Old World species; the majority of the Philippine species are included in this group. Group B (Culex s. str. or pipiens-group)--species with one lower mesepimeral bristle present; the proboscis without distinct pale band, and the tarsomeres completely dark; only two species are included in this group: C. quinquefasciatus, Cosmopolitan and C. fuscocephalus, in the Oriental region. The ♂ genitalia show good specific differences in the phallosome structure, as well as in the appendages of the subapical lobe. The ♀♀ are difficult to identify and a number of species cannot be recognized by this sex. The larval characters are excellent for

differentiating species; the pupae, however, have not been sufficiently studied.

The following are changes in the nomenclature: Culex palmi Baisas is here proposed as a synonym of C. annulirostris Skuse, C. salinus Baisas as C. sitiens Wiedemann and C. confusus Baisas as C. mimulus Edwards; Culex suborientalis Baisas is treated as a nomen dubium. Culex orientalis Edwards is probably a misdetermination, and C. pseudovishnui Colless is reported as new record.

Distribution:

The subgenus Culex occupies the entire range of the genus.

Habitats and relation to disease:

Generally ground water breeders, but some breed in artificial containers, rockholes, crabholes, bamboo and treeholes. Some ground pool and artificial breeders have high tolerance for salts and organic matter. Several species are closely associated with man and are notorious biters, but they are apparently not important in the transmission of filariasis in the Philippines.

Key to species (Adult)

1. Proboscis with pale band; tarsomeres with narrow pale basal rings; no lower mesepimeral bristle----- 2
- Proboscis without distinct band, and tarsomeres dark; one lower mesepimeral bristle always present----- 6
- 2(1). Wings with three costal white spots----- 3
- Wings dark or speckled----- 4

- 3(2). First costal white spot extends only to subcosts; ♂
 paraproct with small basal process----- fasyi Baisas
 First costal white spot includes subcosta and R₁; ♂
 paraproct with large basal process----- mimulus Edwards
- 4(3). Mesonotum mostly covered with white scales----- 5
 Mesonotum largely brown or with patches of pale scales----- 7
- 5(4). Mesonotum entirely white scaled from front to before
 level of wing base, the prescutellar area and scutellar
 lobes dark; ♂ paraproct with large basal process-----
 ----- gelidus Theobald
 Mesonotal white scales continued posteriorly through
 prescutellar space onto midlobe of scutellum; ♂ para-
 proct with short peg-like basal process--- whitmorei (Giles)
- 6(1). Pleuron with two dark horizontal bands; abdomen light
 brown, unbanded; ♂ paraproct with large basal process;
 elongate and stout median process of lateral plate of
 phallosome----- fuscocephalus Theobald
 Pleuron unmarked; abdominal terga with pale basal bands;
 ♂ paraproct with small basal process; median process
 of lateral plate large and blade-like-- quinquefasciatus Say
- 7(4). Femora and tibiae speckled; wing scales all dark or
 speckled----- 8
 Femora, tibiae and wings not speckled----- 11
- 8(7). Wings speckled; ♂ leaf appendage of subapical lobe small
 and narrow; lateral plate of phallosome with three or
 four small foliiform median processes-- bitaeniorhynchus Giles

- Wing scales all dark; ♂ leaf appendage of subapical lobe
 large and broad; lateral plate of phallosome varied----- 9
- 9(8). Anterior 2/3 of mesonotum covered with pale golden scales,
 dark brown scales posteriorly onto scutellum-----
 ----- sinensis Theobald
- Mesonotum largely brown with patches of pale scales or
 with pale golden scales on prescutellar area----- 10
- 10(9). Lateral plate of ♂ phallosome with three foliform teeth
 on median process; the ventral cornu toothed or spiny---
 ----- annulirostris Skuse
- Lateral plate of ♂ phallosome with three or four strong
 graduated teeth on median process, the basal mesal
 portion of plate hairy; ventral cornu not toothed-----
 ----- sitiens Wiedemann
- 11(7). Mesonotal scales uniformly brown or coppery brown;
 upright scales on vertex all brown; lateral plate of
 ♂ phallosome with four pointed teeth and one foliform
 tooth on median process----- tritaeniorhynchus ssp.
summosus Dyar
- Mesonotal scales brown with variable pale scales forming
 indefinite pattern; lateral plate of ♂ phallosome with
 three or four teeth on median process----- 12
- 12(11). Vertex with upright scales all dark; ♂ proboscis with
 prominent ventral setae at base of white band-----
 ----- annulus Theobald

Vertex with a central patch of pale golden upright

scales, dark laterally; few ventral setae on proboscis--- 13

13(12). Lateral plate of ♂ phallosome with three large and two

smaller (accessory) teeth on median process; pale

golden and dark upright scales on vertex not

contrasting----- incognitus Baisas

Lateral plate of ♂ phallosome with three or four large

recurved teeth, no accessory teeth; pale golden and

dark upright scales on vertex sharply contrasting-- -----

----- pseudovishnui Colless

Culex (Culex) annulus Theobald (figs. 251-253)

Culex annulus Theobald, 1901. Monogr. Cul. 1: 358 (♀, key). Type loc:

Lamma, Tai Po, Pokfulam, Hongkong (British (Nat. Hist.) Museum).

Culex (Culex) annulus Theobald. Colless, 1957. Ann. trop. Med.

Parasit. 59: 93 (♂♀, L, tax., resurr. from syn. with

tritaeniorhynchus).

Culex (Culex) adela Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 200

(♂♀, L, P, fig., key). Type loc: Tungkong Manga, San Jose,

Bulacan (lost). Colless, 1957. Ann. trop. Med. Parasit.

51: 95 (syn.).

C. annulus most closely resembles pseudovishnui and tritaeniorhynchus summosus in the adults, but the larva shows marked characteristic features such as the numerous comb teeth or spines, the rather stout siphon with long, well developed tufts, and the finely spiculate thoracic integument.

♀. Head: Vertex usually with dark brown upright scales and with patches of broad white scales on lower sides. Proboscis with the usual narrow white band. Thorax: Mesonotal scales mostly brown, with pale yellowish scales on prescutellar space and scutellar lobes. Legs: Femora pale ventrally. Tarsomeres with dull pale rings. Abdomen: Terga with pale bands decreasing in width posteriorly, segment VII-VIII sometimes with few median pale scales on apical margin; sterna broadly pale basally.

♂. Coloration as in ♀. Proboscis with prominent long ventral setae near base of pale band; long segment of palpus with a row of short flattened setae; abdominal tergal bands usually with marked lateral extensions and more pronounced apical scaling on posterior segments. Genitalia (fig. 251) very similar to pseudovishnui or incognitus. Subapical lobe with three rods; one broad leaf and seta; four stout setae, two shorter than others; lateral plate of phallosome with three or four large recurved teeth on median process; ventral cornu with toothed or serrated distal margin; paraproct with large basal process; two cercal setae.

Pupa. Not described here.

Larva (figs. 252-253). Clypeal h-1 spine-like; head h-4 single, thin; h-5 & 6 both double; h-7 with 9 branches. Antenna spinose, narrowed distally and infuscated at this portion beyond insertion of shaft h-1; strong subapical and apical hairs. Thoracic integument finely spiculate. Prothoracic h-1, 2 & 3 all single and equally long. Comb teeth patch arranged in irregular rows, each tooth or spine long and pointed with lateral fringe. Siphon rather stout, narrowly dark at

base and acus; with 5-6 pairs of branched ventral tufts, and one pair laterad; pecten teeth long and pointed, each tooth with fine lateral denticles. Saddle spiculate; lateral h-2 with 2-3 weak branches; dorsal brush 2 with 2-3 short basal branches, 3 single.

Material examined:

Series of larvae, Munoz, Nueva Ecija, VIII.1945 (D. F. Bray, ricefields); ♂♂♀♀ Batangas, 1945; La Union, 1945; Leyte Gulf, 1945; Iwahig, Palawan, 1945; Calicoan Is., XII.1944; Samar, 1944.

Recorded distribution:

Manila, Rizal, Palawan, Bulacan; China, Java, Malaya, Thailand.

Habitats:

The larvae (as adela) breed in both fresh and salt water, common pools affected by tide water and found in association with summorosus and annulirostris.

Culex (Culex) annulirostris Skuse (figs. 254-256)

Culex annulirostris Skuse, 1889. Proc. Linn. Soc. N. S. W. 3: 1737 (♀).

Type loc: Blue Mts. & Berowra, New South Wales, Australia

(Mackay Museum Nat. Hist., Univ. Sydney).

Culex (Culex) annulirostris Skuse. Bohart, 1945. USNavmed 580, p. 77

(key); Knight & Hurlbut, 1949. J. Wash. Acad. Sci. 39: 30 (♂♀, P, L, tax.); Penn, 1949. Pacific Sci. 3: 81 (P); Bohart, 1956 (1957). Ins. Micronesia 12: 80 (♂♀, L); Belkin, 1962. Mosq. S. Pacific vol. 1; p. 207 (♂♀, L, P).

Culex (Culex) palmi Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 207

(♂♀, L, P, fig., key). Type loc: Paranaque, Rizal (lost). New synonymy.

For complete synonymy see Stone, Knight & Starcke (1959, p. 241).

This species is readily recognizable by the dark wing scales, speckled femora and tibiae, and it is particularly distinctive because of the structure of the lateral plate of the ♂ phallosome. The synonymy of C. palmi Baisas with C. annulirostris Skuse is based upon a careful comparison of Baisas' original description and figures with known specimens of annulirostris. Baisas' type has been lost and his description and figures gave no characters which would differentiate this from annulirostris.

♀. Resembles C. sitiens in general habitus. Vertex with all upright scales dark brown. Mesonotal scales largely brown, with pale golden scales on prescutellar area. Femora and tibiae speckled, the femora dark apically, tarsomeres I-IV with clear narrow basal rings. Abdominal tergal basal bands usually produced medianly; sterna mostly pale with dark apices and lateral dark patches.

♂. Essentially similar to ♀. Proboscis with few ventral hairs at base of white band. Terminal segment of palpus broadly white tipped, the long segment with a row of curved dark setae. Genitalia as in figure 256. Subapical lobe with three slender rods, one shorter and with rounded tip than others; one large broad leaf and seta; two slender setae; lateral plate of phallosome distinctive, median process with three foliform teeth, the ventral cornu toothed or spiny, and large external process; paraproct with small, undeveloped basal process; three cercal setae.

Pupa. Not described here.

Larva (figs. 254-255). Clypeal h-1 as stout spine; h-4 single, h-5 with 5 branches, h-6 with 3 branches, h-7 with 10-12 branches. Antenna spinose, greatly narrowed beyond insertion of shaft h-1 and infuscated at this portion, the subapical and apical hairs strong. Prothoracic h-1, 2 & 3 single, equally developed. Comb teeth numerous, each tooth fringed laterally and apically. Siphon granulose, usually with 11 individual long tufts or 5 pairs and 1 unpaired tufts arranged irregularly; pecten teeth with even lateral denticles. Saddle spiculate; lateral h-1 with 3 weak branches; dorsal brush 2 with 3 branches, 3 single. Anal papillae short and narrow, about as long as anal segment.

Material examined:

♂♂♀ Wackwack, Rizal, XII.1945 (light trap); Los Banos, Laguna XI.1914; Manila, 10.VI.1906; Caminawit Pt., Mindoro, I.1945 (G. H. Penn); San Jose, Mindoro, I.1945 (E. S. Ross); Iloilo, 22.XII.1923 (G. W. McCoy); Dulag, Leyte, XI.1945 (brackish marsh, H. R. Roberts).

Recorded distribution:

Bulacan, Manila, Cavite, Rizal, Leyte; Southern & western Australasian region, Indonesia.

Habitats:

The larvae breed in almost any type of water on the ground, both fresh and strongly brackish, clear or with very high organic content; fresh water pools, fish ponds, water pools near shore and salt beds (as palmi). ♀♀ readily attack man at night both indoors and outdoors, and

may be potentially important species in the transmission of filariasis in the South Pacific.

Culex (Culex) bitaeniorhynchus Giles (figs. 256a-258)

Culex bitaeniorhynchus Giles, 1901. J. Bombay Nat. Hist. Soc. 13: 607

(A). Type loc: Travancore, India (nonextant).

Culex (Culex) bitaeniorhynchus Giles. Barraud, 1934. Fauna Brit.

India, Dipt. 5: 391 (♂♀, L, fig.); Baisas, 1938. Mon. Bull. Bur.

Hlth. Manila 18: 211 (P, fig., key); Bohart, 1945. USNavmed 580,

p. 78 (L, ♂ gen. fig., key); La Casse & Yamaguti, 1950. Mosq.

Fauna Japan & Korea, p. 201 (♂♀, L, P, fig.); Belkin, 1962. Mosq.

S. Pacific vol. 1, p. 215 (♂♀, L, P).

Culex (Culex) bitaeniorhynchus var. ambiguus Theobald. Baisas, 1938.

Mon. Bull. Bur. Hlth. Manila 18: 211 (A).

Taeniorhynchus ager Giles, 1901. Entom. 34: 196 (♀). Type loc: Madras

Presidency, India (British (Nat. Hist.) Museum). Bezzi, 1913.

Philip. J. Sci. D8: 307 (listed).

Grabhamia ambiguus Theobald, 1901. Monogr. Cul. 3: 248 (♂). Type loc:

Quilon (Travancore) India (British (Nat. Hist.) Museum); Bohart,

1956 (1957). Ins. Micronesia 12: 84 (syn.).

For complete synonymy see Stone, Knight & Starcke (1959, p. 243).

C. bitaeniorhynchus has strikingly variable mesonotal and abdominal tergal pale markings, but the ♂ genitalia appear to be relatively uniform, and no differences have been noted in the larvae and pupae. Most specimens can be recognized by the broad apical terbal bands

on abdomen, speckled wings, femora and tibiae and usually pale mesonotal scales.

♀. Head: Proboscis with broad white band; vertex mostly dark with few pale decumbent scales. Thorax: Mesonotum usually pale scaled from front to before wing level, dark posteriorly; midlobe of scutellum with pale decumbent scales; no lower mesepimeral bristle. Wing: speckled. Legs: Femora and tibiae speckled, the hind and mid femora extensively pale ventrally; tersetomeres narrowly pale basally, the apices pale. Abdomen: Tergal bands variable: usually with broad complete pale apical bands or pale basal bands produced triangularly, with large lateral patches, pale apices towards segments; sterna largely pale, with subapical dark areas.

♂. Color variation as in ♀; pale band on proboscis narrower; palpus densely hairy. Genitalia as in figure 256a. Subapical lobe with few appendages: two very stout rods and one slender seta; one short blade or narrow leaf and four or five short bristles; clasper short, rather thick set and tapered distally; lateral plate of phallosome with large spinose recurved ventral cornu, broad external process and three or four small median foliform processes; paraproct with slender basal process, the crown with large outer teeth, sharp long inner spines; four cercal setae present.

Pupa. Respiratory trumpet large, funnel-shape, the tracheoid confined to basal 1/4, no slit. Metanotal C-10 well developed with 6-8 long branches, C-11 single, long and stout, C-12 small, single. Abdominal h-1 & 5 on segments IV-VI strong and variously developed; h-9 on VII with 3-4 dendritic branches, inserted about 1/3 from

apico-lateral corner; with 5-6 similar branches on VIII, the apico-lateral corner produced posteriorly. Paddle rounded, infuscated apically, with strong midrib; two small apical hairs.

Larva (figs. 257-258). Clypeal h-1 long, rod-like; head h-4 double, weak; head h-5 & 6 each with 3 & 2 strong branches, respectively. Mentum triangular with many fine teeth. Antenna spinose at basal 1/2; narrower and infuscated beyond insertion of shaft h-1 at mid portion; the apical and subapical hairs relatively short, stout. Prothoracic h-1, 2 & 3 on prominent tubercle, all single and stout, pilose. Comb teeth few, simple and spine-like, each tooth with fine basal lateral fringe. Siphon long and tapered, with 5-6 pecten teeth, confined at base, each pointed tooth with 1-3 basal teeth; three or four pairs of short branched tufts; fairly long apical spine. Saddle smooth, lateral h-1 short, double; dorsal brush 2 with 5 branches, 3 single.

Material examined:

♂♂♀ San Manuel, Pangasinan, II-III.1945 (D. F. Bray, fish pond & mountain stream) Dingalan Bay, (Tayabas) Quezon, 1945; Camp Stotsenberg, Pampanga; Manila; Camp Nichols, Rizal, I.1925; San Jose, Mindoro, I.1945 (E. S. Ross, marsh along algae); Leyte Gulf, 1945 (J. T. Medler); Osmena, Samar, 1945 (Rozeboom, Knight & Laffoon); Zamboanga, 1945.

Recorded distribution:

Bulacan, Baguio, Rizal, Palawan, Cotabato; over much of the Oriental and Indomalayan regions, southern Palearctic, Ethiopian and Malagasy regions, New Caledonia, New Guinea, Palau Is., Australia, Western Pacific.

Habitats:

The larvae are found almost always associated with green algae; nothing is definitely known about disease relations of the adults; the ♀♀ readily attacked man at night.

Culex (Culex) fasyi Baisas (fig. 259)

Culex (Culex) fasyi Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 215

(♂♀, key, fig.). Type loc: Baguio, Luzon (lost).

Very similar to mimeticus Noe in most characters but fasyi differs by having undeveloped or small basal process of paraproct; other differentiating characters are as follows:

♀. Head: Proboscis with broad pale band. Thorax: No lower mesepimeral bristle. Wing: Costal white spots as follows: first spot extends only to subcosta; second spot includes subcosta and R_1 , and usually base of fork R_{2+3} ; apical spot quite variable, includes tip of R_1 to near apex of R_2 ; middle of R_{3+4} , Cu_1 and basal portion of anal vein pale; fringe pale at tip of Cu_2 . Legs: Tarsomeres I-IV with narrow pale basal rings involving apices of the preceeding segments. Abdomen: Tergal basal bands becoming narrower towards posterior segments.

♂. Wing and abdominal tergal markings as in ♀. Genitalia as in figure 259. Subapical lobe of sidepiece with three slender rods; one broad leaf; three short flattened setae, and one narrow blade; clasper slender, tapered; lateral plate of phallosome with three large teeth and

one large curved basal tooth; paraproct with small basal process, the crown composed of numerous spines; two cercal setae present.

Pupa and larva. Unknown.

Material examined:

♀ Calawan, Laguna, 7.III.1930; ♂♂ Baguio, Luzon, 7.IX.1945 (S. E. Shields); ♂♀ Luzon, 11.V.1945 (32 MSU #842); ♀ Camp John Hay, Baguio, 4.II.1923.

Distribution:

Known only from type locality.

Habitats:

Unknown.

Culex (Culex) fuscocephalus Theobald (fig. 260)

Culex fuscocephala Theobald, 1907. Monogr. Cul. 4: 420 (♀). Type loc: Peradeniya, Ceylon (British (Nat. Hist.) Museum).

Culex (Culex) fuscocephalus Theobald. Barraud, 1934. Fauna Brit.

India, Dipt. 5: 424 (♂♀, L, P, fig., key); Bonne-Wepster & Brug, 1937. Geneesk. Tijdschr. 7: 80 (♂♀); Bonne-Wepster & Brug, 1939. Geneesk. Tijdschr. 70: 1277 (L); Bohart, 1945. USNavmed 580, p. 78 (♂, L, fig., key); Bick, 1949. Nat. Hist. Misc. 41: 2, 4 (listed); Baisas, 1957. Philip. J. Sci. 86: 71, 118 (rel. to filariasis).

Culex taytayensis Banks, 1909. Philip. J. Sci. 4: 545 (♂♀). Type loc: Taytay, Rizal (non-extant); Bezzi, 1913. Philip. J. Sci. D8: 307 (listed).

Culex inelegans Dyar, 1920. Insec. Inscit. Menst. 8: 179 (♂). Type

loc: Los Banos, Laguna (U. S. National Museum); Bohart, 1945.

USNavmed 580, p. 78 (syn.).

For complete synonymy see Stone, Knight & Starcke (1959, p. 248).

♀. Easily recognizable by its general light brown color, unmarked proboscis, abdomen and tarsi; the pleuron with two dark horizontal bands which have a white area between; upper sternopleuron and mesepimeron with patches of white scales; one lower mesepimeral bristle present. Femora and tibiae pale ventrally.

♂. Coloration essentially as in ♀; the long segment of palpus without translucent setae. Genitalia as in figure 260. Sidepiece with appendages of subapical lobe borne on prominent tubercles as follows: a) three slender rods, b) two slender setae and a rod; and one large broad leaf and seta between the tubercles; clasper slender; lateral plate of phallosome with four or five large teeth and stout long median process; paraproct with large, stout basal process, crown of strong spines; two or three cercal setae.

Pupa. Not available for study.

Larva. Clypeal h-1 weak not spine-like; head h-4 single, weak, h-5 & 6 each with 2-3 strong pilose branches, h-7 with 3-4 branches. Antenna spinose and slender, lightly infuscated distally. Prothoracic h-1, 2 & 3 all single, about equal in length. Comb teeth fringed apically. Siphon long, almost cylindrical, with four pairs of short tufts; pecten teeth long and pointed with 1-3 median lateral teeth. Saddle with few visible minute spines distally; lateral h-1 double, weak; dorsal brush 2 with 1-2 accessory setae, 3 single.

Material examined:

♂♀ Tala, Wack-wack, Ft. McKinley, Camp Nichols, Rizal, 1924;
 1945; Los Banos, Laguna, 1917; San Fernando, La Union, 19.VIII.1945
 (S. E. Shields); Urdaneta, Pangasinan, 16.IV.1945 (D. F. Bray, small
 brooks & irrigation ditches); Camp Stotsenberg, Pampanga, 1924; Parang,
 Cotabato, 28.V.1946 (J. H. Paullus); Lasang, Davao, 1946 (Enke &
 Hoogstraal, muddy pond with weeds & algae); Dansalan, Lanao, 1946 (Enke,
 ground pools); Abuyog, Palo, Leyte Gulf, Leyte, 1945 (Krombein; Graham);
 San Antonio, Guirang, Samar, 1944 (Rozeboom, Knight & Laffoon);
 Dumaguete, Negros Oriental, 28.IX.1959 (L. W. Quate); Surigao, 1959;
 San Jose, Mindoro, 1944-45 (E. S. Ross).

Recorded distribution:

Laguna, Rizal, Ilocos Sur, Leyte, Sorsogon, Zamboanga; Ceylon,
 Burma, Java, India, Borneo, Sumatra, Malaya, Andaman Is., Thailand,
 Indochina, Formosa.

Habitats and relation to disease:

The larvae have been collected mostly in ground pools and rice
 paddies; the adults are common in houses and animal baited traps, and
 may be a potentially dangerous species in the transmission of
 filariasis (Baisas, 1947).

Culex (Culex) gelidus Theobald (figs. 261-262)

Culex gelidus Theobald, 1901. Monogr. Cul. 2: 20 (♀, key, fig.). Type
 loc: Selangor, Malaya (British (Nat. Hist.) Museum).

Culex (Culex) gelidus Theobald. Barraud, 1934. Fauna Brit. India,
 Dipt. 5: 407 (♂♀, L, fig., key); Bohart, 1945. USNavmed 580, p.78

(L, key); Bick, 1949. Nat. Hist. Misc. 41: 2, 4 (listed).

Culex gelidus var. cuneatus Theobald, 1901. Monogr. Cul. 2: 22 (♀).

Type loc: Taipang, Perak, Malaya & Quilon, Travancore, India (British (Nat. Hist.) Museum). Banks, 1906. Philip. J. Sci. 1: 987 (listed); Giles, 1904. J. Trop. Med. 7: 368 (listed); Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 212 (♂♀, L, P, key, fig.).

Theobaldiomyia gelida Theobald. Bezzi, 1913. Philip. J. Sci. D8: 307 (listed).

Leucomyia gelida var. bipunctata Theobald, 1907. Monogr. Cul. 4: 374 (♂). Type loc: India & Sarawak (Borneo) (British (Nat. Hist.) Museum).

Readily recognizable by the extensively white mesonotum. Other distinguishing characters are as follows:

♀. Head: Proboscis with narrow white band; vertex with all white decumbent and upright scales, dark upright scales confined on both sides. Thorax: Mesonotum entirely white scaled from front to before level of wing base, the area from this to scutellum uniformly dark; no lower mesepimeral bristle. Legs: Mostly brown, the basal rings on tarsomeres sometimes indistinct or dull. Abdomen: Tergal bands produced into an elongate median spot; sterna mostly pale scaled.

♂. Coloration as in ♀. Long segment of palpus without translucent setae. Genitalia as in figure 261. Subapical lobe of sidepiece with three rods, one noticeably stouter than others; one large broad leaf; three flattened setae, one longer and broader distally; clasper

strongly swollen distally; lateral plate of phallosome simple, with one large spinose median process and a rounded spiculate external process; basal process of paraproct very large, as long as paraproct, the crown with coarse outer and fine, sharp inner teeth; three cercal setae present.

Pupa. Not available for study.

Larva (fig. 262). Clypeal h-1 dark, spine-like; head h-4 single and weak, h-5 & 6 each with 3 long pilose branches, h-7 with 6-8 pilose branches; mentum teeth fine. Antenna spinose, slightly infuscated beyond shaft h-1; subapical and apical hairs strong. Prothoracic h-1, 2 & 3 on prominent tubercle, all single, graduated in length. Comb teeth arranged in three or four irregular rows, each tooth fringed apically. Siphon large, distinctly swollen at mid portion, with small spine at tip, short hairs on valve; four pairs of tufts, no lateral tufts; pecten teeth elongate with coarse lateral teeth. Saddle with few small spines along distal edge, lateral h-1 single, long but weak; dorsal brush 2 with accessory seta, 3 single.

Material examined:

♂♂♀♀ Panitian & Calaccad, Mt. Prov., 12.II.1963; San Fabian, Pangasinan, 2.II.1945; Camp Stotsenberg, Pampanga, 12.VII.1929; San Fernando, La Union, 14.XII.1945; Malolos, Bulacan, IV.1903; Los Banos, Laguna, 15.XII.1915; 2.XII.1914; Osmena, Samar, V.1945; Tacloban, Abuyog, Tolosa, Leyte Gulf, Leyte, 1944-1945 (E. S. Ross; O. H. Graham; Pepper; J. T. Medler); Cape Melville, Balabac Is.; Iwahig & Pto. Princesa, Palawan, V.1945; San Jose, Mindoro, 26.VII.1945; Kabakan, Mindanao, 6.V.1945 (R. Staples; rice paddies, fishponds).

Recorded distribution:

Laguna, Rizal, Sorsogon, Manila, Pangasinan, Bulacan, Pampanga, Cotabato; Nepal, Ceylon, Pakistan, India, Burma, Malaya, Formosa, China, Japan, Indochina, New Guinea.

Habitats:

The adults were caught in carabao baited traps and inside houses; the larvae are ground pool breeders, usually in weedy and marshy areas.

Culex (Culex) incognitus Baisas (figs. 263-264)

Culex (Culex) incognitus Baisas, 1938. Mon. Bull. Bur. Hlth. Manila

18: 203 (♂♀, L, P, fig., key). Type loc: Calawan, Laguna (lost).

Baisas, 1957. Philip. J. Sci. 86: 72 (rel. to filariasis).

C. incognitus together with C. pseudovishnui, C. annulus and the related C. tritaeniorhynchus summosus apparently belongs to the Culex vishnui group of Colless (1957). The adults markedly resemble each other in general habitus and ♂ genitalic characters, but the larvae differ from each other quite strikingly by the comb teeth and by the shape and chaetotaxy of the siphon. The shape of respiratory trumpet and development of metanotal hairs in the pupa are also useful in delimiting the species. C. incognitus larva is readily distinguished by the well differentiated size of comb teeth; each small tooth fringed apically becoming larger and pointed towards outer row.

♀. Head: Proboscis with narrow pale band beyond mid portion; vertex mostly covered with yellowish decumbent scales, upright scales pale medianly, dark laterally and nape, patches of broad scales at lower

sides. Thorax: Mesonotum dark with patches of yellowish scales, and mid lobe of scutellum yellowish; pleuron with patches of white scales on upper and lower sternopleuron and upper mesepimeron; no lower mesepimeral bristle. Legs: Femora lightly speckled, the hind and mid femora extensively pale; tarsomeres I-II pale ringed basally. Abdomen: With pale narrow basal tergal bands produced laterally; sterna largely pale with dark apical patches on posterior segments.

♂. Coloration as in ♀. Proboscis with few hairs on mid ventral portion. Long segment of palpus with a row of short, flattened setae. Genitalia as in figure 264, very similar to summorosus. Subapical lobe with three stout rods, two bent at tips; one shorter stout rod swollen distally and two slender strong setae; one broad, large leaf and a seta. Clasper large, thickset; lateral plate of phallosome with three large teeth on median process and two smaller teeth (accessory teeth of Baisas); paraproct with large basal process; two cercal setae.

Pupa (based on a single cast skin). Respiratory trumpet long, slender throughout its entire length, the tracheoid extending almost to mid portion, no slit. Metanotal hairs varied: C-10 with 4 branches, C-11 single or double, C-12 with 3 branches; most abdominal hairs missing. Paddle rounded distally, with strong midrib and outer margin; one apical hair.

Larva (fig. 263). Clypeal h-1 spine-like; head h-4 small, thin hair, h-5 & 6 with 2 or 3 branches each, h-7 with 8-10 pilose branches. Antenna spinose, dark ringed at base, infuscated beyond insertion of shaft h-1, the subapical and apical hairs strong. Prothoracic h-1, 2 & 3 all single and equally long. Comb teeth patch markedly differentiated

in size, arranged in semi-circle; the small teeth fringed apically, the large outer teeth elongate and pointed with fine basal lateral fringe. Siphon very long and slender, markedly tapered, with about 16 individual weakly branched tufts, the tufts mostly scattered and unpaired; pecten teeth gradually becoming longer posteriorly, each tooth with fine lateral denticles. Saddle spiculate, lateral h-1 with 3-4 weak short branches; dorsal brush 2 with 2-3 basal branches, 3 single.

Material examined:

Larvae, San Jose, Mindoro, I-II.1945 (forest swamps, shaded creek); Leyte, X.1944 (grassy puddles, stagnant pools, E. S. Ross); ♂♀ Alcala, Cagayan, VII.1945 (rice fields, D. F. Bray); Palawan, 1945 (ground pools); La Union, 1945; Tala, Rizal, 1955; Leyte, 1944 (Pepper); Lanao, 1946 (Edgar, Enke & Hoogstraal); Calicoan Is., 1945; Jinamoc Is., 1945; Parang, Cotabato, 1945; Calaccad, Mt. Prov., II.1963 (Rozeboom); Osmena, Samar, 1945 (Rozeboom, Knight & Laffoon).

Recorded distribution:

Baguio, Bulacan, Laguna, Sorsogon, Palawan, Mindanao.

Habitats:

The larvae have been collected in water tank, rice fields, ground pools, forest creeks, swamps and in clear flowing streams associated with algae; the adults are common inside houses and carabao traps; not definitely associated with filariasis transmission.

Culex (Culex) pseudovishnui Colless (fig. 268)

Culex pseudovishnui Colless, 1957. Ann. trop. Med. Parasit. 51: 88 (♂♀, L, P, fig.). Type loc: Singapore (British (Nat. Hist.) Museum).

Culex vishnui (nec Theobald, 1910. Monogr. Cul. 1: 355). Bezzi, 1913.
Philip. J. Sci. D8: 307 (listed); Bohart, 1945. USNavmed 580,
p. 80 (♂ gen. fig., L).

For the present, the Philippine adult specimens identified as vishnui in the U. S. National Museum collection are referred provisionally to pseudovishnui until individual rearings can be made, and the group is thoroughly studied. It shows considerable variation, and it is difficult to be certain; a number of similarities are found with annulus or incognitus. The species can be readily distinguished by the contrasting pale golden and dark upright scales on vertex of the ♀, and by the absence of median long hairs on mid portion of proboscis in the ♂. The larva (fig. 268) markedly differs from other members of the group by having the comb teeth, arranged in a single row of four to six long spines with basal lateral fringe and elongate basal attachment, and by the tapered siphon which has a characteristic curvature and with six pairs of long ventral tufts and one or two short lateral pairs; the pecten teeth with lateral denticles almost confined to basal 1/2. Bohart's (1945) larval description and figure of ♂ genitalia (in part) of vishnui could apply equally well to pseudovishnui. Colless (1957) gave an excellent description of the adults and larva which may be consulted; the pupa is briefly described below:

Pupa (based on a single cast skin associated with larva).

Respiratory trumpet narrowly elongate, slightly widened at opening, the tracheoid extending to mid portion. Metanotal hair C-10 with 6 weak branches; C-11 single, stout; C-12 with 2-3 branches. Abdominal h-1 of

II weak short tuft, with long, weak branches on other segments; h-5 strong and double on V-VI; h-9 on VII with 4 short weak branches; 5-6 dendritic longer branches on VIII. Paddle narrow with strong midrib; two apical hairs.

Material examined:

Series of larvae, San Jose, Mindoro, II.1945 (stagnant pond with algae, E. S. Ross); ♀♂♂ Leyte Gulf, 1945 (J. T. Medler); Pt. Princesa, Palawan, 1945; (ground pools); Kabakan, Mindanao, IV.1945 (R. Staples); Camp Nichols, Rizal.

Recorded distribution:

Bulacan, Rizal, Laguna, Tayabas (Quezon), Pangasinan, Pampanga (as vishnui); Malaya, India, Thailand.

Habitats:

The larvae breed in various types of ground pools, including ricefields and salt marshes; ♀♀ biting habits unknown.

Culex (Culex) quinquefasciatus Say (fig. 269)

Culex quinquefasciatus Say, 1823. J. Acad. Nat. Sci. Philad. 3: 10 (A).

Type loc: Mississippi River, U.S.A. (non-extant).

Culex (Culex) quinquefasciatus Say. Russell, 1932. Philip. J. Sci.

49: 651 (bionomics); Bohart, 1945. USNavmed 580, p. 79 (♂, L, key); Bick, 1949. Nat. Hist. Misc. 41: 2, 4 (listed); Stone, 1956. Proc. ent. Soc. Wash. 58: 342 (systematics); Belkin, 1962. Mosq. S. Pacific 1: 195 (♂♀, P, L, fig., to sp. status); Stone, 1963. Proc. ent. Soc. Wash. 65: 135 (as valid sp.).

Culex fatigans Wiedemann, 1828. Aussereurop. zweifl. Ins. 1: 9 (♂♀).

Type loc: East Indies (Indonesia) (Naturhistorisches Museum, Vienna). Banks, 1906. Philip. J. Sci. 1: 986 (listed, dist.); Bezzi, 1913. Philip. J. Sci. D8: 307 (listed); Stone, 1956(57). Proc. ent. Soc. Wash. 58: 342 (syn.); Baisas, 1957. Philip. J. Sci. 86: 71, 117 (bionomics, rel. to filariasis); Rozeboom, 1962. Proc. 9th Pacific Sci. Congress, Bangkok 17: 118 (rel. to filariasis); Rozeboom & Cabrera, 1964. J. Med. ent. 1: 18 (rel. to filariasis).

Culex pipiens auct. (nec Linnaeus, 1758. Syst., Nat. ed. 10, 1: 602).

Elera, 1895. Cat. Sist. Fauna Filipinas 2: 490 (listed); Theobald, 1910. Monogr. Cul. 5: 381 (listed).

Culex hensemaeon Dyar, 1920. Insec. Inscit. Menst. 8: 178 (♀). Type loc: Los Banos, Laguna (U. S. National Museum). Edwards, 1922. Indian J. med. Res. 10: 472 (listed).

For complete synonymy see Stone, Knight & Starcke (1959, p. 255).

In treating the Philippine form as a distinct species and applying the name quinquefasciatus Say, I am following Stone (1956; 1963) and Belkin (1962). Although a variable species, the adults can be readily differentiated from other members of the subgenus by the unmarked proboscis and tarsi, and banded abdominal terga; by the characteristic larval siphon and tufts, and the pupal respiratory trumpet and paddle. It is the most common domestic mosquito and very abundant throughout the islands.

♀. Head: Proboscis dark sometimes with dull or indistinct pale area about mid portion and venter. Thorax: Pleuron with patches of

white scales on upper and lower sternopleuron and upper mesepimeron; one lower mesepimeral bristle always present. Legs: dark, tarsi unbanded, the femora pale ventrally. Abdomen: Tergal bands variable, usually broad to becoming narrower towards posterior segments and connected to large lateral patches; sterna noticeably pale.

♂. Coloration as in ♀, except broader tergal bands; proboscis and palpus dark, the long segment of palpus without translucent setae, with dull pale area at mid portion. Genitalia as in figure 269. Subapical lobe prominent, with appendages as follows: two stout rods and one slender seta; two short setae and one stout rod, one narrow leaf and seta; clasper slender; lateral plate of phallosome distinctive and fairly simple, with a large, curved blade-like median process; paraproct with small basal process, the crown with many sharp spines; two or four cercal setae present.

Pupa. Respiratory trumpet long, cylindrical, the tracheoid extending to basal 1/3, with deep opening, no slit. Metanotal hair C-10, 11 & 12 all branched, with C-12 less developed than others; abdominal h-5 on segment IV-VI with 2-3 long branches, weak on others; h-9 on VII with 4-6 branches and far removed from corners; with 8-12 branches on VIII. Paddle broader distally, with strong midrib, two unequal apical hairs.

Larva. Clypeal h-1 long and slender; head h-4 single, h-5 & 6 variable, usually each with 5-6 branches, h-7 with 9-11 branches. Antenna relatively short, slender, spinose and uniformly infuscated; shaft h-1 inserted 3/4 from base; the subapical and apical hairs rather short. Prothoracic h-1, 2 & 3 long and single. Comb teeth arranged in

a triangular patch, each tooth fringed apically. Siphon variable in shape, usually stout and swollen at mid portion, greatly narrowed distally; four pairs of tufts, the two distal pairs are laterad in position and with 3-4 short, weak branches; pecten teeth few, each tooth with 1-4 basal teeth. Saddle finely spiculate distally; lateral h-1 long, single; dorsal brush 2 double, 3 single.

Material examined:

♂♂♀ Manila, 1901-1910 (C. S. Ludlow; C. S. Banks); Los Banos, Laguna, 1915; Camp Stotsenberg, 1927; Ft. McKinley, Camp Nichols, Rizal; San Fernando, La Union, 1945; Baguio, 1945; Baymabang, Pangasinan, 1945; Corregidor Is., 1945; Binalonan, Pangasinan, 1945 (D. F. Bray, artificial containers); Caminawit Pt., Mindoro, 1945; Palawan, 1945; Palo, Carigara, Leyte, 1944-45; (E. S. Ross); Pettit Barracks, Cotabato, 1920; Jolo, Jolo Is.

Recorded distribution:

Occurs nearly everywhere throughout the islands; widely distributed over much of the world: tropical subtropical, and warm temperate regions.

Habitats and relation to disease:

The principal breeding places are foul ground pools, ditches, cesspools, sewage filled drains and many large artificial containers. A very troublesome night biter, they readily attack man both indoors and outdoors. Although an important vector of the periodic strain of Wuchereria bancrofti in many Southeast Asian countries, Rozeboom (1962) reported conclusively that quinquefasciatus is not an important vector of human filariasis in the Philippines. It is, however, capable of

assuming an important vector role in urban development (Baisas, 1958; Rozeboom & Cabrera, 1964).

Culex (Culex) mimulus Edwards (fig. 265)

Culex mimulus Edwards, 1915. Bull. ent. Res. 5: 284 (♂♀). Type loc: Sarawak, Borneo (British (Nat. Hist.) Museum).

Culex (Culex) mimulus Edwards. Barraud, 1934. Fauna Brit. India, Dipt. 5: 412 (♂, L, fig.); Bonne-Wepster & Brug, 1937. Geneesk. Tijdschr. Ned. Ind. 7: 66 (♂♀); Baisas, 1938. Mon. Bull. Bur. Hlth., Manila 18: 214 (♂, fig., key); Bonne-Wepster & Brug, 1939. Geneesk. Tijdschr. Ned. Ind. 79: 1275 (L, fig.).

Culex mossmani Taylor, 1915. Proc. Linn. Soc. NSW 40: 181 (♂♀). Type loc: Mossman, Queensland, Australia (Univ. Sydney).

Culex (Culex) confusus Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 216 (♂♀, key, fig.). Type loc: Balabac Is. (lost). New synonymy.

I am treating C. confusus Baisas as a synonym since neither the original description and figure, nor the specimens (♀ & ♂, abdomen missing) from Balabac identified by Mr. Baisas as confusus, show any significant differences from mimulus.

The Philippine C. mimulus apparently shows considerable variation in the extent of the costal white spots and abdominal tergal bands, and also in the ♂ genitalia. However, there are no striking differences between forms worthy of recognition as separate taxa.

♀. Head: Proboscis with broad pale band. Thorax: No lower mesepimeral bristle. Wing: Costal white spots as follows: first spot

continued through subcosta to R_1 ; second spot from subcosta to base of fork R_{2+3} ; the apical spot quite variable, usually involves the tip of R_1 and near apex of R_2 ; middle of R_{4+5} , Cu_1 and basal portion of anal vein pale; fringe at tip of Cu_2 pale. Legs: With bases of tarsomeres I-IV narrowly pale ringed. Abdomen: Tergal pale bands variable: with median patches on segments II-IV, and lateral patches on posterior segments, or with broad bands progressively becoming narrow towards posterior segments.

♂. Wing and abdominal tergal markings as in ♀. Long segment of palpus with a row of short flattened setae, the terminal segment broadly pale distally, hairy. Genitalia as in figure 265. Subapical lobe of sidepiece with three slender rods; one broad leaf; three shorter flattened setae (sometimes 1 or 2 setae with apical serrations); clasper rather stout, thickset; the lateral plate of phallosome with 5 or 6 large teeth and few smaller ones; paraproct with large basal process, the crown composed of sharp spines; two or three cercal setae present.

Pupa and larva. Not available for description.

Material examined:

♀ Tacloban, Leyte, VII.1945; ♂♂♀♀ Isabella, Basilan Is., IX.1945; Jolo, Jolo Is., 1945 (Rozeboom, Knight & Laffoon); ♂ San Francisco, Agusan 10Km SE, 15.XI.1959 (L. W. Quate, empty snail shell); ♂♀ Puerto Princesa, Palawan, 27.IX.1945 (19th MGL, truck rut); ♂♀ Balabac Is., 23.VI.1934.

Recorded distribution:

Balabac Is. (as confusus); Borneo, Indonesia, Burma, Thailand, Malaya, Indochina, China, Ceylon, India, Nepal, New Guinea, Australia.

Habitats:

Some adults have been reared from larvae collected in empty snail shells and truck rut; the ♀ biting habits unknown.

Culex (Culex) sinensis Theobald

Culex gelidus var. sinensis Theobald, 1903. Monogr. Cul. 3: 180 (♀).

Type loc: Shaohyling, China (British (Nat. Hist.) Museum).

Culex (Culex) sinensis Theobald. Baisas, 1938. Mon. Bull. Bur. Hlth.

Manila 18: 209 (♀, E); Bohart, 1945. USNavmed 580, p. 79 (♂, L, key); La Casse & Yamaguti, 1950. Mosq. fauna Japan & Korea, p. 206 (♂♀, L, P, fig.).

Culex sepositus Leicester, 1908. Cul. Malaya 3: 152 (♀). Type loc:

Kuala Lumpur, Malaya (non-extant).

Taeniorhynchus tenax Leicester, 1908. Cul. Malaya 3: 167 (♀). Type

loc: Kuala Lumpur, Malaya (non-extant).

Culex tripunctatus Mochizuki, 1913. Fukuoka Acta Med. 7: 24 (♂♀, E).

Type loc: Fukuoka, Kyushu, Japan (location unknown).

A rather uncommon species; I have not had an opportunity to study the ♂ or the immature stages. The ♀ is easily distinguished by the mesonotal ornamentation by having the area anterior to the wing base covered with pale golden scales and with dark brown scales extending posteriorly into scutellum; the scutellar lobes with marginal golden scales; also in some specimens, a pair of dark lateral spots and a third median spot anteriorly. Vertex with golden decumbent and upright scales medianly, patches of dark brown upright and white broad scales on both sides. Proboscis with usual pale median band. Femora and tibiae

speckled, the mid and hind femora pale ventrally to basal 2/3, speckled and dark apically, the tarsomeres narrowly pale ringed. Abdominal terga II-VII with narrow golden apical bands, basal on VIII; the sterna largely pale golden with dark lateral patches.

Material examined:

♀♀ Calaccad, Mt. Prov., II.1963; Wackwack, Rizal, VIII-IX, 1945 (light trap).

Recorded distribution:

Bulacan; China, USSR (Maritime Prov.); India, Ceylon, Korea, Japan, Ryukyu-Retto, Formosa, Indonesia, Malaya, Thailand, Burma.

Habitats:

The larvae breed in ricefields and large weedy pools; ♀♀ have been collected in animal baited traps and bite man in houses during night time.

Culex (Culex) sitiens Wiedemann (figs. 270, 272 & 275)

Culex sitiens Wiedemann, 1828. Aussereurop. zweifl. Ins. 1: 542 (♀).

Type loc: Sumatra (Zoologisk Museum, Copenhagen). Bezzi, 1913. Philip. J. Sci. D8: 307 (listed); Bick, 1949. Nat. Hist. Misc. 41: 2 (listed).

Culex (Culex) sitiens Wiedemann. Bohart, 1945. USNavmed 580, p. 80 (listed); Bohart & Ingram, 1946. USNavmed 1055, p. 18 (♂, L, tax.); Penn, 1949. Pacific Sci. 3: 80 (P); Yamaguti & LaCasse, 1950. Mosq. Fauna Guam, p. 30 (♂♀, L); Iyengar & Memon, 1955. Bull. ent. Soc. 46: 7 (♂, L); Mattingly & Knight, 1956. Bull.

Brit. Mus. (Nat. Hist.) B4: 104 (tax.); Belkin, 1962. Mosq. S. Pacific vol. 1, p. 205 (♂♀, L, P).

Culex impellens Walker, 1859. Proc. Linn. Soc. Lond. 4: 91 (♀). Type loc: Makassar, Celebes (British (Nat. Hist.) Museum). Banks, 1906. Philip. J. Sci. 1: 987 (listed); Bezzi, 1913. Philip. J. Sci. D8: 307 (listed); Giles, 1904. J. trop. Med. 7: 368 (listed); Theobald, 1910. Monogr. Cul. 5: 331 (listed).

Culex microannulatus Theobald, 1901. Monogr. Cul. 1: 353 (♂♀). Type loc: Quilon, Travancore, Madras & Shahjahanpur, India (British (Nat. Hist.) Museum). Banks, 1906. Philip. J. Sci. 1: 988 (listed); Bezzi, 1913. Philip. J. Sci. D8: 507 (listed).

Culex (Culex) salinus Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 204 (♂♀, L, P, fig., key). Type loc: Caloocan, Rizal (lost).

New synonymy.

For complete synonymy see Stone, Knight & Starcke (1959, p. 260).

♀. Head: Proboscis with the usual median white band; vertex with all upright scales dark brown, covered with pale decumbent scales and with patches of broad white scales at sides. Thorax: Mesonotal scales largely brown with patches of golden and pale scales on prescutellar area, the scutellar scales pale; pleuron with patches of broad white scales on sternopleuron and upper mesepimeron. Wings: Dark, not speckled. Legs: Femora speckled, pale ventrally except for dark apices; tibiae with scattered pale scales; tarsomeres I-III with narrowly pale basal rings including apices of preceding segments. Abdomen: Dark brown, with variable tergal basal bands and lateral patches; the band usually produced medianly on II, broad on III-V then

abruptly narrowed on posterior segments, sometimes indistinct; sterna largely pale scaled at basal 1/2.

♂. Coloration as in ♀. Proboscis with ventral long hairs at base of pale band. Terminal segment of palpus white tipped, broad distal band and row of translucent setae on long segment. Genitalia as in figure 272. Subapical lobe with three stout rods, one slightly shorter and rounded at tip; one large, broad leaf and a seta; three or four slender setae with bent tips; clasper large and thickset at base, tapered apically; lateral plate of phallosome with three or four graduated teeth on median process and very large external process, the basal mesal portion of the plate hairy; paraproct with large basal process; three cercal setae.

Pupa. Not described here.

Larva (figs. 270 & 275). Readily recognizable by the small rounded anal papillae. Clypeal h-1 greatly enlarged, usually blunt apically; head h-4 single, h-5 with 6-8 branches, h-6 at most 5-branched, h-7 with 8-10 branches. Antenna spinose, infuscated and narrowed beyond insertion of shaft h-1; subapical and apical hairs all single, strong. Prothoracic h-1, 2 & 3 all single and equally developed. Comb teeth patch arranged in rows, each tooth with lateral and apical fringe. Siphon granulose, rather stout, narrowed distally, with 6 pairs of long ventral tufts, sometimes the distal pair with 2-3 weak and short branches; one lateral pair with 2-3 weak branches; pecten teeth long, each tooth with even lateral denticles; length of siphon variable. Saddle finely spiculate, except distally with coarse spines; lateral h-1 long, single; dorsal brush 2 with 5 branches, 3 single.

Material examined:

Series of larvae, Irahuan, Pto. Princesa, Palawan, VI.1945
 (ground pool with algae, hot spring); Caminawit Pt., San Jose, Mindoro,
 XI.1944, 1945 (G. Penn, E. S. Ross & Culver; foxhole near beach Subic
 Bay, Zambales, 1945; Oriental Misamis, 1946 (J. Enke; ground pool near
 beach); Dansalan, Lanao, IV.1946 (J. Enke, Corcega; bamboo stumps);
 Nichols Field, Rizal, X.1948 (J. Tamp); ♂♂♀♀ Calicoan Is., I.1945;
 Davao, I.1947; Zamboanga, V-XI.1923-25 (Fabrigo & Visaya); ♂♂♀♀ Jolo,
 Jolo; Ft. Pikit, Cotabato, IV.1907 (Halliday).

Recorded distribution:

Manila, Rizal (as salinus), Jolo, Leyte, Panay; Coastal: Oriental
 region to Okinawa; Tanganyika to southern Arabian Peninsula,
 Madagascar, northern Australia & Pacific islands to Samoa.

The type of C. salinus Baisas has been lost but the original
 description corresponds equally well to C. sitiens, particularly the
 larval characters; Baisas (1938, p. 205) compared salinus with sitiens
 from India; salinus shows identical phallosome structures. I consider
C. salinus as a synonym of C. sitiens.

Culex (Culex) tritaeniorhynchus ssp. summorosus Dyar (figs. 266-267)

Culex summorosus Dyar, 1920. Insec. Inscit. Menst. 8: 180 (♂). Type
 loc: Los Banos, Laguna (U. S. National Museum). Baisas, 1938.
 Mon. Bull. Bur. Hlth. Manila 18: 186 (♂♀, L, P, tax.); Bohart,
 1945. USNavmed 580, p. 80 (syn. with vishnui).

Culex (Culex) tritaeniorhynchus Giles. Bohart, 1945. USNavmed 580,
 p. 80 (key, ♂ gen. fig); Bick, 1949. Nat. Hist. Misc. 41: 2, 4

(listed); LaCasse & Yamaguti, 1950. Mosq. fauna Japan & Korea,
p. 230 (♂♀, L, P, fig.).

Culex (Culex) tritaeniorhynchus ssp. summorosus Dyar. Colless, 1957.

Ann. trop. Med. Parasit. 51: 98 (♂♀, L, fig., tax., to ssp. status);
Baisas, 1957. Philip. J. Sci. 86: 118 (rel. to filariasis).

Culex tritaeniorhynchus var. siamensis Barraud & Christophers, 1931.

Rec. Malar. Surv. India 2: 283 (♂). Type loc: Chiangmai,
Thailand. Colless, 1957. Ann. trop. med. Parasit. 51: 98 (syn.).

The adults are readily distinguished from those of other members
of the group by the predominantly dark brown mesonotal scales and by the
presence of pale scales on venter of proboscis; the larva has a large
patch of comb teeth, each tooth rounded and fringed apically.

♀. Head: Proboscis with the usual pale band, and few ventral
pale scales. Vertex with all upright scales dark brown. Thorax:
Mesonotal scales almost uniformly brown or coppery brown, few pale
golden scales on prescutellar space; no lower mesepimeral bristle.
Legs: Femora and tibiae pale ventrally, dark at apices; clear pale
narrow rings on tarsomeres I-III. Abdomen: Tergal banding variable,
usually with rather narrow pale basal bands reduced towards posterior
segments; or may be as broad as C. annulus; sterna largely pale with
lateral dark patches.

♂. Coloration essentially as in ♀. Proboscis with lateral hairs
at base of pale band; terminal segment of palpus dark; the long segment
without row of short flattened setae. Genitalia (fig. 266) similar to
pseudovishnui. Subapical lobe with three rods, one large leaf and a
seta, two or three setae with apical serrations, and one much enlarged;

clasper thickset; the lateral plate of phallosome with four stronger pointed median processes, one rounded or foliform; large basal process of paraproct; two or three cercal setae.

Pupa. Respiratory trumpet narrowly elongate, slightly wider at opening, the tracheoid reaching to almost mid portion. Metanotal hairs C-10, 11 & 12 all branched and equally developed. Abdominal h-5 double and stronger on V-VI; h-9 with 4-5 dendritic branches and inserted at about distal 1/3; 8-10 dendritic branches on VIII. Paddle rather narrow, outer margin and midrib strong, with two short apical hairs.

Larva (fig. 267). Clypeal h-1 slender, dark spine; head h-4 fine, single or double, h-5 & 6 with 2-3 pilose long branches. Antenna spinose, narrowed and infuscated beyond insertion of shaft h-1, sub-apical and apical hairs strong. Prothoracic h-1, 2, 3 on prominent tubercle, all single and about equal in length. Comb teeth arranged in triangular patch, each tooth fringed apically. Siphon granulose, long and tapered, with at most five pairs of 3-5 weakly branched tufts, and one pair of lateral tufts; pecten teeth with lateral denticles to apex. Saddle spinose, lateral h-1 with 2 or 3 branches; dorsal brush h-2 with 2 or 3 short branches, 3 single.

Material examined:

Larvae, Nueva Ecija, V-VI.1945 (D. F. Bray, stream); ♂♂♀♀ La Union, 1945; Rizal, 1946 (light trap); Caminawit Pt., San Jose, Mindoro, XII.1944, I.1945 (Penn, E. S. Ross); Leyte, 1945 (E. Shields); Samar, XII, 1944; Parang, Cotabato, V.1945 (R. Staples); Bukidnon, 1946 (ground pool); Jolo, Jolo, 1945.

Recorded distribution:

Jolo, Leyte, Palawan, Sorsogon; Formosa, Japan, Korea, China, Manchuria, Ryukyu-Retto, Indochina, Indonesia, Malaya, Thailand, India.

Habitats and relation to disease:

A rather common species throughout the Philippines; the ♀♀ are persistent biters and readily enter houses and may assume some importance in the transmission of filariasis. The larvae are commonly found in ground pools, rice paddies, stream margins and rock pools.

Culex (Culex) whitmorei (Giles) (figs. 271, 273-274)

Taeniorhynchus whitmorei Giles, 1904. J. trop. Med. 7: 367 (♀). Type loc: Camp Stotsenberg (Angeles), Pampanga (British (Nat. Hist.) Museum). Banks, 1906. Philip. J. Sci. 1: 989 (listed).

Culex (Culex) whitmorei Giles. Barraud, 1934. Fauna Brit. India, Dipt. 5: 406 (♂♀, L, fig., key); Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 211 (♂♀, L, P, key, fig.); Bohart, 1945. USNav-med 580, p. 81 (key, listed); LaCasse & Yamaguti, 1950. Mosq. Fauna Japan & Korea, p. 211 (♂♀, P, L, fig.).

Taeniorhynchus argenteus Ludlow, 1905. Canad. ent. 37: 98 (♀). Type loc: Angeles, Pampanga (U. S. National Museum). Banks, 1906. Philip. J. Sci. 1: 989 (listed); Bezzi, 1913. Philip. J. Sci. D8: 307 (listed); Dyar & Shannon, 1925. Insec. Inscit. Menst. 13: 84 (syn.).

Theobaldiomyia whitmorei Giles. Bezzi, 1913. Philip. J. Sci. D8: 307 (listed).

For complete synonymy see Stone, Knight & Starcke (1959, p. 265).

C. whitmorei, like gelidus, is distinguished by the marked ornamentation of the mesonotum, and easily separated by the diagnostic characters mentioned in the key. It is further characterized by the following:

♀. Proboscis with broad white band; vertex with all white decumbent scales, few brown upright scales confined to nape and sides. Mesonotum with white scales from front to level of wing base then continued posteriorly through prescutellar space onto midlobe of scutellum, the supraalar and prescutellar areas dark to lateral lobes; two dark round spots present on mid anterior portion; no lower mesepimeral bristle. Femora and tibiae speckled, venter of hind and mid femora extensively pale; the bases of tarsomeres I-IV narrowly pale; abdominal basal tergal bands usually produced triangularly; sterna largely pale.

♂. Coloration as in ♀, except narrower pale band on proboscis, and more extensive abdominal tergal bands. Palpus with a row of translucent setae on long segment. Genitalia as in figure 273. Subapical lobe of sidepiece with three slender rods; three short setae with bent tips; one large broad leaf and a short seta; clasper thickset; lateral plate of phallosome with three large teeth almost equal in size; basal process of paraproct short, the crown with numerous sharp spines; three or six cercal setae present.

Pupa. Not available for study.

Larva (figs. 271-274). Clypeal h-1 dark, spine-like; head h-4 tiny; h-5 & 6 each with 2 long heavy branches, h-7 with 8-10 pilose branches. Mentum teeth large. Antenna spinose, the distal portion beyond shaft h-1 infuscated; subapical and apical hairs strong.

Prothoracic h-1, 2 & 3 on prominent tubercle, all single and equally long. Comb teeth few, about six or eight, each tooth long and pointed with fine basal lateral fringe. Siphon tapered, slightly curved at mid portion, with strong apical spine and a pair of long setae on valve; five pairs of tufts, and two or three additional pairs of short lateral tufts; pecten teeth elongate, with fine lateral fringe. Saddle finely spiculate distally; dorsal brush h-2 & 3 both single; lateral h-1 with 2 weak branches.

Material examined:

♀♀♂♂ Calaccad, Mt. Province, 3, 12-13, 20.II.1963 (L. E. Rozeboom); Wackwack, Rizal, 24.XII.1945 (light trap); Camp Nichols, Rizal, 14-30.IX.1924 (Pvt. Carraway); Ft. McKinley, Rizal, VIII.1920; Los Banos, Laguna, 22.IX.1945; Camp Stotsenberg, 30.I.1920 (San Fernando, La Union, 14.IX.1945 (S. E. Shields); Calicoan Is., 12.I.1945 (J. H. Paullus); Tala, Rizal, 15.VII.1955 (F. E. Baisas); Natividad, Pangasinan, 16-18.V.1945 (D. F. Bray, ricefields); San Jose, Mindoro, 27.VI.1945 (E. S. Ross, biting at night).

Recorded distribution:

Laguna, Rizal, Pampanga, Pangasinan; Oriental region, China, Korea, USSR (Maritime Prov.), Japan, New Guinea.

Habitats:

The ♀♀ were caught inside houses and biting at night; the larvae breed largely in ground water, rice paddies, pools and margins of slow moving streams.

Nomen dubiumCulex (Culex) suborientalis Baisas

Culex (Culex) suborientalis Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 217 (♀). Type loc: Baguio, Luzon (lost).

The identity of suborientalis is uncertain; the original description is very inadequate and based only on a single ♀ specimen. The ♀ type has been lost and no other material is available for study. I would, therefore, prefer to treat C. suborientalis as a nomen dubium.

MisdeterminationCulex (Culex) orientalis Edwards

Culex orientalis Edwards, 1921. Bull. ent. Res. 12: 338 (♂♀). Type loc: Tokyo (Honshu), Japan (British (Nat. Hist.) Museum); Baisas, 1938. Mon. Bull. Bur. Hlth. Manila 18: 217 (♀).

No specimen has been found in the collection, although Baisas (1938) provisionally referred to orientalis the ♀♀ specimens from Balabac Is. and Laguna on the extent of the costal white spot. I suspect this is probably no more than a variation of mimulus.

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FIGURES

1. A map of the Philippines
2. Distribution map of the Culicine Mosquitoes of the Philippines
(exclusive of the Aedes)
3. Thorax, dorsal
4. Thorax, lateral
5. Wing venation and cell designation
6. Pupa
7. Larva

Wings of Genera:

8. Ficalbia (Mimomyia)
 9. Mansonia (Mansonioides)
 10. Coquillettidia (Coquillettidia)
 11. Uranotaenia
 12. Hodgesia
 13. Zeugomyia
 14. Orthopodomyia
 15. Aedeomyia
 16. Heizmannia
 17. Armigeres (Armigeres)
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- F. (Mimomyia) chamberlaini, Larva: 19. antenna, 20. head, 21. terminal segment; Pupa: 22. terminal segment, 23. respiratory trumpet, 24. metanotum.
- F. (Etorleptiomyia) luzonensis, 25. ♂ genitalia; Larva: 26. head; Pupa: 27. terminal segment, 28. respiratory trumpet, 29. metanotum;

30. terminal segment of larva.

F. (Ravenalites) deguzmanae, 31. ♂ genitalia; Larva: 32. antenna, 33. head; Pupa: 34. terminal segment, 35. respiratory trumpet, 36. metanotum, 37. terminal segment of larva.

Coq. (Coq.) aureosquammata, 38. ♂ genitalia.

Mansonia (M.) annulifera, 39. ♂ genitalia.

Coq. (Coq.) crassipes, 40. ♂ genitalia.

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M. (M.) annulata, 49. ♀ tergum VIII.

M. (M.) dives, 50. ♀ tergum VIII.

M. (M.) uniformis, 51. ♀ tergum VIII.

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U. arguellesi, Pupa: 59. terminal segment, 60. metanotum, 61. respiratory trumpet; 62. ♂ genitalia; Larva: 63. antenna, 64. head, 65. terminal segment.

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segment.

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U. lateralis, 84. ♂ genitalia; Larva: 85. antenna, 86. head, 87. terminal segment.

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U. rossi, 92. ♂ genitalia.

U. bimaculata, 93. ♂ genitalia (lectotype).

U. mendiolai, 94. ♂ genitalia; Larva: 95. antenna, 96. head, 97. terminal segment; Pupa: 98. terminal segment, 99. metanotum, 100. respiratory trumpet.

U. philippinensis, Pupa: 101. terminal segment, 102. respiratory trumpet; 103. ♂ genitalia; Larva: 104. antenna, 105. head, 106. terminal segment.

U. testacea, 107. ♂ genitalia; Larva: 108. antenna, 109. head, 110. terminal segment; Pupa: 111. terminal segment, 112. metanotum, 113. respiratory trumpet.

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Culex (Lutzia) fuscanus, 184. ♂ genitalia; Larva: 185. antenna, 186. head, 187. terminal segment; Pupa: 188. terminal segment, 189. respiratory trumpet; halifaxii, 190. ♂ genitalia.

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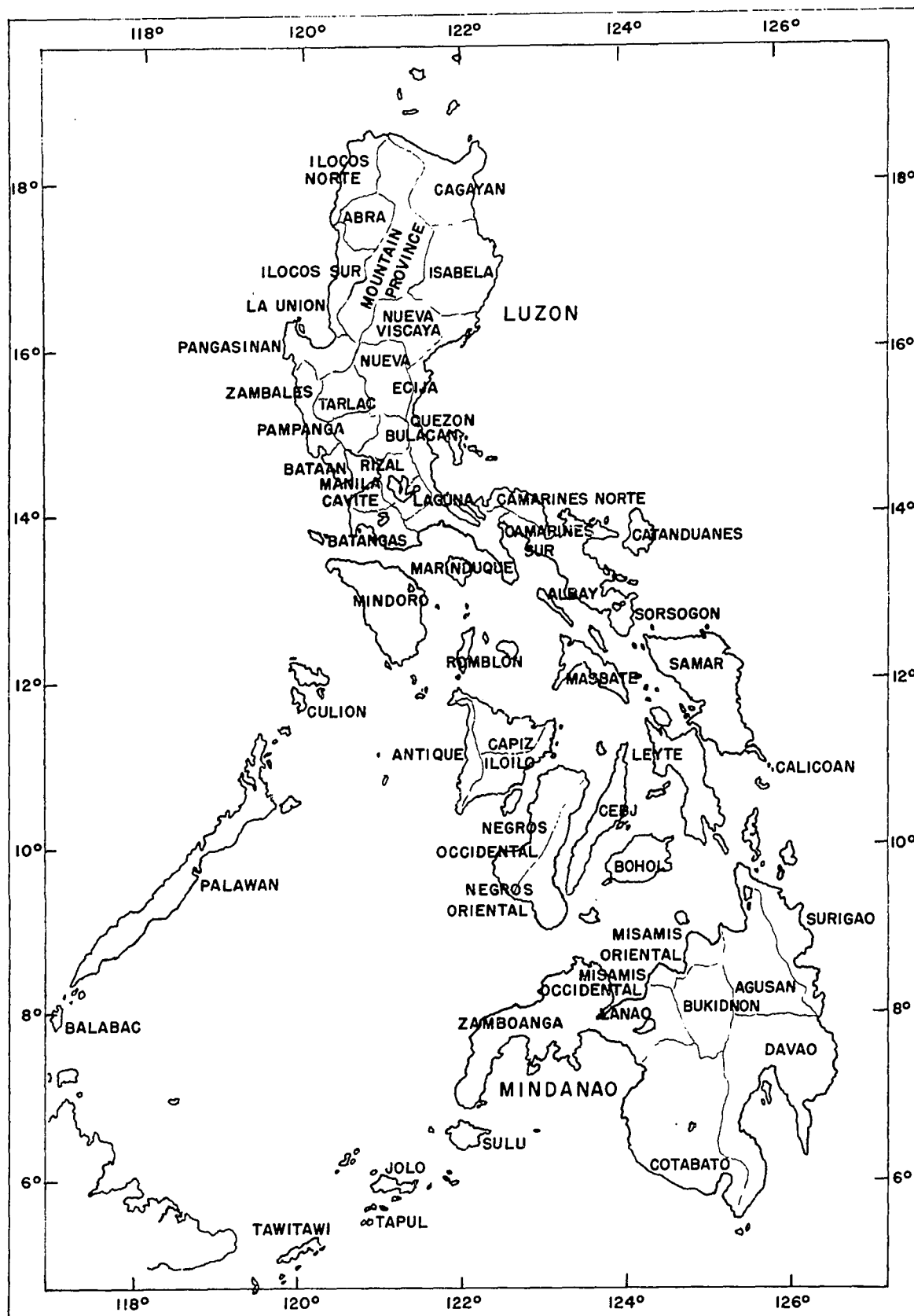
Culex (Neoculex) brevipalpis, 206. pupal respiratory trumpet.

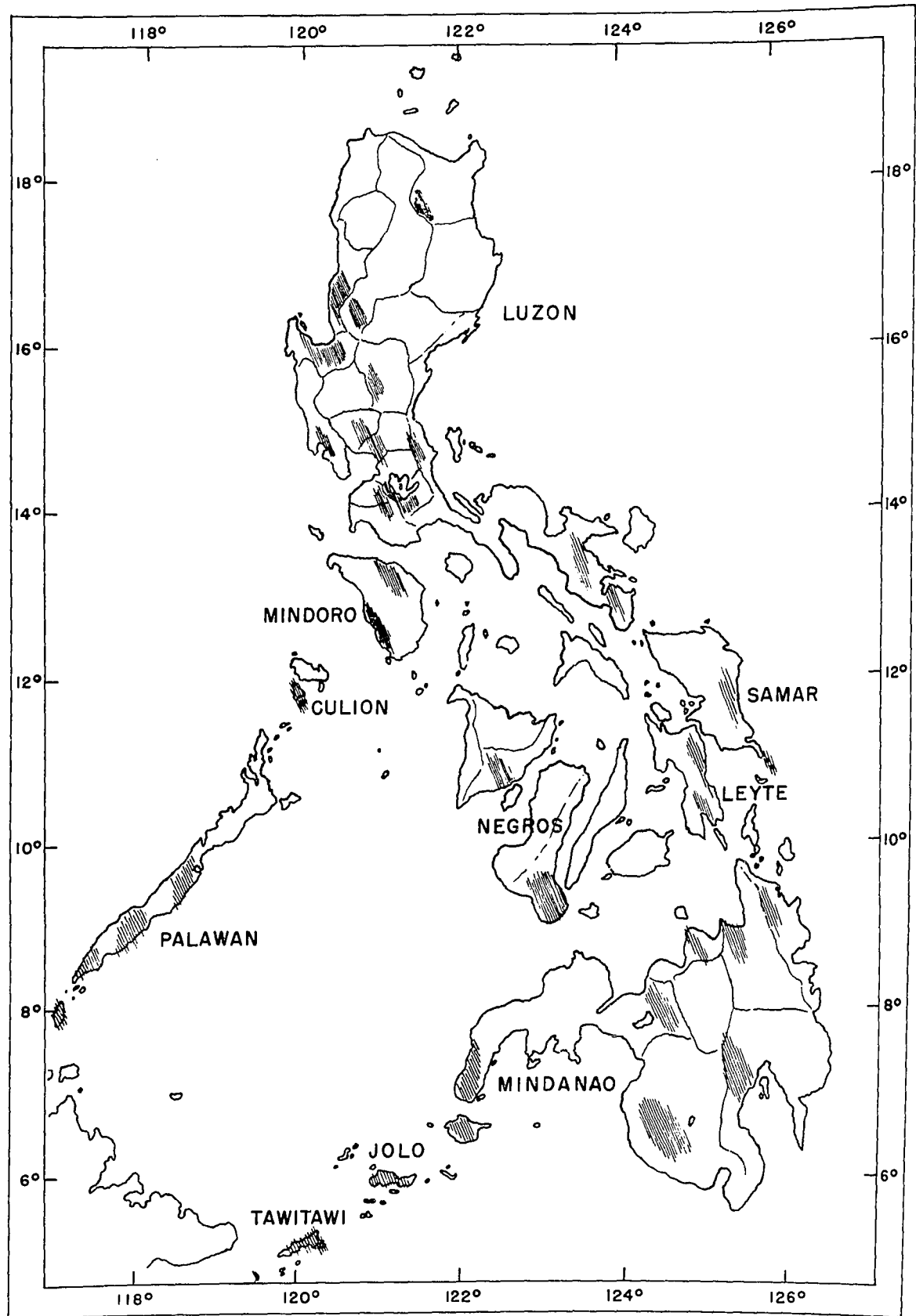
Culex (Lophoceraomyia) cinctellus, 207. ♂ genitalia; gibbulus n. sp., 208. ♂ genitalia (holotype); josephinae, 209. ♂ genitalia, 210. ♂ antenna, flagellomere V; infantulus, 211. ♂ genitalia, lavatae, 212. ♂ genitalia; minor, 213. ♂ genitalia, 214. ♂ antenna, flagellomere V; pachecoi, 215. ♂ genitalia (paratype), 216. ♂ antenna, flagellomere V; rubithoracis, 217. ♂ genitalia; macdonaldi, 218. ♂ antenna, flagellomere V, 219. ♂ genitalia, 220. pupal respiratory trumpet; 221. prothoracic hair grp. of larva; mammilifer, 222. ♂ genitalia, 223. ♂ antenna, flagellomere V, 224. pupal respiratory trumpet; Larva: 225. prothoracic hair

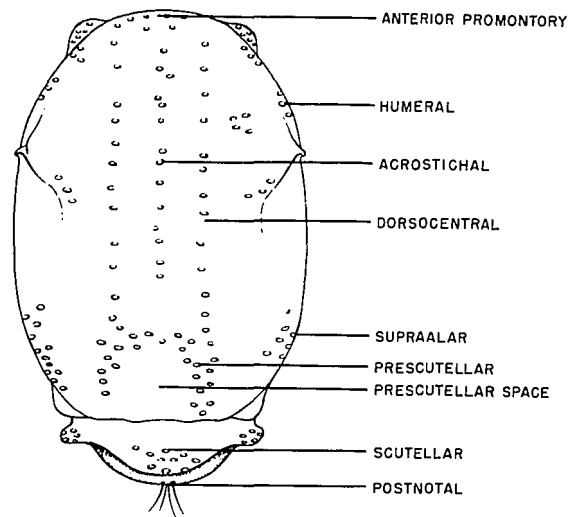
grp., 226. antenna, 227. head; reidi, 228. ♂ antenna, flagellomere V, 229. ♂ genitalia; uniformis, Larva: 230. terminal segment, 231. antenna, 232. pupal respiratory trumpet.

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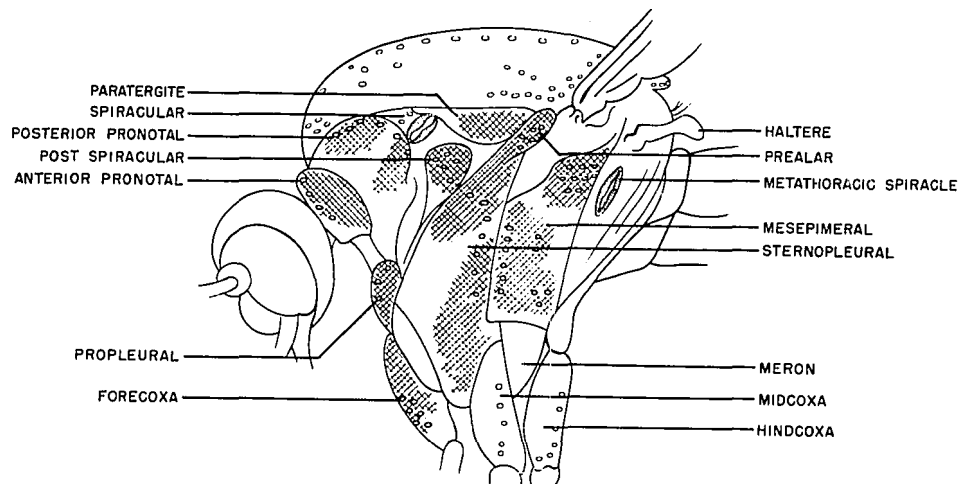
Culex (Culex) annulus, 251. ♂ genitalia; Larva: 252. terminal segment, 253. clypeal h-1; annulirostris, Larva: 254. terminal segment, 255. clypeal h-1; 256. ♂ genitalia; bitaeniorhynchus, 256a. ♂ genitalia, Larva: 257. terminal segment, 258. clypeal h-1; fasyi, 259. ♂ genitalia; fuscocephalus, 260. ♂ genitalia, gelidus, 261. ♂ genitalia, Larva: 262. terminal segment; incognitus, Larva: 263. terminal segment, 264. ♂ genitalia; mimulus, 265. ♂ genitalia; tritaeniorhynchus summosus, 266. ♂ genitalia, 267. Larva: terminal segment; pseudovishnui, 268. Larva: terminal segment; quinquefasciatus, 269. ♂ genitalia; sitiens, Larva: 270. terminal segment, 275. clypeal h-1, 272. ♂ genitalia; whitmorei, 273. ♂ genitalia, Larva: 274. terminal segment, 271. clypeal h-1.



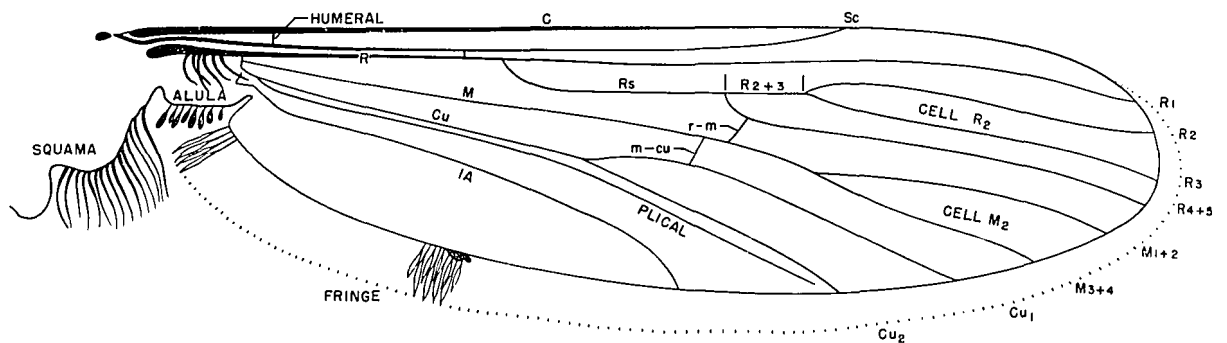




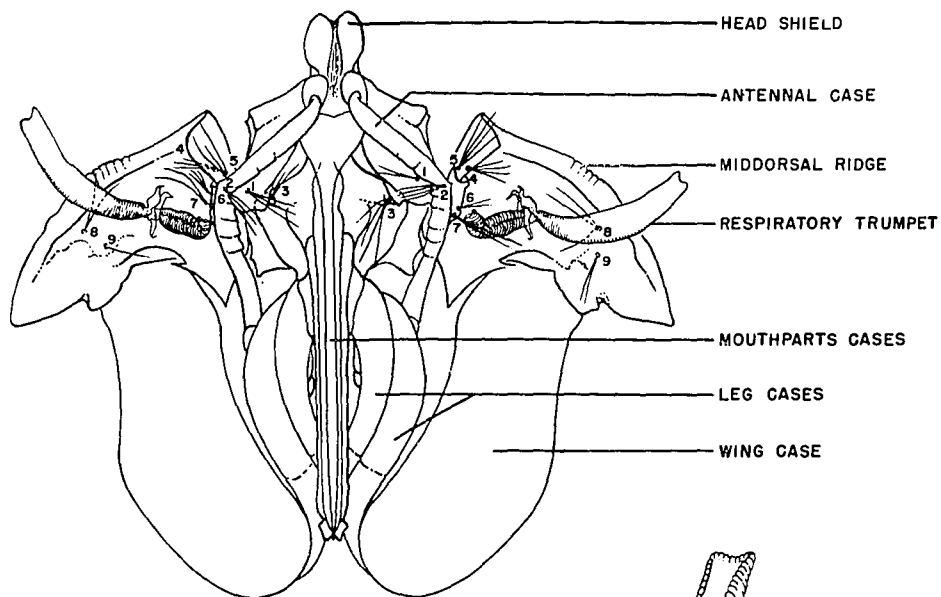
3 THORAX-DORSAL BRISTLES



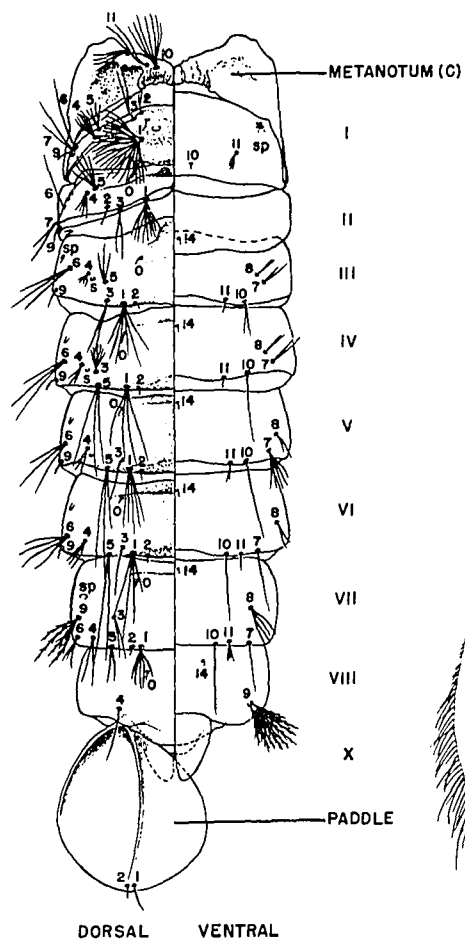
4 THORAX-LATERAL BRISTLES AND SCALING



5 WING

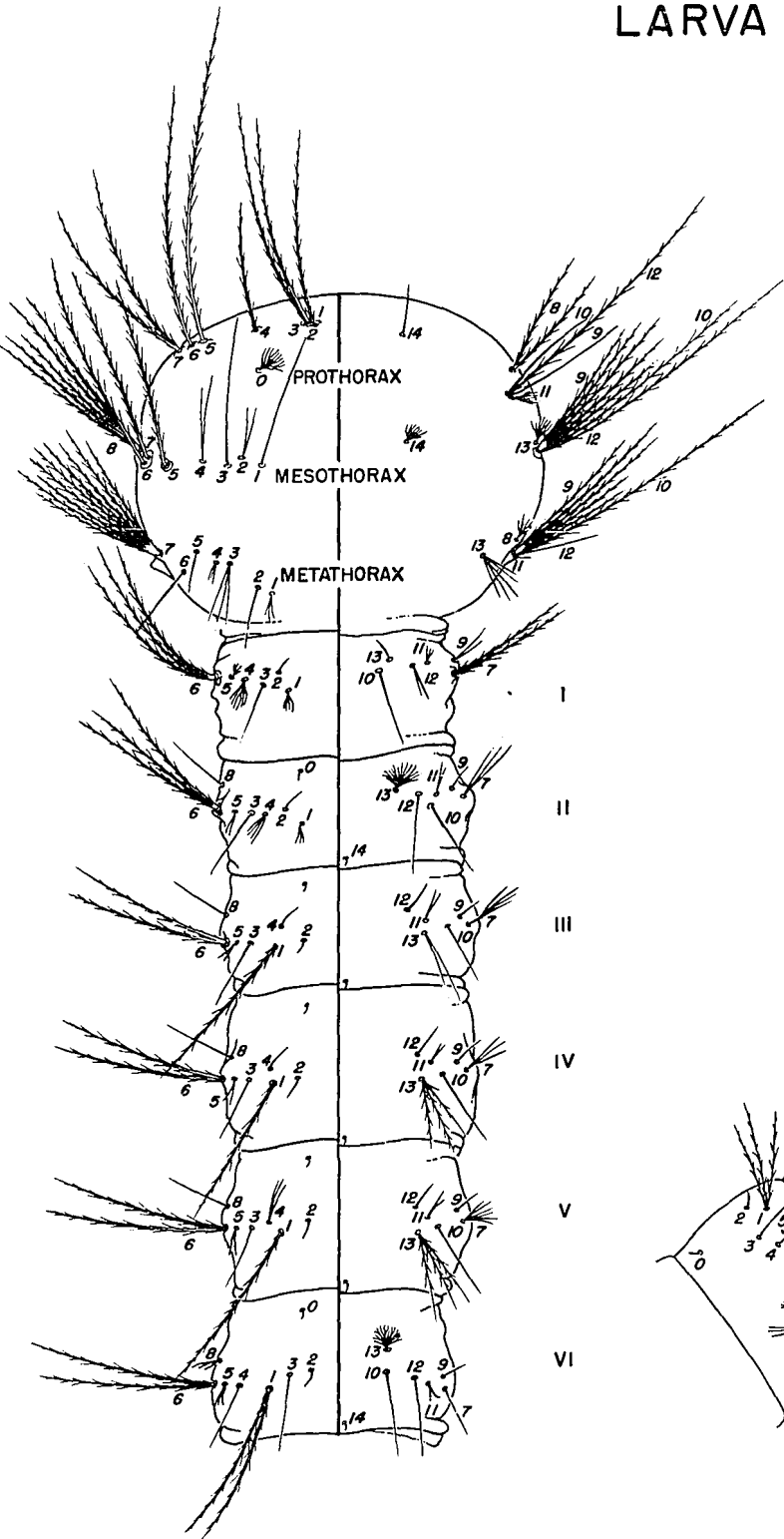


CEPHALOTHORAX



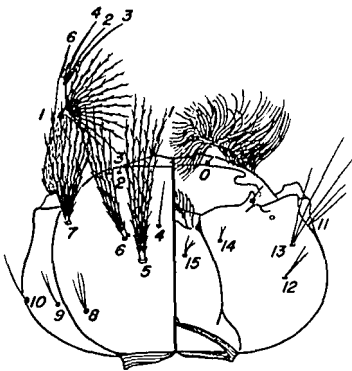
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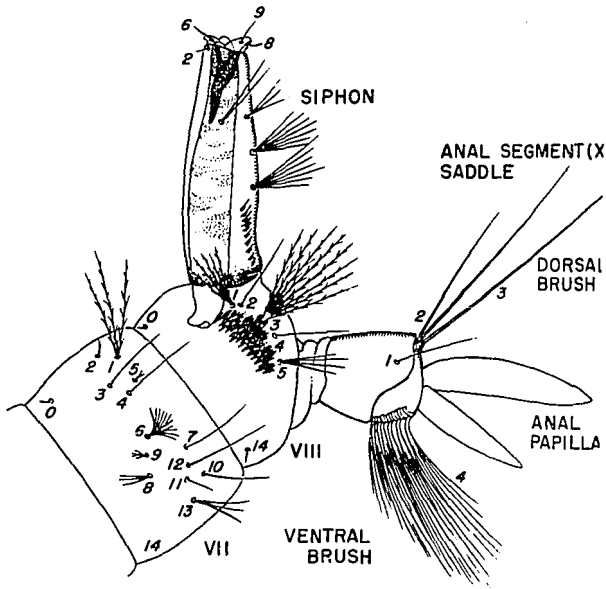
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ABDOMEN



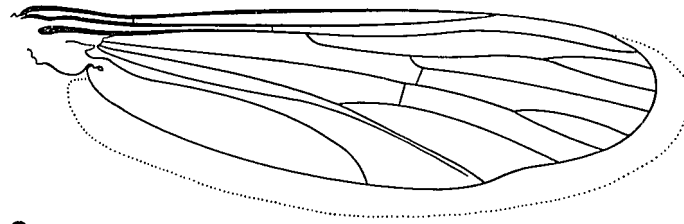
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HEAD

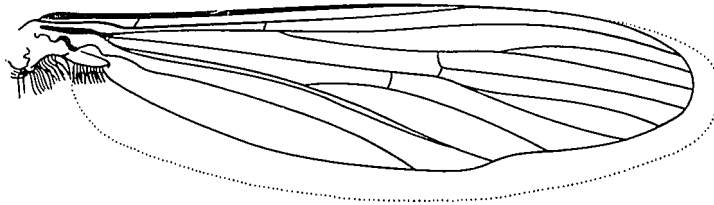


TERMINAL SEGMENT

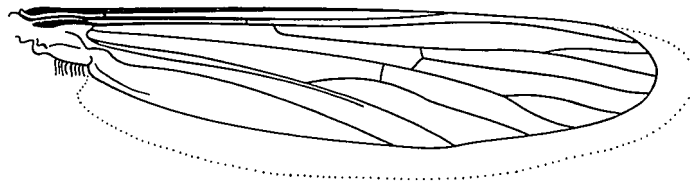
LATERAL



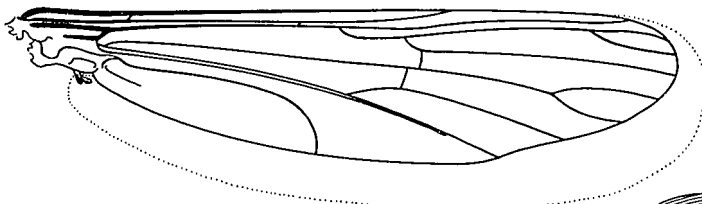
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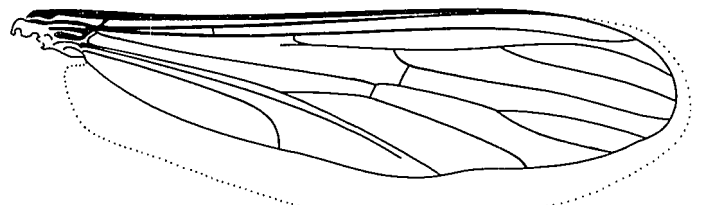
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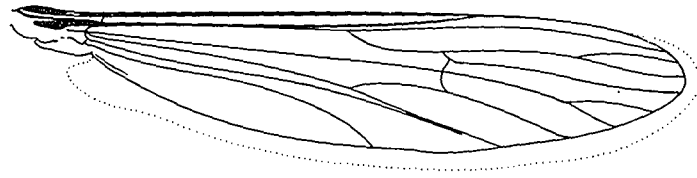
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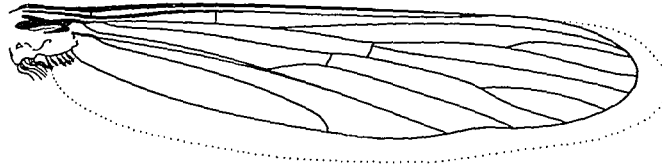
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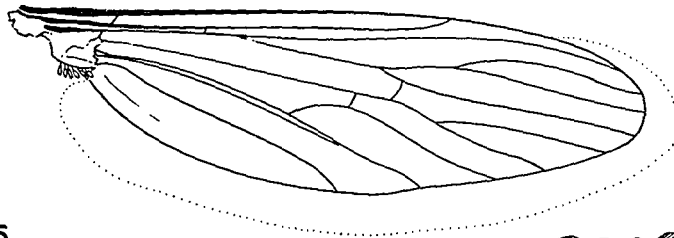
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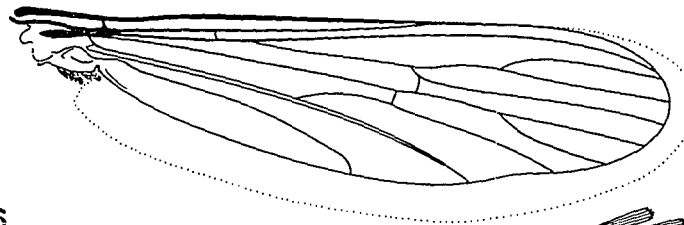
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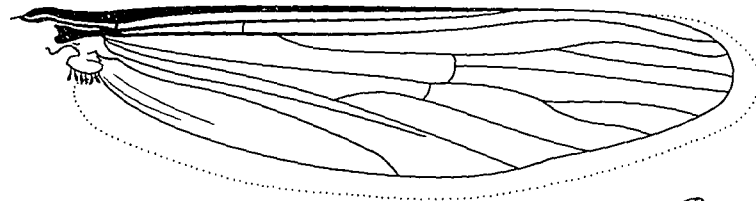
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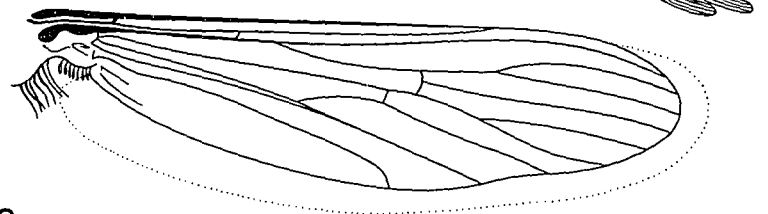
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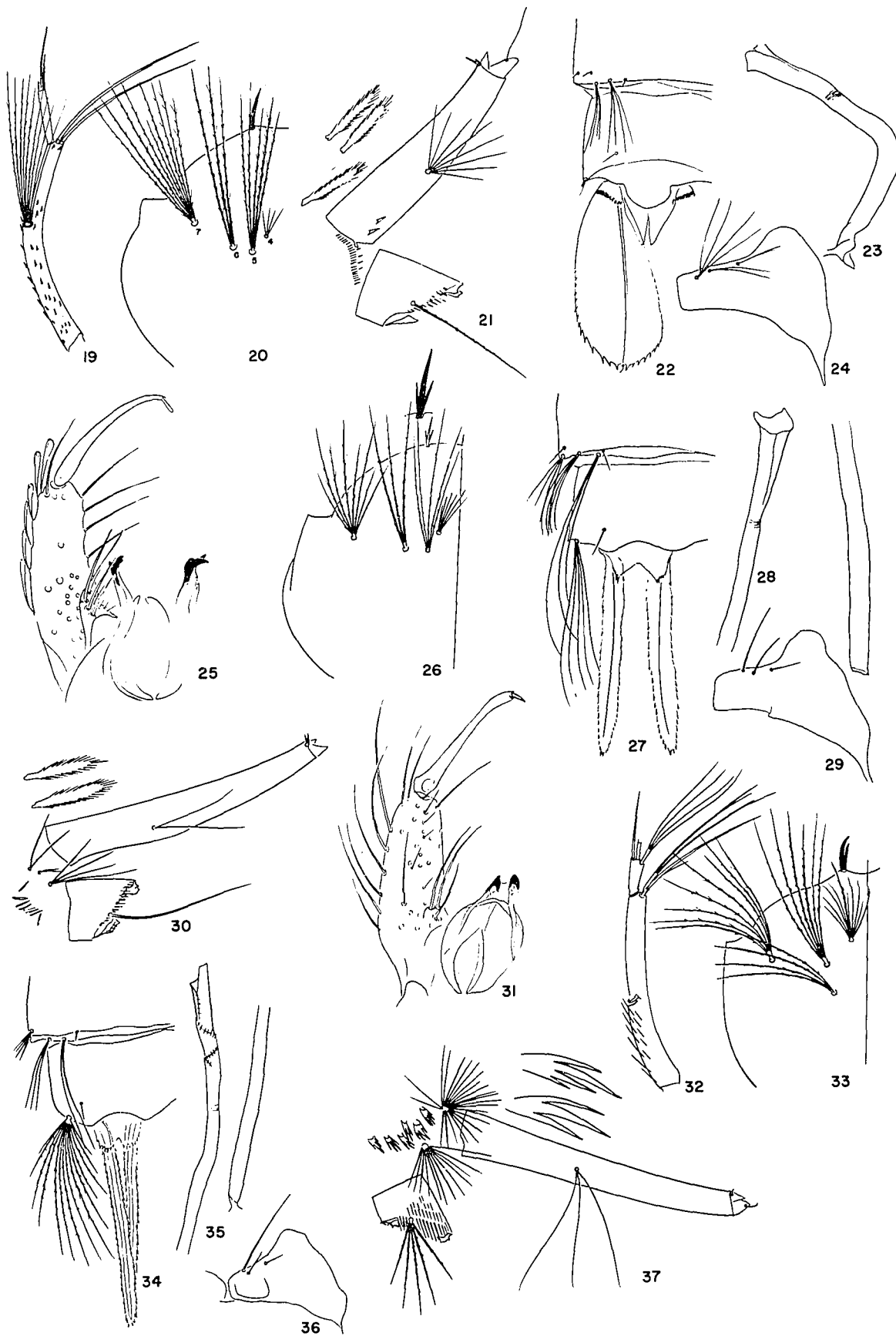
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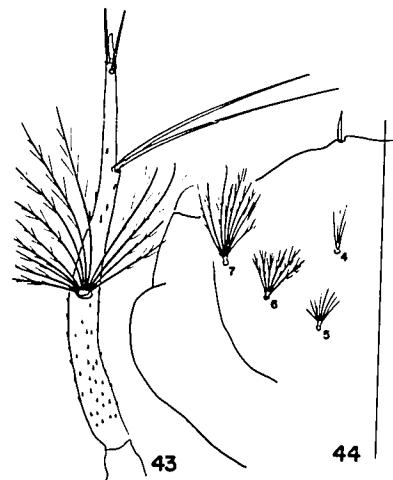
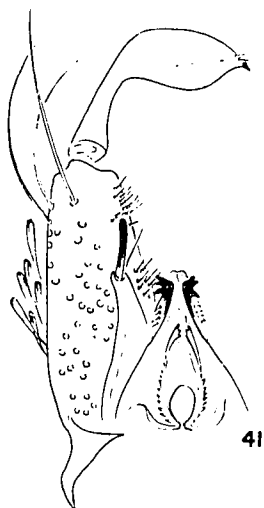
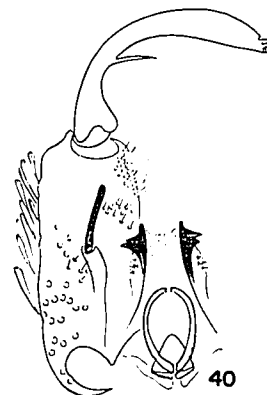
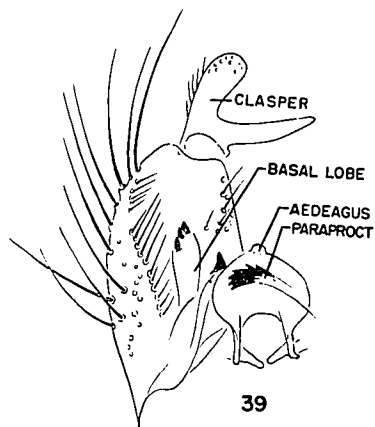
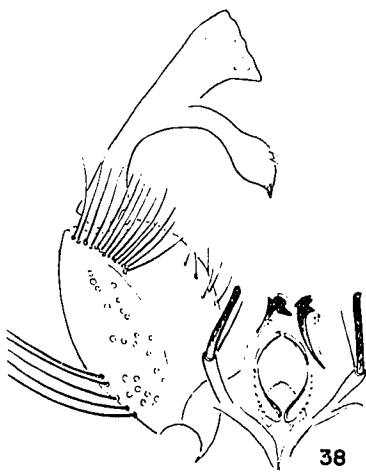


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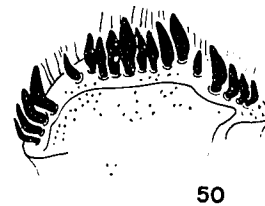
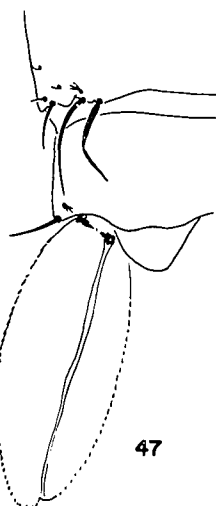
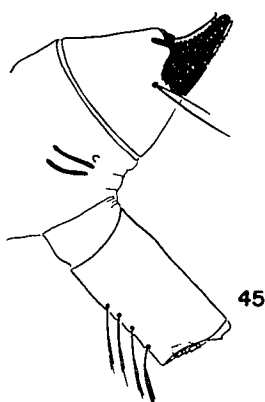


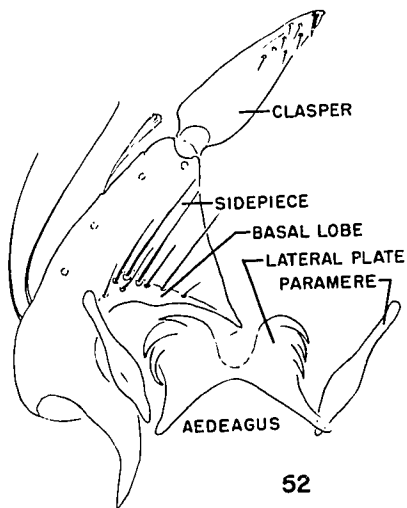
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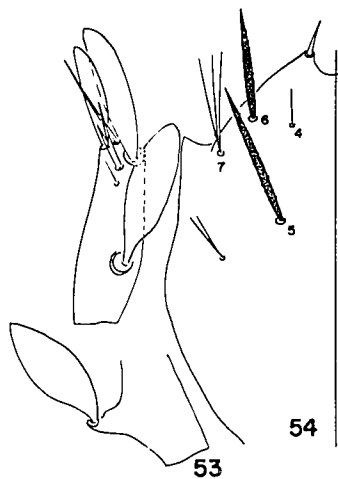


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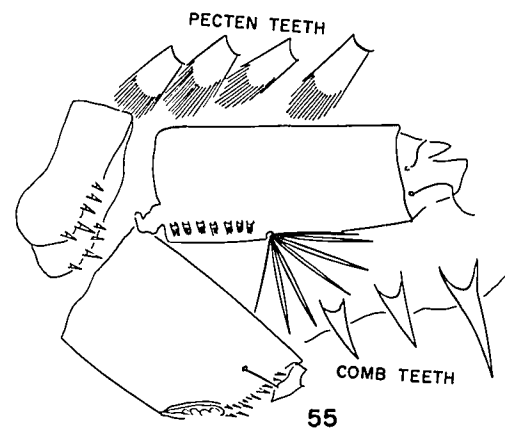




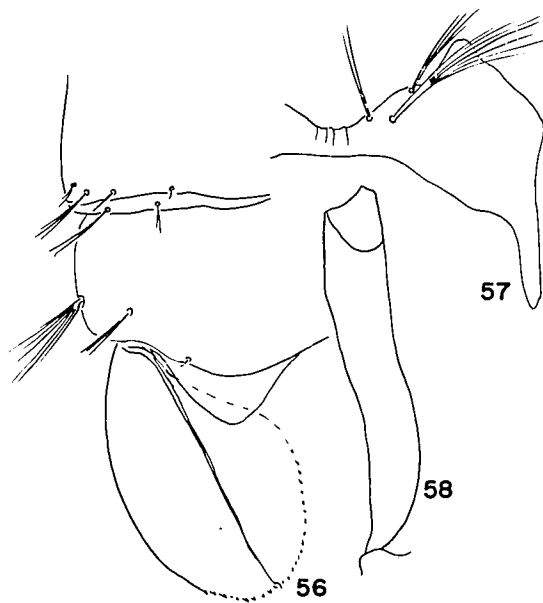
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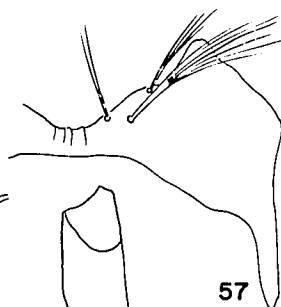
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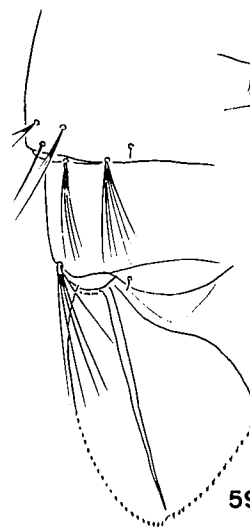
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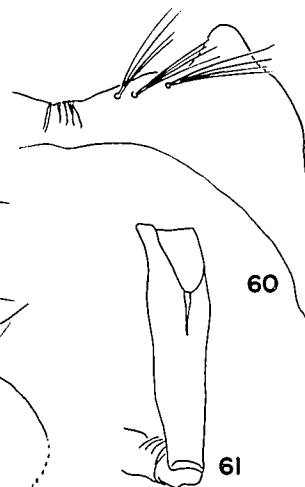
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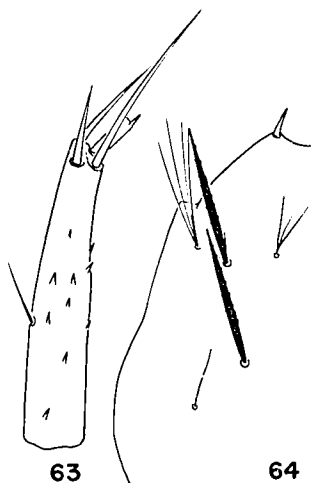
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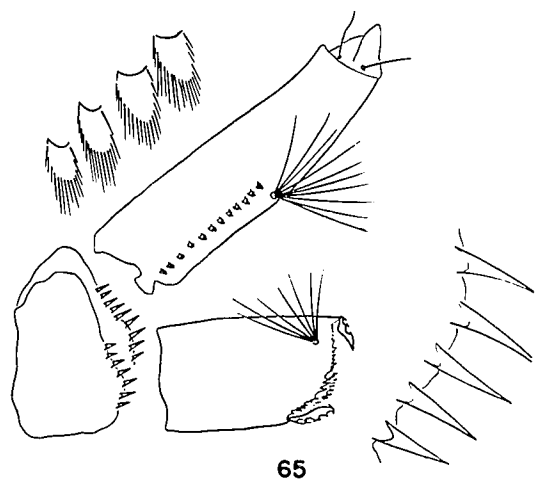
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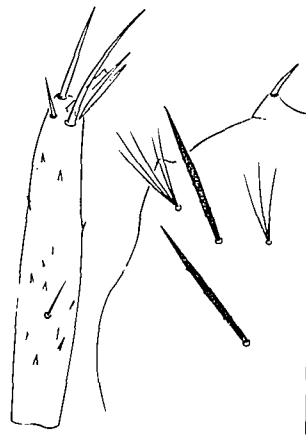
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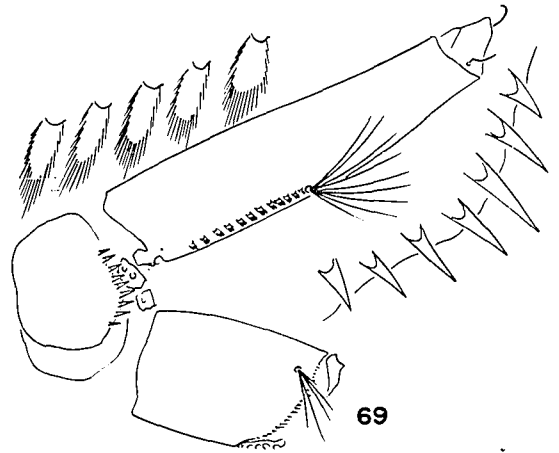
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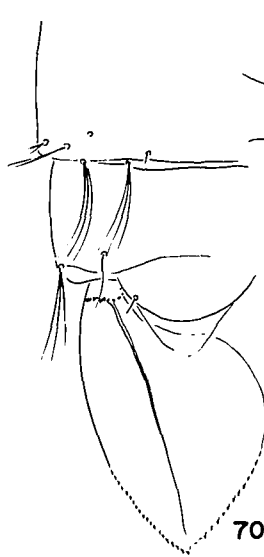
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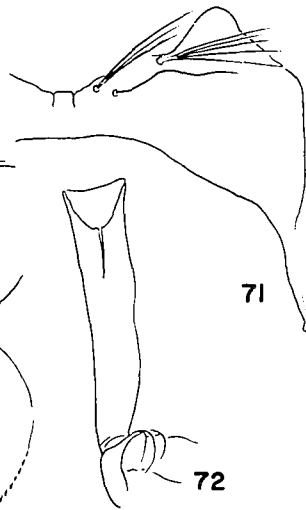
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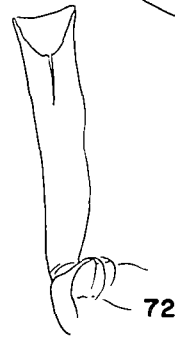
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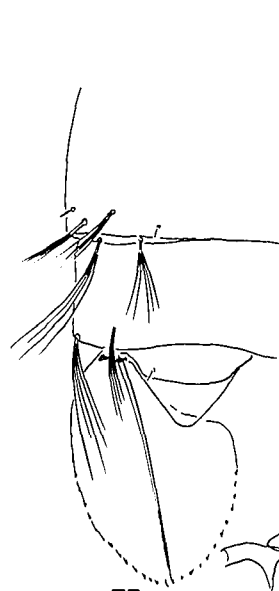
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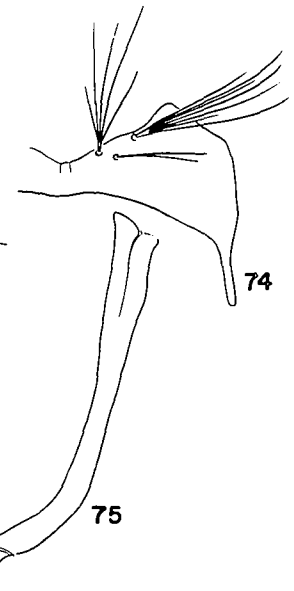
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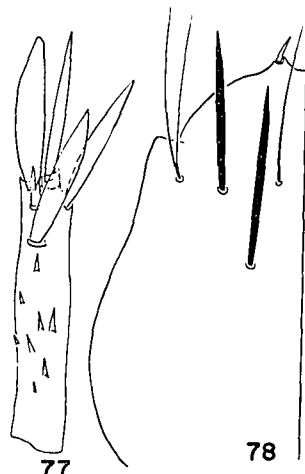
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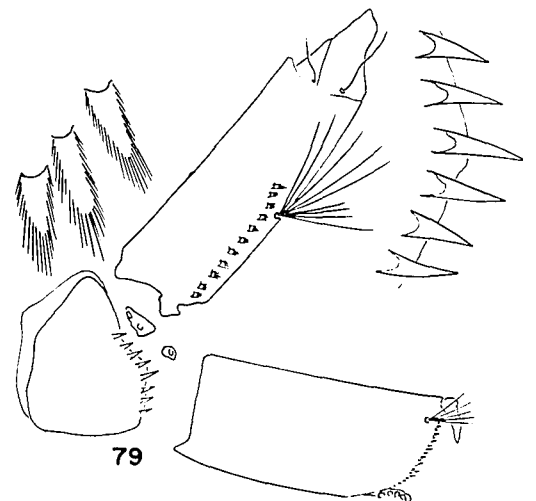
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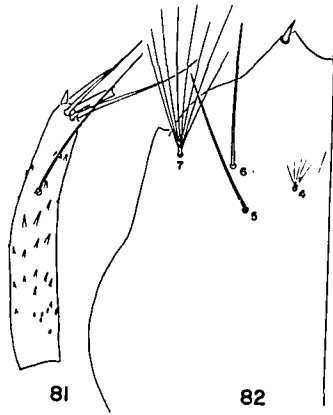
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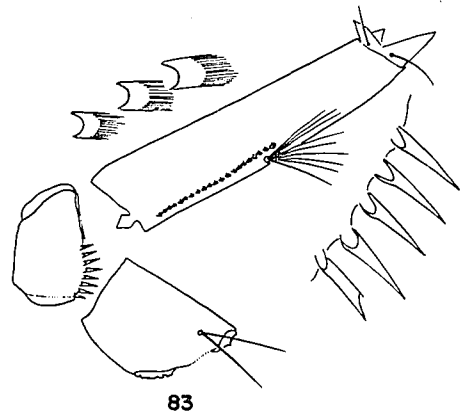


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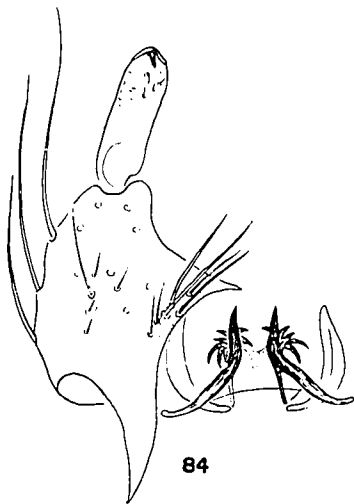


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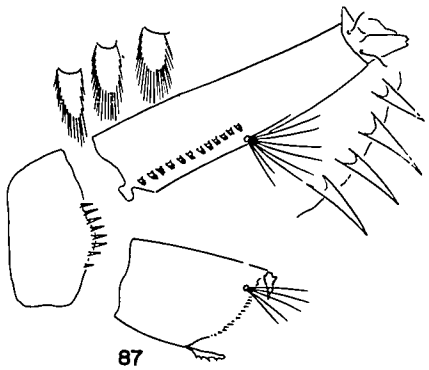


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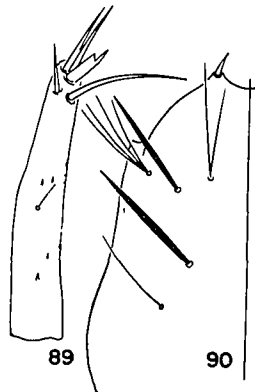


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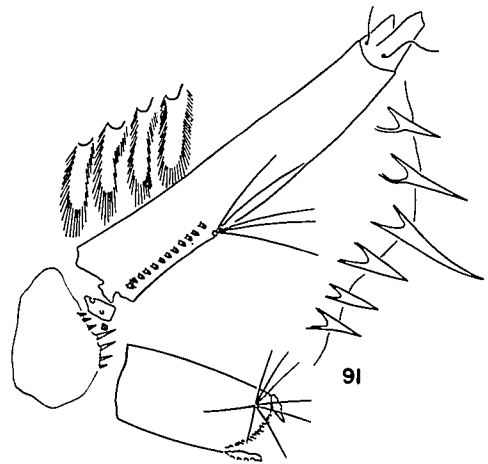


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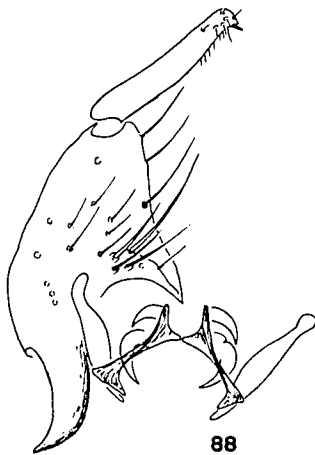


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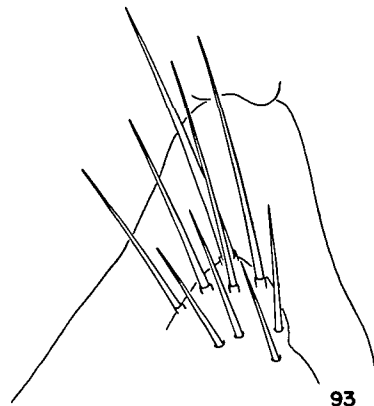
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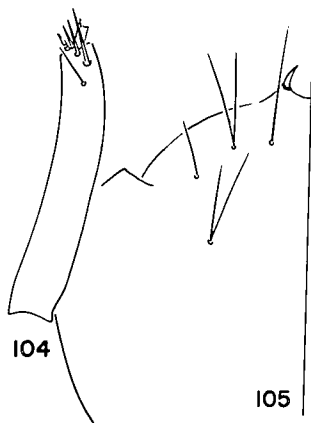
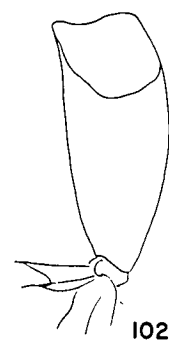
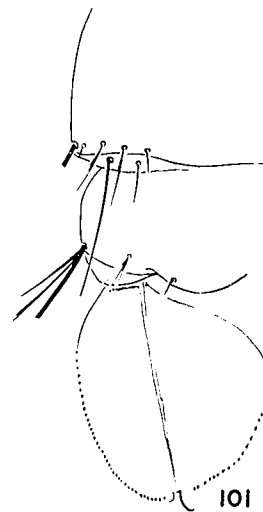
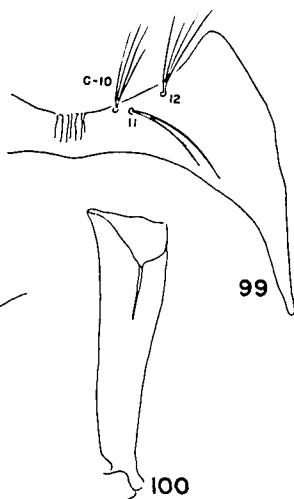
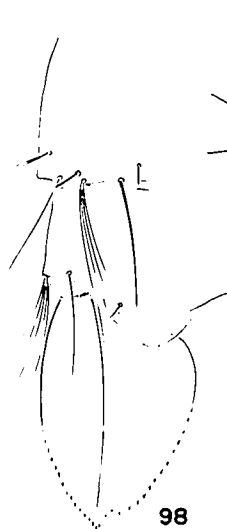
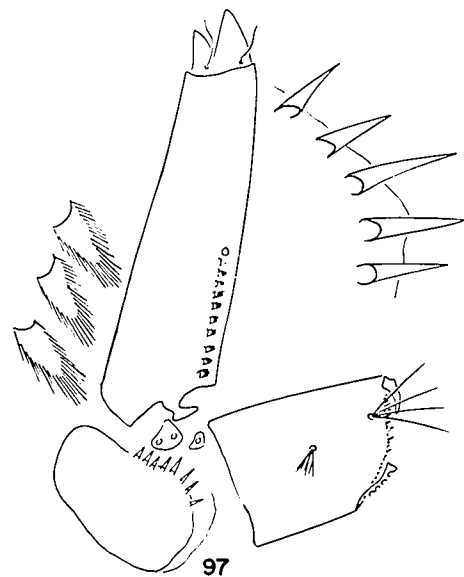
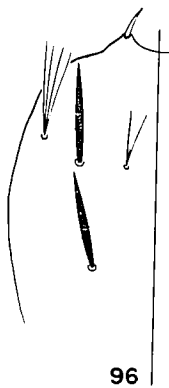
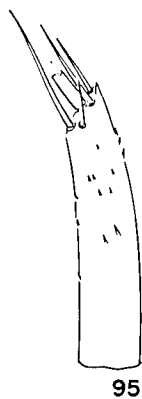
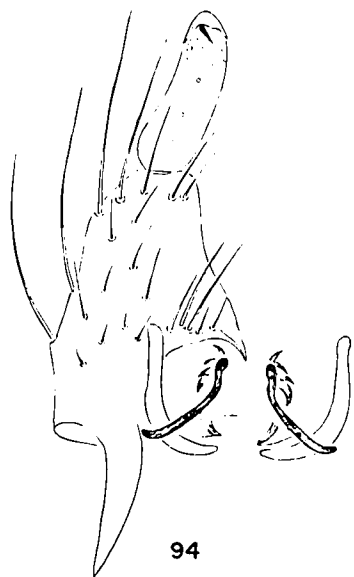
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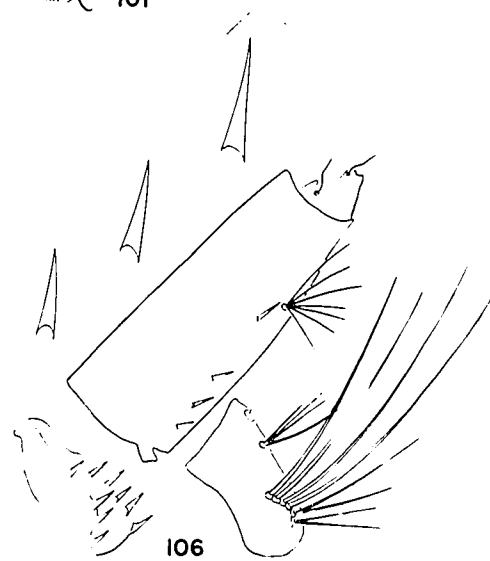
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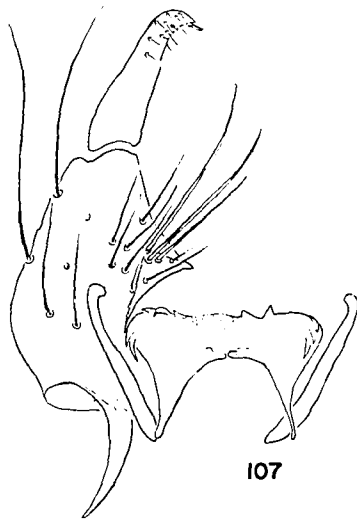


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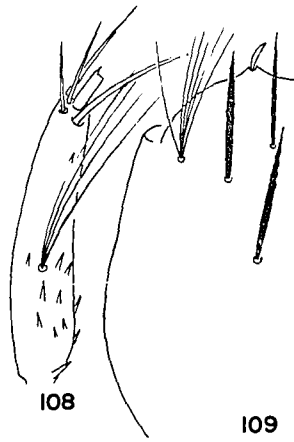


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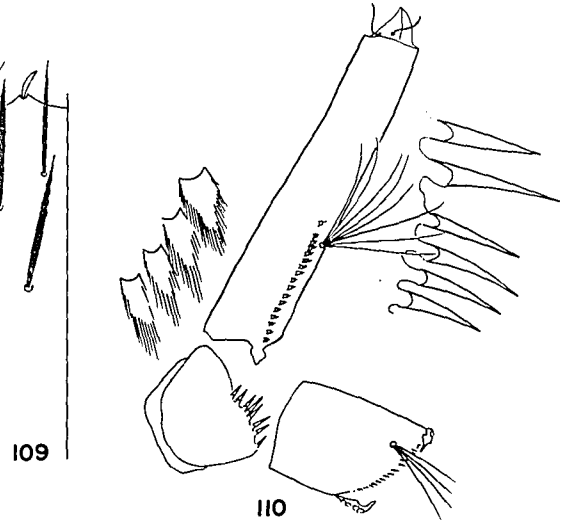




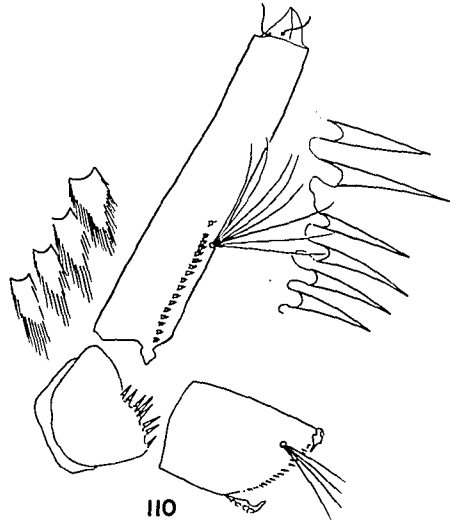
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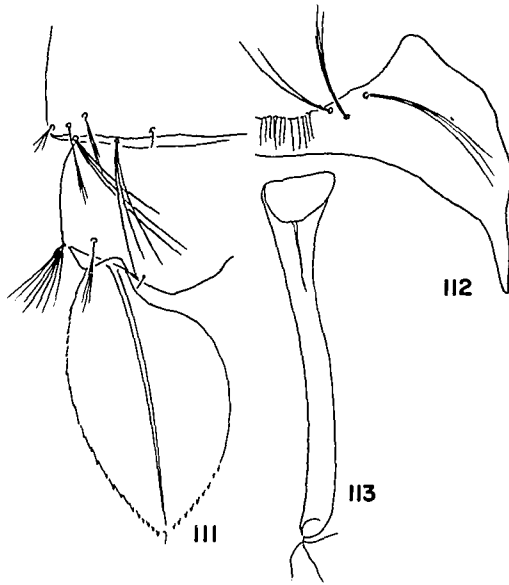
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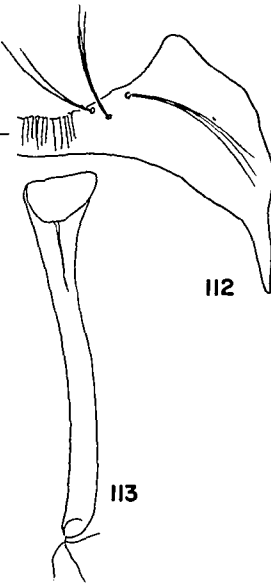
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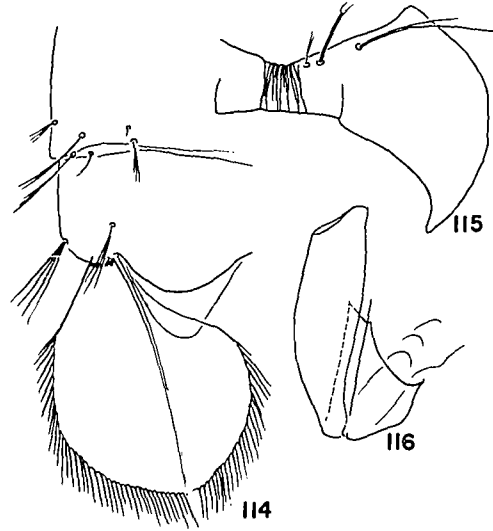
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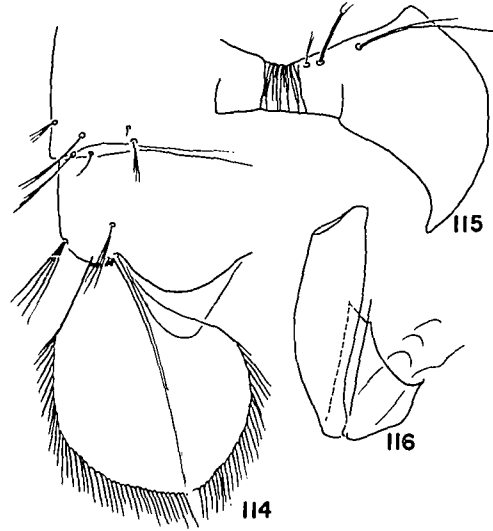
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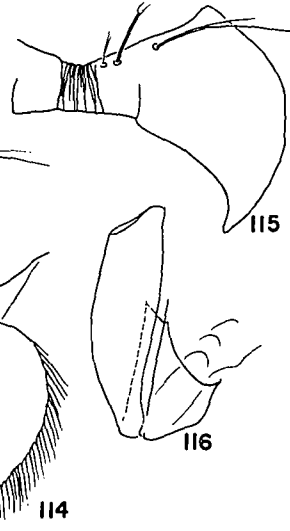
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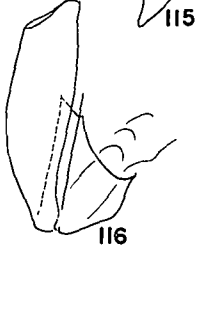
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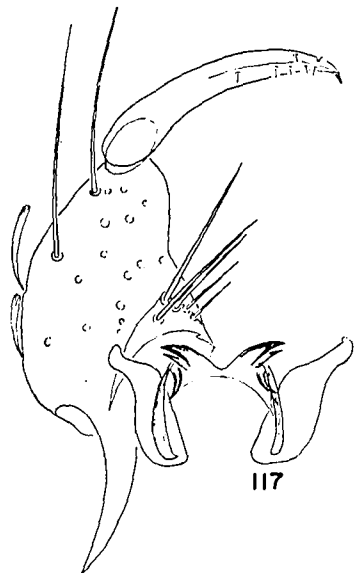
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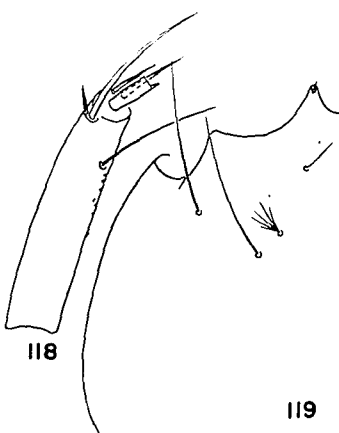
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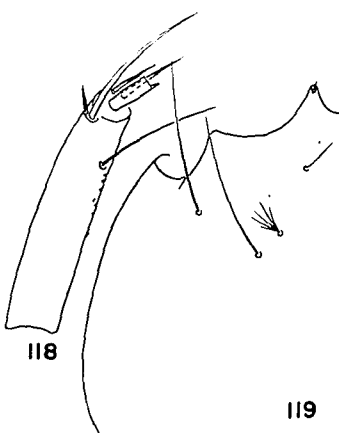
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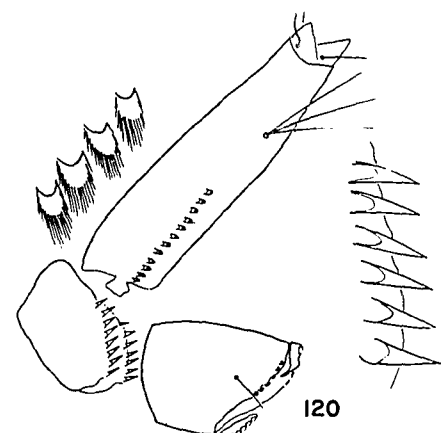
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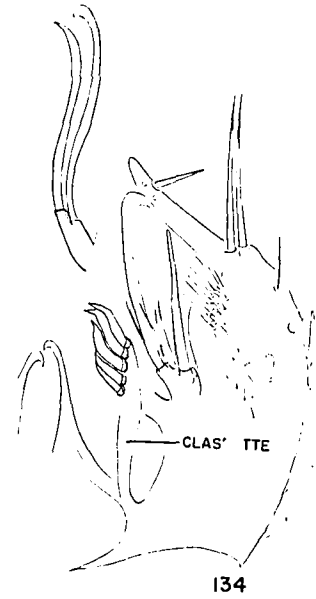
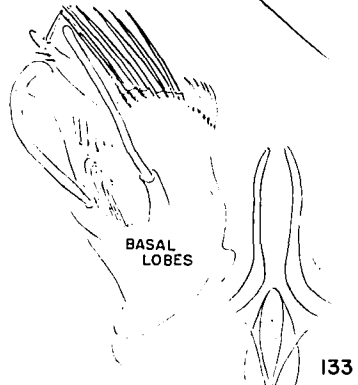
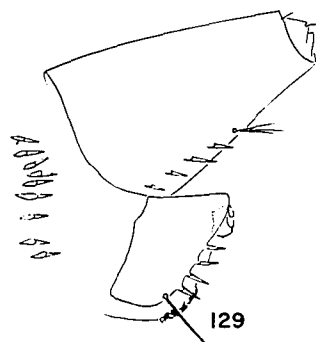
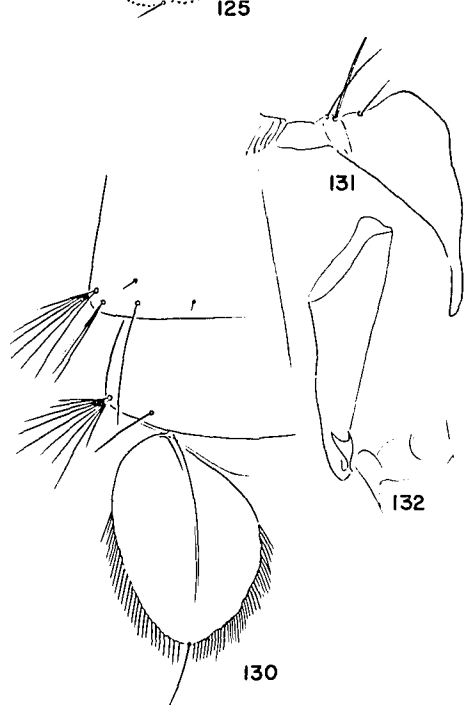
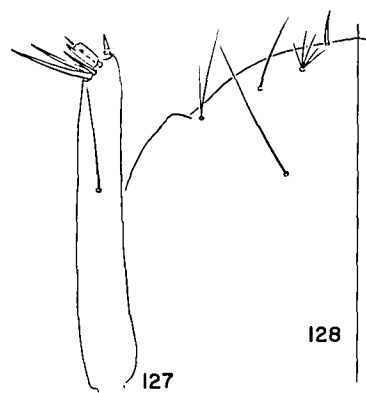
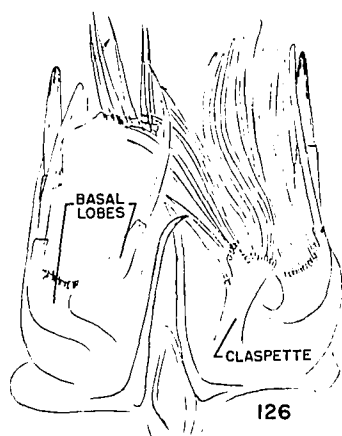
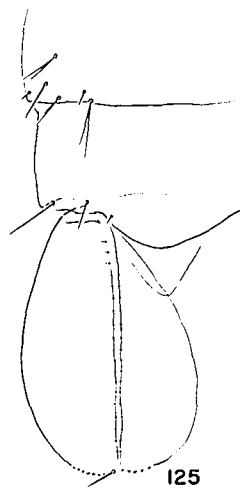
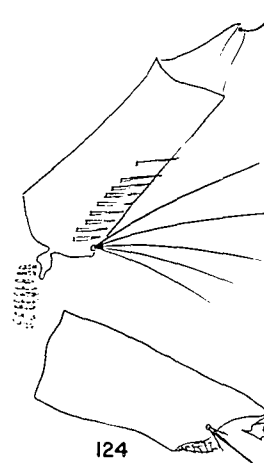
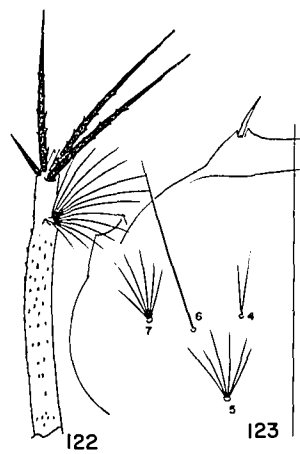
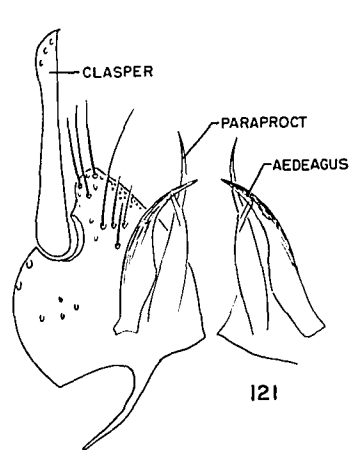
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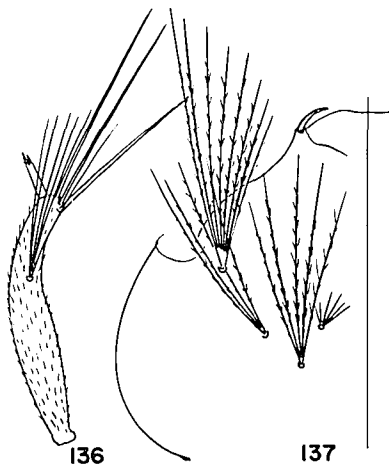


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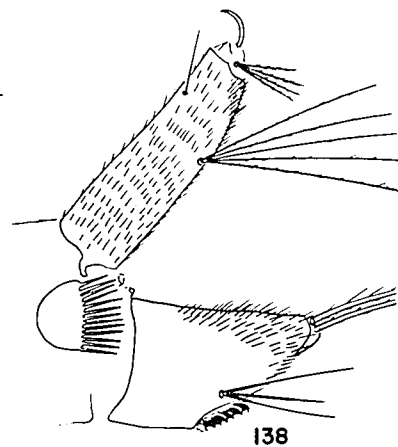




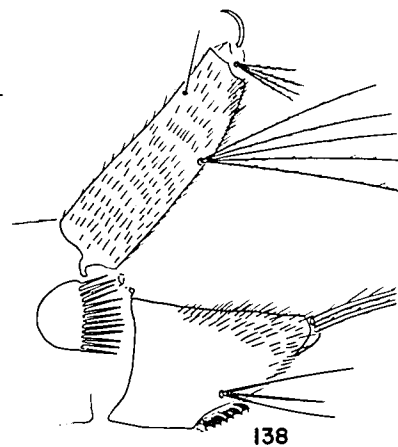
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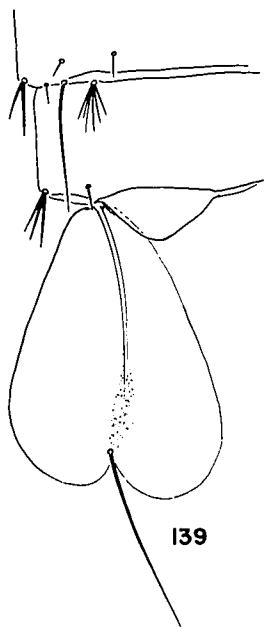
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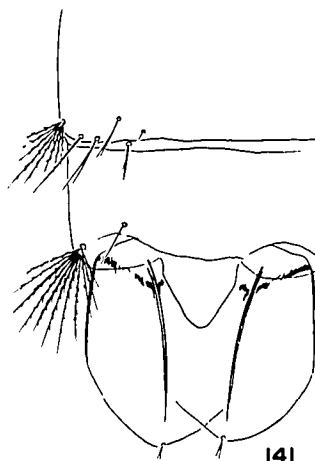
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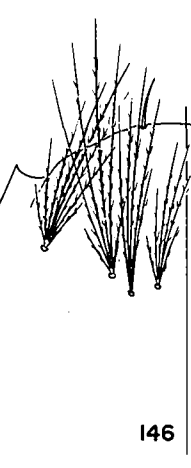
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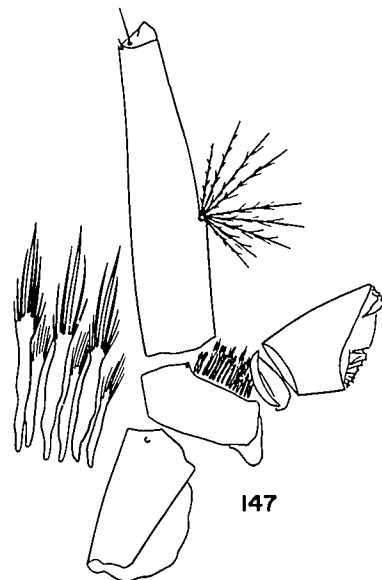
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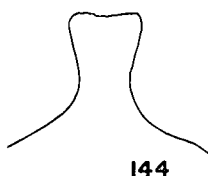
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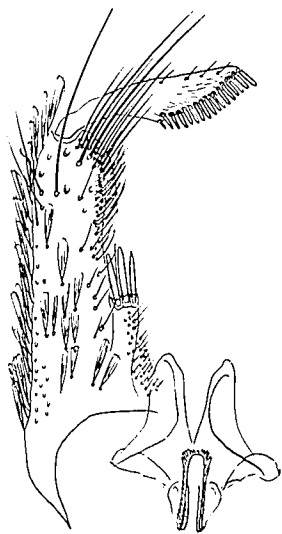
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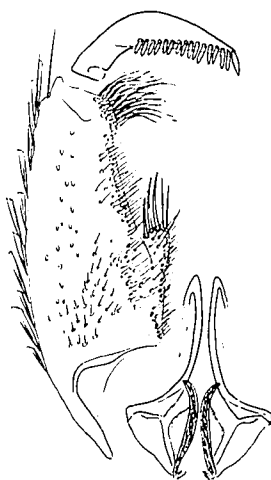
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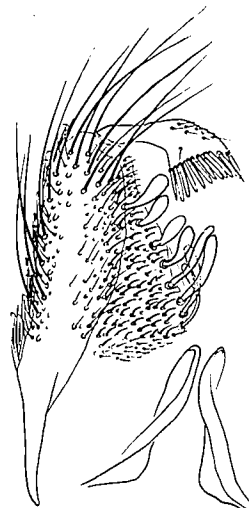
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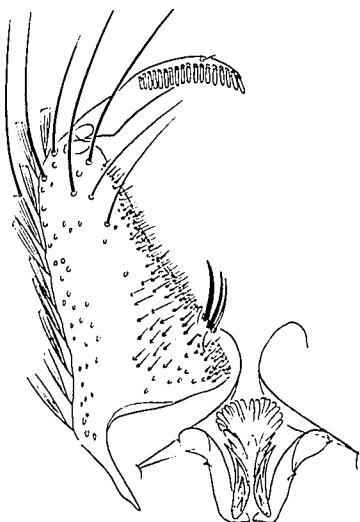
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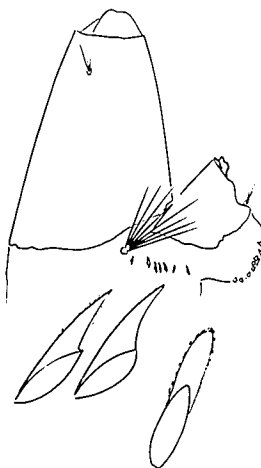
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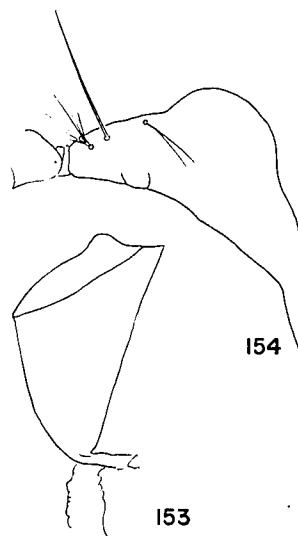
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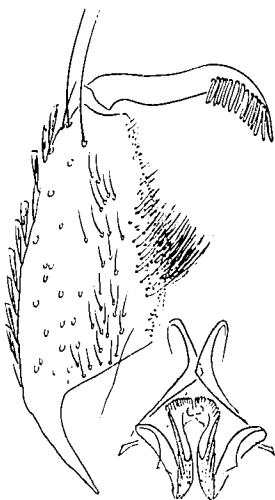


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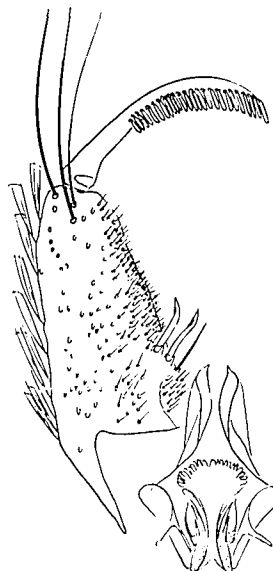


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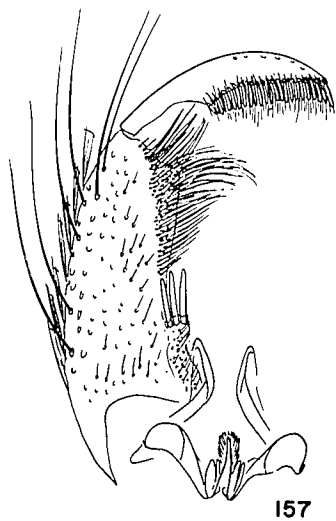
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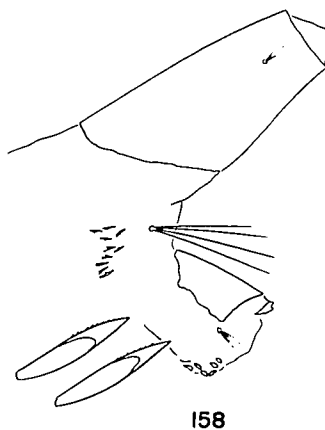
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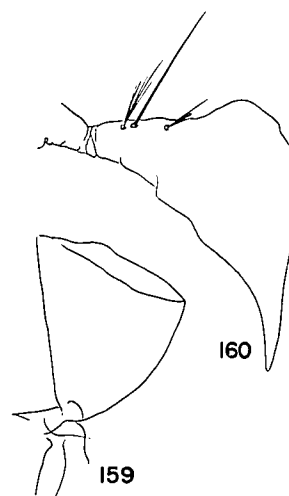
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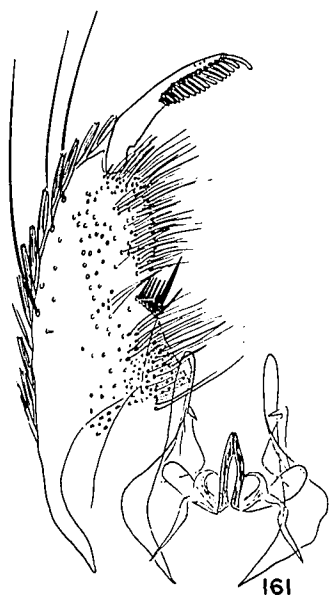


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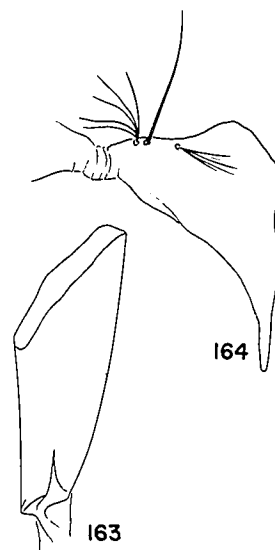
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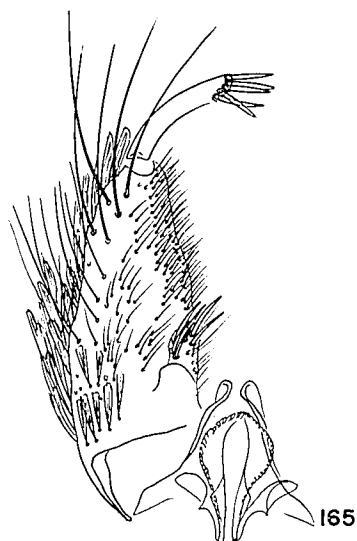


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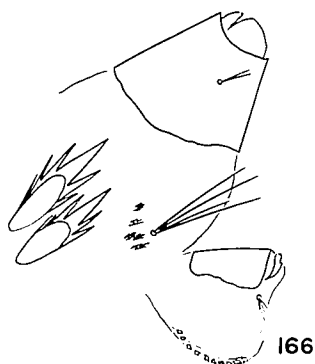


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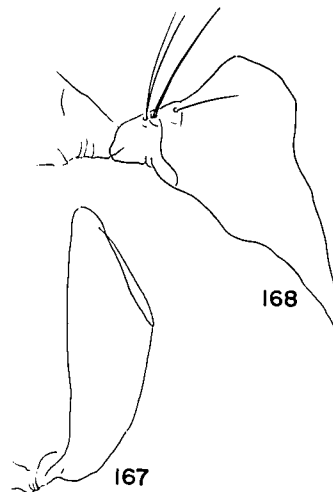
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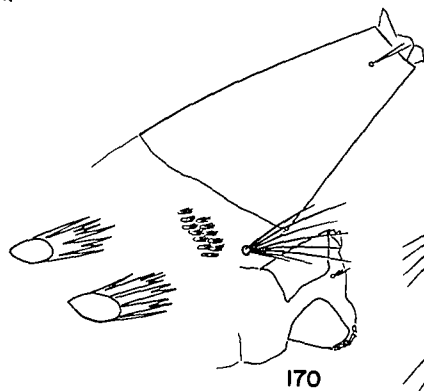


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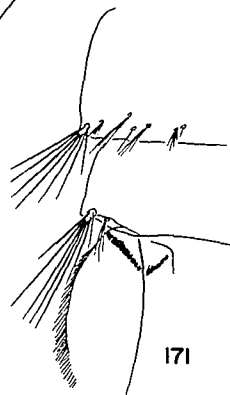
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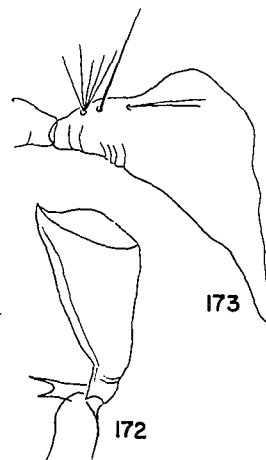
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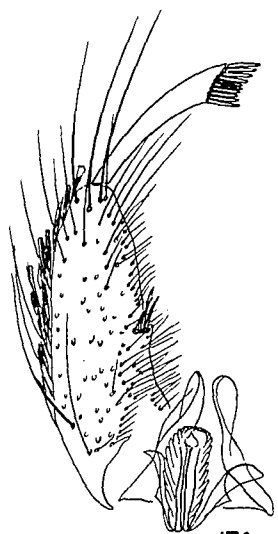


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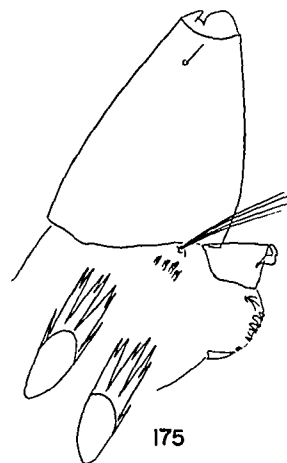


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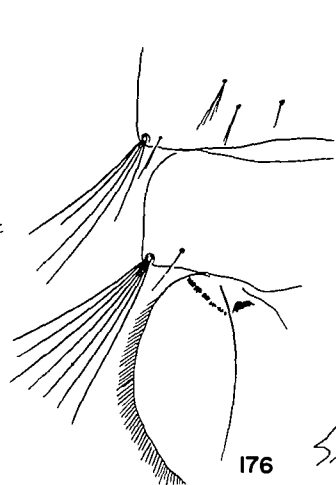
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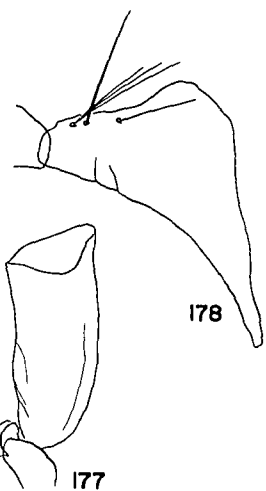
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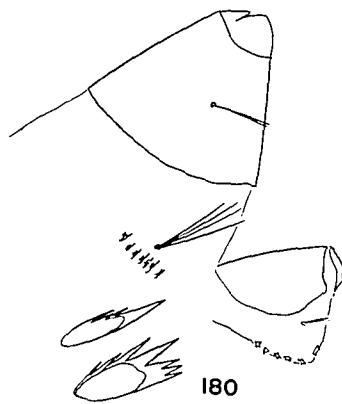


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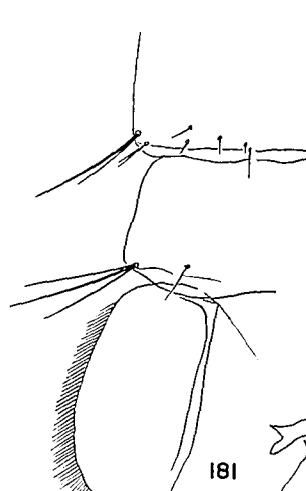
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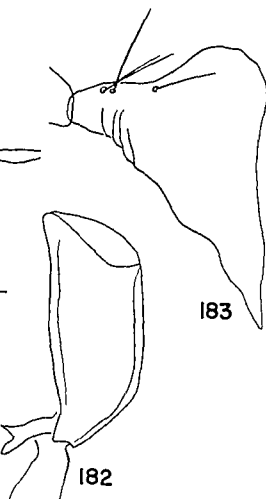
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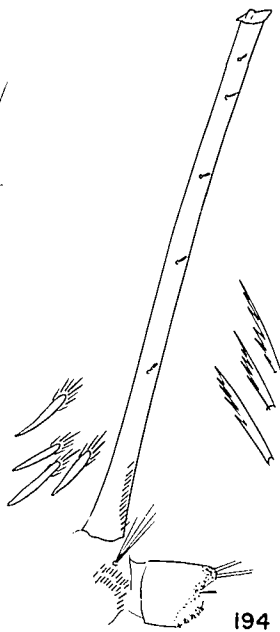
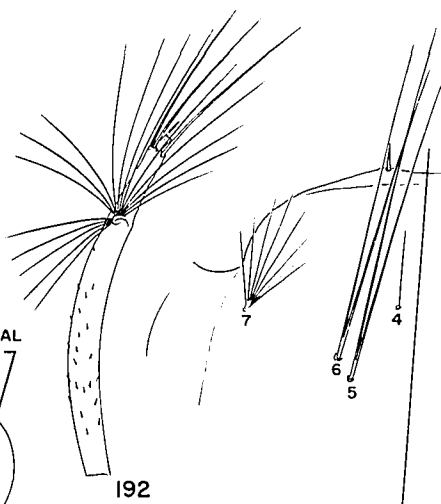
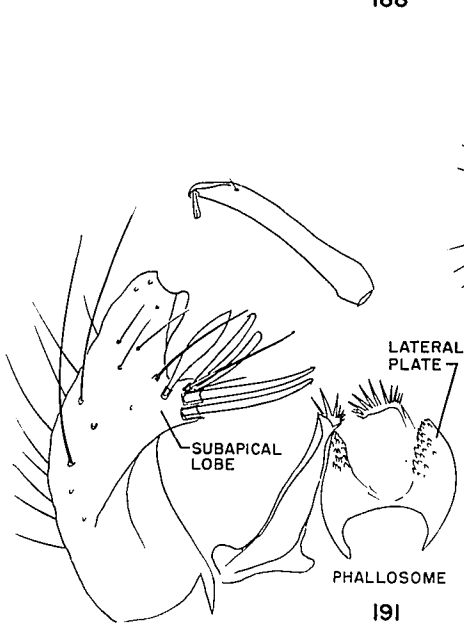
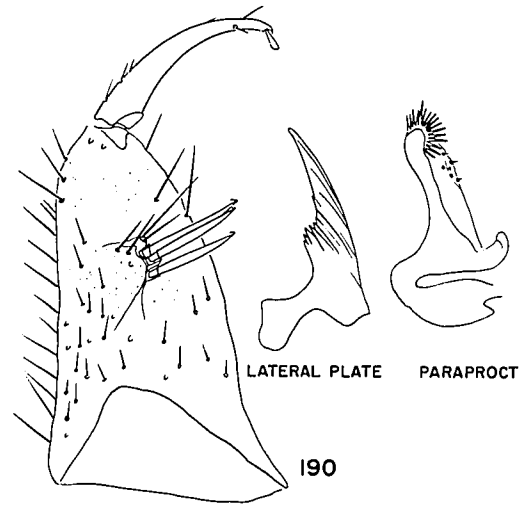
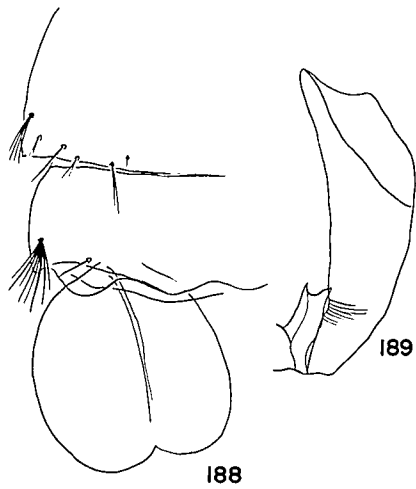
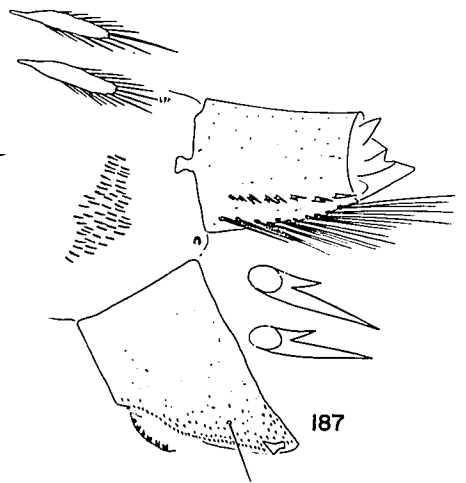
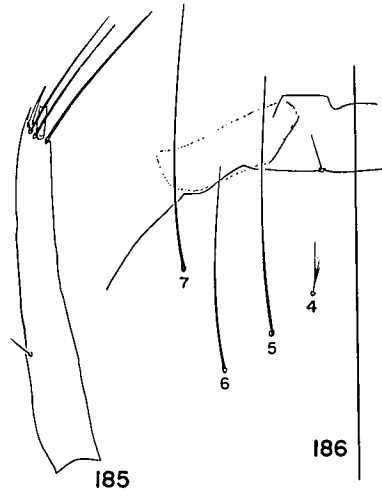
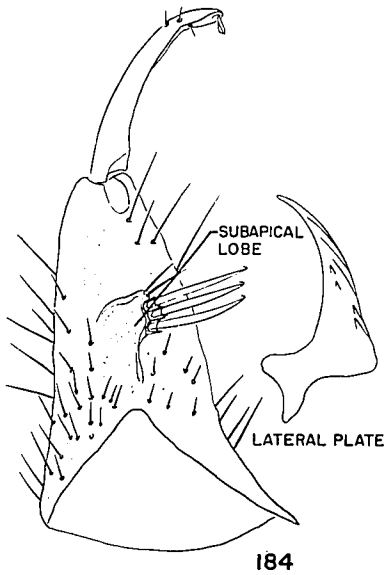


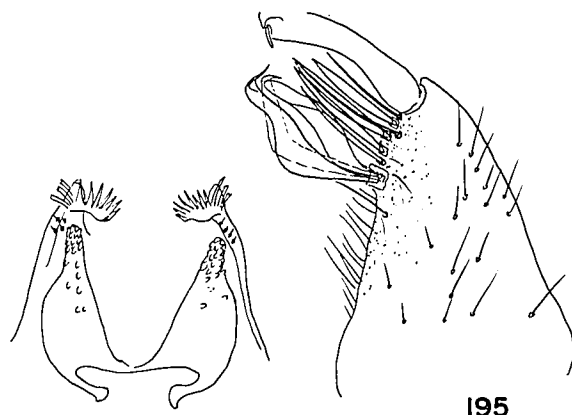
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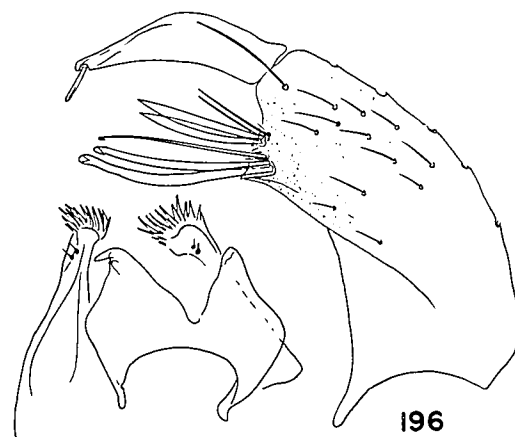
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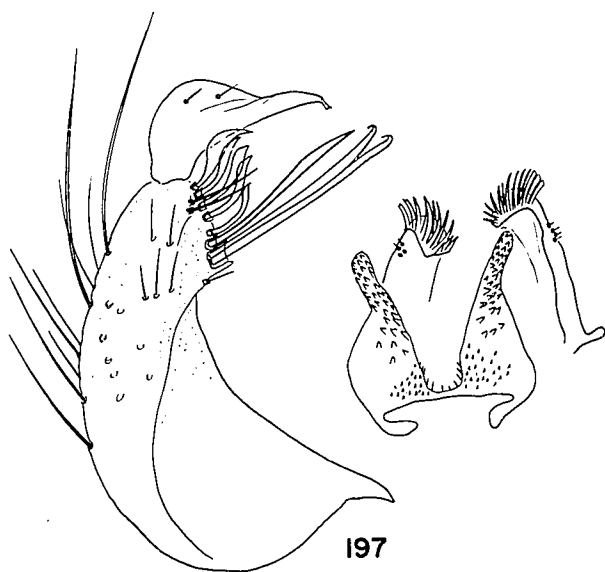




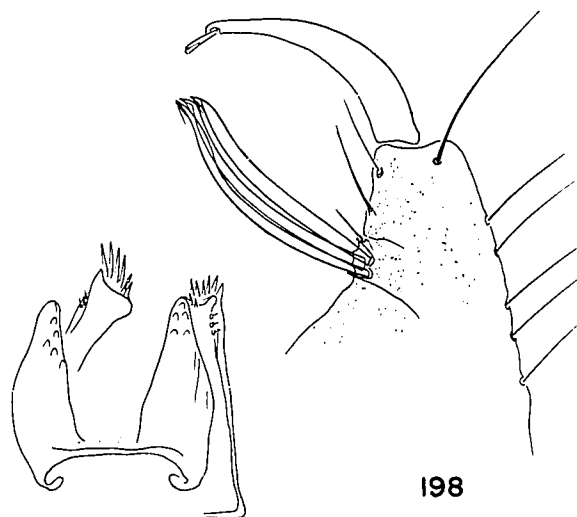
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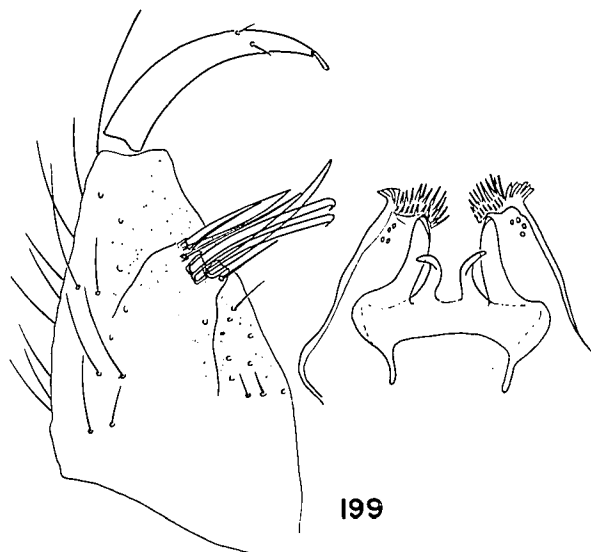
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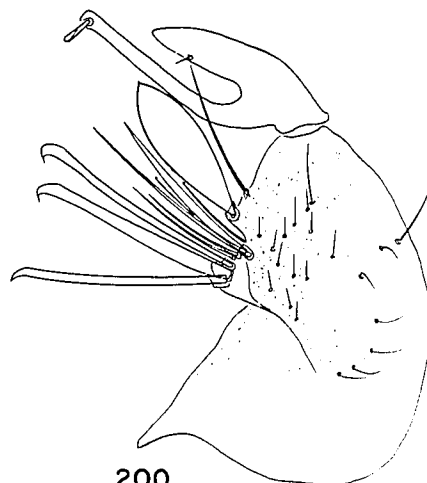
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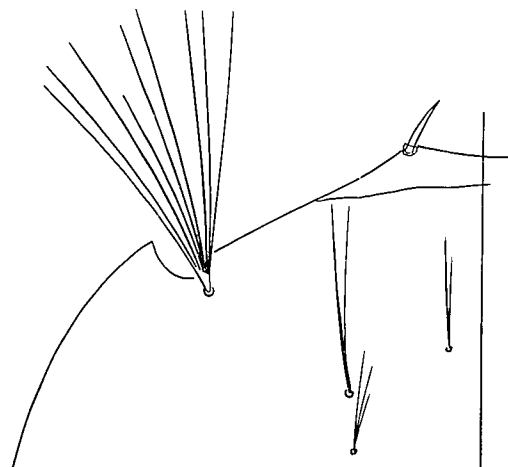
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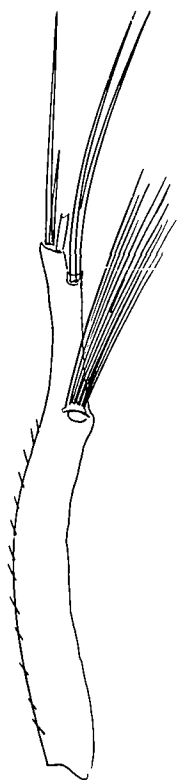
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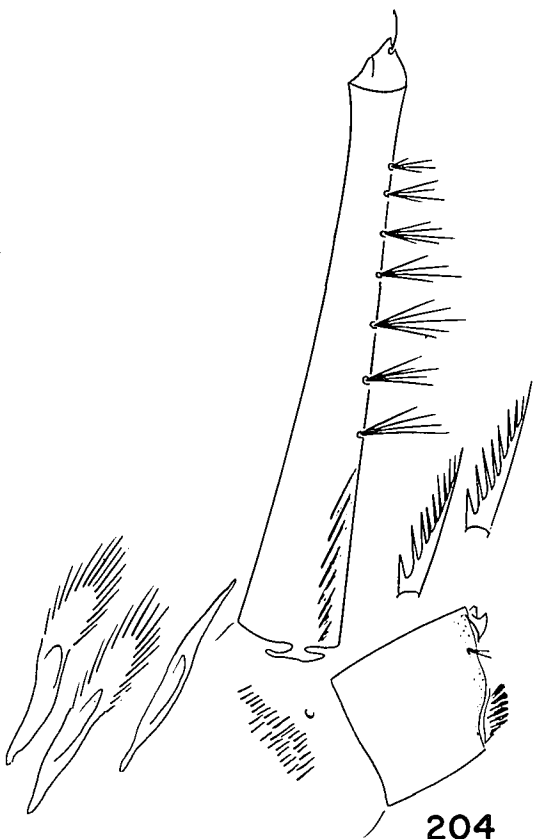
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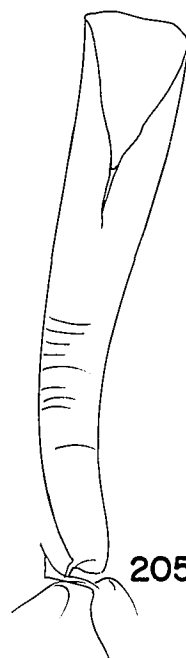
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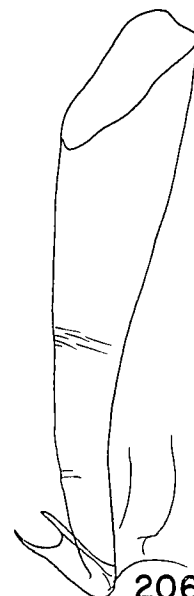
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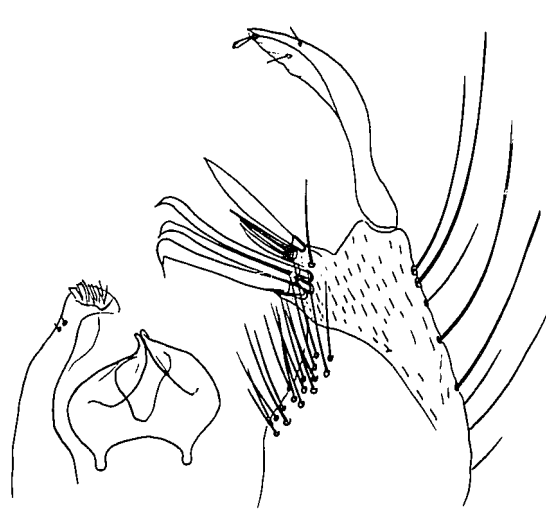
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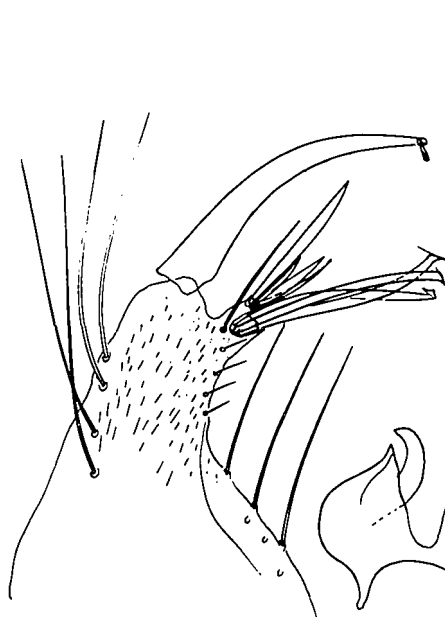
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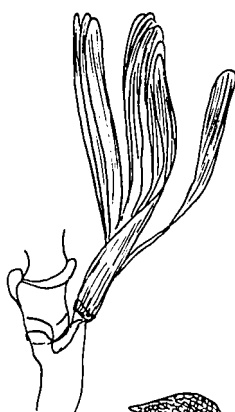
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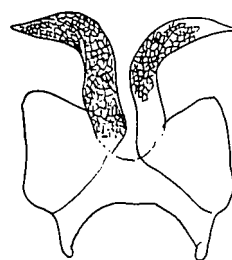
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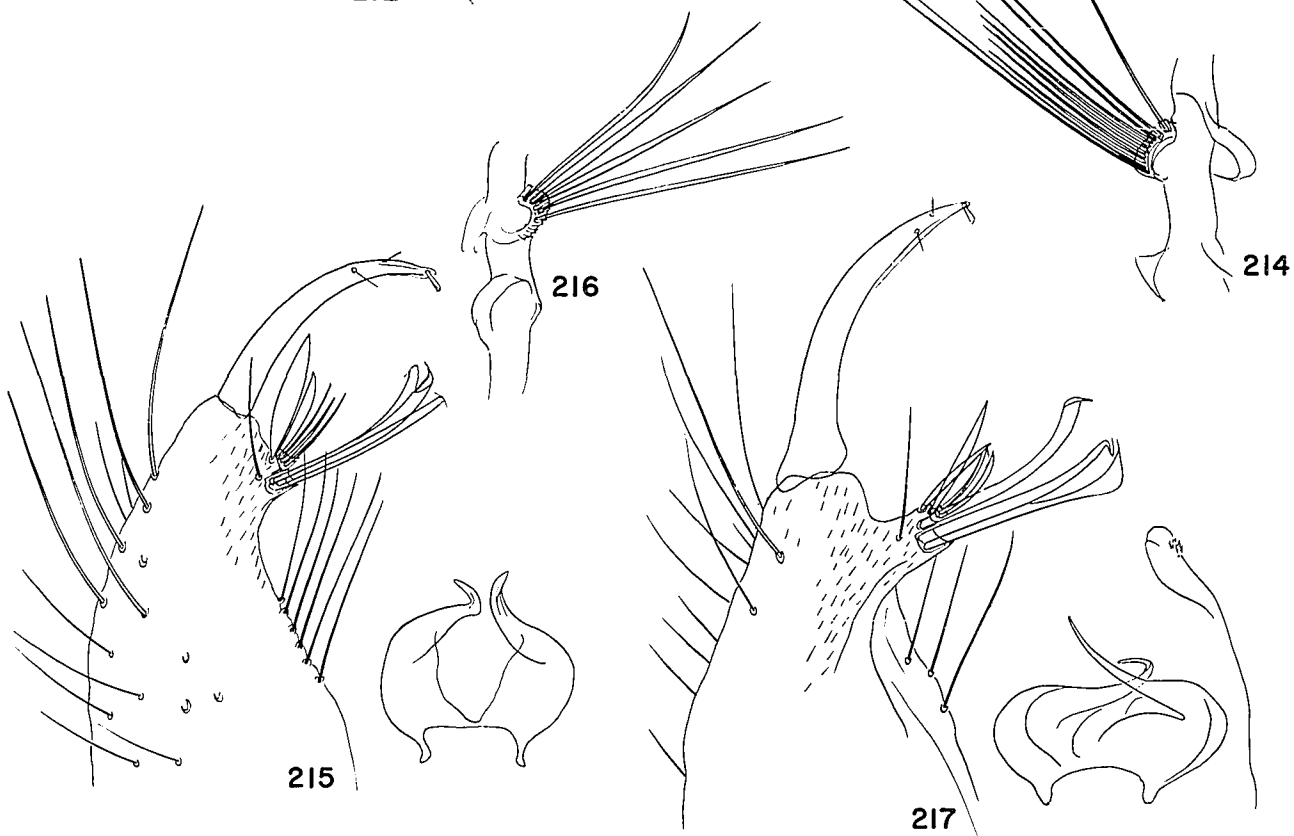
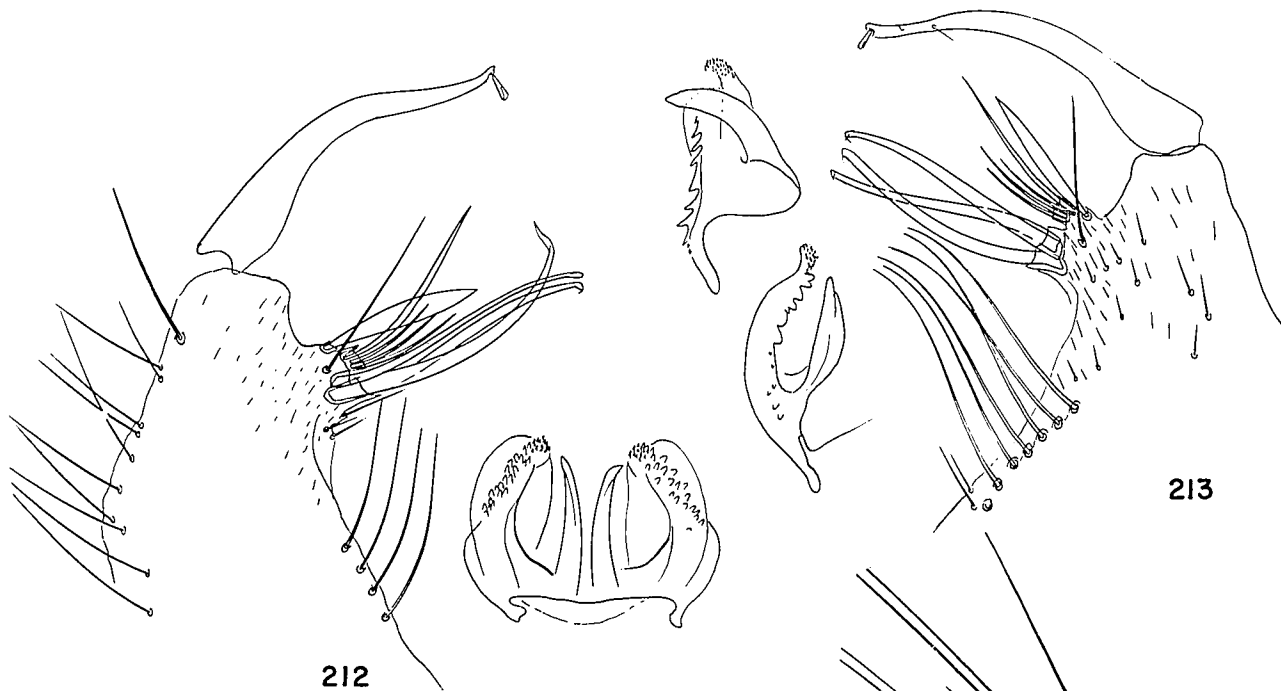
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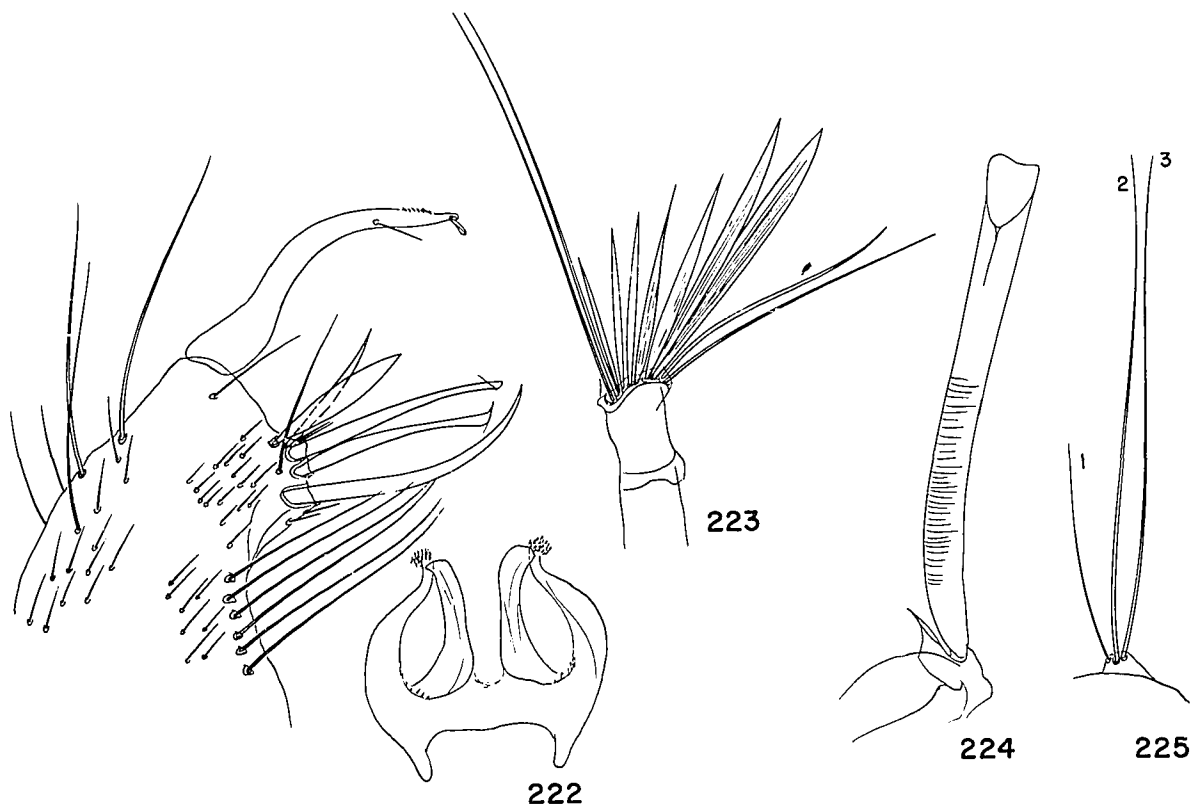
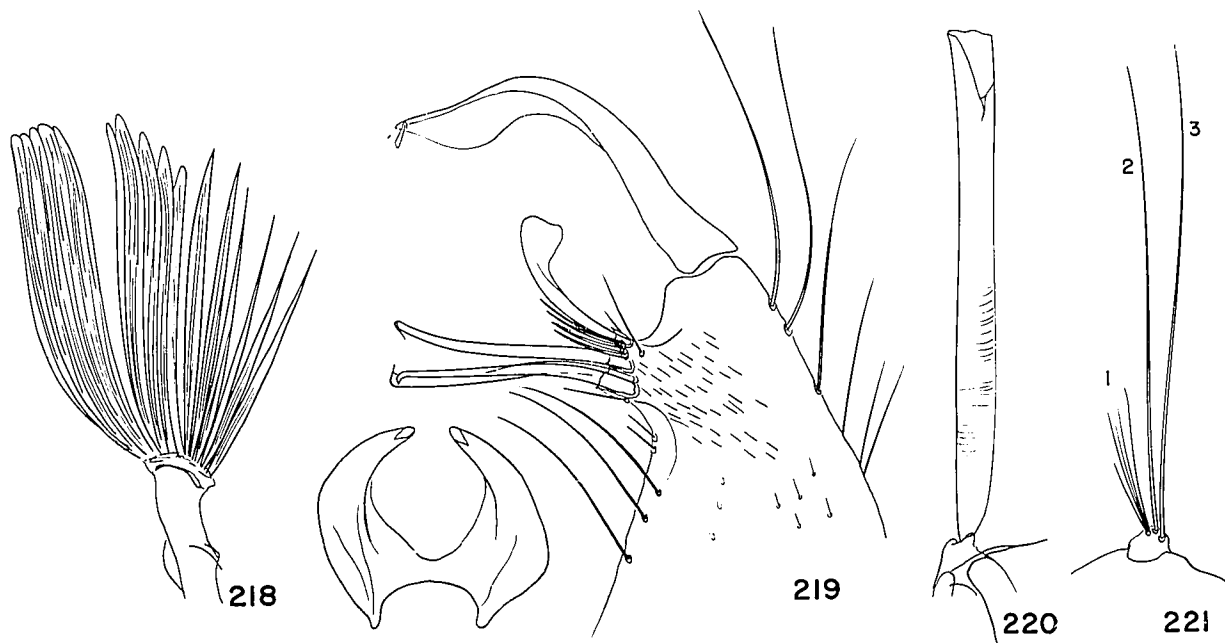


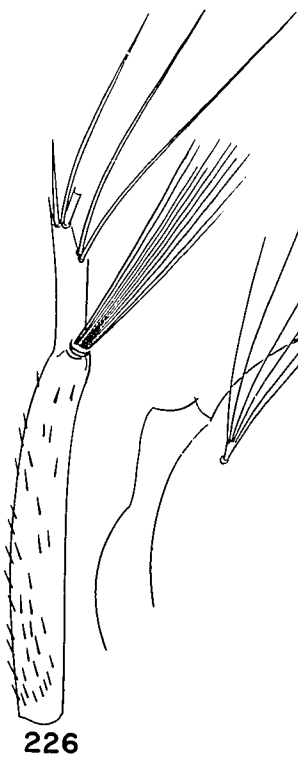
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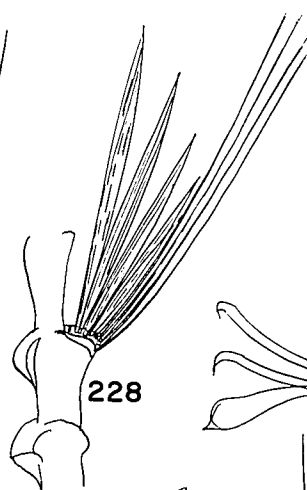




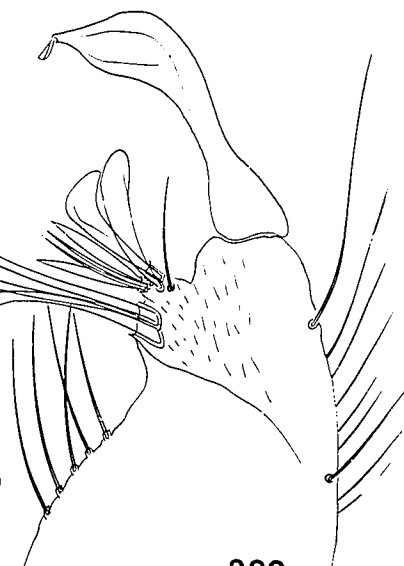
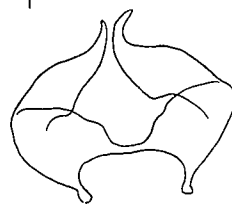
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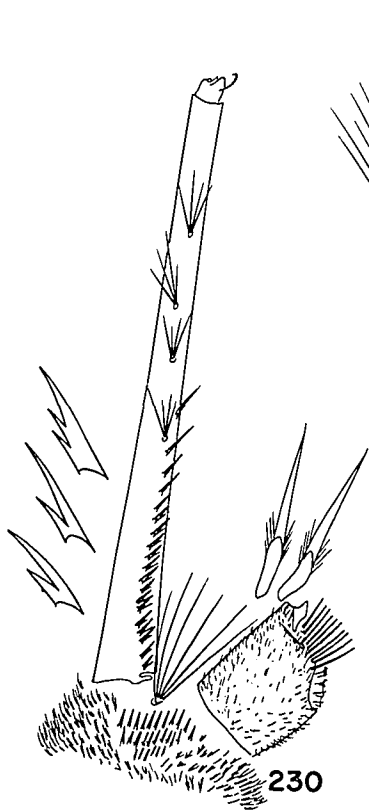
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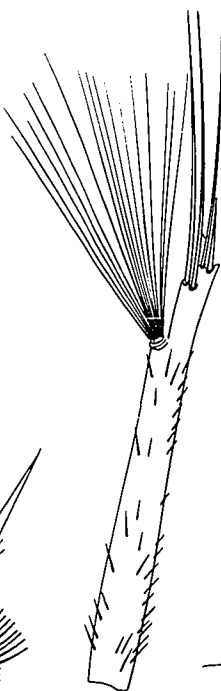
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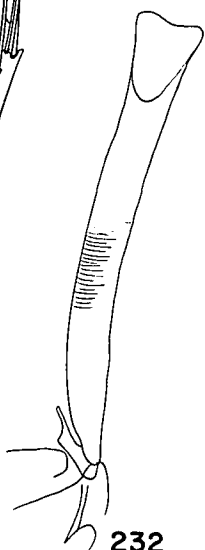
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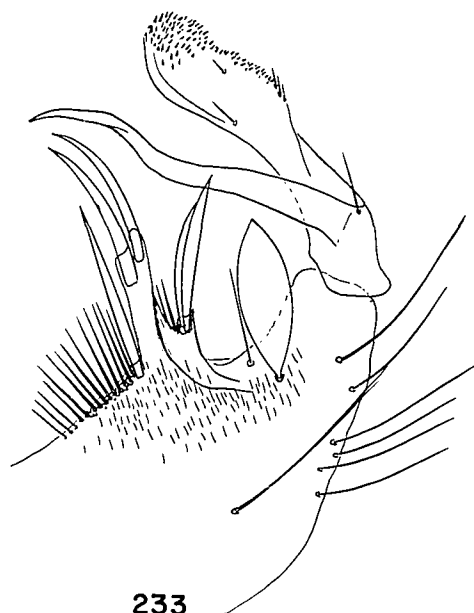
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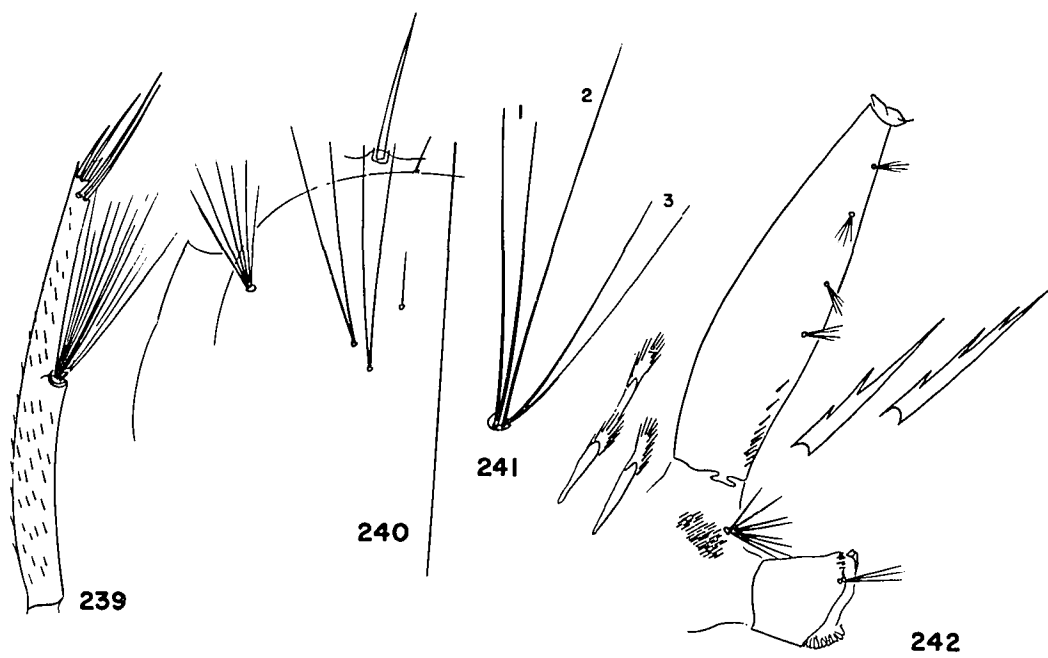
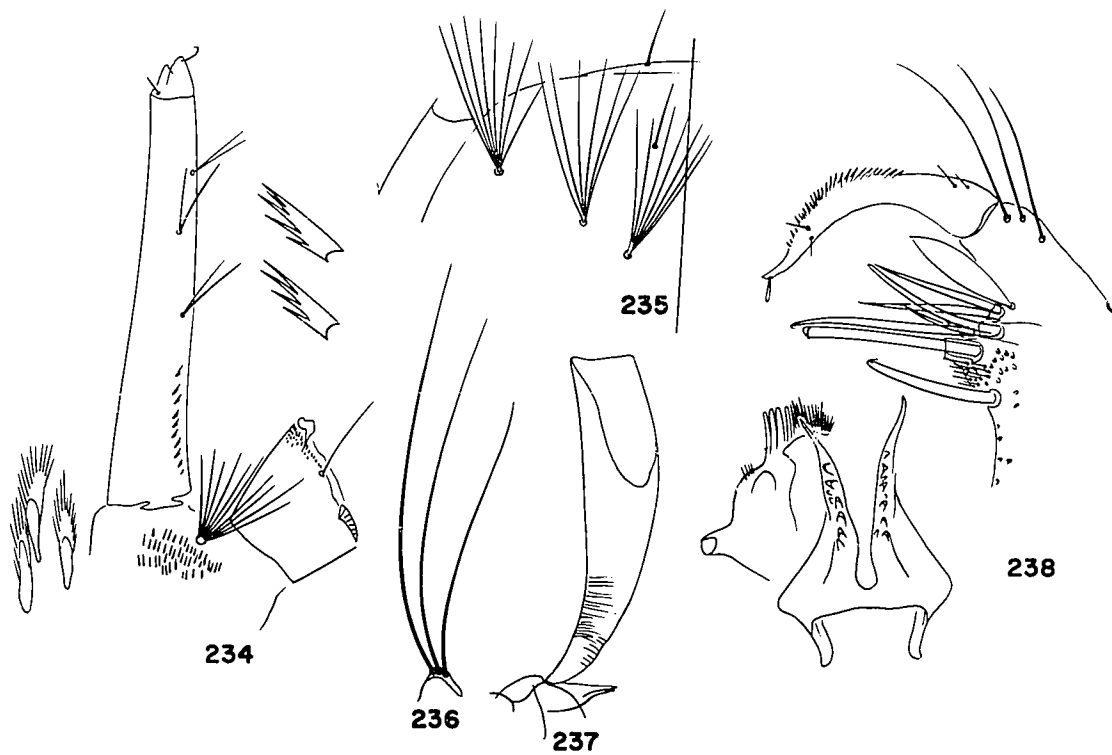
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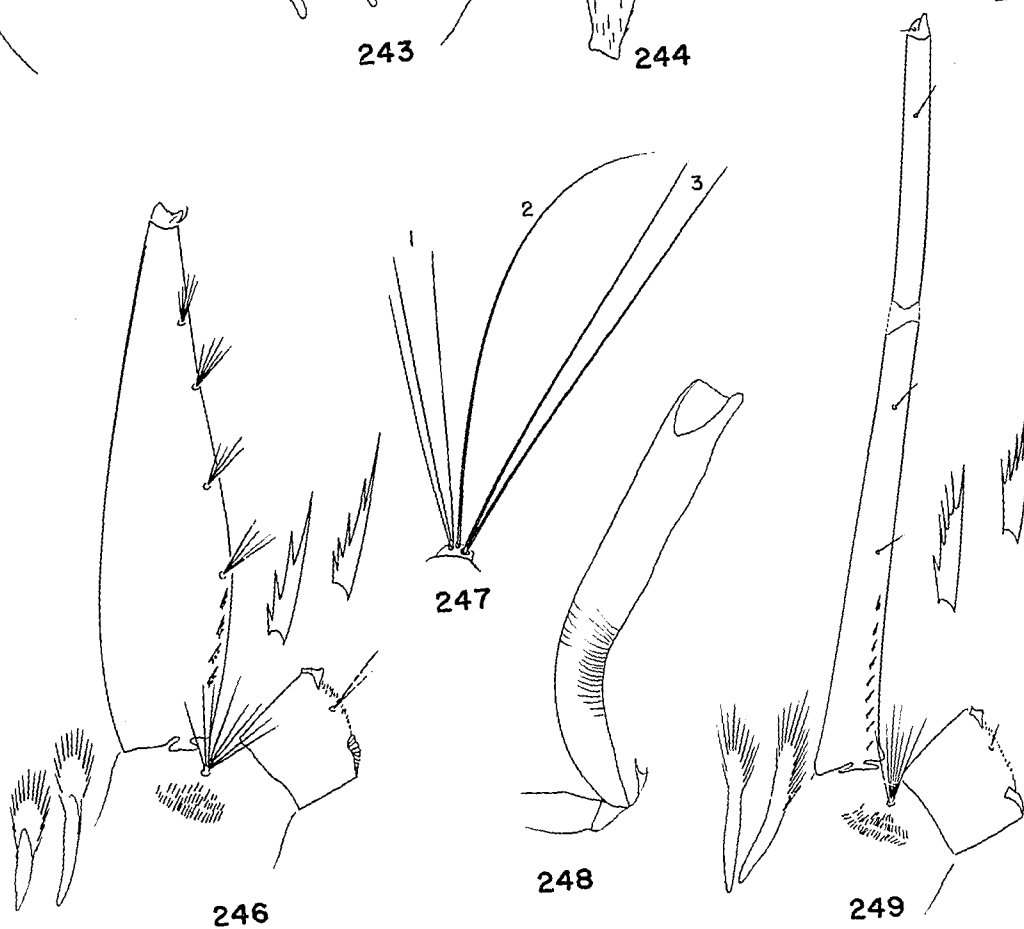
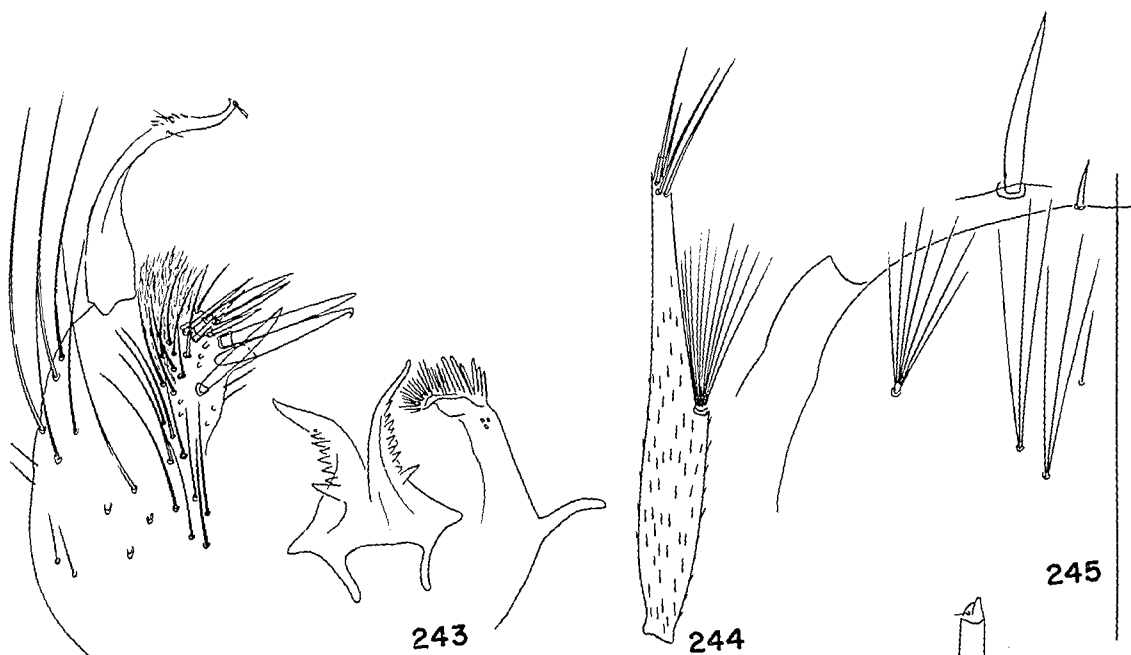


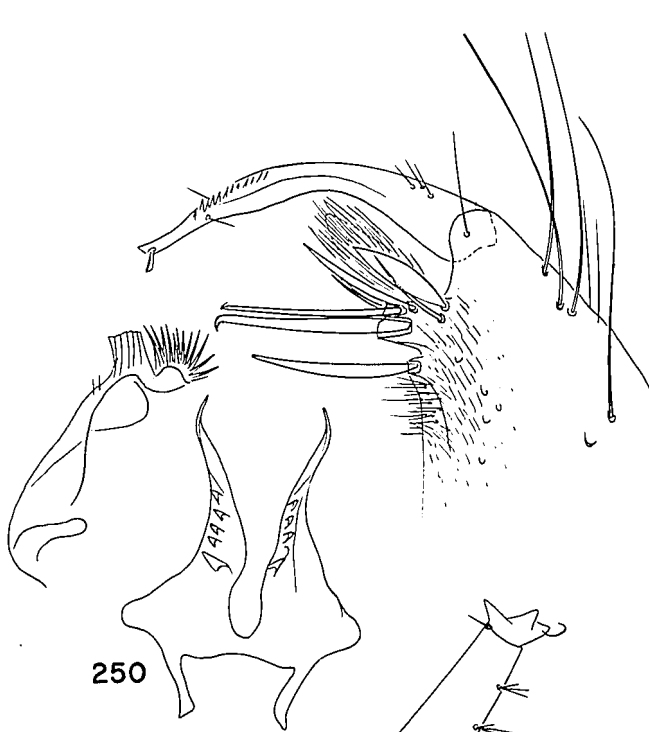
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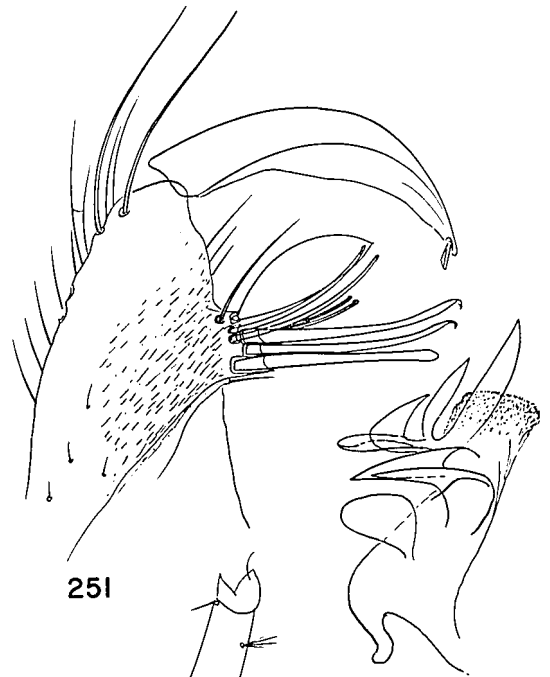
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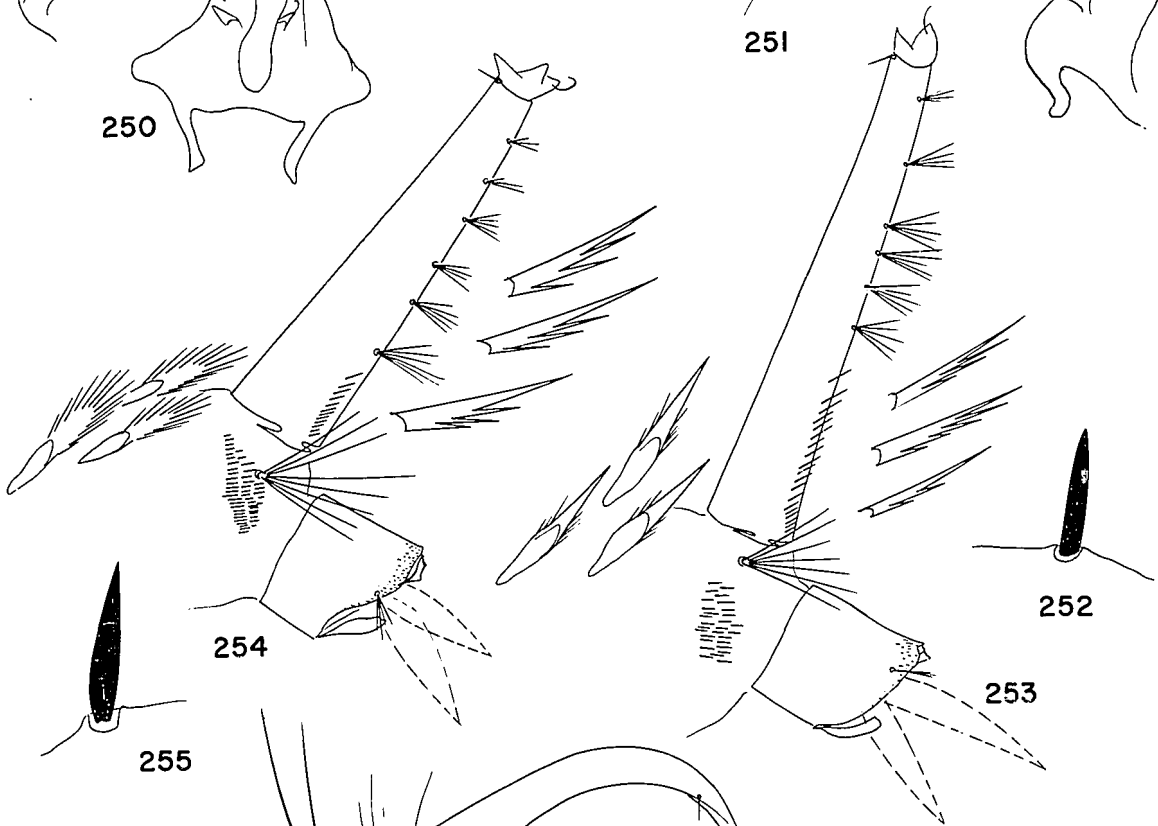




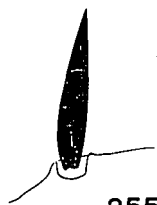
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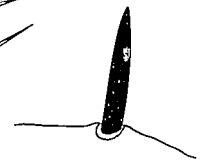
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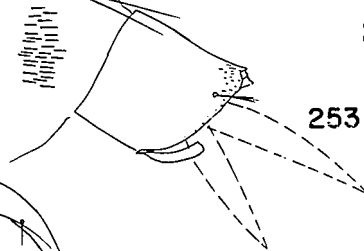
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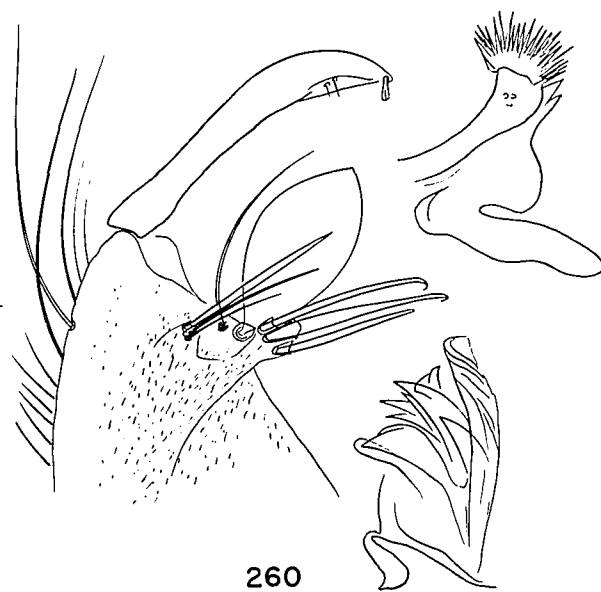
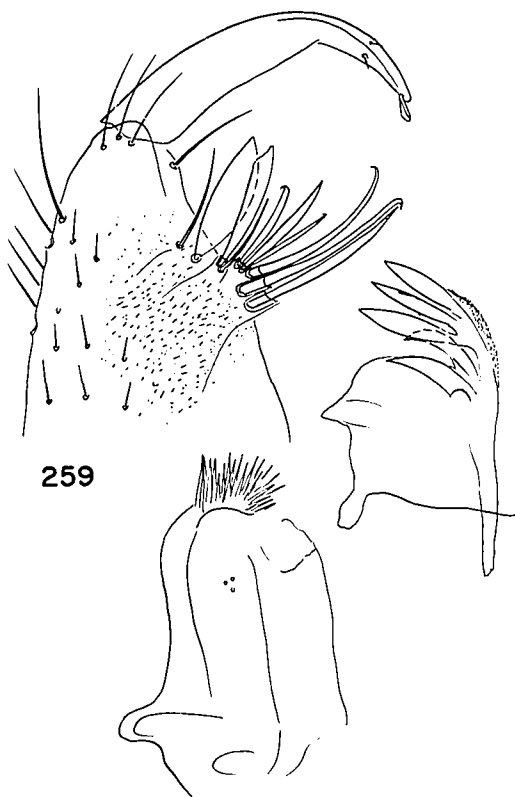
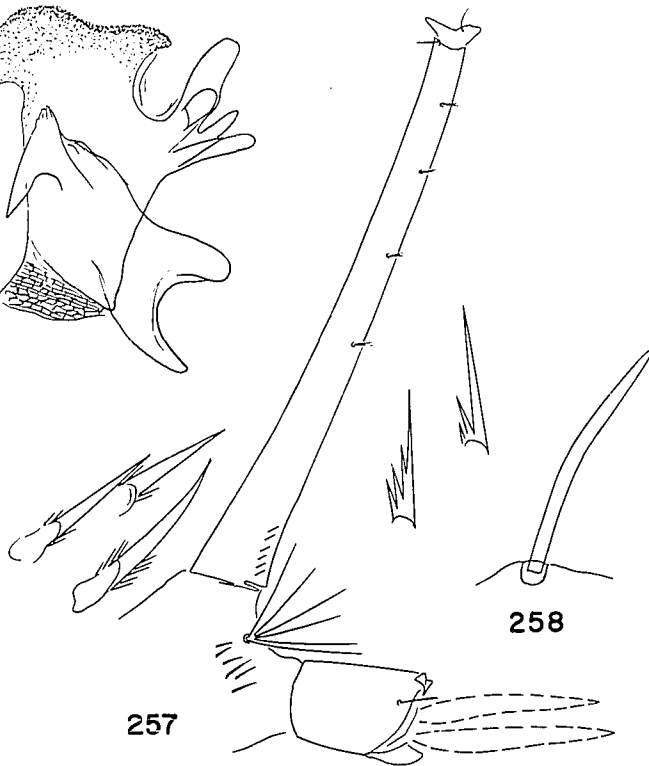
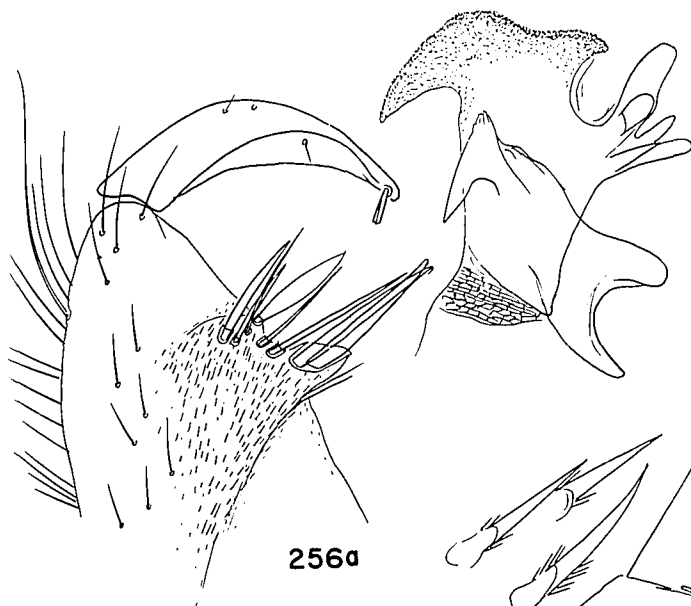
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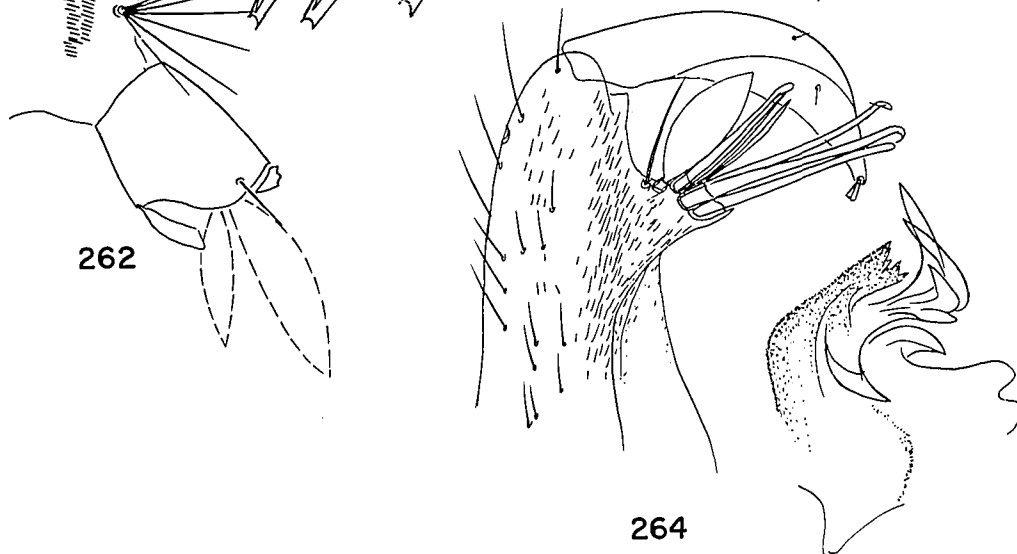
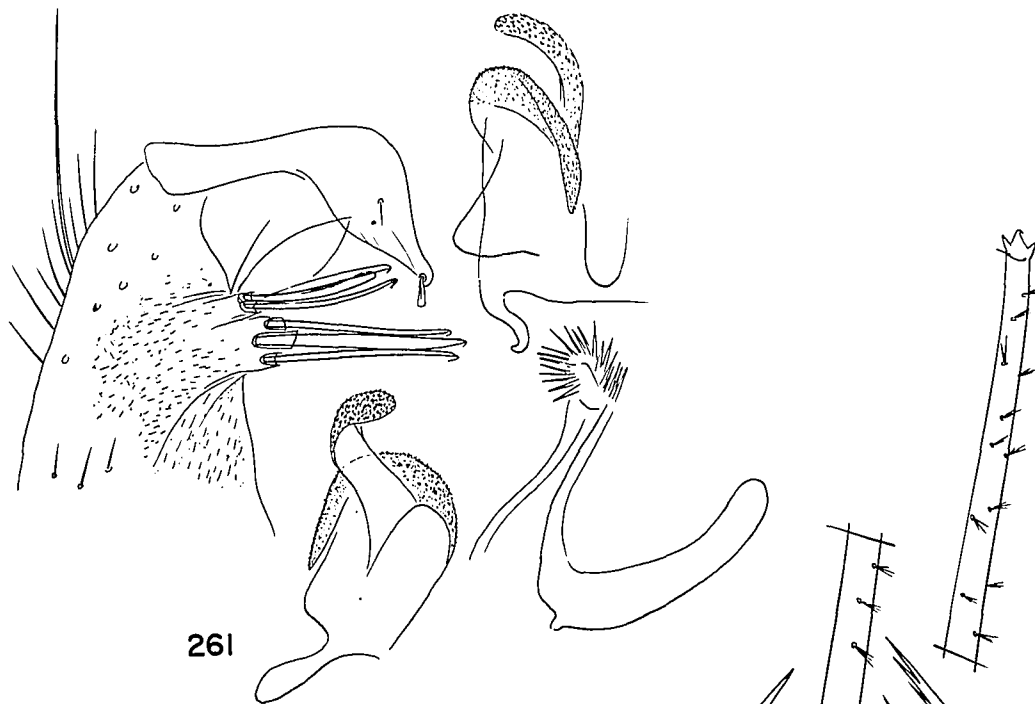


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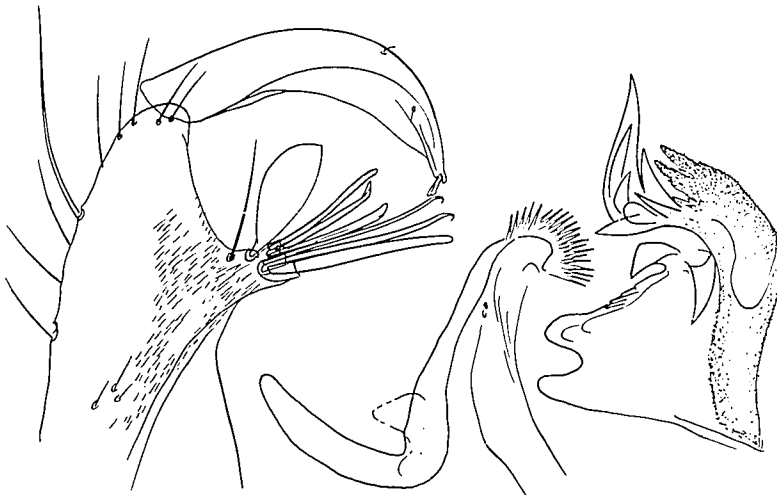
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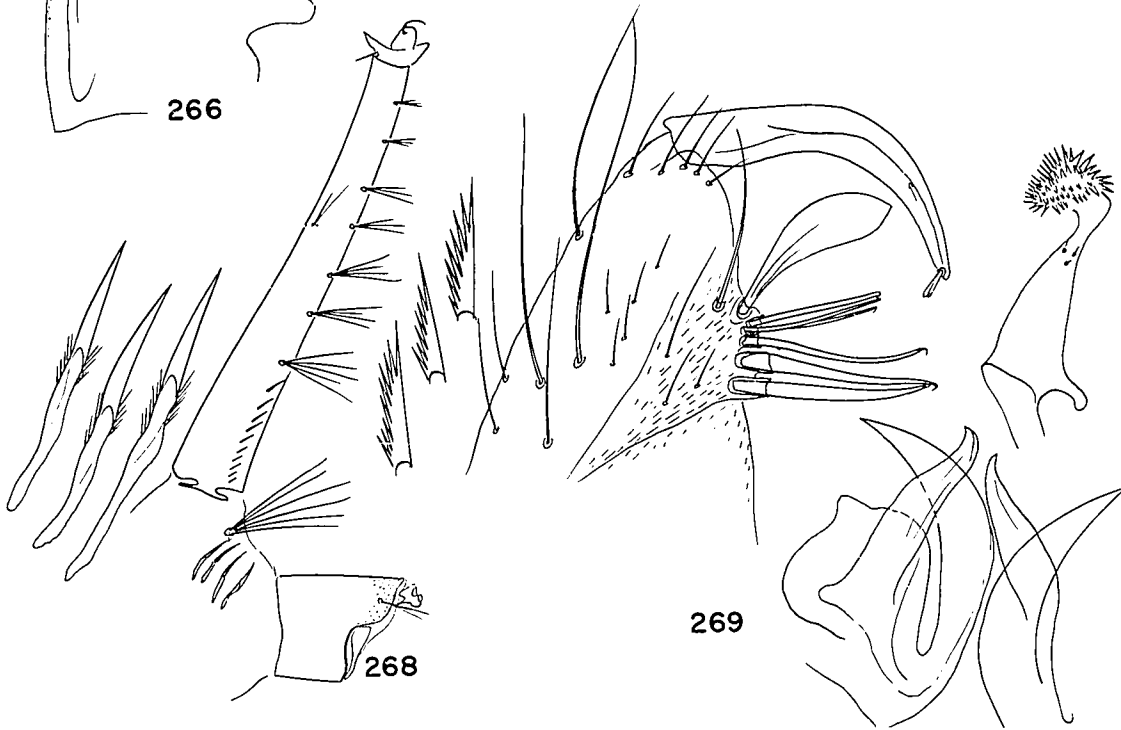
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