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MOSQUITO STUDIES (Diptera, Culicidae)

XXVIII. The New World species formerly placed in Aedes (Finlaya).

By Thomas J. Zavortink

MOSQUITO STUDIES (Diptera, Culicidae)

XXVIII. THE NEW WORLD SPECIES FORMERLY PLACED IN *AEDES (FINLAYA)*[1]

by

Thomas J. Zavortink[2]

CONTENTS

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INTRODUCTION

The present revision includes the majority of the species of New World *Aedes (Finlaya)* exclusive of the Terrens Group, as well as *Aedes (Abraedes), Aedes (Kompia)* and *Aedes (Ochlerotatus) muelleri.* A total of 23 named species, known in all stages, and 4 unnamed forms, known by 1 or more females, is treated. In all, 22,235 specimens, 4,164 males, 4,967 females, 7,542 larvae, 5,562 pupae and 2,424 individual rearings (1,497 larval, 767 pupal, 160 incomplete) have been examined.

The methods of study and presentation, as well as the terminology and abbreviations, follow, in general, Belkin (1962); a few additional terms for the mesoscutal markings and details of the genitalia follow Berlin (1969) and Schick (1970a), respectively.

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SYSTEMATICS

I am removing all New World *Aedes* that have been placed in the subgenus *Finlaya* from that subgenus and assigning them to other subgenera or genera, as follows: the Triseriatus, Zoosophus, Kompi and Knabi Groups treated in the present paper and the Terrens Group treated by Schick (1970a,b) are placed into the subgenus *Protomacleaya* of *Aedes; ramirezi* and *mediovittatus* are placed into the monotypic subgenera *Aztecaedes* and *Gymnometopa* of *Aedes,* respectively; the Atropalpus and Fluviatilis Groups are placed into the subgenus *Ochlerotatus* of *Aedes; scutellalbum* and *upatensis* are transferred to *Ochlerotatus,* where they are related to *milleri* Dyar, 1922 and *lepidus* Cerqueira and Paraense, 1945, respectively, and are not considered further because of lack of material; and, the Leucocelaenus Group is placed into the subgenus *Conopostegus* and transferred to *Haemagogus.* The present paper also treats the monotypic subgenera *Kompia* and *Abraedes* of *Aedes* and *Aedes (Ochlerotatus) muelleri.*

In hope of making the keys that follow more useful, I have included in them, where possible, the following additional groups of New World container-breeding *Aedes:* the subgenus *Howardina,* the Terrens Group of *Pro tomacleay a ,* the Varipalpus Group of *Ochlerotatus,* and *Aedes (Stegomyia) aegypti.* Additional information on these taxa may be found in the revision of *Howardina* by Berlin (1969),

the revision of the Terrens Group by Schick (1970a,b), the revision of the Varipalpus Group by Arnell and Nielsen (1972), and, for *aegypti,* "The Culicidae of Jamaica" by Belkin, Heinemann and Page (1970).

MEDICAL IMPORTANCE

Aedes triseriatus is known to be a vector of the LaCrosse strain of California encephalitis in Ohio and Wisconsin, *Aedes fluviatilis* may have been a vector of sylvan yellow fever in Brazil on 1 occasion, and species of *Haemagogus (Conopostegus)* have been found naturally infected with yellow fever in Brazil and Colombia and with the arbovirus Una in Brazil. In addition, laboratory experiments have shown *Aedes atropalpus, Aedes fluviatilis, Aedes triseriatus* and *Haemagogus leucocelaenus* capable of transmitting 1 or more of the following: eastern equine encephalomyelitis, western equine encephalomyelitis, Venezuelan equine encephalomyelitis and yellow fever. Additional details on natural and artificial infections can be found in the bionomics section of the 4 species just named and the large and small Colombian forms of *Haemagogus (Conopostegus).*

In addition, it should be stressed that most of the species included in the present revision are known to be anthropophilic and many are capable of breeding in natural or artificial containers in domestic or quasi-domestic situations, and, as a consequence, all these are of potential importance as vectors of arboviruses.

KEYS TO GENERA AND SUBGENERA

ADULTS

1. Mesoscutum with moderately broad to broad flat scales; mesoscutum with metallic coppery, green, blue or violet scales *or* pleuron with 2 very conspicuous, nearly vertical bands of scales ..... *Haemagogus*
   Mesoscutum with narrow curved scales; mesoscutum never with metallic coppery, green, blue or violet scales; pleuron usually without vertical bands of scales, rarely with a single conspicuous vertical band 2

2(1). Postspiracular area without bristles (12. *purpureipes) . . . Aedes (Kompia)*
   Postspiracular area with bristles 3

3(2). Abdominal tergites VI and VII with a pair of large, bristly, scaleless areas; sternopleuron with 2 narrow, diagonal, median lines of silver scales (13. *papago)* ..... *Aedes (Abraedes)*
   Abdominal tergites VI and VII completely scaled; sternopleuron with a single narrow, median, diagonal or horizontal line of scales, a single median patch of scales, or nearly entirely covered with scales 4

4(3). Mesoscutum with a very narrow white-scaled median acrostichal line that is continued as a median prescutellar line through prescutellar space to scutellum; paratergite bare; tarsi entirely dark scaled (14. *ramirezi) . . .* ..... *Aedes (Aztecaedes)*
   Mesoscutum never with continuous light-scaled median acrostichal and med-

ian prescutellar lines; paratergite with scales *and/or* tarsi with 1 or more light bands 5

5(4). Clypeus with scales; scutellum with broad flat silver-white scales on all lobes forming a complete transverse band *(aegypti;* see Systematics) . . . . *Aedes (Stegomyia)*
Clypeus without scales; scutellum without broad flat white scales on all lobes forming a complete transverse band 6

6(5). Sternopleuron without scales at base of prealar knob; hindtibia with conspicuous patch of white scales about 0.3-0.4 distance from base ***(15. mediovittatus)*** ..... ***Aedes (Gymnometopa)***
Sternopleuron with scales at base of prealar knob; hindtibia without patch of white scales about 0.3-0.4 distance from base 7

7(6). Laterotergite of abdominal segment I without scales *or* outer surface of hindcoxa bare (Atropalpus Section) . . . in part ***Aedes (Ochlerotatus)***
Laterotergite *and* outer surface of hindcoxa with scales 8

8(7). Hindtarsal segments 2 and 3 with conspicuous broad white apical band (Varipalpus Group—in part Pulchritarsis Section; see Systematics) . . . . in part ***Aedes*** *(Ochlerotatus)*
Hindtarsal segments 2 and 3 entirely dark scaled *or* 1 or both with light basal band 9

9(8). Hypostigial area with patch of white scales *and* hindtarsus entirely dark scaled (16. ***muelleri—in*** part Pulchritarsis Section) .... in part ***Aedes (Ochlerotatus)***
Hypostigial area usually bare, *if* scaled *then* hindtarsus with at least 1 light band 10

10(9). Vertex of head usually with narrow curved scales and numerous erect scales; mesepimeron usually with a single large patch of scales covering most of sclerite; tarsi varied, but light scales, if present, not restricted to band at base of segment 1 of all legs ..... ***Aedes (Protomacleaya)***
Vertex of head with broad flat scales except along midline and with few or no erect scales; mesepimeron usually with 1 or 2 small patches of scales; *if* with a single large patch *then* only tarsal segment 1 of all legs with a light basal band (see Systematics) ..... *Aedes (Howardina)*

FEMALE GENITALIA

1. Cercus obliquely truncate in lateral aspect and with 2-4 strongly developed setae at apex; tergite IX well developed, moderately to strongly sclerotized, rather narrow anteriorly and with a pair of narrow elongate posterior extensions so that it is more or less U- or V-shaped . ***Haemagogus***
Cercus not obliquely truncate in lateral aspect and without strongly developed setae; tergite IX weakly to moderately developed and sclerotized, usually not distinctly U- or V-shaped 2

2(1). Insula without setae; apical margin of sternite VIII deeply emarginate between a pair of more strongly sclerotized submedian lobes *(aegypti;* see Systematics) ..... *Aedes (Stegomyia)*
Insula with at least 1 pair of conspicuous elongate setae; apical margin of sternite VIII straight or shallowly emarginate, without differentially sclerotized submedian lobes 3

3(2). Tergite VIII with scales absent or few (Varipalpus Group—in part Pulchritarsis Section; see Systematics) ..... in part *Aedes (Ochlerotatus)*
Tergite VIII with numerous scales 4

4(3). Tergite IX reduced to a pair of separate, weakly sclerotized, dorsolateral plates without setae; postgenital plate with a pair of setae that are as strongly developed as setae of cercus (Atropalpus Section) .....
..... in part *Aedes (Ochlerotatus)*
Tergite IX not reduced to a pair of dorsolateral plates and usually with at least 1 pair of setae; postgenital plate with setae that are not as strongly developed as setae of cercus 5

5(4). Atrial plates present 6
Atrial plates absent 7

6(5). Postgenital plate moderately long and broad; cercus with numerous scales; basal portion of spermathecal duct not sclerotized *(15. mediovittatus)*
..... *Aedes (Gymnometopa)*
Postgenital plate long and narrow; cercus without scales; basal portion of spermathecal duct sclerotized ..... *Aedes (Protomacleaya)*

7(5). Tergite IX lobe with 11-17 moderately developed setae; insula with same degree of sclerotization and pigmentation as sigma (12. *purpureipes)*
..... *Aedes (Kompia)*
Tergite IX lobe with 9 or fewer setae *or* insula much more strongly sclerotized and pigmented than sigma 8

8(7). Sternite VIII with relatively few conspicuous scales 9
Sternite VIII with very numerous conspicuous scales **10**

9(8). Insula weakly sclerotized and pigmented; tergite IX lobe with 1 seta; cercus with scales (13. *papago)* ..... *Aedes (Abraedes)*
Insula strongly sclerotized and pigmented; tergite IX lobe with 5-9 setae; cercus without scales (14. *ramirezi)* ..... *Aedes (Aztecaedes)*

10(8). Postgenital plate with moderately to strongly developed basal median apodeme; tergite VIII with conspicuous setae on disc and without a dense band of outstanding scales distally (16. *muelleri—in* part Pulchritarsis Section) ..... in part *Aedes (Ochlerotatus)*
Postgenital plate without a basal median apodeme; tergite VIII usually without conspicuous setae on disc and usually with a dense band of outstanding scales distally (see Systematics) ..... *Aedes (Howardina)*

MALE GENITALIA

1. Sternomesal surface of sidepiece with long broad striated scales; paraproct with striated knob at apex ..... *Haemagogus*
Sternomesal surface of sidepiece without long broad striated scales; paraproct with 1 or rarely more apical teeth 2

2(1). Aedeagus with apical and lateral teeth; cercal setae absent; paraproct with long sternal arm *(aegypti;* see Systematics) ..... *Aedes (Stegomyia)*
Aedeagus without apical or lateral teeth; cercal setae present; paraproct without sternal arm 3

3(2). Claspette represented by a small basal lobe or large plaque on sternomesal margin of sidepiece and never bearing a single long, strong, curved filament (see Systematics) ..... *Aedes (Howardina)*
Claspette developed as a columnar stem projecting caudad mesad of sidepiece and bearing a single, long, strong, curved filament 4

4(3). Proctiger unusually long in dorsal aspect, the basolateral sclerotization nearly horizontal (13. *papago)* ..... *Aedes (Abraedes)*
Proctiger not unusually long in dorsal aspect, the basolateral sclerotization nearly vertical 5

5(4). Tergite IX without sclerotized lobes and without setae (Atropalpus Section) ..... in part *Aedes (Ochlerotatus)*
Tergite IX with small to large sclerotized lobes bearing 2 or more setae . . 6

6(5). Claspette stem with 2 strongly developed, elongate setae arising on dorsal surface distally (14. *ramirezi)* ..... *Aedes (Aztecaedes)*
Claspette stem without strongly developed setae 7

7(6). Claspette filament with a distinct, large, retrorse angle on convex side; spiniform of clasper long, 0.5-0.7 length of clasper, and basal tergomesal area of sidepiece with a single, long, strong, differentiated seta (15. *mediovittatus)* ..... *Aedes (Gymnometopa)*
Claspette filament without distinct retrorse angle; spiniform shorter than 0.4 of clasper length *and/or* basal tergomesal area of sidepiece without a long, strong, differentiated seta 8

8(7). Aedeagus distinctly expanded distally in dorsal aspect; tergite IX lobe with 8-17 setae in several series (12. *purpureipes)* ..... *Aedes (Konzpia)*
Aedeagus not expanded distally in dorsal aspect; tergite IX lobe with 2-10 setae in a single or partially double series 9

9(8). Basal tergomesal area of sidepiece with clump of few to very numerous weakly to moderately developed setae; clasper without setae on outer surface near apex; spiniform of clasper long, 0.3-0.6 length of clasper ..... *Aedes (Protomacleaya)*
Basal tergomesal area of sidepiece with 1 or more long, strong, differentiated setae; clasper with 1 or 2 setae on outer surface near apex; spiniform of clasper short, 0.2-0.3 length of clasper 10

10(9). Tergal surface of sidepiece with numerous scales among the shorter setae; aedeagus usually broadest in middle and more or less barrel-shaped in dorsal aspect (16. *muelleri—in* part Pulchritarsis Section) ..... in part *Aedes (Ochlerotatus)*

Tergal surface of sidepiece without scales or with very few scales among the shorter setae; aedeagus usually broadest at base and slightly tapered distally in dorsal aspect (Varipalpus Group—in part Pulchritarsis Section; see Systematics) ..... in part *Aedes (Ochlerotatus)*

PUPAE

[Aedes (Howardina), Varipalpus Group of *Aedes (Ochlerotatus)* and Terrens Group of *Aedes (Protomacleaya)* not included]

1. Float hair (1-I) usually displaced mesad and 1-II usually displaced laterad, so that distance between alveoli of float hairs is usually less than 0.6 distance between alveoli of hairs 1-II ..... *Haemagogus*

Distance between alveoli of float hairs usually greater than 0.7 distance between alveoli of hairs 1-II 2

2(1). Hair 6-C longer and stronger than 7-C *(aegypti;* see Systematics) . . . . *Aedes (Stegomyia)*

Hair 6-C shorter and weaker than 7-C 3

3(2). Paddle with long filamentous marginal spicules (13. *papago)* .... *Aedes (Abraedes)*

Paddle without long filamentous marginal spicules 4

4(3). Tergites II-VI or VII with a long, strong, irregular transverse ridge slightly caudad of level of hair 0; midrib of paddle conspicuous only basally *(14. ramirezi)* ..... *Aedes (Aztecaedes)*

Tergites II-VI or VII without a transverse ridge caudad of level of hair 0 *or* midrib of paddle conspicuous to or nearly to apex of paddle 5

5(4). Hair 6-VII strongly developed, longer and stronger than 6-VI and 9-VII *(15. mediovittatus)* ..... *Aedes (Gymnometopa)*

Hair 6-VII weakly to moderately developed, weaker and shorter than 6-VI and/or 9-VII 6

6(5). Paddle as broad as or broader than long (Atropalpus Section) . . . . in part *Aedes (Ochlerotatus)*

Paddle distinctly longer than broad 7

7(6). Hair 5-IV,V short, 0.4-0.7 length of corresponding tergite (12. *purpureipes)* ..... *Aedes (Kompia)*

Hair 5-IV,V moderately long to long, 1.0-2.2 length of corresponding tergite 8

8(7). Hair 1-V or VI to VII much more weakly developed than hair 1 of immediately preceding segments; 6-III-VI relatively strongly developed (16. *muel-*

leri—in part Pulchritarsis Section) ..... in part *Aedes (Ochlerotatus)*
Hair 1-V or VI to VII not conspicuously weaker than hair 1 of immediately preceding segments; 6-III-VI weakly to moderately developed . . .. in part *Aedes (Protomacleaya)*

LARVAE

1. Hair 3-VII strongly developed, very long, usually single (single or double) . 2
Hair 3-VII weakly to moderately developed, short, single to multiple . . . 4

2(1). Pecten of siphon strongly arcuate dorsad distally; comb scales with 1 or 2 long and usually 1-3 shorter unfringed spines from a large basal plate *(15. mediovittatus)* ..... *Aedes (Gymnometopa)*
Pecten of siphon more or less straight; comb scales with a single fringed or serrate apical projection from a small base 3

3(2). Hair 9-III-V as long and strong as or longer and stronger than hair 7 of corresponding segment; 12-I absent (see Systematics) .... *Aedes (Howardina)*
Hair 9-III-V shorter and weaker than hair 7 of corresponding segment *and/or* 12-I present ..... *Haemagogus*

4(1). Ventral brush (hair 4-X) arising from a weakly to strongly sclerotized boss 5
Ventral brush arising from a grid 7

5(4). Boss of ventral brush weakly sclerotized; siphon without acus; labial plate subquadrate (13. *papago)* ..... *Aedes (Ahraedes)*
Boss of ventral brush strongly sclerotized; siphon with distinct acus; labial plate distinctly narrowed apically 6

6(5). Integument of thorax and abdomen with conspicuous simple spicules; pecten of siphon relatively long, more or less straight; comb scales with long unfringed apical spine (12. *purpureipes)* ..... *Aedes (Kompia)*
Integument of thorax and abdomen without conspicuous spicules; pecten of siphon short, conspicuously arcuate dorsad distally or oblique; comb scales fringed (14. *ramirezi)* ..... *Aedes (Aztecaedes)*

7(4). Comb scales with long median spine and strong basal spinules; ventral brush with 5 pairs of hairs *(aegypti;* see Systematics). . . . *Aedes (Stegomyia)*
Comb scales usually fringed; *if* with long median spine, *then* without strong basal spinules *and* ventral brush with more than 5 pairs of hairs 8

8(7). Comb scales with long unfringed apical spine; most caudal hair of ventral brush (4a-X) short; ventral brush with 7 pairs of hairs (16. *muelleri—in* part Pulchritarsis Section) ..... in part *Aedes (Ochlerotatus)*
Comb scales fringed, the apical element of the fringe rarely produced into moderately long spine; most caudal hair of ventral brush usually long,

if short *then* ventral brush with only 6 pairs of hairs 9

9(8). Ventral brush with 6 pairs of hairs *and* the more caudal hairs (4a-c-X) single or double (Varipalpus Group—in part Pulchritarsis Section; see Systematics) ..... in part *Aedes (Ochlerotatus)*
Ventral brush varied, but never with 6 pairs of hairs and the more caudal hairs single or double 10

10(9). Hair 5-II-IV moderately to strongly developed; comb scales not irregularly cleft and distal pecten teeth not strongly detached ..... *Aedes (Protomacleaya)*
Hair 5-II-IV weakly developed; comb scales irregularly cleft or distal pecten teeth strongly detached (Atropalpus Section) ..... in part *Aedes (Ochlerotatus)*

TAXONOMIC TREATMENT

Genus AEDES Meigen

1818. *Aedes* Meigen, 1818:13. TYPE SPECIES: *Aedes cinereus* Meigen, 1818, Europe; monobasic.

For complete synonymy see Stone, Knight and Starcke (1959).

Subgenus PROTOMACLEAYA Theobald

1904. *Gualteria* Lutz, 1904a:13, 1904b:4. TYPE SPECIES: *Gualteria oswaldi* Lutz, 1904, Brazil; first of 2 included species, selection of Brunetti (1914:61). Preoccupied by *Gualteria* Agassiz, 1872.
1907. *Protomacleaya* Theobald, 1907:253-254. TYPE SPECIES: *Culex triseriatus* Say, 1823, United States of America; monobasic and original designation.

Protomacleaya of Theobald (1907:253-254; 1910:250, in part).
Aedes (Gualteria) in part of Lutz (1904a:13); Dyar (1918:79); Vargas (1950:62-63); Vargas and Downs (1950:161-172).
Aedes (Finlaya) in part of most authors.

FEMALES. Dark scales of palpus, proboscis, legs, wing and abdomen with blue or violet reflections. *Head:* Eyes narrowly separated above antennae, the resulting space with light narrow curved scales. Integument yellow to tan or brown to black. Frontal bristles strongly developed, 1-3 pairs. Orbital bristles relatively few, mesal 2-5 pairs strongly developed, lateral 4 or 5 pairs moderately developed. Vertex and occiput with numerous narrow curved decumbent scales and numerous erect scales. Orbital line of light narrow curved scales present. Dorsolateral, lateral and ventral surfaces with broad flat scales. Clypeus moderately large, bare. Proboscis relatively stout, longer than to subequal in length to forefemur; entirely dark scaled; with a few basal bristles. Palpus moderately long, about 0.22-0.29 of proboscis; 3- or 4-segmented, segment 4 very small to minute when present; segments 1-3 with bristles; entirely dark scaled. Antenna subequal in length

to proboscis or slightly longer; torus frequently without scales, scales small and inconspicuous when present; flagellar segment 1 longer than 2, usually slightly swollen, with small scales; flagellar segments 2-13 usually with 6 moderate bristles in basal whorl; each of flagellar segments 3-13 slightly longer than preceding. *Thorax:* Integument yellow to tan or brown to black. Acrostichal and dorsocentral bristles in complete well developed rows or reduced in number and extent and then sometimes totally absent from disc; prescutellar and supraalar bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles varying from numerous and well developed to absent; 1 parascutellar bristle present. Scutellum with 4-10 strong bristles on midlobe, 3-10 on lateral lobe. Mesoscutum completely covered with narrow curved scales except for anterior inner dorsocentral and median and lateral prescutellar bare spaces; pattern varied. Scutellum with narrow curved and/or broad flat scales on midlobe, narrow curved scales on lateral lobe; color of scales varied. Paratergite broad, with patch of light scales. *Apn* not enlarged. *Ppn* separated from mesoscutum by strong suture. Meron large. Pleuron with bristles on *apn, ppn, ppl, psp, stp, pra* and upper *mep; stp* bristles in long row from *psp* bristles to below lower margin of *mep; ssp* and lower *mep* bristles absent. *Apn* with broad and/or narrow curved scales, neither type closely appressed; *ppn* nearly entirely covered with scales, these narrow curved and/or broad flat; broad scales in patches on *ppl, stp* below *pra, stp* caudad of *ssp* area, *stp* cephalodorsad of midcoxa, and in a single large patch extending from upper bristles nearly to lower margin on *mep;* additional patch usually on *ssp* and sometimes on *pst, psp* and metameron; *pcx* and hypostigial scales absent. *Legs:* Hindcoxa subequal in size to or smaller than midcoxa, its base far below upper margin of meron. Legs moderately long, the forefemur about 1.18-1.40 times distance from top of thorax to tip of midcoxa. Forecoxa with light or light and dark scales on outer surface; midcoxa and hindcoxa with light scales on outer surface. Forefemur and midfemur dark scaled with light scales in at least basal 0.5 of posterior and sometimes dorsal and/or ventral surfaces and sometimes at base on anterior surface; hindfemur light scaled in at least basal 0.5, dark scaled in apical portion; light scales on posterior and/or ventral surfaces of all femora sometimes extending to apex. Knee spots small to large, white to silver; largest on hindleg, sometimes absent on foreleg. Tibiae basically dark scaled, sometimes with basal light patch or ring or light streak on posterior surface. Tarsi varied. Claws of foreleg and midleg with acute submedian tooth; claws of hindleg varied. *Wing:* Entirely dark scaled or with light scales at base of costa and/or vein R. Plume scales present on dorsum of veins Rs, R_{2+3}, R_2, R_3, M basad of furcation, and less conspicuously on apical portion of 1A. *Haltere:* Knob light and/or dark scaled. *Abdomen:* Tergite I with numerous scales middorsally. Laterotergite with large patch of white or silver scales. Segments VI and VII completely scaled. Without outstanding scales. Ornamentation varied.

FEMALE GENITALIA (figs. 5,14). *Segment VIII:* Tergite semielliptical in shape, length along midline about 0.55-0.65 length of tergite VII; distal 0.65-0.75 with scales and bristles. Sternite long, about 1.2-1.4 length of tergite, much broader distally than basally; distal margin broadly emarginate; all but narrow basal and lateral portions with scales or bristles, the latter predominating; bristles more numerous along midline and distal margin, largely weakly developed and short, but some moderately developed and elongate. *Tergite IX:* Deeply notched apically, maximum length about 0.45-0.55 of tergite VIII; moderately sclerotized; apical lobe with 1-7 fine short bristles. *Insula:* Weakly sclerotized; connected to sigma;

with 2-5 pairs of moderately developed bristles. *Cercus:* Long, length of dorsal edge 0.85-0.95 length of tergite VIII; compressed; apex rounded in lateral view; bristles numerous apically, the largest moderately developed; scales absent. *Postgenital Plate:* Long and narrow, length 0.65-0.80 of tergite VIII; index about 2.8-3.3; apex rounded in ventral view; distal portion with numerous weakly developed bristles; basal median longitudinal apodeme strongly sclerotized. *Cowl:* Strongly sclerotized. Atrial plates moderately large, strongly sclerotized. *Sigma:* Continuous with cowl; weakly to moderately sclerotized. Basal portion of spermathecal duct strongly sclerotized. Spermathecae 3, strongly sclerotized, more or less spherical, 1 slightly larger than others.

MALES. Essentially as in females except for sexual characters. *Head:* Proboscis relatively stout. Palpus subequal in length to or slightly longer than proboscis; 5-segmented; segments 2 and 3 ankylosed and long, making up 0.62-0.67 length of palpus; segment 4 short, 0.16-0.18 length of palpus; segment 5 short, 0.12-0.15 length of palpus; palpus slender except for swollen apex of segment 3 and swollen segment 4; apex of segment 3 upturned, segments 4 and 5 drooping; apex of segment 3 and all of segments 4 and 5 with long bristles; usually completely dark scaled. Antenna subequal in length to or slightly shorter than proboscis; torus much enlarged, bare; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment 1 slightly elongate, with scales; flagellar segments 12 and 13 elongate, subequal in length or penultimate longer, the 2 combined nearly equal to total length of first 11 segments. *Legs:* Claws of foreleg and midleg enlarged, unequal; larger claw with blunt submedian tooth and with or without an acute basal external tooth; smaller claw with acute submedian tooth. Claws of hindleg small, varied. *Abdomen:* Apical segments and genitalia not conspicuously bent ventrad.

MALE GENITALIA. Predominantly various shades of straw-yellow to brown with apex of paraproct dark brown to black. *Segment VIII:* Tergite long; 0.78-0.98 length of sternite; exserted, apical 0.50-0.70 scaled. *Segment IX:* Well developed; middorsal portion of tergite weakly to moderately sclerotized, at or caudad of level of base of sidepiece; tergite lobes prominent, narrowly to broadly connected middorsally, each with 1-9 moderately to strongly developed setae in 1 series; sternite large, with 2-8 setae distally. *Sidepiece:* Well developed, usually subcylindrical to subconical; mesal surface membranous from base to apex; basal tergomesal area slightly to conspicuously swollen, with few to numerous weakly to moderately developed setae; apical lobe absent; median sternomesal sclerite absent to well developed and then with a conspicuous tuft of setae; sternomesal surface without long broad striated scales; dorsal, lateral and ventral surfaces with numerous scales and bristles; bristles of ventral surface not specialized. *Claspette:* Well developed; stem short, straight in dorsal aspect; spiculose; with 2-6 weakly developed setae; filament long, subterete to distinctly flattened apically, curved or angled dorsad, with or without ridge on convex side, without retrorse barb. *Clasper:* Simple, short, swollen subbasally; median portion straight, with longitudinal ridges or wrinkles; basal portion spiculose; apical portion with 1 or 2 fine setae on inner surface, none on outer surface; apical spiniform long, 0.35-0.50 length of clasper. *Phallosome:* Aedeagus moderately large, without teeth; base slightly bulbous, remainder subparallel-sided with truncate apex in dorsal aspect. *Proctiger:* Strongly developed; not unusually long in dorsal aspect, the basolateral sclerotization vertical; paraproct well sclerotized, with a single large, very heavily sclerotized curved apical tooth; cercal setae fine, short, 3-6.

PUPAE. *Cephalothorax:* Weakly to moderately pigmented, lighter ventrally. Hair 5-C moderately to strongly developed, short to moderately long, never reaching more than 0.6 distance from its base to that of trumpet. *Trumpet:* Light golden brown to dark brown in color. Broadening gradually from base to apex; tracheoid sculpturing relatively well developed in basal 0.11-0.21; reticulate sculpturing strong. *Abdomen:* Weakly to moderately pigmented, lighter posteriorly. Tergites II-VII without a strong transverse ridge anteriorly. Hair 1-II weakly to strongly developed, usually 3-7b (1-14); hair **1-III-V** subequally developed, weak to moderately strong, usually with fewer [1-5 (1-8)] , shorter and finer branches than 1-II; hair 1-VI,VII weakly to moderately developed, subequal to 1-III-V or slightly smaller, usually 1-4b (1-5). Hair **2-III-V** mesad or laterad of hair 1 of corresponding segment. Hair 5-IV,V 1.0-2.2 length of corresponding tergite; 5-VII moderately long to long, usually single (single or double), weaker and shorter or stronger and longer than 4-VII. Hair **6-III-VI** subequally developed, moderately long, fine to moderately strong; 6-VII shorter and finer than **6-III-VI.** Hair 8-VI,VII ventral. Hair **9-III-VI** subequally developed, short to relatively long, fine to stout, caudad of the level of hair 6 of the corresponding segment (except possibly in *knabi);* **9-VII** near or moderately cephalad of caudolateral angle of segment, with 1 or 2 (1-4) moderately long to long primary branches; 9-VIII at or slightly mesad of caudolateral angle of segment; with 3-5 (2-7) long, strong primary branches. Hair 10-VI relatively close to 11-VI. *Terminal Segments:* Male genital lobe moderately large, about 1.1-1.4 length of tergite **VIII.** *Paddle:* Length always greater than width. Apex produced, pointed, rounded or subtruncate. Midrib conspicuous to or nearly to apex; without wrinkled area near apex. Without long marginal spicules. Hair 1-P short to moderately long, usually single (single or double).

LARVAE. *Head:* Lightly to moderately pigmented, lightened in ocular area, darkened posteriorly. Labial plate distinctly narrowed anteriorly. Hair 1-C usually stout (fine in *knabi).* Hairs 4,6-C displaced caudad, not near labrum. Hair 4-C weakly to strongly developed, 2-24b; mesad or laterad of 1-C and cephalad or caudad of level of 6-C. Hair 5-C single to multiple; more or less in line with 6-C. Hair 6-C single to multiple; distinctly laterad of 1-C. Hair 7-C usually 3-11 b (2-13). Hair 15-C usually short to moderately long and 2,3b (1-3) (long and 25-35b in *knabi).* Mental plate with 9-12 (8-13) teeth on each side of median tooth. *Antenna:* Shaft with or without small spicules. Hair 1-A moderately long, usually single (1-3b). *Thorax:* Epidermis and fat body with or without pigment. Integument without spicules. Tubercles of hairs 5-7-P separate. Hair 1-M moderately long to long, branched; 1-T usually moderately long, branched. Hair 4-P branched. Hair 5-P usually branched (single in *knabi);* 5-M single. Hair 11-P usually much shorter than 9-P, sometimes enlarged and up to 0.6 length of 9-P; hair 11-M,T much shorter than 9-P. Hair 13-T moderately to strongly developed, usually 2-7b (2-10); subequal in size to 14-M or slightly larger. Hair 14-M weakly to strongly developed, usually 3-9b (2-11). *Abdomen:* Hair 1-I weakly to strongly developed, usually 3-8b (2-10); hair 1-IV,V strongly developed, usually 2-7b (1-8). Hair 2-III-V laterad or mesad of hair 1 of corresponding segment; usually single or double (1-4b) (3-6b and stellate on **III** and IV in *chionotum).* Hair 3-VII weakly to moderately developed, usually 2-4b (1-5), short. Hair 5-II-IV moderately to strongly developed, usually 2-7b (1-9). Hair 6-11I-V usually double. Hair 9-III-V usually single or double (1-3b). Hair 11-I weakly to strongly developed, usually 3-8b (2-11). Hair 12-I usually present (absent in *zoosophus).* Hair 13-I weakly to strongly developed, usually 2-6b (2-8); hair 13-IV,V strongly de-

veloped, usually 2-8b (1-9); hair 13-VI usually with numerous [6-13 (3-18)] short fine branches and usually cephalad of the level of 10-VI [with fewer (4) longer and stronger branches and then sometimes distinctly cephalolaterad or laterad of 10-VI in *sandrae]. Segment VIII:* Hairs 1 and 2 separated. Hair 1 moderately to strongly developed, usually 3-8b (1-9). Comb scales small to moderate in size; fringed; relatively few (8-15) in 1 or more regular or irregular rows or numerous (16-58) in a patch. *Siphon:* Moderately to strongly pigmented. Short to moderately long, index 1.7-5.0. Acus small to moderate in size. Pecten teeth with numerous irregular basal denticles; 13-47 in a more or less straight even row. Hair 1-S slightly distad of pecten; moderately to strongly developed, 1-5b. *Anal Segment:* Saddle small to large; without spines on caudal margin; moderately to strongly pigmented. Hair 1-X moderately to strongly developed, usually 2-7b (1-9) (single in *knabi).* Hair 2-X usually 4-6b (3-9). Hair 3-X single. Ventral brush (4-X) weakly to strongly developed; with 5 *(hendersoni, brelandi),* 6 (most species) or *7 (zoosophus, knabi)* pairs of hairs; all but most proximal 1 or 2 hairs on grid; hair 4a-X usually long (shortened in *sandrae),* 3-6b; hairs 4b,4c-X usually 3,4b (2-5) [regularly double (2,3b) in *hendersoni,* apparently 5-7b in *knabi].* Anal gills varied.

DISCUSSION. The subgenus *Protomacleaya* is characterized as follows: in the adults by the combination of (1) the narrowly separated to partially contiguous eyes, (2) the usual presence of numerous erect scales and narrow curved scales on the vertex of the head, (3) the ornamentation of the mesoscutum, which is usually dark scaled with anterior lateral or lateral silver or white markings, (4) the 3 distinct patches of scales on the sternopleuron, (5) the large patch of scales on the paratergite and laterotergite, (6) the usually single large patch of scales on the mesepimeron, (7) the completely scaled posterior pronotum with the scales usually broad and flat, (8) the relatively stout proboscis, and (9) the usually entirely dark scaled proboscis and palpus; in the male genitalia by (1) the shape of the aedeagus, which is usually rounded and slightly expanded basally, more or less parallel-sided distally, and truncate apically, (2) the frequent development of at least a weak sternomesal sclerite and tuft, and the combination of (3) the lobes of tergite IX, which bear 1-9 setae in a single series, (4) the patch of few to very numerous weakly to moderately developed setae in the basal tergomesal area of the sidepiece, (5) the absence of numerous long, strong setae along the apical portion of the sternomesal surface of the sidepiece, (6) the relatively short clasper without setae on the outer surface near the apex, and (7) the relatively long spiniform; in the pupae by the combination of (1) the absence of a transverse anterior ridge on tergites II-VII, (2) the usually strongly pigmented trumpet, (3) the usually relatively strongly developed and long branches of hair 1-II, (4) the moderately long to long 5-IV,V, and (5) the usually fine 9-III-VI; and, in the larvae by the combination of (1) the weakly to moderately developed, short, 2-6b (1-7) hair 3-VII, (2) the moderately to strongly developed 5-II-IV, (3) the usual presence of 12-I, (4) the comb scales, which are fringed and numerous enough to form a large patch in most species, and (5) the development of the ventral brush, which arises from a grid and is moderately to strongly developed, with 6-8 pairs of hairs and 4b,4c-X 3-12b, in most species.

Protomacleaya, with more than 40 species, is the dominant subgenus of tree-hole-breeding *Aedes* in the New World. Although the subgenus is quite diverse, is defined mainly on negative characters, and many of the included species depart from the "normal" in 1 or more characteristics of 1 or more stages, it is, I believe,

natural because of the basically similar male genitalia of virtually all species. There is no morphological evidence to indicate that *Protomacleaya* is related to any other Middle American group of treehole-breeding *Aedes,* and I suspect that this subgenus has been produced by radiation following the independent, relatively recent invasion of this habitat by a ground-pool breeding form in Middle America. To the north, in Mexico, the United States, and Canada, the distributions of *Protomacleaya* and the Pulchritarsis Section of *Ochlerotatus* are basically complementary; while I would usually interpret this as a sign of relationship, I do not believe that can be the explanation in this case.

The species of *Protomacleaya* fall into 5 groups. Four of these, the monotypic Knabi and Zoosophus Groups and the larger Kompi and Triseriatus Groups, are treated in the present study; the fifth and largest group, Terrens, has been revised by Schick (1970a,b). The 5 groups appear to be distinguishable only in the adult and larval stages. Even the 4 small groups treated here can be separated only with difficulty in the pupal stage and male genitalia.

Since the groups of *Protomacleaya* differ most conspicuously in adult ornamentation, particularly tarsal banding, their relationship was not detected by Edwards (1932) or Knight and Marks (1952), and the species of *Protomacleaya* known to these authors are scattered throughout several of the major groups (B, F, and H) of *"Finlaya."*

The description of *Protomacleaya* is based on only the 4 groups treated here; the diagnosis, though, does include the Terrens Group, which has also been added to the keys to the adults and larvae.

The immatures of *Protomacleaya* are found primarily in treeholes and occasionally in broken or cut bamboo internodes, artificial containers, rockholes, coconut shells and pitcher plants.

Protomacleaya extends from southern Canada to northern Argentina and southeastern Brazil; it is absent from the West Indies. The Triseriatus, Kompi and Terrens Groups replace each other geographically; the Zoosophus Group occurs with the Triseriatus Group in the southcentral United States and the Knabi Group is found with the Terrens Group in southern Mexico.

KEYS TO GROUPS

ADULTS

1. Integument of head and thorax yellow to tan; scales of head and mesoscutum largely yellow to golden; claws of hindleg with an acute submedian tooth in both sexes (11. *knabi)* ..... Knabi Group
   Integument of head and thorax brown to black; scales of head and mesoscutum usually largely dark brown to black and white to silver-white, sometimes partially yellowish, creamish-tan or golden brown (Zoosophus Group); claws of hindleg simple in both sexes 2

2(1). Tarsal segments 1-5 of all legs entirely dark scaled . . Triseriatus Group
   Some tarsal segments marked with white 3

3(2). Tarsal segments 1-3 or 4 of foreleg and midleg and tarsal segments 1-4 or 5 of hindleg with conspicuous basal white band (4. *zoosophus)* . . . . Zoosophus Group

Tarsal segments 3-5 usually entirely dark scaled 4

4(3). Hindtarsus with a conspicuous band over joint between segments 1 and 2 *and/or* hindfemur with a dark basal band ..... Terrens Group
Hindtarsus without a band over joint between segments 1 and 2; hindfemur without a dark basal band ..... Kompi Group

MALE GENITALIA

(Terrens Group not included)

1. Setae of basal tergomesal area of sidepiece arising from a differentially sclerotized plaque (11. *knabi)* ..... Knabi Group
Setae of basal tergomesal area of sidepiece not arising from a differentially sclerotized plaque 2

2(1). Aedeagus relatively short and broad (length 1.7-2.0 times maximum width) *and* median sternomesal tuft of sidepiece weakly to moderately developed ..... Kompi Group
Aedeagus relatively long and slender (length 2.1-2.3 times maximum width) *or* median sternomesal tuft of sidepiece strongly developed 3

3(2). Median sternomesal tuft of sidepiece very weakly developed and inconspicuous (4. *zoosophus)* ..... Zoosophus Group
Median sternomesal tuft of sidepiece moderately to strongly developed and conspicuous to very conspicuous ..... Triseriatus Group

PUPAE

(Terrens Group not included)

1. Hairs 4,8-C very strongly developed and long ..... Kompi Group
Hairs 4,8-C weakly to strongly developed and short 2

2(1). Hair 6-1,11 strongly developed, as stout as or stouter than 3-1,11; hair 9-III-VI stout and relatively long (4. *zoosophus)* ..... Zoosophus Group
Hair 6-1,11 moderately developed, much finer than 3-1,11; hair 9-111-VI fine, short to relatively long 3

3(2). Apex of paddle rounded or subtruncate ..... Triseriatus Group
Apex of paddle pointed or produced (11. *knabi)* ..... Knabi Group

LARVAE

1. Hair 15-C long, 25-35b; hair 1-C fine; mental plate with 1 or 2 lateral teeth much enlarged (11. *knabi)* ..... Knabi Group
Hair 15-C short to moderately long, 1-3b; hair 1-C stout; mental plate without conspicuously enlarged lateral teeth 2

2(1). Hair 4-C well developed, with 8-24 long branches, nearer to longitudinal midline of head than to 6-C; comb scales relatively few, 10-13 (8-15), in 1 or 2 regular or irregular rows 3

Hair 4-C weakly developed, with 2-7 (2-11) short branches, usually nearer to 6-C than to longitudinal midline of head; comb scales relatively numerous, 20-100, usually in a patch 4

3(2). Saddle of anal segment large, extending 0.65-0.80 distance down lateral surface of segment, with a narrow lightened or transparent ventral marginal or submarginal area; ventral brush (4-X) with 7 pairs of hairs; hair 12-I absent (4. *zoosophus)* ..... Zoosophus Group

Saddle of anal segment small to moderate in size, extending 0.40-0.65 distance down lateral surface of segment, without a narrow lightened or transparent ventral marginal or submarginal area; ventral brush with 5 or 6 pairs of hairs; hair 12-I present ..... Triseriatus Group

4(2). Ventral brush with 6 pairs of hairs *and* 4b,4c-X usually 3,4b (2-5) . . .. Kompi Group

Ventral brush with 5-9 pairs of hairs; *if* with 6 pairs *then* 4b,4c-X usually 5-10b (3-12) ..... Terrens Group

TRISERIATUS GROUP

FEMALES. *Head:* Integument brown to black. Erect scales usually unicolorous, white to amber. Narrow curved scales usually unicolorous, white to silver-white (dark brown in Florida *triseriatus). Thorax:* Integument brown to black. Acrostichal, anterior dorsocentral, humeral, lateral prescutal and posterior fossal bristles numerous and well developed or much reduced in number and size or even mostly absent except on anterior promontory. Mesoscutum with background of small dark brown or black scales with varied pattern of larger white, silver-white, dingy silver-white or even yellowish or tannish scales (Florida *triseriatus),* as follows: (1) short to long broad patch on median anterior promontory usually developed, (2) narrow broken or complete acrostichal line sometimes developed, (3) narrow to broad lateral prescutellar line usually developed, (4) narrow broken or complete posterior outer dorsocentral line sometimes developed, and (5) broad to very broad lateral marginal line extending from anterior promontory to wing root and mesad along scutal suture usually developed. Midlobe of scutellum with scales dense, mostly broad and flat, usually silver, sometimes dark. *Ppn* scales predominantly broad and flat, usually white to silver-white; *psp* scales present or absent; *ssp* scales usually present; *pst* and metameron normally bare. *Legs:* Tarsi entirely dark scaled or with an inconspicuous pale longitudinal streak on posterior and/or ventral surface of 1 or more basal segments. Claws of hindleg simple. *Wing:* Base of costa with or without a small light patch. Base of vein R with or without a very small light patch. *Abdomen:* Tergites II-VII usually dark scaled with basolateral light patch. Basal sternites light scaled; distal dark scaled with basolateral light patch or light basal band that is broader laterally.

MALES. Essentially as in females except for sexual characters. *Head:* Palpus entirely dark scaled; with few to numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum usually more extensively light scaled than in females, rarely entirely light scaled. *Legs:* Larger claw of foreleg and midleg with or without an acute basal external tooth; claws of hindleg simple. *Wing:* Remigium (base of vein R) dark scaled or entirely or partially light scaled to about level of crossvein *h.*

MALE GENITALIA. *Sidepiece:* Usually weakly to moderately pigmented. Basal tergomesal area slightly to conspicuously swollen; setae of basal tergomesal tuft few to numerous, not arising from a differentially sclerotized plaque; median sternomesal sclerite moderately to strongly developed; median sternomesal tuft moderately to strongly developed, the setae sometimes strongly curved dorsad. *Claspette:* Filament evenly curved or angulate. *Phallosome:* Aedeagus relatively long and slender, length usually 2.0-2.3 (1.8-2.4) greatest width.

PUPAE. Hairs largely moderately strong and moderately pigmented. *Cephalothorax:* Hairs 4,8-C weakly to moderately developed, short; 8-C shorter and finer than 9-C. *Trumpet:* Light golden brown to brown. *Abdomen:* Branches of hair 1-II weakly to moderately developed, short. Hair 6-1,11 moderately developed, usually much finer than 3-1,11. Hair **9-III-VI** fine, short to relatively long. *Paddle:* Apex rounded or subtruncate.

LARVAE. *Head:* Labrum more or less evenly rounded in dorsal aspect. Hair 1-C stout, arising on or near front edge of labrum. Hair 4-C well developed, with numerous (8-24) long branches; closer to midline than to 6-C. Hair 5-C 1-3b. Hair 6-C 1-5b. Hair 7-C 5-13b. Hair 15-C short to moderately long, 1-3b. Mental plate distinctly triangular, lateral teeth not conspicuously enlarged. *Antenna:* Shaft smooth or with a few spicules. *Thorax:* Pigment present or absent. Hairs 1,5-P branched. *Abdomen:* Hair 12-I present. *Segment VIII:* Comb scales usually 10-13 (9-15), in 1 or 2 irregular rows. *Siphon:* Index 2.2-3.5. Acus attached or detached, sometimes removed from base of siphon. Pecten teeth short to long, moderately to darkly pigmented; 13-30. *Anal Segment:* Saddle small to moderate in size, extending 0.40-0.65 down lateral surface of segment; without a lightened or transparent ventral marginal or submarginal area. Hair 1-X 1-9b. Ventral brush with 5 or 6 pairs of hairs; hairs 4b,4c-X usually 2-4b (2-5). Gills sausage-shaped or tapered; dorsal subequal to ventral or longer, 0.5-4.5 length of saddle.

DISCUSSION. The Triseriatus Group is characterized as follows: in the **adults** by the dark tarsi; in the **male genitalia** by the combination of (1) the weak to moderate pigmentation, (2) the absence of a differentially sclerotized plaque in the basal tergomesal area, (3) the moderately to strongly developed sternomesal tuft, and (4) the usually relatively long slender aedeagus; in the **pupae** by the combination of (1) the short hairs 4,8-C, (2) the weak 6-1,11 and **9-III-VI,** and (3) the rounded or subtruncate apex of the paddle; and in the **larvae** by the combination of (1) the well developed hair 4-C, (2) the usually 10-13 (8-15) comb scales arranged in 1 or 2 irregular rows, and (3) the ventral brush, which has 5 or 6 pairs of hairs and 4b,4c-X 2-4b (2-5).

This group contains at least 3 species, *triseriatus, hendersoni* and *brelandi. Aedes triseriatus* is conspicuously differentiated from the other 2 in the adult and larval stages and male genitalia. *Aedes hendersoni* and *brelandi* differ in relatively few characters of the adults, pupae and larvae.

The light scaling of the mesoscutum of species in this group is usually more extensive in males than in females and is frequently less extensive in depauperate individuals of both sexes. This must be considered when identifying specimens on the basis of the mesoscutal pattern.

The immature stages of species in the Triseriatus Group are characteristically found in rot cavities in trees, stumps and logs and in water-holding crotches of trees. They have also been found in artificial containers, pitcher plants and rockholes. Females of all 3 species are known to bite humans.

The Triseriatus Group is restricted to North America, where it extends from

southern Canada to northern Mexico. Two of the species, *hendersoni* and *triseriatus,* are widespread and sympatric; the third, *brelandi,* is presently known from a limited area of southwestern Texas that is outside the range of both other species. The distributions attributed to the species of this group are based solely on the material that I have examined because, in most instances, it is impossible to tell to which species published records of *triseriatus* refer.

KEYS TO SPECIES

ADULTS

1. Bristles of anterior portion of mesoscutum relatively few and predominantly weakly developed, the fossa not completely bordered by setae and rarely more than 1 or 2 of the setae conspicuous; light scaling of fossa reduced, usually restricted to a narrow or broad stripe along lateral and posterior portions; base of costal vein of female completely dark scaled or with only a few light scales; palpus of male with relatively few long bristles from apex of segment 3 distad (fig. 2) 3 *triseriatus*

Bristles of anterior portion of mesoscutum relatively numerous and well developed, the fossa more or less bordered on all sides by conspicuous setae; light scaling of fossa usually extensive and extending mesad of anterior dorsocentral bristles; base of costal vein of female usually with small but conspicuous white patch; palpus of male with numerous long bristles from apex of segment 3 distad 2

2(1). *Psp* scale patch absent to small in female, usually absent in male; bristles around fossa of female lightly to moderately pigmented (fig. 2) . . . . 1. *hendersoni*

Psp scale patch large in female, usually small in male; bristles around fossa of female more darkly pigmented (figs. 2,5)..... 2. *brelandi*

MALE GENITALIA

1. Tergal surface of sidepiece conspicuously constricted at level of claspette filament; setae of mesal half of middle portion of tergal surface of sidepiece much reduced in size and number; median sternomesal tuft strongly developed, many of the setae sharply curved cephalad and/or dorsad (figs. 3,6) ..... *1. hendersoni;* 2. *brelandi*

Tergal surface of sidepiece not constricted; setae of mesal half of middle portion of tergal surface of sidepiece not reduced in size or number; median sternomesal tuft moderately developed, none or very few of the setae sharply curved cephalad and/or dorsad (fig. 8) . . . 3. *triseriatus*

PUPAE

1. Trumpet light to medium golden brown in color (fig. 6) . . . . 2. *brelandi*

Trumpet medium to dark brown in color 2

2(1). Hair 1-IV usually 4,5b (2-8); hair 5-IV usually 1.6-2.2 length of 3-111 (fig. 3) ..... 1. *hendersoni*

Hair 1-IV usually 2,3b (2-4); hair 5-IV usually 1.0-1.3 (1.0-2.0) length of 3-III (fig. 8) 3 *triseriatus*

LARVAE

1. Ventral brush (4-X) with 6 pairs of hairs; thorax and abdomen pigmented; hair 1-X usually 4,5b (2-9); anal gills tapering distally, relatively short, dorsal longer than ventral (fig. 9) ..... *3. triseriatus*
Ventral brush with 5 pairs of hairs; thorax and abdomen without pigment; hair 1-X usually double (1-3b); anal gills sausage-shaped, relatively long, dorsal and ventral subequal in length 2

2(1). Hairs 4b,4c-X usually double (2,3b) (fig. 4) ..... 1. *hendersoni*
Hairs 4b,4c-X usually 3,4b (2-5) (fig. 7) ..... 2. *brelandi*

1. Aedes (Protomacleaya) hendersoni Cockerell

Figs. 1-4

1918. *Aedes triseriatus* var. *hendersoni* Cockerell, 1918:199-200. TYPE: *Lectotype* female, Box Elder Creek, 19 mi W Douglas, Wyoming, United States of America, 25 Aug 1917, E. Schwabe and J. Henderson [USNM; selection of Stone and Knight, 1956:218] . Reduced to synonymy with *triseriatus* by Dyar (1919:39); resurrected to specific rank by Breland (1960:601).

Aedes (Finlaya) hendersoni of Breland (1960:600-606); Stone (1961:40).
Aedes hendersoni of Hedeen (1963:349-350); Nielsen, Arnell and Linam (1967:72-74); Nielsen, Linam, Arnell and Zavortink (1968:361-362); Truman and Craig (1968:1020.1025); Harmston (1969:490-491); Loor and DeFoliart (1970:60,64).
Aedes (Finlaya) triseriatus in part of Dyar (1928:222); Edwards (1932:155); Matheson (1944: 187-188); Knight and Marks (1952:542,572); Carpenter and LaCasse (1955:255-257); Stone, Knight and Starcke (1959:172); Stone (1961:41).
Aedes triseriatus in part of Howard, Dyar and Knab (1917:762-766); Dyar (1919:39); Rozeboom (1942:34); Jenkins and Carpenter (1946:37-39); Breland (1949:93-100).
For additional references see Carpenter (1970:53-54).

FEMALE (fig. 2). Wing: 3.87 mm. Proboscis: 2.35 mm. Forefemur: 2.23 mm. Abdomen: about 3.1 mm. *Head:* Decumbent scales of dorsal surface light. *Thorax:* Most mesoscutal bristles lightly to moderately pigmented. Acrostichal bristles usually restricted to anterior promontory; anterior dorsocentral, humeral, lateral prescutal and posterior fossal bristles relatively numerous and conspicuous. Light mesoscutal scales predominantly silver-white in western populations, frequently more dingy in eastern populations. Narrow interrupted or complete acrostichal and posterior outer dorsocentral light scale lines sometimes developed in western populations; lateral prescutellar light scale line present; light scaling of fossa extensive, usually extending mesad of anterior dorsocentral bristles; light scales sometimes in anterior transverse band on mesoscutum in western populations. Midlobe of scutellum with light scales. Pleural scale patches silver-white. *Psp* scales absent or very few. *Legs:* Forecoxal scales usually all light. Posterior or ventral surface of forefemur and midfemur with light scales restricted to basal 0.6-0.8 or extending to apex in a narrowed streak. Knee spot absent to moderate on foreleg, small to moderate on midleg, moderate to large on hindleg. Tibiae and

tarsi very frequently marked with pale scales on at least posterior surface. Claws of foreleg and midleg rather abruptly and sharply curved, the tooth long. *Wing:* Costa usually with small basal light patch. *Haltere:* Varying from entirely light scaled to predominantly dark scaled. *Abdomen:* Tergites II-VII with large basolateral white to silver-white patch that is usually rounded mesally in eastern populations, usually cuneate mesally and sometimes joining mate in western populations.

MALE (fig. 2). Essentially as in female except for sexual characters. *Head:* Palpus with numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutal bristles lighter than in female. Light scaling of mesoscutum frequently more extensive than in female, rarely all scutal scales light. *Psp* scale patch usually absent. *Legs:* Larger claw of foreleg and midleg with an acute basal external tooth. *Wing:* Remigium (base of vein R) with light scales.

MALE GENITALIA (fig. 3). *Sidepiece:* Tergal sclerotization conspicuously broadened distally, so that tergal surface appears constricted at level of claspette filament; basal tergomesal area usually conspicuously swollen and with numerous elongate setae in a more or less oval to circular patch, the conspicuousness of these setae enhanced by the reduction in size and number of the setae on the mesal half of middle portion of tergal surface; median sternomesal sclerite strongly developed, triangular, projecting far into mesal membrane; median sternomesal tuft strongly developed, consisting of very numerous setae, many of which are sharply curved cephalad and/or dorsad. *Claspette:* Filament angulate. *Phallosome:* Aedeagus about 2.0-2.1 (1.8-2.2) times longer than greatest width.

PUPA (fig. 3). Abdomen: about 3.2 mm. Trumpet: 0.56 mm. Paddle: 0.90 mm. *Trumpet:* Medium to dark brown in color. *Abdomen:* Hair 1-II usually 4-6b (3-14); hair **1-III** usually 4-6b (2-10); hair 14V usually 4,5b (2-8); hair 1-V usually 3-5b (2-6). Hair 2411 usually mesad of **1-III.** Hair **4-11** usually laterad of 541 Hair 5-IV usually 1.6-2.2 length of **3411.**

LARVA (fig. 4). Head: 0.84 mm. Siphon: 0.85 mm. Anal Saddle: 0.26 mm. *Head:* Hair 5-C usually single (1-3b). Hair 6-C usually 3,4b (3-5). Hair 8-C usually double (single or double). *Thorax:* Pigment absent, living larva white in color. Alveolar plate of hairs 1-3-P usually absent. *Abdomen:* Hair **4-III,IV** usually double or bifid (1-3b or 30. *Siphon:* Index usually 2.7-3.3 (2.5-3.5). Acus detached and usually removed from base of siphon. Pecten teeth relatively short, usually moderately pigmented; 18-26 (15-30) in number. Hair 1-S usually 2,3b (2-4). *Anal Segment:* Saddle small to moderate in size, extending about 0.40-0.60 down lateral surface of segment. Hair 1-X located near caudolateral angle of saddle or less frequently along posterior margin of saddle near its caudolateral angle, its alveolus usually at edge of saddle or in unsclerotized notch; usually double (1-3b). Ventral brush with 5 pairs of hairs; hairs 4b,4c-X usually double (2,3b). Gills sausage-shaped; dorsal and ventral subequal in development and long to very long, usually 3.0-4.0 (2.4-4.4) length of saddle.

SYSTEMATICS. I am in full agreement with Breland (1960), who restored *hendersoni* to full specific rank. This species is well differentiated from *triseriatus* in the adult and larval stages and male genitalia and can be easily separated from that species as follows: in the **adult** by (1) the numerous and well developed anterior dorsocentral, humeral, lateral prescutal and posterior fossal bristles, (2) the more extensive light scaling of the fossal area, the light scales almost always extending mesad of the anterior dorsocentral bristles, (3) the claws of the foreleg and midleg, which are abruptly and sharply curved and have a long submedian tooth in the female, and which have an external tooth at the base of the

larger claw in the male, (4) the ornamentation of the wing, which has a small but conspicuous patch of white scales at the base of the costa in the female and the remigium (base of vein R) entirely or partially light scaled in the male, and (5) the more numerous long bristles on the palpus of the male; in the male genitalia most conspicuously by (1) the constricted tergal surface of the sidepiece, (2) the more numerous elongate setae of the basal tergomesal area of the sidepiece and their arrangement in a more or less oval to circular patch, (3) the reduction in size and number of the setae on the mesal half of the middle portion of the tergal surface of the sidepiece, (4) the larger, triangular sternomesal sclerite, (5) the strongly developed sternomesal tuft with many of the setae strongly curved cephalad or dorsad, and (6) the more angular claspette filament; and in the larva by (1) the absence of pigment in the thorax and abdomen, (2) the acus, which is detached and removed from the base of the siphon, (3) the shorter and usually more lightly pigmented pecten teeth, (4) the usually double (1-3b) hair 1-X, (5) the ventral brush which has 5 pairs of hairs and 4b,4c-X usually double (2,3b), and (6) the 4 subequally developed, long to very long sausage-shaped anal gills. The pupae of *hendersoni* and *triseriatus* are not as reliably separated as the other stages of these species, but the pupa of *hendersoni* is usually distinguished from that of *triseriatus* by (1) the more numerous branches in hair 1-IV, and (2) the longer 5-IV.

Aedes hendersoni is most closely related to *brelandi,* a species from the Chisos Mountains of southwestern Texas, and is separated from it by relatively few characters in each stage, as follows: in the adult by (1) the usual absence of acrostichal bristles on the disc of the mesoscutum, (2) the lighter color of the mesoscutal bristles, (3) the more silver-white or dingy-white color of the light scales on the thorax, and (4) the reduced number or even absence of postspiracular scales; in the pupa by the darker trumpet; and in the larva by the more weakly developed ventral brush in which hairs 4b,4c-X are usually double (2,3b). The male genitalia of *hendersoni* and *brelandi* are apparently indistinguishable.

Adults of *hendersoni* from areas west of the range of *triseriatus* are generally more extensively light scaled than those from within the range of that species. Many from the west have light scales in a transverse band across the anterior portion of the mesoscutum and in narrow acrostichal and outer posterior dorsocentral lines, and most from this area have the basolateral light patches of the abdominal tergites enlarged and distinctly cuneate. The basis for the east-west variation has not been determined.

Since *hendersoni* is widespread in temperate North America and its larva and male genitalia are among the most derived in this subgenus, it is undoubtedly one of the most recent species of *Protomacleaya.*

BIONOMICS. The immature stages of *hendersoni* normally occur in treeholes; according to Truman and Craig (1968:1021) they are found only in those treeholes with water of high organic content. The Cornell University collection contains adults with the label "bred from pitcher plant" *[Sarracenia purpurea* Linnaeus]. Adults of both sexes of *hendersoni* have been taken at lights and resting in buildings and females have been collected biting humans and visiting *Ceanothus* flowers.

The immatures of *hendersoni* are frequently associated with 2 other species of *Protomacleaya, triseriatus* and *zoosophus,* and sometimes with *Ae. (0.) epactius* and *Ae. (0.) sierrensis* (Ludlow, 1905). It would be interesting to investigate the ecological distinctions that permit the continued coexistence of these species of *Pro to-*

macleaya. This is particularly true in the case of *hendersoni* and *triseriatus,* fairly closely related species that are geographically sympatric over a very broad area. Either these species typically inhabit different types of forest, their immatures characteristically occur in different sorts of treeholes, the larvae of each species are competitively superior to those of the other in some particular kind of treehole, or the larvae occupy different ecological niches within the same treehole. The larva of *hendersoni* is neotenic, that is, it retains in the fourth instar characteristics that are found in only the younger instars of less differentiated species of the subgenus, such as the reduced extent of sclerotization and reduced ventral brush. Since neoteny has obviously played a role in the differentiation of the larvae of another pair of closely related arboricolous species from the eastern United States, *Orthopodomyia alba* Baker, 1936 and *0. signifera* (Coquillett, 1896) (Zavortink, 1968:50-51), it seems certain that this phenomenon bears upon the question of competition between the members of these species pairs. The morphology, physiology or behavior of these neotenic larvae must in some way adapt them to a different type of treehole, make them competitively superior to their less differentiated associates under some conditions, or change what they do in a treehole. To postulate that competition between larvae of different species can be reduced by neoteny forces one to question the extent of competition between the different larval instars of a single species and the effect this might have on the population structure of that species.

DISTRIBUTION (fig. 1). *Aedes hendersoni* is the most widespread treehole-breeding mosquito in North America. I have seen specimens from all of the United States of America (excluding Alaska and Hawaii) except Arizona, California, Florida, Nevada, North Dakota, Rhode Island, Vermont, Washington and Wisconsin. The species has been reported from Wisconsin by Loor and DeFoliart (1970:60-64), undoubtedly occurs in North Dakota, Rhode Island, Vermont and Washington, and very probably occurs in northern Florida, which leaves only Arizona, California and Nevada outside its range. I have seen specimens from the Canadian Province of British Columbia and the species undoubtedly occurs throughout southern Canada. It may also occur in northeastern Mexico. Material examined: 710 specimens; 169 males, 312 females, 174 larvae, 55 pupae; 23 individual rearings (20 larval, 3 incomplete).

CANADA. *British Columbia:* Sidar, Kootenay Lake, 1 Aug 1968, L.T. Nielsen (N-25-68), 5 M, 1 M gen, 2 F [UTAH] .

UNITED STATES. *Alabama:* Wilson Dam, Colbert Co., July 1954, R.X. Schick, 1 L [UCLA] . *Arkansas:* Brinkley, 18 May 1923, H.G. Dyar, 1 F [USNM] . Camp Pike, 17 May 1918, R.W. Gies, 1 F [USNM] . Scott, 1-10 June 1909, J.K. Thibault, 1 F [USNM] . Stone Co., 5 Aug 1915, 1 F [USNM] . *Colorado:* Aurora, 6 Sept 1944, L.E. Perry, 1 F [UTAH] . Boulder, 8 km NE, 8 July-15 Aug 1958, J.R. Hilliard, 3 M, 3 M gen, 8 F, 6 L [USNM] . Greeley, 4 July 1962, F.C. Harmston, 1 M [UTAH] . Kuner, 5 June 1959, F.C. Harmston, 17 M, 2 M gen, 12 F [CDC] , 8 M, 14 F [USNM] . Platteville, 1 June 1962, F.C. Harmston, 8 M, 4 M gen, 2 F [UTAH] . Pueblo, 5 Sept 1944, L.E. Perry, 1 F [UTAH] . Vineland, 30 May 1967, M. Manson, 5 M, 1 F [UTAH] . *Connecticut:* Redding, 4 July 1928-July 1930, A.L. Melander, 3 F [USNM] . *Delaware:* Newark, 6 May 1936, D. MacCreary, 1 M, 1 M gen [USNM] *District of Columbia:* Site not specified, 22 June 1906-25 June 1915, F. Knab, 2 F [USNM] ; 9 May 1918, H.G. Dyar, 1 M [USNM] ; 14 May 1918, H. Morrison, 1 F [USNM] ; 26 Sept 1921, A.N. Caudell, 1 F [USNM] ; 23 May 1924, R.C. Shannon, 1 F [USNM] . *Georgia:* Atlanta, Fort McPherson, 1943, S.J. Carpenter, 1 M [UTAH] . Atlanta, 2 June 1948, H.D. Pratt, 2 F [CDC] , 1 F [UTAH] ; 16 Sept 1951, G. Heid, 1 F [UCLA] ; 25 Mar 1953, W.D. Sudia and R.H. Gogel, 4 M, 1 M gen [CDC] . Chamblee, Apr 1951, H.D. Pratt, 1 L [CDC] . College Park, 28 Apr 1948, L.T. Foote, 1 M, 1 M gen [CDC] . Worth Co., 31 Mar 1951, J.K. Wall, 1 L [CDC] . *Idaho:* Nampa,

27 June 1945, F.C. Harmston, 1 F [UTAH] . *Illinois:* Glencoe, July 1923, G.W. Edwards, 1 F [USNM] . Oakwood, Camp Drake, 28 July 1941, G.T. Riegel, 1 F [UTAH] . White Heath, 30 June 1938, Dirks, 1 M gen [CU] . *Indiana:* Lafayette, July 1928, 1 M [USNM] . *Iowa:* Ames, 21 July 1919, F.C. Bishopp, 1 F [USNM] . *Kansas:* Manhattan, 10 Oct 1934, C.W. Sabrosky, 1 F [USNM] . *Kentucky:* Corbin, 24 Aug 1904, H.S. Barber, 3 F [USNM] . Hickman, J.A. Pearson, 1 F [USNM] . *Louisiana:* Baton Rouge, 22 Apr-24 May 1903, 3 F [USNM] . *Maine:* Kittery Point, R. Thaxter, 1 F [USNM] . *Maryland:* Baltimore, 30 July 1919, 1 F [UCLA] . Hyattsville, 14 Aug 1907, 1 F [USNM] . Plummer's Island, July 1907-Mar 1908, R.P. Currie, 2 F [USNM] ; July 1924, R.C. Shannon, 2 F [USNM] ; 7 Sept, 1 F [USNM] . River View, Aug 1905, T. Pergande, 3 M, 1 M gen, 1 F [USNM] . Silver Spring, 20 July 1940, F.C. Bishopp, 1 M [USNM] Takoma Park, 1 F [USNM] . *Massachusetts:* Framingham, 16 Sept 1937, C.A. Frost, 1 F [USNM] . West Springfield, 26 July-13 Sept 1903, F. Knab, 2 F [USNM] . *Michigan:* East Lansing, 21 June 1942, C. Sabrosky, 1 M [USNM] . *Minnesota:* Detroit Lakes, 8,9 Sept 1940, W.A. Hoffman, 1 F [USNM] . *Mississippi:* Agricultural College, 4 May-12 July 1905, G.W. Herrick, 2 F [USNM] . Belzoni, 4 Aug, H.S. Barber, 1 F [USNM] . *Missouri:* Atherton, 12 June-July 1915, C.F. Adams, 1 M, 1 F [USNM] . Gumbo, 4 July 1941, W.M. Gordon, 1 F [CU] . Henson, 14 June 1918, 1 F [USNM] . Jefferson Bks', 24 May 1927, E.C. Bingham, 1 F [USNM] . Joplin, 7 July 1942, A.B. Gurney, 1 F [USNM] . Kansas City, July 1951, 2 F [CDC] . Kirkwood, 13 June 1952, F.C. Harmston, 2 M [UTAH] . Neosho, Camp Crowder, 26,28 June 1942, A.B. Gurney, 1 M, 1 F [USNM] . St. Louis Co., 4 June-17 July 1940, W.M. Gordon, 1 M, 1 M gen, 2 F [CU] . Webster Groves, Satterthwait, 1 F [USNM] . *Montana:* Drummond (3.2 km S), 16 Aug 1967, L.T. Nielsen, J.H. Linam and J.H. Arnell (N-37-67), 1 M, 1 M gen, 1 F [UTAH] . Forsyth, 16 Aug 1964, L.T. Nielsen and J.H. Linam (N-34-64), 7 M, 4 F, 3 P, 3 L [UTAH] . Glendive, 18 June 1922, H.G. Dyar, 2 F [USNM] . Hall (9.7 km S), 16 Aug 1967, L.T. Nielsen, J.H. Linam and J.H. Arnell (N-36-67), 4 F [UTAH] . Hamilton, 5 Aug 1965, J.H. Arnell (HA-18-65), 2 M, 4 F, 3 P, 3 L; same data (HA-19-65), 8 F [UTAH] . Jordon, 16 Aug 1964, L.T. Nielsen and J.H. Linam (N-32-64), 1 F, 2 L [UTAH] . Landusky (32 km S), James Kipp State Park, 15 Aug 1964, L.T. Nielsen and J.H. Linam (N-30-64), 11 M, 1 M gen, 38 F [UTAH] . Lolo, 5 Aug 1965, J.H. Arnell (HA-20-65), 7 L [UTAH] . Miles City, 16 Aug 1964, L.T. Nielsen and J.H. Linam (N-33-64), 3 F, 3 P [UTAH] . Missoula, 6 July 1917, H.G. Dyar, 1 F [USNM] . Mosby, 16 Aug 1964, L.T. Nielsen and J.H. Linam (N-31-64), 3 M, 5 F, 20 L [UTAH] . Silver Star, 15 Aug 1967, L.T. Nielsen, J.H. Linam and J.H. Arnell (N-34-67), 1 M, 4 F [UTAH] . *Nebraska:* Albion, 10 Aug 1963, 8 L [UTAH] . Niobrara, 24 Aug 1943, W.C. Reeves and P. Galindo, 1 F [USNM] . Norfolk, 5 Aug 1943, W.C. Reeves and P. Galindo, 2 M, 1 M gen [USNM] . *New Hampshire:* Center Harbor, 24 June, H.G. Dyar, 1 F [USNM] . Durham, 8 Aug, H.G. Dyar, 1 M, 1 M gen [USNM] . White Mountains, Morrison, 1 F [USNM] . *New Jersey:* Ridgewood, 28 June 1911, M.D. Leonard, 1 F [CU] . Union Co., 1938, 1 F [UTAH] . *New Mexico:* Puerto de Luna, 17 Mar 1968, L.T. Nielsen, J.H. Linam and J.H. Arnell (HA-28-68), 4 M, 1 M gen, 1 F [UTAH] . *New York:* Cayuta Lake, June 1943, R. Matheson, 1 M, 1 M gen, 5 F [CU] . Fort Niagara, 27 Sept 1944, 1 F [CDC] . Franklin Co., Goldsmith, Aug 1955, J.N. Belkin, 1 F [UCLA] . Honeoye Falls, 7 Aug 1915, M.D. Leonard, 1 F [USNM] . Ithaca, Aug 1901, 1 F [CU] ; 6 July 1930-4 May 1942, 6 M, 4 M gen, 12 F, 3 L [CU] ; 19 Sept 1941-Apr 1942, J.N. Belkin, 1 M, 1 M gen, 2 F, 3 P [UCLA] . Lake Mahopac, 13 July 1908, 1 F [CU] . McLean Bog, Aug 1942, H.T. Dalmat, 1 F [CU] . McLean Reservoir, The Shack, 7 July 1924, 1 F [CU] . Rome, 8 Oct 1944, 1 F [CDC] . Saranac, 30 Aug 1955, J.N. Belkin, 1 F [UCLA] . Suffolk Co., July-Aug 1928, 1 F [CU] . *North Carolina:* Charlotte, 30 May 1916, H.P. Barret, 1 M, 1 F [USNM] . Henderson Co., 7 Oct 1901, J.L. Coker, Jr., 1 F [USNM] . Lumberton, 13 May 1920, H.P. Barret, 1 F [USNM] . Old Fort, 28 Sept 1933, CCC Survey, 9 F [USNM] . *Ohio:* Ravenna, 8 June 1970, M.J. Zavortink (UCLA 571), 7 1pM (571-24,29,32,33,35,38,40), 6 1pF (571-21,26,28,30,34,37), 3 1p (571-25,36,43), 2 M gen, 1 F, 1 P, 5 L [UCLA] . *Oklahoma:* Flint, 19 June 1937, Standish-Kaiser, 1 F [CU] . Gore, 20 July 1937, Standish-Kaiser, 1 F [CU] . Page, 23 June 1937, Standish-Kaiser, 1 F [CU] . Wister, 2 July 1904, H.S. Barber, 1 F [USNM] . Woodward (9.7 km E), Boiling Springs State Park, 1 Sept 1968, L.T. Nielsen (N-32-68), 7 M, 1 M gen, 8 F, 9 P, 50 L [UTAH] . *Oregon:* Pendleton (3.2 km E), 18 Aug 1967, L.T. Nielsen, J.H. Arnell and J.H. Linam (N-41-67), 1 M, 1 M gen [UTAH] .

Pennsylvania: Allentown, 22 July 1945, R.C. Barnes, 1 F [CDC] . Philadelphia, University of Pennsylvania, 28 July 1921, 1 F [USNM] . *South Carolina:* Richland Co., 10 Oct 1944, 1 F [CDC] . *South Dakota:* Belle Fourche, 14 July 1966, J.H. Linam, J.H. Arnell and L.T. Nielsen, 1 F [UTAH] . Hot Springs (9.7 km SE), 14 July 1966, J.H. Arnell, J.H. Linam and L.T. Nielsen (HA-34-66), 8 M, 9 F, 4 P, 15 L [UTAH] . *Tennessee:* Reelfoot Lake, 1 Sept 1941, M. Gordon, 1 F [CU] . Rives, 27 July, H.S. Barber, 1 F [USNM] . *Texas:* Austin, 1 Sept 1957, Zilker, 2 L [UTAH] . Huntington, 24 Apr 1934, CCC Survey, 1 F [USNM] . Leon Springs, Camp Stanley, 24 May 1918, D.L. VanDine, 1 F [USNM] . Matagorda Co., 13 Aug 1943, 1 F [CDC] . *Utah:* Weber Co., Weber Canyon, 13 May 1970, L.T. Nielsen et al. (HA-7-70), 1 1pM (7), 6 1pF (1,2,4,5,6,8), 6 M, 1 M gen, 1 F, 2 L [UTAH] . *Virginia:* Fairfax Co., Dead Run, 22 June 1915, R.C. Shannon, 1 F [USNM] . Falls Church, Holmes Run, 4 June-1 July 1961, W.W. Wirth, 1 M, I F [USNM] Falls Church, 4 July 1913, F. Knab, 1 M, 1 M gen [USNM] . Glencarlyn, 26 June 1910, F. Knab, 1 F [USNM] . Monterey, 20 Aug 1934, S.S. Cook, 1 F [USNM] . *West Virginia:* Rock Gap, Cacapon State Park, 1-5 Sept 1955, C.W. Sabrosky, 2 F [USNM] . *Wyoming:* Careyhurst, Boxelder Creek, 15 July 1966, L.T. Nielsen, J.H. Arnell and J.H. Linam (HA-41-66), 5 M, 1 M gen, 4 F, 4 L [UTAH] . Casper, 15 July 1966, L.T. Nielsen, J.H. Arnell and J.H. Linam (HA-42-66), 1 M, 11 F [UTAH] . Devils Tower, 13 July 1966, J.H. Arnell (HA-31-66), 6 F [UTAH] . Lander, 12 July 1966, J.H. Arnell (HA-25-66), 1 M, 2 F [UTAH] . Lingle (3.2 km W), 15 July 1966, L.T. Nielsen, J.H. Arnell and J.H. Linam (HA-38-66), 5 M, 7 F [UTAH] . Newcastle (47 km S), 14 July 1966, L.T. Nielsen, J.H. Linam and J.H. Arnell (HA-35-66), 5 M, 1 M gen, 4 F, 2 P, 6 L [UTAH] . Niobrara Co., Old Woman Creek at Hwy. 85, 14 July 1966, L.T. Nielsen, J.H. Arnell and J.H. Linam (HA-36-66), 2 M, 2 M gen, 3 F, 4 P, 6 L [UTAH] . Orin, 30 July 1961, L.T. Nielsen, 1 F [UTAH] . Orin Junction, 15 July 1966, L.T. Nielsen, J.H. Arnell and J.H. Linam (HA-40-66), 1 M [UTAH] . Riverton, 12 July 1966, L.T. Nielsen, J.H. Arnell and J.H. Linam (HA-26-66), 4 M, 1 F; same data (HA-27-66), 4 M, 4 F, 6 L [UTAH] . *State Unknown:* Wilsor, 7 July 1931, 1 F [CU] .

LOCALITY UNKNOWN. 1 M gen (550310-21) [UCLA] .

2. *Aedes (Protomacleaya) brelandi* Zavortink, n.sp.

Figs. 1,2,5-7

TYPES: *Holotype* male with associated larval and pupal skins and genitalia (UCLA 611-11), Chisos Mountains, Big Bend National Park, Brewster Co., Texas, United States of America, elevation above 1770 m, larva from rothole in living evergreen oak tree, 1 Sept 1969, T.J. Zavortink [USNM] . *Allotype* female with associated larval and pupal skins (UCLA 611-15), same data as holotype [USNM] . *Paratypes:* 2 1pM (611-12,13), 2 1pF (611-14,18), 1 1p (611-17), 1 M gen, 1 L, same data as holotype (UCLA 611); 5 1pF (609-10-13,80), 2 pM (609-100,102), 5 pF (609-101,103-105,108), 1 P, 4 L, same data as holotype (UCLA 609); 2 1pF (610-10,11), same data as holotype (UCLA 610); 1 pM (612-102), 2 F, 2 P, 1 L, same data as holotype (UCLA 612); 4 1pM (613-15,20,22,27), 15 1pF (613-10-12,16-18,23-26,28-32), 2 1p (613-19,21), 4 pM (613-100,102-104), 50 M, 4 M gen, 26 F, 134 P, 20 L, same data as holotype (UCLA 613); 3 1pF (614-10-12), same data as holotype (UCLA 614); 23 L, same data as holotype except collected on 31 Aug 1969 by T.J. Zavortink and J.A. Bergland (UCLA 602); 2 1pM (603-29, 30), 3 1pF (603-32,36,90), 3 L, same data as holotype except collected on 31 Aug 1969 by T.J. Zavortink and J.A. Bergland (UCLA 603); 1 L, same data as holotype except collected on 31 Aug 1969 by T.J. Zavortink and J.A. Bergland (UCLA 604); 1 F, same data as holotype except collected biting human on 31 Aug 1969 by T.J. Zavortink and J.A. Bergland (UCLA 605); 1 F, same data as holotype except collected biting human on 31 Aug 1969 by T.J. Zavortink and J.A. Bergland, and 2 1pM (606-10,11), 1 1p (602-12), 1 P, 3 L reared from eggs laid by F (UCLA 606) [UCLA, ISET, BM] ; 1 F, Chisos Basin Campground, Chisos Mountains, Big Bend National Park, 10 Sept 1968, L.T. Nielsen (A-11-68) [UTAH] . This species is dedicated to Osmond P. Breland in recognition of his contributions to the knowledge of the Culicidae.

FEMALE (figs. 2,5). Wing: 3.58 mm. Proboscis: 2.17 mm. Forefemur: 2.05 mm. Abdomen: about 3.3 mm. *Head:* Decumbent scales of dorsal surface light. *Thorax:* Most mesoscutal bristles darkly pigmented. Acrostichal bristles frequently in a more or less complete row; anterior dorsocentral, humeral, lateral prescutal and posterior fossal bristles numerous and conspicuous. Light mesoscutal scales usually whitish. Narrow interrupted to moderately broad complete acrostichal and posterior outer dorsocentral light scale lines frequently developed; lateral prescutellar light scale line developed; light scaling of fossa extensive, extending mesad of anterior dorsocentral bristles; light scales usually in anterior transverse band on mesoscutum. Scales of midlobe of scutellum light. Pleural scales white. *Psp* with well developed scale patch. *Legs:* Forecoxal scales all light. Posterior or ventral surface of forefemur and midfemur with light scales restricted to basal 0.55-0.70. Knee spot absent to small on foreleg, small to moderate on midleg, moderate on hindleg. Tibiae and tarsi entirely dark scaled or rarely marked with broken pale streak or pale speckles on posterior surface. Claws of foreleg and midleg rather abruptly and sharply curved, the tooth long. *Wing:* Costa with small basal light patch. *Haltere:* Light scaled. *Abdomen:* Tergites II-VII with large basolateral cream-white patch that is usually rounded mesally.

MALE (figs. 2,5). Generally as in female except for sexual characters. *Head:* Palpus with numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutal bristles frequently lightly pigmented. Light scaling of mesoscutum frequently more extensive than in female, rarely all scutal scales light. *Psp* scale patch usually present, small. *Legs:* Larger claw of foreleg and midleg with an acute basal external tooth. *Wing:* Remigium (base of vein R) with light scales.

MALE GENITALIA (fig. 6). Apparently indistinguishable from *hendersoni.*

PUPA (fig. 6). Abdomen: about 3.4 mm. Trumpet: 0.59 mm. Paddle: 0.91 mm. *Trumpet:* Light to medium golden brown in color. *Abdomen:* Hair 1-II 4-7b; hair 1-III-V usually 3-5b (2-6). Hair 2411 usually mesad of 1-III. Hair 4-11 usually laterad of 5-11. Hair 5-IV usually at least 2.0 (1.9-2.7) length of 3-111.

LARVA (fig. 7). Head: 0.86 mm. Siphon: 0.78 mm. Anal Saddle: 0.25 mm. *Head:* Hair 5-C usually double (1-3b). Hair 6-C usually 3,4b (2-6). Hair 8-C usually double (single or double). *Thorax:* Pigment absent, living larva white in color. Alveolar plate of hairs 1-3-P absent or poorly developed. *Abdomen:* Hair 4-III,IV usually 2-4b or 4f. *Siphon:* Index usually 2.5-3.2 (2.2-3.5). Acus detached and removed from base of siphon. Pecten teeth relatively short, usually moderately pigmented; 18-24 (14-25) in number. Hair 1-S usually 3,4b (3-5). *Anal Segment:* Saddle small to moderate in size, extending about 0.50-0.60 down lateral surface of segment. Hair 1-X located along posterior margin of saddle near its caudolateral angle or less frequently at caudolateral angle, its alveolus usually at edge of saddle or in unsclerotized notch; usually double (1-3b). Ventral brush with 5 pairs of hairs; hairs 4b,4c-X usually 3,4b (2-5). Gills sausage-shaped; dorsal and ventral subequal in length and long to very long, usually 2.7-4.0 (2.3-4.5) length of saddle.

SYSTEMATICS. *Aedes brelandi* is most closely related to *hendersoni.* It differs from that species as follows: in the adult by (1) the frequent presence of acrostichal bristles on the disc of the mesoscutum, (2) the darker color of the mesoscutal bristles, (3) the whiter color of the light scales of the thorax, and (4) the greater number of postspiracular scales; in the pupa by the lighter color of the trumpet; and in the larva by the more strongly developed ventral brush, in which hairs 4b,4c-X are usually 3,4b (2-5). The male genitalia of *brelandi* and

hendersoni are apparently indistinguishable.

The extent of light scaling on the mesoscutum of *brelandi* appears to vary directly with size of the adults; the light acrostichal and outer posterior dorsocentral scale lines, so conspicuous on robust specimens, may be completely absent on smaller individuals.

BIONOMICS. The immature stages of *brelandi* were recovered from rotholes in oak trees *(Quercus* spp.) growing at elevations above 1770 meters in the Chisos Mountains. They were associated with the other arboricolous species *Aedes (Ochlerotatus) muelleri, Anopheles (An.) judithae* Zavortink, 1969 and *Orthopodomyia kummi* Edwards, 1939. Females of *brelandi* were troublesome biters in the vicinity of these treeholes.

Rainfall in the Chisos Mountains was less than normal during the summer of 1969 and many treeholes that typically would have contained water in that season were dry. Many *brelandi* and *muelleri* were obtained as first instar larvae by filling dry treeholes with drinking water and removing it 2-5 hours later.

DISTRIBUTION (fig. 1). *Aedes brelandi* is at present known from only the Chisos Mountains in southwestern Texas. It was not recovered from numerous collections made in the Davis Mountains to the northwest, but may occur to the south at appropriate elevations in the Sierra Madre Oriental of Mexico. Such a thesis is supported by the fact that it was collected with other treehole-breeding species which occur farther south in the highlands of northern Mexico. Material examined: 433 specimens; 68 males, 67 females, 102 larvae, 196 pupae; 58 individual rearings (42 larval, 12 pupal, 4 incomplete).

UNITED STATES. *Texas:* Chisos Mts., Big Bend National Park, Brewster Co., type series, cited above.

3. *Aedes (Protomacleaya) triseriatus* (Say)

Figs. 1,2,8,9

1823. *Culex triseriatus* Say, 1823:12. TYPE: Female, Pennsylvania, United States of America [nonexistent] . A neotype must be designated for *triseriatus* in order to preserve the current taxonomic interpretation of this species and insure nomenclatorial stability. This has not been done in the present paper because reared material from Pennsylvania is not available.

1905. *Finlaya ? nigra* Ludlow, 1905:387-388. TYPE: *Holotype* female, Rock Island Arsenal, Illinois, United States of America, 3 Aug 1905, G.G. Craig [USNM] . Synonymy with *triseriatus* by Coquillett (1906c:21). This synonymy confirmed through courtesy of W.W. Wirth.

Aedes (Protomacleaya) triseriata of Theobald (1907:254-257).

Aedes (Finlaya) triseriatus of Dyar (1928:222, in part); Edwards (1932:155, in part); Matheson (1944:187-188, in part); Darsie (1951:14); Knight and Marks (1952:542,572, in part); Carpenter and LaCasse (1955:255-257, in part); Stone, Knight and Starcke (1959:172, in part); Breland (1960:600-606).

Aedes triseriatus of Dyar and Knab (1906:195-196); Howard, Dyar and Knab (1917:762-766, in part); Cockerell (1918:200); Dyar (1919:39, in part); Bennett, Baker and Sellards (1939: 101-105); Davis (1940:49); Jakmauh (1940:17); Jenkins and Carpenter (1946:37-39, in part); Breland (1949:93-100, in part); Chamberlain, Sikes, Nelson and Sudia (1954:280-283); Davis, Hogge, Corristan and Ferrell (1966:227-230); Kissling and Chamberlain (1967:68); Truman and Craig (1968:1020-1025); Harmston (1969:490-491); Loor and DeFoliart (1970:60-64); Masterson, Stegmiller, Parsons, Croft and Spencer (1971:93-94,95); Messersmith (1971:7);

Sudia, Newhouse, Calisher and Chamberlain (1971:584,590,595-596); Sudia, Newhouse and Henderson (1971:209); Thompson, Anslow, Hanson and DeFoliart (1972:94-95).

Aedes (Gualteria) triseriatus of Dyar (1918:73,79); Vargas (1950:62); Vargas and Downs (1950: 171).

Ochlerotatus triseriatus of Coquillett (1906c:19,21).

For additional references see Howard, Dyar and Knab (1917:762-763), Carpenter and LaCasse (1955:256-257), and Carpenter (1968:83; 1970:54).

FEMALE (fig. 2). Wing: 4.10 mm. Proboscis: 2.47 mm. Forefemur: 2.44 mm. Abdomen: about 3.0 mm. *Head:* Decumbent scales of dorsal surface usually all light in typical populations, dark in Florida population. *Thorax:* Mesoscutal bristles lightly to darkly pigmented. Acrostichal bristles usually restricted to anterior promontory; anterior dorsocentral, humeral, lateral prescutal and posterior fossal bristles relatively few and predominantly inconspicuous in typical populations, largely absent in populations from the southeastern United States. Light mesoscutal scales silver-white in typical populations, tinged with yellow or tan in Florida population. Light acrostichal and posterior outer dorsocentral scale lines never developed; lateral prescutellar light scale line present in typical populations, sometimes not developed in Florida population; in typical populations light scaling of fossa usually restricted to a narrow or broad stripe along lateral and posterior portions, but rarely extending mesad to dorsocentral area; light scaling usually restricted to a small patch dorsocephalad of *ppn* or a very narrow lateral line in Florida population; light scales rarely in complete anterior transverse band on mesoscutum. Scales of midscutellar lobe usually all light in typical populations, dark in Florida population. All pleural scale patches silver-white in typical populations, dorsal patches tinged with yellow or tan in Florida population. *Psp* scales absent or very few. *Legs:* Forecoxal scales usually all light in typical populations, partially dark in Florida population. Posterior or ventral surface of forefemur and midfemur with light scales usually extending to apex in a broad streak in typical populations, but with light scales usually restricted to basal 0.5-0.6 in Florida population. Knee spot absent to small on foreleg, small to moderate on midleg, and usually moderate on hindleg in typical populations, absent to small on foreleg and midleg and small on hindleg in Florida population. Tibiae and tarsi entirely dark scaled or sometimes marked with pale streak on posterior or ventral surface. Claws of foreleg and midleg usually evenly curved, the tooth usually short. *Wing:* Costa usually entirely dark scaled at base, sometimes with a few light scales. *Haltere:* Usually entirely or largely light scaled in typical populations, dark scaled in Florida population. *Abdomen:* Tergites II-VII with basolateral white to silver-white patch that is rounded mesally, the patch usually large in typical populations, usually small in Florida population.

MALE (fig. 2). Essentially as in female except for sexual characters. *Head:* Palpus with relatively few long bristles from apex of segment 3 distad. *Thorax:* Mesoscutal bristles frequently lighter than in female. Light scaling of mesoscutum more extensive than in female, that of fossa frequently extending mesad to dorsocentral area. *Psp* scales absent. *Legs:* Larger claw of foreleg and midleg without basal external tooth. *Wing:* Remigium (base of vein R) entirely dark scaled.

MALE GENITALIA (fig. 8). *Sidepiece:* Tergal sclerotization progressively narrowing distally, the tergal surface not appearing constricted; basal tergomesal area usually only slightly swollen and with relatively few elongate setae in a narrow strip, the conspicuousness of these setae not enhanced by a reduction in size or number of the setae on the mesal half of middle portion of tergal surface; med-

ian sternomesal sclerite moderately developed, rounded, extending only moderately far into mesal membrane; median sternomesal tuft moderately developed, consisting of moderately numerous setae, none or very few of which are sharply curved cephalad and/or dorsad. *Claspette:* Filament more or less evenly curved. *Phallosome:* Aedeagus about 2.2-2.3 (2.1-2.4) times longer than greatest width.

PUPA (fig. 8). Abdomen: about 3.7 mm. Trumpet: 0.51 mm. Paddle: 0.84 mm. *Trumpet:* Medium to dark brown in color. *Abdomen:* Hair 1-II usually 2-5b (1-14); hair 1-III usually 2-4b (2-6); hair 1-IV usually 2,3b (1-4); hair 1-V 2,3b (1-3). Hair 2411 usually laterad of 1-III. Hair 4-II usually mesad of 5-II. Hair 5-IV usually 1.0-1.3 (1.0-2.0) length of 3-III.

LARVA (fig. 9). Head: 0.92 mm. Siphon: 0.81 mm. Anal Saddle: 0.31 mm. *Head:* Hair 5-C single. Hair 6-C usually 2,3b (1-4). Hair 8-C usually single (single or double). *Thorax:* Pigment present, living larva dark in color. Alveolar plate of hairs 1-3-P usually well developed. *Abdomen:* Hair 4-III,IV usually single (single, double or bifid). *Siphon:* Index usually 2.4-2.8 (2.3-3.0). Acus attached or detached but near base of siphon. Pecten teeth relatively long, usually darkly pigmented; 16-25 (13-30) in number. Hair 1-S usually double (single or double). *Anal Segment:* Saddle usually moderate in size, extending 0.50-0.65 down lateral surface of segment. Hair 1-X usually located along posterior margin of saddle near its caudolateral angle, its alveolus usually on saddle and removed from edge of sclerotization by 2 or 3 alveolar diameters; usually 4,5b (3-9) in typical populations, frequently only 2,3b in populations from the southeastern United States. Ventral brush with 6 pairs of hairs; hairs 4b,4c-X usually 3,4b (2-4). Gills usually tapering distally; dorsal usually much longer than ventral and relatively short, 0.9-1.6 (0.5-2.0) length of saddle.

SYSTEMATICS. *Aedes triseriatus* can be readily separated from *hendersoni* and *brelandi* by the following characters: in the adult by (1) the reduction in number and size or the absence of the anterior dorsocentral, humeral, lateral prescutal and posterior fossal bristles, (2) the less extensive light scaling of the fossal area, the light scales usually not extending as far mesad as the dorsocentral area, (3) the claws of the foreleg and midleg, which are evenly curved and have a short submedian tooth in the female, and which do not have an external tooth at the base of the larger claw in the male, (4) the ornamentation of the wing, which usually does not have white scales at the base of the costa in the female or on the remigium (base of vein R) in the male, and (5) the fewer long bristles on the palpus of the male; in the male genitalia most conspicuously by (1) the absence of a constriction in the tergal surface of the sidepiece, (2) the fewer elongate setae of the basal tergomesal area of the sidepiece and their arrangement in a narrow strip, (3) the setae on the mesal half of the middle portion of the tergal surface of the sidepiece, which are not reduced in size or number, (4) the smaller, more rounded sternomesal sclerite, (5) the moderately developed sternomesal tuft with none or but very few of the setae strongly curved cephalad or dorsad, and (6) the more evenly curved claspette filament; and in the larva by (1) the presence of pigment in the thorax and abdomen, (2) the acus, which is attached or detached but close to the base of the siphon, (3) the longer and usually more darkly pigmented pecten teeth, (4) the usually 4,5b (3-9) hair 1-X of typical populations, (5) the ventral brush, which has 6 pairs of hairs and 4b,4c-X usually 3,4b (2-4), and (6) the anal gills, which are unequal, with the dorsal longer than the ventral, relatively short and tapered distally. The pupa of *triseriatus* can usually be separated from that of *hendersoni* or *brelandi* by (1) the few branches

in hair 1-IV, and (2) the shorter 5-IV.

There is a striking geographic variation in chaetotaxy and coloration of the adults of *triseriatus.* Females from the southern two-thirds of Florida differ from the typical *triseriatus* of the northeastern United States in the absence of most anterior mesoscutal bristles and the great reduction of light scaling on the head, mesoscutum, scutellum, haltere, femora and abdomen. Females from northern Florida, southern Georgia and coastal areas along the Atlantic northeast to North Carolina and along the Gulf west to Louisiana usually also lack most of the anterior mesoscutal bristles and usually have the light scaling of the mesoscutum and femora slightly reduced in extent. This partially darkened form seems to intergrade with typical *triseriatus* to the north and even with the much darkened form to the south. I have not been able to find any constant differences between the male genitalia, pupae or larvae of these darkened forms and northern *triseriatus.* It is possible that the much darkened form from southern Florida is a species distinct from *triseriatus,* but this cannot be determined at this time. A great deal of additional collecting must be done in order to determine the geographical and ecological distribution of these darkened forms and to document the existence and extent of zones of intergradation between them.

The mouthparts of *triseriatus* larvae are quite variable. The maxillae may be oval or triangular and the mental plate may be obtuse or acute. These variations are correlated with each other and are frequently, but not always, correlated with dimorphism of the mouthbrushes and antennae, as follows. Larvae with filamentous mouthbrushes and long antennae usually have oval maxillae and an obtuse mental plate, while those with pectinate mouthbrushes and short antennae frequently have triangular maxillae and an acute mental plate. Larvae with the first set of characteristics predominate in the northern portion of the range of *triseriatus* and larvae with the second set are more common in the southeastern United States.

BIONOMICS. The immatures of *triseriatus* are usually found in treeholes and are occasionally found in artificial containers and rockholes. They are frequently associated with the immatures of *hendersoni* and *zoosophus* and rarely with those of *Ae. (Ochlerotatus) atropalpus.* Adults have been collected at lights and in buildings and vehicles and females have been collected biting humans and horses.

Aedes triseriatus may be very important in the natural transmission of arboviruses. It is a proven vector of the LaCrosse strain of California encephalitis virus in Ohio and Wisconsin (Masterson et al., 1971:93-94,95; Sudia, Newhouse, Calisher and Chamberlain, 1971:595-596; Thompson et al., 1972:94-95) and under laboratory conditions it is an effective vector of the viruses of yellow fever (Bennett et al., 1939:101-105), eastern equine encephalomyelitis (Davis, 1940:49; Jakmauh, 1940:17; Chamberlain et al., 1954:280-283), Venezuelan equine encephalomyelitis (Davis et al., 1966:227-230; Kissling and Chamberlain, 1967:68; Sudia, Newhouse and Henderson, 1971:209), and western equine encephalomyelitis (Chamberlain et al., 1954:280-283).

DISTRIBUTION (fig. 1). *Aedes triseriatus* is found throughout the eastern United States, from Minnesota to Maine, south to central Texas and Florida. The species undoubtedly occurs in southeastern Canada and northeastern Mexico. Messersmith (1971:7) reported finding 2 males of *triseriatus* in southern Greenland. The existence of a breeding population of this species there should be verified by finding the immatures. Material examined: 4286 specimens; 1163 males, 1335 females, 1085 larvae, 703 pupae; 240 individual rearings (173 larval, 56 pupal, 11 incomplete).

GREENLAND. Narssarssuag, 15 July 1957, D.H. Messersmith, 1 M gen [USNM] .

UNITED STATES. *Alabama:* Auburn, Chewacla State Park, 27 Apr 1953, W.L. Seal, 2 L [USNM] . Auburn, 8 Apr 1953, W.L. Seal, 1 L [USNM] . Ozark, Camp Rucker, 24 Feb-14 Mar 1943, J.G. Franclemont, 1 F [CDC] , 39 M, 2 M gen, 24 F [CU] ; 6 Mar 1944, 2 L [USNM] ; J.G. Franclemont, 2 L [CU] . Sheffield, 7 June-18 Aug 1942, J.N. Belkin, 2 M, 1 M gen, 5 F [UCLA] . Tuscaloosa, 19 Aug 1915, R.H. Van Ezdorf, 1 F [USNM] . Wilson Dam, Colbert Co., June-16 Aug 1954, R.X. Schick, 2 M, 2 M gen, 8 F, 10 P, 74 L [UCLA] . Wilson Dam, 27 July 1941-10 June 1942, J.N. Belkin, 1 pM (140), 1 pF (98), 1 M gen, 2 F [UCLA] ; 14 Apr 1932-14 Apr 1937, 16 M, 1 F [CU] . *Arkansas:* Fayetteville, 8 May 1933, 1 M, 1 M gen [CU] . Helena, 30 July, H.S. Barber, 3 F [USNM] . Little Rock, Boyle Park, 28 Mar 1943, J.N. Belkin, 6 1p (441-446), 1 P [UCLA] . Little Rock, 14 Mar 1940, C.J. Carpenter, 1 M, 1 F [UTAH] . Scott, 1-10 June 1909, J.K. Thibault, 5 F [USNM] ; 29 May 1914, D.L. VanDine, 1 F [USNM] . Stone Co., 5 Aug 1965, 1 F [USNM] . *Connecticut:* Fairfield Co., Aug 1910, V. Howard, 1 F [USNM] . Redding, 14 Sept 1936, A.L. Melander, 1 F [USNM] . *Delaware:* Dover, 23-25 July 1935, 2 F [USNM] ; 8-13 June 1944, 1 F, 14 L [CDC] . Newark, 8 Nov 1961-25 Mar 1963, R.W. Lake, 1 M, 1 M gen, 1 F [USNM] . New Castle Co., 1962, 2 M, 1 F [UTAH] . Smyrna, 27 Aug 1933, D. MacCreary, 2 F [USNM] . Summit Bridge, 13 June 1963, R.W. Lake and F.W. Kutz, 1 L [USNM] . *District of Columbia:* Catholic University, 12 Nov 1902-20 Sept 1906, T. Pergande, 1 M, 9 F [USNM] . Chain Bridge, 26 June-Sept 1905, T. Pergande, 3 F [USNM] Eastern Branch, 25 Aug, H.S. Barber, 1 F [USNM] . Site not specified, 4 Sept 1901, W.E. Hinds, 1 F [USNM] ; May 1903, A. Busck, 1 F [USNM] ; 15 June 1903, W.V. Warner, 1 M, 1 M gen, 1 F [USNM] ; 2-11 Sept 1903, J. Kotinsky, 1 M, 2 F, 1 L [USNM] ; 1 Aug 1904, T. Pergande, 5 M, 5 F [USNM] ; 7 June 1908, H.O. Marsh, 1 F [USNM] . *Florida:* Avon Park, Aug 1943, R.H. Arnett, Jr., 1 F [UCLA] . Gainesville, 11 Mar 1969, J.F. Reinert (69.20), 1 1pM; 17 Feb 1969 (69.21), 1 1pM; same data (69.22), 1 1pM; 21 Mar 1969 (69.23), 1 1pM; 29 Mar 1969 (69.29), 1 1pF; 19 Apr 1969 (69.35), 1 pM; 22 Apr 1969 (69.36), 1 pM; 19 June 1969 (69.40), 3 M, 4 F; 19-29 June 1969 (69.41), 6 M, 11 F; 28 June 1969 (69.44), 8 M, 2 F; 12 July 1969 (69.50), 8 M, 9 P; 30 July 1969 (69.57), 2 F, 2 P; 29 July 1969 (69.61), 3 M; 6 May 1969 (69.88), 8 M; 31 May 1969 (69.89), 12 M, 1 F; 11 Apr 1970 (70.42), 7 F, 7 P; 15 June 1970 (70.71), 11 1pF (2-5,7-13), 3 pM (1,18,19), 5 pF (6,14-17); 17 June 1970 (70.72), 21 1pF (1-6,8-14,18,27,29-34), 4 pM (16,19,21,25), 8 pF (15,17,20,22-24,26,28), 1 F; 28 June 1970 (70.73), 2 1pM (27,41), 10 1pF (26,28-36), 15 pM (1-3,6,7,9,10,12,13,16-21), 7 pF (8,14,15,22-25), 4 M, 2 F, 6 P, 27 L; 29 Mar-28 July 1969, 43 M, 11 F [REINERT] . Indian River Co., 13 Nov 1970, G.F. O'Meara (UCLA 578), 12 1pM (578-11,13,17-19,22,24,35,40,42,44,46), 26 1pF (578-10,12,15,16,20,21, 23,25-34,36-29,41,43,45,47,48), 7 pM (578-100-104,107,109), 3 pF (578-105,106,108), 1 1p (578-14), 13 M, 3 M gen, 6 F, 22 P, 30 L [UCLA] . Jacksonville, 14 Nov 1946, Miller, 1 F [CDC] . Miami, 16,17 June 1934, J. Pearson, 4 F [CU] ; Oct 1944, L. Stutz, 1 F [USNM] ; 8 Mar, 1 F [USNM] . Orlando, 30 July 1937, G.E. Quinby (F1-20), 3 M, 1 M gen, 1 F [USNM] ; 4 Aug 1937, G.E. Quinby (F1-27), 1 M, 1 M gen [USNM] ; 6 Aug 1937, G.E. Quinby (F1-28), 1 L [CDC] ; 6 Apr 1968, L.T. Nielsen, 1 F [UTAH] ; 2 Mar 1969, L.T. Nielsen, 2 M, 2 F [UTAH] ; (1847), 1 M, 2 F; 16 June 1937 (1877), 2 M, 2 F; 23 June 1937 (1881), 2 L; 20 Jan 1936, 1 L [USNM] . Ormond, 24 June 1940, 1 M gen [USNM] . Vero Beach, 18 Apr 1970, J.F. Reinert (70.48), 5 L [REINERT] . West Palm Beach, 21 Mar 1947, Kaplan and W.F. Buren, 1 M, 1 M gen, 2 F [CDC] . No locality, 2 L [CDC] ; (1499), 2 F; (1742), 2 M, 1 F; (1869), 1 F; (1885G1), 1 M; (2050), 1 F; (22-ff), 1 M, 2 F; H.G. Dyar and A.N. Caudell (38), 3 M, 2 F [USNM] *Georgia:* Atlanta, Fort McPherson, 2 Aug 1943, 3 F [UTAH] ; 21 Mar-5 Apr 1944, 4 M, 6 F [USNM] ; 6 July 1945, Gould, 1 L [CDC] ; 23 June 1953, 1 L [CDC] . Atlanta, NW, 1-8 May 1947, 36 M, 1 M gen, 2 F [CDC] . Atlanta, 31 July 1906, W.B. Summerall, 2 F [USNM] ; 29 July 1944, R.F. Fritz, 1 L [CDC] ; 15 Aug 1944, H. Knutson, 2 L [CDC] ; Apr 1946-31 May 1950, H.D. Pratt, 107 M, 94 F, 55 L [CDC] , 2 M [UTAH] ; 2 June 1947, R.C. Barnes, 2 F [CDC] ; 4 Mar-21 Apr 1948, C.J. Phillips, 5 F [CDC] , 1 M [UTAH] ; 23 Mar 1948, R.H. Foote (436), 1 1pM (436-10), 8 1pF (436-2-4,7,9,11,12,16), 2 1p (436-6,8) [CDC] ; 14 Feb 1949, H.D. Pratt and C.J. Phillips, 13 L [CDC] ; 3 May 1952, G. Heid, 1 F [UCLA] ; 25 Mar 1953, W.D. Sudia and R.H. Gogel, 13 M, 1 M gen, 1 F [CDC] ; 1944, 2 M, 2 F, 1 L [USNM] ; Mar 1948, 60 L

[CDC]; 14 L [CDC]. Augusta Arsenal, Aug 1905, 1 M, 8 F [USNM] . Augusta, Camp Gordon, 26 Aug 1946, 4 L [CDC] . Billy's Island, Okefenokee Swamp, June-7 July 1912, 1 M, 10 F [CU]. Black Rock Lake, 29 Apr 1946, 1 F [USNM]. College Park, 17 May 1948, R.H. Foote, 1 F [CDC]. Columbus, Fort Benning, 10 Sept 1927, E.E. Hermes, 2 M, 1 F [USNM] ; 3 May 1928, E.E. Hume, 3 M, 1 F [USNM] ; 15 Aug 1942, W.W. Middlekauff, 1 M gen [CU] ; 1923, 3 M, 7 F [USNM] ; 12 July 1924, 1 M [USNM] . Cornelia, 30 Mar 1948, 1 F [CDC] . Decatur Co., Spring Creek, 14-29 July 1912, 2 F [CU] . Dublin, 13 Aug 1945, R. Dodge, 1 F [CDC]. Forsyth, 4 Mar 1945, H. Knutson, 8 L [CDC] . Newton, Emory University, 8 Nov 1949, R.E. Bellamy, 1 M, 1 M gen [CDC] . Rabun Co., Black Rock Mountain, 20-25 May 1911, 2 F [CU] . Savannah, 10 Mar 1937, 1 M [USNM] . Union Co., Lake Trahlyta, 22 July 1945, Barrington, 2 L [CDC]. Worth Co., 31 Mar 1951, J.K. Wall, 2 L [CDC]. No locality, 22 Aug 1924, 2 F [USNM] ; 5 M, 10 F [UTAH] . *Illinois:* Des Plaines, 30 June 1942, H.H. Ross, 1 M [UTAH] ; 5 July 1942, H.H. Ross and Mohr, 1 F [CDC] . Glencoe, July 1925, C.W. Edwards, 4 F [USNM] . Homer Park, 30 June 1927, 3 F [CU] . *Indiana:* Indianapolis, Fort Benjamin Harrison, 9 Aug 1923, 1 F [USNM] . Lafayette, 13-24 July, J.M. Aldrich, 2 F [USNM] . *Iowa:* Ames, 17 Aug 1906, Quayle, 3 F [USNM]; 5 July-10 Sept 1919, 4 F [USNM]. Guttenburg (8.0 km N), 12 June 1967, M. Manson, 4 L [UTAH] . Keosauqua, 5 Sept 1933, CCC Survey, 8 F [USNM] . *Kansas:* Franklin Co., 30 Aug 1951, R.S. Roberts, 2 M, 1 F [UTAH] . Lawrence, May, H.T. Martin, 1 M, 1 F [USNM] . Topeka, 21 June 1951, R.E. Beer, 2 M, 1 F [UTAH]. *Kentucky:* Brandenburg (6.4 km NE), 21 Aug 1941, G.E. Quinby and J.E. Rayl (Gq 465), 5 M, 3 F [USNM] . Corbin, 24 Aug 1904, H.S. Barber, 3 F [USNM]. Fort Knox (3.2 km S), 28 July 1941, G.E. Quinby (Gq 439), 8 M [USNM] . Louisville, Cherokee Park, 9 Aug 1941, J.E. Rayl (Gq 484), 3 F [USNM] ; 22 Aug 1941, J.E. Rayl and G.E. Quinby (Gq 472), 3 F [USNM] . Louisville, 15 Aug 1935, 2 F [CU]. *Louisiana:* Alexandria, Camp Beauregard, 3 Apr 1943, W.W. Wirth, 1 M, 1 M gen [USNM]. Alexandria, 31 Mar 1943, W.W. Wirth, 1 F [USNM] . Baton Rouge, 15 Aug 1902-15 Aug 1903, 10 F [USNM] ; 12 June 1941-5 Apr 1942, W.W. Wirth, 1 L [CDC] , I F, 4 L [USNM] . Buras, 1-8 June 1927, R.L. Turner, 1 F, 1 L [USNM] . Houma, 23-27 Apr 1931, 17 M, 4 M gen, 7 F [CU]. Jennings, 10 Oct 1906, A.A. Hammar, 1 F [CU] . Kilbourne, 13 May 1944-18 Feb 1947, W.W. Wirth, 3 M [CDC] , 1 F, 31 L [USNM] . Lafitte, 12 Apr 1931, 2 F [CU] . Lake Charles, USDA laboratory colony (UCLA 572), 10 1pM (572-20,22,25-30,32,34), 10 1pF (572-21,23,24,31,33,35-39), 107 M, 57 F, 212 P, 175 L [UCLA] . Lake Charles, 14 July 1970, H.C. Chapman (UCLA 573), 8 1pM (573-20-25,27,34), 9 1pF (573-26,28-33,35,36), 40 M, 3 M gen, 17 F, 35 P, 10 L [UCLA] . Logansport, 23 Mar 1908, E.S. Tucker, 1 F [USNM] . Mound, 27 Apr 1915, D.L. VanDine, 4 M, 3 M gen, 2 F [USNM] ; G.H. Bradley, 3 F [USNM] ; 2 L [USNM]. New Orleans, Camp Plauche, Apr-May 1944, 3 F [USNM]. Norco, 15 Oct 1944, F.N. Young, 2 L [UCLA] . Port Jackson, 2 M, 2 F [USNM]. Rapides, 7 Apr 1943, W.W. Wirth, 1 F [USNM] . St. Martinville, Longfellow Evangeline State Park, 8 Sept 1968, L.T. Nielsen (N-33-68), 5 M, 3 F, 9 P, 7 L [UTAH] . Starks, 20 July 1970, H.C. Chapman (UCLA 575), 5 1pM (575-20,23,27,29,30), 6 1pF (575-21,22,24-26,28), 25 M, 1 F, 27 P, 36 L [UCLA] . No locality, 3 M gen [USNM] . *Maine:* Naples, Sebago Lake State Park, J.C. Kuschke, 2 F [USNM] . *Maryland:* Baltimore, Patapsco State Park, 17 Oct 1965, W.A. McDonald (UCLA 286), 2 1pM (286-30,31) [UCLA] . Baltimore, Nov 1922, W.A. Hoffman, 2 F [USNM] ; 11 July 1919, 2 F [UCLA] . Bethseda, 6 Aug 1949, K.L. Knight, 1 1pF (8.8), 1 M [UTAH]. Cabin John, 30 Aug-5 Sept 1908, F. Knab, 2 M, 3 F [USNM] ; 17 June 1928, H.G. Dyar, 1 M [USNM]. Camp Verde, May-June 1919, R.C. Shannon, 1 F [USNM] . Edgewood, 11 Sept 1947, S.J. Carpenter, 1 F [UTAH] . Forest Glen, 29 Aug 1966, W.W. Wirth, 1 M, 1 M gen [USNM] . Herzog's Island, 24 June 1906, 1 M [USNM] . Plummer's Island, 5 June-19 Aug 1903, W.V. Warner, 2 F [USNM]; Sept 1903, A. Busck, 1 F [USNM] ; 30 Aug 1908-28 July 1912, F. Knab, 2 F [USNM]; 13 Aug 1914, R.C. Shannon, 1 M [USNM]; 3 May 1936, H.S. Barber, 1 L [USNM] ; 27 June 1965, W. Grimm (UCLA 283), 1 1pM (283-10), 1 M gen [UCLA] ; 25 Aug, R.P. Currie, 2 F [USNM] ; R.P. Currie and F. Knab, 1 1p (282) [USNM] . River View, Aug 1905, T. Pergande, 8 M, 1 M gen, 3 F [USNM]. Rockville, 4 July 1960, C.W. Sabrosky, 1 F [USNIv1]. Silver Spring, 20 July 1940, F.C. Bishopp, 2 M [USNM] . Takoma Park, 1 F [USNM] . *Massachusetts:* Amherst, 1 June 1943, 2 M [CDC] . Athol, 10 Sept 1932, A.L. Melander, 1 F [USNM] . Ayer, Fort

Devens, 25 July 1944, 1 M [CDC]. Chicopee, 17 Aug 1903, F. Knab, 1 F [USNM] . East Lee, 26 July 1921, J.L. Webb, 1 F [USNM]. Framingham, 20 Aug 1943, 6 F [CDC] . Granby, 12 Sept 1903, F. Knab, 1 F [USNM] . Springfield, W.H. Chaplin, 2 M, 1 M gen, 1 F [USNM]. Westfield, 30 July 1903, F. Knab, 1 F [USNM] . West Springfield, 26 July-24 Sept 1903, F. Knab, 3 M, 1 M gen, 20 F, 2 P [USNM] . *Michigan:* East Lansing, 21 June 1942, C.W. Sabrosky, 1 M, 1 F [USNM] . Nottawa, June 1942, C.W. Sabrosky, 2 F [USNM] . Ogemaw Co., 1,2 Aug 1959, R.R. Dreisbach, 1 F [USNM]. *Minnesota:* Detroit Lakes, 8,9 Aug 1940, W.A. Hoffman, 2 F [USNM]. Minneapolis, 3 July, K. Taylor, 1 F [USNM] . *Mississippi:* Agricultural College, 11 May-14 July 1905, G.W. Herrick, 1 M, 2 F [USNM] . Clarksdale, 1 Aug 1904, H.S. Barber, 1 F [USNM]. Columbus, Columbus Army Air Field, 13 May 1943, S.J. Carpenter, 1 F [UTAH] . Corinth, 14 Aug 1904, H.S. Barber, 1 F [USNM] . Gulfport, 6 Apr 1944, 4 L [USNM]. Hattiesburg, Camp Shelby, 18 Aug 1943, 1 L [CDC] ; 7 Feb-7 June 1944, 16 L [USNM] . Jackson, 8 Aug 1904, H.S. Barber, 1 F [USNM]. Scott, 24 Apr 1915, M.B. Mitzmain, 1 F [USNM] . Sibley, A. Fleming, 5 M, 2 F, 1 L [USNM] . West Point, 11 Aug 1904, H.S. Barber, 1 M, 1 F [USNM]. *Missouri:* Boone's Lick, 3 May 1966, C. Childers, 1 L [USNM] . Columbia, 20 Aug 1941, W.M. Gordon, 2 F [CU] ; 18 Aug, K.C. Sullivan, 1 F [USNM]. Eagle Rock, Roaring River State Park, 5 July 1942, A.B. Gurney, 1 F [USNM] . Jefferson Bks'., 21 Oct 1926-24 May 1927, E.C. Bingham, 2 F [USNM] . Kansas City, July 1951, 1 M [CDC] . Neosho, Camp Crowder, 19 June-27 July 1942, A.B. Gurney, 1 M, 1 M gen, 3 F [USNM]. Oakville, 24 Sept 1941, W.M. Gordon, 1 F [CU]. St. Louis (3.2 km W), Sept-Oct 1904, A. Busck, 2 M, 5 F [USNM] . St. Louis Co., 4 June 1940-28 June 1941, W.M. Gordon, 5 F [CU]. Sikeston, 27 Aug 1921, M.F. Boyd, 3 M, 2 F [USNM] . Webster-Groves, 15 July 1919-28 May 1920, Satterthwait, 20 M, 9 F [USNM]. *New Jersey:* Chester, 24 Sept, J.M. Aldrich, 1 F [USNM] . Hewitt, 18 June 1904, 1 F [CU]. Lahaway, 31 May-6 June 1903, J.T. Brakeley, 4 M, 3 F [USNM] ; 8 June-2 Aug 1903, H.G. Dyar, 4 M, 5 F, 3 P, 2 L [USNM] . Menlo Park, 26 June 1947, S.J. Carpenter, 1 F [UTAH] . New Brunswick, 29 Aug, J.M. Aldrich, 1 F [USNM]. Paterson, 7 Sept, J.M. Aldrich, 1 F [USNM] . Ridgewood, 2 July 1911, M.D. Leonard, 1 F [CU] . Stelton, 23 June 1944, 6 L [CDC] . *New York:* Albany, 10 Aug 1907, 3 F [CU] . Cayuta Lake, June-July 1943, R. Matheson, 97 M, 2 M gen, 97 F, 3 L [CU] . Cranberry Lake, 24-26 June 1963, W.W. Wirth, 1 M [USNM] . Fort Niagara, 13 July-23 Aug 1944, 9 F [CDC] . Ithaca, Buttermilk, 10 July 1928, 1 F [CU] . Ithaca, Six Mile Creek, 6 May 1922, R.C. Shannon and West, 4 L [CU] ; 7 Sept 1922, R.C. Shannon, 1 F [CU]. Ithaca, Woodson Hill, 24 June 1914, 2 F [CU] . Ithaca, 1901-1903, O.A. Johannsen, 13 M, 8 F, 3 P, 4 L [USNM] ; Apr-May 1942, J.N. Belkin, 1 M, 1 M gen, 5 P [UCLA] ; 4 July 1969, G. Steyskal, 3 F [USNM] ; 3 Aug 1901, 1 F [CU] ; 20 July 1914-7 Sept 1942, 34 M, 132 F [CU], 1 F [UCLA] , 2 L [USNM] ; 4 M, 12 F, 4 L [CU] . Manhattan, 2 Sept 1909, 1 F [CU] . McLean, 27 June 1940, 1 F [CU] . New York City, 15 Pine St., 27 July 1944, C. Slemrod, 1 M [CDC]. Niagara Falls, 24 July 1944, 1 F [CDC] . North River, 6-16 Aug 1950, C.W. Sabrosky, 1 F [USNM] . Orangeburg, Camp Shanks, 23 June 1944, 1 F [CDC] . Rome, 10 Aug 1944, 1 F [CDC] ; 19 May-3 Aug 1945, 4 F [CDC]. Suffolk Co., July-Aug 1928, 7 F [CU] . Syracuse, 28 June 1932, 1 F [CU]. Tannersville, 16 Sept 1926, L.O. Howard, 1 F [USNM]. Watkins Glen, 7 July 1928, 4 F [CU] . West Point, 2 Aug 1944, 1 F [CDC] . Yaphank, July 1909, W.T. Davis, 1 F [CU]. *North Carolina:* Asheville, 30 May 1944, H.F. Schoof, 5 L [CDC]. Bodie Island, 23 Sept 1960, 1 F [CDC]. Chapel Hill, 1 Apr 1970, R.L. Knight (UCLA 569), 6 1pM (569-20-25), 1 1pF (569-26) [UCLA] ; same data (UCLA 570), 1 1pF (570-90) [UCLA] . Charlotte, 1916, H.P. Barret, 1 F [USNM] . Flat Rock, 4 July 1914, A.H. Jennings, 1 M, 1 F [USNM] ; 22 July 1914, R.H. VanEzdorf and J.A. LePrince, 1 F [USNM] . Maxton, 24 June-13 Sept 1943, A.B. Klots, 1 M, 2 F [USNM] . Old Fort, 28 Sept 1933, CCC Survey, 3 F [USNM] . New River, May 1942, G.E. Bohart, 1 L [UCLA]. Pinnacle, Aug 1906, F. Sherman, 1 F [USNM]. Roanoke Rapids, 20 Aug 1915, T.H.D. Griffiths, 1 F [USNM] . Wilmington, 1920, H.P. Barret, 1 M [USNM] . *Ohio:* Columbus, 18-28 May 1943, H.W. Smith, 2 M, 2 M gen, 1 F [UCLA] . Fairfield Co., 31 July 1951, F. Mead, 1 F [CDC] ; 1 F [CDC]. Ravenna, 8 June 1970, M.J. Zavortink (UCLA 571), 3 1pM (571-20,23,31), 4 1pF (571-22,27,39,41), 1 1p (571-42), 2 M gen [UCLA]. Toledo, 24-30 June 1915, C. Fox, 2 F [USNM] . Wilmot, 5 July 1965, T.J. Zavortink (UCLA 444), 1 1pM (444-10), 6 1pF (444-11-16), 35 M, 2 M gen, 19 F, 94 P, 172 L

[UCLA] . *Oklahoma:* Chickasha, 18 May 1944, 1 L [CDC] . Flint, 19 June 1937, Standish-Kaiser, 1 M, 1 M gen [CU] . Stillwater, 21 Sept 1964-18 Apr 1965, J.F. Reinert, 4 L [REINERT] . *Pennsylvania:* Allentown, 22 July 1945, R.C. Barnes, 4 F [CDC]. Mt. Gretna, 4 M, 2 F [USNM] . Turtle Creek, 31 Aug 1947, 10 L [CDC] . *South Carolina:* Charleston, Naval Ammunition Depot, 6 July 1944, 1 L [CDC] . Columbia, 1 Aug 1906, 2 F [USNM] . Myrtle Beach, 3 July 1943 (L-24), 4 M [UTAH] ; 10 July 1943-31 Mar 1944, 8 L [USNM] ; 2 F [USNM] . Orangeburg Co., 25 Feb 1944, 2 L [CDC] . Richland Co., 26 May 1944, 1 F [CDC] . Santee-Cooper Reservoir, 27 May-1 June 1945, C.W. Sabrosky, 27 M, 4 F [USNM] . Swansea, 6 Aug 1911, F. Knab, 1 F [USNM] . *Tennessee:* Athens, 21,22 Aug, H.S. Barber, 1 M, 2 F [USNM] . Decherd, 18 Aug 1904, H.S. Barber, 1 F [USNM] . Kingsport, 18 July-18 Aug 1934, L. Arnott, 6 M, 1 M gen, 2 F, 1 L [CU] ; 18 July 1934, W. Heinrich, 12 M, 2 M gen [CU] . Knoxville, 26-30 Apr 1935, S.E. Shields, 1 M, 9 F [USNM]. Norris, 28 May 1935, S.E. Shields, 1 M [USNM]. Reelfoot Lake, 1 Sept 1941, M. Gordon, 2 F [CU] . *Texas:* Austin, 17 June 1947, O.P. Breland, 2 F [CDC] ; 30 July 1947-15 June 1948, O.P. Wilkins, 2 L [CDC] . Bexar Co., 20 July 1942, 1 M [CDC] . Brazoria Co., 2 Sept 1943, 1 L [CDC]. Brownsville, 15 May 1940, 1 F [CU]. Cyprus Bayou, 23 Aug 1903, J.D. Mitchell, 5 F [USNM] . Denison, 22,25 June 1904, H.S. Barber, 2 F [USNM] . Eagle Lake, 8 Sept 1968, L.T. Nielsen (N-34-68), 7 M, 17 F, 9 L [UTAH] . Frio Co., 2 June 1943, 1 M, 1 F [CDC] . Harris Co., 4 Aug 1943, 1 L [CDC] . Hondo, 9 Sept 1968, L.T. Nielsen (N-35-68), 8 M, 15 F, 2 P, 9 L [UTAH] . Huntington, 24 Apr 1934, CCC Survey, 1 F [USNM] . Luling, Palmetto State Park, 11 Jan 1948, O.P. Breland, 2 L [CDC] . McAllen, 4 Nov 1925, R.L. Turner, 1 F [USNM] . San Antonio, Fort Sam Houston, 13 Mar 1964, J.F. Reinert, 3 L [REINERT] . San Antonio, 29,30 Apr 1942, W.C. Reeves, B. Brookman and R.B. Eads, 1 M, 1 F [USNM] . Victoria, 28 July-18 Oct 1904, E.G. Hinds, 3 M, 7 F, 5 P, 4 L [USNM]. No locality, 1953, F.C. Harmston, 3 M, 2 F [UTAH] . *Vermont:* Jacksonville, Laurel Lake, 18 May 1947, H.D. Pratt, 1 M, 7 F [CDC]. *Virginia:* Accotink, Fort Humphreys, 23 June 1921, 11 M, 1 M gen, 9 F [USNM] Bluemont, 27-29 July 1904, 6 M, 3 F [USNM] . Difficult Run, 11 July 1906, H.S. Barber and F. Knab, 1 F [USNM] . Falls Church, Holmes Run, 10 July 1960-17 Sept 1961, W.W. Wirth, 10 M, 1 F [USNM] . Falls Church, 4 Sept 1906, A.N. Caudell, 1 F [USNM] . Glencarlyn, 10 May 1920, C.T. Green, 1 M, 1 F [USNM]. Great Falls, 3 Oct 1903-3 Sept 1909, T. Pergande, 15 M, 24 F [USNM] ; 15 June 1953, G. Steyskal, 1 F [USNM] ; 22-28 June 1911, 3 M, 2 F [USNM] . Hampton, Fort Monroe, 19 July 1927, E. Slackshear, 1 F [USNM] . Lake Drummond, 8-11 June 1905, H.S. Barber, 1 F [USNM] . Monterey, 20 Aug 1934, S.S. Cook, 1 M, 5 F [USNM] . Mt. Vernon, 15 July 1923, 1 F [USNM] . Richmond, July 1927, 1 F [CDC] . Rosslyn, 19 Sept 1902-July 1910, T. Pergande, 8 M, 11 F [USNM] ; 20 Aug 1913, F. Knab, 1 F [USNM] . Williamsburg, Camp Peary, July 1943, R.M. Bohart, 1 L [USNM]. Woodstock, 2 June 1903-12 Aug 1904, F.C. Pratt, 9 F, 8 P, 11 L [USNM] . No locality, 18 June 1903-5 Oct 1905, T. Pergande, 4 M, 2 F [UCLA] , 48 M, 78 F, 1 P [USNM] , 2 F [UTAH] . *Wisconsin:* Darlington, 2 July 1950, R.E. Ryckman, 1 F [USNM] . *State Unknown:* New Smyrna, 23 July 1941, 1 M, 1 M gen [USNM] .

LOCALITY UNKNOWN. 5 M, 2 F [CDC] ; 1 1pF, 9 M, 8 M gen, 7 F, 2 L [CU] ; 15 Aug 1919, 2 F; E.J. Gerberg (UCLA 284), 1 1pM (284-11), 1 1pF (284-10), 1 M gen; 1 M gen (550310-22) [UCLA] ; May 1905, F. Knab (224), 2 M, 1 F; Marcovitch, 1 F; 1 M, 1 F [USNM] .

ZOOSOPHUS GROUP

4. *Aedes (Protomacleaya) zoosophus* Dyar & Knab

Figs. 1 0-1 2

1918. *Aedes zoosophus* Dyar and Knab, 1918:165. TYPE: *Holo type* female, Kerrville, Texas, United States of America, 19 Aug 1909, F.C. Pratt [USNM] . Synonymy with *fluviatilis* (Lutz, 1904) by Dyar (1921a:30); resurrected by Dyar (1928:220-221).

1925. *Aedes alleni* Turner, 1924:84. TYPE: *Lectotype* male with genitalia slide, Mission, Texas, United States of America, reared from larva found in treehole, 28 Dec 1923 [USNM; selection of Stone and Knight, 1956:214] . Synonymy with *zoosophus* by Gjullin (1946: 234).

Aedes (Finlaya) zoosophus of Gjullin (1946:234); Knight and Marks (1952:538,567); Carpenter and LaCasse (1955:259-261); Stone, Knight and Starcke (1959:173); Carpenter (1968:83; 1970:54).
Aedes (Taeniorhynchus) zoosophus of Dyar (1928:220-221).
Aedes (?Taeniorhynchus) zoosophus of Dyar (1918:74).
Aedes (?Ochlerotatus) zoosophus of Edwards (1932:138).
Aedes (Finlaya) alleni of Dyar (1928:222-223); Edwards (1932:152); Matheson (1944:185-186).
Aedes alleni of Dyar (1924:131-132); Rozeboom (1942:30); Jenkins and Carpenter (1946:36); Breland (1949:93-100).
Aedes (Taeniorhynchus) fluviatilis in part of Dyar (1921a:30; 1922b:86-87; 1925:146).

FEMALE. Wing: 3.02 mm. Proboscis: 1.92 mm. Forefemur: 1.68 mm. Abdomen: about 2.8 mm. *Head:* Integument brown to black. Erect scales usually unicolorous, white to yellowish. Narrow curved scales usually unicolorous, silver-white. *Thorax:* Integument brown to black. Acrostichal, anterior dorsocentral, humeral and posterior fossal bristles usually absent, rarely a total of 1 or 2 present and well developed; usually 1 well developed lateral prescutal bristle present. Mesoscutum with background of predominantly small creamish-tan to golden-brown scales anteriorly and dark brown or black scales posteriorly and with pattern of predominantly larger silver-white or cream-colored scales, as follows: (1) cream-colored scales in broad patch on median anterior promontory, (2) cream-colored scales sometimes forming narrow broken or complete acrostichal line, (3) silver-white scales in broad lateral prescutellar line, (4) silver-white scales usually in narrow to broad posterior outer dorsocentral line, and (5) cream-colored and silver scales in broad to very broad lateral marginal line extending from anterior promontory to wing root and mesad along scutal suture, the scales more distinctly cream-colored anteriorly and more distinctly silver posteriorly. Midlobe of scutellum with scales very dense, broad and flat, silver. *Ppn* scales narrow and curved, creamish-tan, yellowish-cream and/or cream-white. Pleural scale patches silver-white; *psp* scales absent or few; *ssp* scales present; *pst* and metameron bare. *Legs:* Posterior or ventral surface of forefemur and midfemur with light scales restricted to basal 0.5-0.6. Knee spot absent to small on foreleg, small to moderate on midleg, moderate to large on hindleg. Tibiae usually with basal light patch or ring and sometimes with pale streak on posterior surface. Tarsal segments 1-3 or 4 of foreleg and midleg and tarsal segments 1-4 or 5 of hindleg with conspicuous broad basal white ring. Claws of hindleg simple. *Wing:* Base of costa with white scales in large patch or short line extending about 0.5 distance to crossvein *h*. Base of vein R white scaled to slightly distad of level of crossvein *h*. *Abdomen:* Tergites II-VIII usually dark scaled with basal light band that is broader laterally. Basal sternites light scaled, distal dark scaled with broad basal light band that may be broader laterally.

MALE. Essentially as in female except for sexual characters. *Head:* Palpus usually with light scales on dorsal surface of segments 2 and 3; with numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum with greater proportion of scales of anterior portion silver-white to cream-colored than in female. *Psp* scales usually absent. *Legs:* Larger claw of foreleg and midleg with an acute basal external tooth; claws of hindleg simple. *Wing:* Remigium (base of vein R)

light scaled to slightly beyond level of crossvein *h*.

MALE GENITALIA (fig. 11). *Sidepiece:* Usually weakly to moderately pigmented. Basal tergomesal area moderately to conspicuously swollen; setae of basal tergomesal area few, not arising from a differentially sclerotized plaque; median sternomesal sclerite weakly developed; median sternomesal tuft very weakly developed, the setae not strongly curved dorsad. *Claspette:* Filament evenly curved. *Phallosome:* Aedeagus relatively long and slender, length 2.1-2.4 greatest width.

PUPA (fig. 11). Abdomen: about 3.3 mm. Trumpet: 0.48 mm. Paddle: 0.66 mm. Hairs largely strongly developed and strongly pigmented. *Cephalothorax:* Hairs 4,8-C moderately to strongly developed, short; 8-C shorter and finer than 9-C. *Trumpet:* Medium golden-brown to brown. *Abdomen:* Hair 1-II with 2-4 moderately to strongly developed short branches; 1-III usually double (1-4b); hair 1-IV usually double (1-3b); hair 1.-V single or double (1-3b). Hair 2411 mesad or laterad of 1-III. Hair 441 mesad of 541. Hair 5-IV 1.8-2.6 length of 3411. Hair 6-1,11 strongly developed, as stout as or stouter than 3-1,11. Hair 941I-VI stout, relatively long. *Paddle:* Apex rounded or subtruncate.

LARVA (fig. 12). Head: 1.05 mm. Siphon: 0.85 mm. Anal Saddle: 0.32 mm. *Head:* Labrum more or less evenly rounded in dorsal aspect. Hair 1-C stout, arising on or near front edge of labrum. Hair 4-C well developed, with numerous (10-24) long branches; closer to midline than to 6-C. Hair 5-C single or double. Hair 6-C usually 2,3b (2-4). Hair 7-C 6-9b. Hair 15-C short to moderately long, 1-3b. Mental plate distinctly triangular, lateral teeth not conspicuously enlarged. *Antenna:* Shaft smooth or with a few spicules. *Thorax:* Pigment absent, living larva white in color. Alveolar plate of hairs 1-3-P usually well developed. Hairs 1,5-P branched. *Abdomen:* Hair 12-I usually absent. *Segment VIII:* Comb scales usually 10-12 (8-12), in 1 regular or irregular row. *Siphon:* Index usually 2.0-2.3 (1.7-2.5). Acus attached or detached but near base of siphon. Pecten teeth moderately long, usually darkly pigmented; usually 19-23 (11-24). Hair 1-S usually 2,3b (1-3). *Anal Segment:* Saddle large, extending 0.65-0.80 down lateral surface of segment; with a narrow lightened or transparent ventral marginal or submarginal area. Hair 1-X located along posterior margin of saddle about midway between dorsal surface and ventral edge, its alveolus on saddle and removed from edge of sclerotization by 2-4 alveolar diameters; usually 4,5b (2-7). Ventral brush with 7 pairs of hairs; hairs 4b,4c-X usually 3b (2-4). Gills sausage-shaped; dorsal much longer than ventral and moderately long, usually 1.5-2.5 (1.3-2.8) length of saddle.

SYSTEMATICS. *Aedes zoosophus* is characterized as follows: in the adult by (1) the creamish-tan to golden-brown background scales of the anterior half of the mesoscutum, (2) the conspicuous white band at the base of tarsal segments 1-3 or 4 of the foreleg and midleg and 1-4 or 5 of the hindleg, and (3) the basally banded tergites; in the male genitalia by the combination of (1) the weak to moderate pigmentation, (2) the setae of the basal tergomesal area, which are few and which do not arise from a differentially sclerotized plaque, (3) the weakly developed sternomesal tuft, and (4) the relatively long, slender aedeagus, which is 2.1-2.4 times longer than its greatest width; in the pupa by the combination of (1) the short hairs 4,8-C, and (2) the relatively strong 6-1,11 and 941I-VI; and in the larva by (1) the absence of hair 12-I, and the combination of (2) the absence of pigment in the thorax and abdomen, (3) the few comb scales in 1 regular or irregular row, (4) the large anal saddle with a narrow ventral marginal or submarginal lightened or transparent area, and (5) the ventral brush which has

7 pairs of hairs and 4b,4c-X usually 3b (2-4).

Aedes zoosophus differs so conspicuously from other species of *Protomacleaya,* particularly in ornamentation of the adult and features of the larva, that I am placing it into a monotypic group. Since it possesses a combination of primitive characters, such as the undifferentiated genitalia of the male and the well developed ventral brush and anal saddle of the larva, and derived characters, such as the unusual ornamentation of the adult and the absence of hair 12-I in the larva, *zoosophus* is probably an early segregate of *Protomacleaya.*

Too few specimens of research quality have been available for study to determine the existence or extent of geographical variation in *zoosophus.* The light scaling of depauperate adults is reduced in extent and in depauperate males the light scales of the palpus may be completely absent.

BIONOMICS. The immatures of *zoosophus* have been collected in treeholes and artificial containers. They are frequently associated with 2 species of *Protomacleaya* in the Triseriatus Group, *hendersoni* and *triseriatus,* and rarely associated with *Ae. (Ochlerotatus) epactius.* Adults of both sexes are attracted to lights and females are known to bite humans.

DISTRIBUTION (fig. 10). *Aedes zoosophus* is definitely known from only the southcentral United States and northeastern Mexico. Material examined: 166 specimens; 40 males, 46 females, 64 larvae, 16 pupae; 12 individual larval rearings.

MEXICO. *Tamaulipas:* Ciudad Victoria, 30 Apr 1962, 1 L [USNM]

UNITED STATES. *Arkansas:* Fort Smith, Camp Chaffee, May 1964, Montague, 1 F [USNM] Pine Bluff, 15 May 1964, Castillion, 1 F [USNM] . *Kansas:* Salina, T.A. Olson, 1 M gen [USNM]. *Oklahoma:* Cheyenne, 7 June 1937, Standish-Kaiser, 1 M, 1 M gen [CU] . Muse, 25 June 1937, Standish-Kaiser, 1 F [CU]. Woodward (9.7 km E), Boiling Springs State Park, 1 Sept 1968, L.T. Nielsen (N-32-68), 1 M, 1 F, 1 L [UTAH] . *Texas:* Austin, Zilkes Park, 23 Feb-10 Mar 1956, Steen, 2 M, 2 M gen, 6 L [UCLA] . Austin, 1941, C.P. Coogle, 1 F [USNM] . Brownsville, 29 Feb 1924, R.L. Turner, 1 F [USNM] ; 25 Mar 1940, F.W. Fiske, Jr., 1 M, 1 M gen, 1 F [USNM] ; 29,29 Sept 1942, E.S. Ross, 1 M, 2 F, 3 L [USNM] ; 12 Sept 1944, C.R. Joyce, 23 L [USNM] ; 7 May 1963, J.F. Reinert, 2 L [REINERT] ; 11-25 Mar 1940, 2 F [USNM] ; 15 Apr-15 May 1940, 4 F, 4 L [CU] . Corpus Christi, Naval Air Station, 3 June 1942, W.M. Gordon, 1 M, 1 M gen [CU] . Fort Worth, 31 May-8 June 1944, J.E. Porter, 2 M, 2 F [USNM] . Frio Co., 2 June 1943, 3 M, 3 F [USNM] . Hondo, 9 Sept 1968, L.T. Nielsen (N-35-68), 4 P, 4 L [UTAH] . Mission, Dec 1923-Mar 1924, R.L. Turner, 10 M, 8 F, 5 L [USNM] . Rio Grande Valley, Oct 1925, R.L. Turner, 1 F [USNM] ; 1 M [USNM] . San Antonio, Fort Sam Houston, 29 July 1964, J.F. Reinert, 2 L [REINERT] . San Antonio, 29 May 1941, 1 M [USNM]. San Benito, 6 June 1942, R.B. Eads, B. Brookman and W.C. Reeves, 3 M, 2 F [USNM] . Sheffield, 7 Mar 1949, A.G. Flury, 3 M, 3 M gen, 5 F [UCLA] ; 30 May 1949, A.G. Flury, 3 M, 4 F [USNM] ; 3 Sept 1969, T.J. Zavortink and J.A. Bergland (UCLA 619), 4 1pM (619-10,12,13,16), 5 1pF (619-11,14,15,17,18), 1 M gen, 1 L; same data (UCLA 632), 1 1pF (632-10); same data (UCLA 633), 2 1pM (633-90,91), 1 M gen [UCLA] .

Additional Record From the Literature

UNITED STATES. *Louisiana:* (see Carpenter, 1968:83).

KOMPI GROUP

FEMALES. *Head:* Integument brown to black. Erect scales usually bicolorous, white to amber mesally, dark brown to black laterally. Narrow curved scales usually bicolorous, white mesally, white and dark brown to black laterally. *Thorax:* Integument brown to black. Acrostichal bristles numerous, moderately to strongly

developed; anterior dorsocentral bristles numerous and well developed, reduced in number and size, or absent from disc; humeral, lateral prescutal and posterior fossal bristles few to numerous, weakly to strongly developed. Mesoscutum with background of mostly small dark brown to black scales and with pattern of mostly larger white to silver-white scales, as follows: (1) narrow to broad complete acrostichal line present or absent, (2) lateral prescutellar line usually present, (3) complete posterior outer dorsocentral line usually present, (4) narrow to broad lateral marginal line extending from anterior promontory to wing root developed, and (5) posterior fossal line joining lateral marginal and posterior outer dorsocentral lines usually present. Midlobe of scutellum with scales sparse, narrow and curved, white to silver-white or some dark. *Ppn* scales varied in shape, usually white to silver-white; *psp* scales usually present, few to numerous; *ssp* scales present; *pst* and metameron bare or scaled. *Legs:* Tarsal segment 1 of foreleg and midleg marked with light scales, the marking varying from a relatively inconspicuous streak on basal portion of posterior and ventral or dorsal surfaces to a conspicuous white band covering nearly entire segment; segment 2 of foreleg and midleg and segment 1 of hindleg sometimes marked with white at base. Claws of hindleg simple. *Wing:* Base of costa and vein R usually without light scales. *Abdomen:* Tergites II-VIII dark scaled with basolateral light patch. Basal sternites frequently light scaled, distal dark scaled with basolateral light patch or light basal band which is broader laterally.

MALES. Essentially as in females except for sexual characters and usually mesoscutal ornamentation. *Head:* Palpus entirely dark scaled; with few to numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum more extensively light scaled than in females, entirely white or silver-white in most species. *Legs:* Larger claw of foreleg and midleg with an acute basal external tooth; claws of hindleg simple. *Wing:* Remigium (base of vein R) dark scaled or entirely or partially light scaled to at least level of crossvein *h*. *Abdomen:* Tergites sometimes with conspicuous basal light band.

MALE GENITALIA. *Sidepiece:* Usually moderately to strongly pigmented. Basal tergomesal area slightly to moderately swollen; setae of basal tergomesal area few to moderately numerous, not arising from a differentially sclerotized plaque; median sternomesal sclerite weakly to moderately developed; median sternomesal tuft absent to moderately developed, the setae not strongly curved dorsad. *Claspette:* Filament evenly curved. *Phallosome:* Aedeagus relatively short and broad, length 1.7-2.0 maximum width.

PUPAE. Hairs strong and deeply pigmented. *Cephalothorax:* Hairs 4,8-C very strongly developed, long; 8-C much longer and stronger than 9-C. *Trumpet:* Light golden brown to brown. *Abdomen:* Branches of hair 1-II moderately to strongly developed, long. Hair 6-1,11 usually strongly to very strongly developed, usually as stout as 3-1,11. Hair 9-111-VI fine, short to relatively long. *Paddle:* Apex usually pointed or produced.

LARVAE. *Head:* Labrum more or less evenly rounded in dorsal aspect. Hair 1-C stout, arising on or near front edge of labrum. Hair 4-C poorly developed, with few (2-8) short branches; much closer to 6-C than to midline. Hair 5-C 1-4b. Hair 6-C 1-7b. Hair 7-C 2-6b. Hair 15-C short to moderately long, 1-3b. Mental plate distinctly triangular, lateral teeth not conspicuously enlarged. *Antenna:* Shaft with numerous small spicules. *Thorax:* Pigment present. Hairs 1,5-P branched. *Abdomen:* Hair 12-I present. *Segment VIII:* Comb scales usually 24-55 (16-65), in a patch. *Siphon:* Index 2.5-5.0. Acus usually attached, sometimes included in ba-

sal sclerotization of siphon and not distinct. Pecten teeth 15-31. Hair 1-S 2-4b. *Anal Segment:* Saddle moderate to large in size, extending 0.50-0.75 down lateral surface of segment; without a narrow lightened or transparent ventral marginal or submarginal area. Hair 1-X 1-9b. Ventral brush with 6 pairs of hairs; hairs 4b,4c-X usually 3,4b (2-5). Gills slender, tapered distally; dorsal subequal to ventral or slightly longer, 1.1-3.5 length of saddle.

DISCUSSION. The Kompi Group is characterized as follows: in the **adults** by (1) the bicolored head scales, and (2) the basal light marking on tarsal segment 1 of the foreleg and midleg; in the **male genitalia** by (1) the usually moderate to strong pigmentation, and (2) the relatively short and broad aedeagus; in the **pupae** by the strongly developed hairs 4,8-C; and in the **larvae** by (1) the patch of usually numerous comb scales and the combination of (2) a weakly developed hair 4-C, and (3) 6 pairs of hairs in the ventral brush.

This group includes 6 species, *burgeri, chionotum, kompi, niveoscutum, sandrae* and *schicki.* Each is differentiated from all the others by 1 or more novelties of the adult and/or larva. The species are, in general, most easily and reliably separated as adults; the male genitalia are apparently indistinguishable. The 6 species fall into 3 pairs, as follows: (1) *kompi* and *burgeri,* characterized by the usually single hairs 5,6-C of the larva, the usually relatively few branched 1,2-1,11 and **1,13-III-V** of the larva and **1-III-V** of the pupa, and the usual mesocaudal displacement of 2-IV-VI of the pupa; (2) *schicki* and *chionotum,* characterized by the presence of scattered light scales in the predominantly dark scaled areas of the mesoscutum of the female, the conspicuous basal band on the abdominal tergites of the male, and the usually multiple hairs 5,6-C on the head of the larva; and (3) *niveoscutum* and *sandrae,* characterized by the predominantly dark scaled midscutellar lobe in the female and the usually relatively highly branched hairs 1,2-1,11 and 1,13411-V of the larva and 1-III-V of the pupa in combination with a relatively short siphon and paddle.

Most species of this group are characterized by strong sexual dimorphism in adult ornamentation. In these, the mesoscutum of the male is completely or predominantly silver-white scaled while that of the female is extensively marked with dark scales.

The immature stages are found in treeholes, broken or cut bamboo internodes and rockholes. Virtually nothing is known about the habits of the adults.

The species of the Kompi Group are found in mountainous regions from southeastern Arizona in the United States to western Guatemala. They are apparently predominantly allopatric, separated either geographically or altitudinally.

KEYS TO SPECIES

FEMALES

1. Prosternum *and* metameron with well developed patch of scales; midlobe of scutellum entirely or predominantly light scaled; dark scaled areas of mesoscutum without scattered yellowish or whitish scales (figs. 13,14) **5** *burgeri*

   Prosternum *and/or* metameron bare; *if* prosternum has patch of scales *then* midlobe of scutellum predominantly dark scaled; *if* metameron has patch of scales *then* dark scaled areas of mesoscutum with scattered yellowish or whitish scales 2

2(1). Metameron with patch of scales; base of hindtarsal segment 1 conspicuously white scaled dorsally; dark scaled areas of mesoscutum with numerous scattered yellowish or whitish scales (fig. 13) ..... 7. *schicki*

Metameron without definite patch of scales, sometimes 1 or more scales present; base of hindtarsal segment 1 entirely dark scaled or with only a few white scales dorsally; dark scaled areas of mesoscutum without scattered yellowish or whitish scales except in *chiono turn* 3

3(2). Prosternum with extensive patch of scales; midlobe of scutellum predominantly dark scaled; inner posterior fossal area without conspicuous white patch (fig. 13) ..... 9. *niveoscutum*

Prosternum without definite patch of scales; midlobe of scutellum predominantly light scaled, *or* if predominantly dark scaled *then* inner posterior fossal area with conspicuous white scaled patch 4

4(3). Erect scales of head very long and narrow, their width at apex scarcely greater than width at midheight; dark scaled areas of mesoscutum with numerous scattered yellowish or whitish scales (fig. 13) . . 8. *chionotum*

Erect scales of head moderately long and moderately broadened distally, their width at apex 2-4 times greater than width at midheight; dark scaled areas of mesoscutum without scattered yellowish or whitish scales 5

5(4). Midlobe of scutellum predominantly light scaled; silver lateral prescutellar scale line moderately broad, conspicuous; inner posterior fossal area without conspicuous white scaled patch, dark scaled, *or* if white scaled *then* these white scales broadly joined to lateral prescutal white line (fig. 13) 6. *kompi*

Midlobe of scutellum predominantly dark scaled; silver lateral prescutellar scale line usually narrow, inconspicuous; inner posterior fossal area with conspicuous white scaled patch (fig. 13) ..... 10. *sandrae*

MALES

1. Mesoscutum with numerous brown scales in conspicuous broad complete dorsocentral line 6. *kompi*

Mesoscutum entirely silver-white scaled or with relatively few brown scales in narrow incomplete dorsocentral line 2

2(1). Prosternum *and* metameron with well developed patch of scales; palpus as long as or longer than proboscis (fig. 14) 5. *burgeri*

Prosternum *and/or* metameron bare; *if* either prosternum or metameron has patch of scales *then* palpus shorter than proboscis 3

3(2). Metameron with patch of scales; base of hindtarsal segment 1 conspicuously white scaled dorsally; palpus shorter than proboscis ..... 7. *schicki*

Metameron without definite patch of scales, sometimes with 1 or more scales; base of hindtarsal segment 1 entirely dark scaled, *or* if white scaled dorsally *then* palpus subequal in length or or longer than proboscis. . . 4

4(3). Prosternum with extensive patch of scales; remigium (base of vein R) dark scaled; palpus usually shorter than proboscis 9 *niveoscutum*
Prosternum without definite patch of scales; remigium predominantly light scaled; palpus subequal in length to or longer than proboscis 5

5(4). Abdominal tergites with conspicuous white basal band . . . 8. *chionotum*
Abdominal tergites not banded or with inconspicuous light basal band ..... 10. *sandrae*

PUPAE

1. Hair 1-II usually 6-8b (5-11) *and* paddle index usually 1.4-1.6 (1.3-1.7); hair 5-IV usually double (1-4b) (figs. 19,21) 7 *schicki;* 8. *chionotum*
Hair 1-II with fewer branches *and/or* paddle index less; 5-IV usually single (single or double) 2

2(1). Hair 2-V usually slightly to greatly cephalad of level of 3-V; paddle index usually 1.1-1.3 (1.1-1.4) (figs. 23,25) . . . 9. *niveoscutum; 10. sandrae*
Hair 2-V usually caudad of level of 3-V; paddle index usually 1.4-1.5 (1.2-1.7) 3

3(2). Hair 10-C moderately developed, distinctly finer and shorter than 12-C; most primary branches of float hair (1-I) usually with numerous secondary branches; branches of 1-II usually moderately developed and finer than primary branches of 1-I (fig. 15) 5 *burgeri*
Hair 10-C strongly 'developed, usually distinctly stouter and longer than 12-C; most primary branches of float hair (1-I) without secondary branches; branches of 1-II strongly developed, as or nearly as stout as primary branches of 1-I (fig. 17) 6 *kompi*

LARVAE

1. Apex of larger comb scales produced into moderate-sized spine; most caudal hair of ventral brush (4a-X) short, usually only 1.0-1.5 length of anal saddle (fig. 26) ..... 10. *sandrae*
Apex of larger comb scales evenly fringed or 1 or 2 apical elements of fringe slightly enlarged; hair 4a-X long, usually at least 2.0 length of anal saddle 2

2(1). Hair 6-C usually 3-5b (2-6); siphon index greater than 3.4 3
Hair 6-C single or double *and/or* siphon index less than 3 2..... 4

3(2). Branches of hairs 1,13-II-V relatively stout and coarse to near apex; 1-III-V usually 3,4b (2-5); hair 5-V-VII usually single or double (1-3b), the branches stout and coarse to near apex (fig. 20) 7 *schicki*
Branches of hairs 1,13-II-V finer and tapering from near base; 1-III-V usually 6,7b (5-10); hair 5-V-VII usually 4,5b (3-6), the branches finer and tapering from near base (fig. 22) ..... 8. *chionotum*

4(2). Hair 5-C usually double (1-3b); hair 2-II usually 2,3b (2-4); hair usually 3,4b (2-5); siphon index usually 2.7-3.0 (2.5-3.1) (fig. 24). . . .. 9. *niveoscutum*

Hair 5-C usually single (single or double); 2-11 usually single (1-4b); hair 1-II-V usually 2,3b (1-4); siphon index frequently greater than 3.1 (2.5-3.9) 5

5(4). Branches of hair 1-VIII finer than those of 1-X (fig. 16) . . . . *5. burgeri*
Branches of hair 1-VIII stouter than those of 1-X (fig. 18) ..... 6 *kompi*

5. *Aedes (Protomaeleaya) burgeri* Zavortink, n.sp.

Figs. 10,13-16

TYPES: *Holotype* male with associated larval and pupal skins (UCLA 562-47), Bodie Canyon, 13 air km east of Lochiel, Santa Cruz Co., Arizona, United States of America, elevation about 1530 m, egg from rothole in living sycamore tree, 27 Dec 1969, L.T. Nielsen and T.J. Zavortink [USNM] *Allotype* female with associated larval and pupal skins (UCLA 562-71), same data as holotype [USNM] . *Paratypes:* 7 1pM (562-46,52,73,74,79,81,82), 20 1pF (562-44,50,53,54, 57-60,62-65,67,68,70,72,75-77,80), 1 pM (562-101), 1 pF (562-100), 12 M, 4 F, 1 M gen, 24 P, 272 L, same data as holotype (UCLA 562); 2 1pF (559-31,32), 1 M, 1 F, 3 P, 64 L, same data as holotype except eggs from rothole in living evergreen oak tree (UCLA 559); 4 1pM (567-20, 29,37,39), 7 1pF (567-23,24,26,32,34,36,40), 1 1p (567-38), 2 M, 1 M gen, 1 F, 9 P, 19 L, same data as holotype except eggs from rothole in living evergreen oak tree (UCLA 567) [UCLA, ISET, BM] ; 20 M, 3 M gen, 20 F, 11 P, 14 L, same data as holotype except collected on 21 Mar 1968 by L.T. Nielsen, J.H. Arnell and J.H. Linam (HA-12-68) [UTAH]. This species is dedicated to the original collector, John F. Burger.

Aedes n.sp. near *kompi* of Zavortink (1970:8); Arnell and Nielsen (1972:16).
Aedes (Finlaya) kompi of Burger (1965:396-398); Stone (1967:208).

FEMALE (figs. 13,14). Wing: 4.00 mm. Proboscis: 2.45 mm. Forefemur: 2.49 mm. Abdomen: about 3.3 mm. *Head:* Erect scales moderately long and moderately broad, their width at apex 2-4 times greater than width at midheight. *Thorax:* Anterior dorsocentral bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles few. Dark scaled areas of mesoscutum without scattered yellowish or whitish scales. Light mesoscutal lines conspicuous; acrostichal line usually broad; lateral prescutellar line broad; posterior outer dorsocentral line usually moderately broad; lateral marginal line very broad, usually extending mesad to inner margin of fossa; posterior fossal line not broadened mesally and forming a conspicuous more or less isolated patch. Midlobe of scutellum with scales entirely or predominantly white. Most pleural patches dense and well defined, consisting of broad flat to slightly outstanding imbricate silver-white scales. Upper anterior *ppn* with scales moderately dense, most moderately broad to broad, flat; *pst* with well developed oblique patch of scales; metameron with patch of scales. *Legs:* Posterior surface of forefemur and midfemur with white streak usually confined to basal 0.5-0.6. Foretibia and midtibia entirely dark scaled or streaked or speckled with white on posterior surface. Foretarsal segment 1 usually marked with white on at least ventral and posterior surfaces in at least basal 0.6; midtarsal segment 1 usually marked with white on all surfaces in at least basal 0.6; hindtarsal segment 1 usually entirely dark scaled.

MALE (fig. 14). Essentially as in female except for sexual characters and mesoscutal ornamentation. *Head:* Palpus usually longer than proboscis; with numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum usually entirely

silver-white scaled, rarely with a few dark scales in posterior inner dorsocentral area. *Wing:* Remigium (base of vein R) entirely dark scaled. *Abdomen:* Tergites not banded or with narrow light scaled basal band.

MALE GENITALIA (fig. 15). Apparently indistinguishable from other species of group.

PUPA (fig. 15). Abdomen: about 3.8 mm. Trumpet: 0.54 mm. Paddle: 0.82 mm. *Cephalothorax:* Hair 10-C moderately developed, distinctly finer and shorter than 12-C. *Abdomen:* Float hair (1-I) moderately developed, with longest branches not extending to lateral margin of segment I, and with most primary branches usually with numerous secondary branches; branches of 1-II usually 3-5 (2-6), usually moderately developed and finer than primary branches of 1-I; hair 1-III-V usually 1-3b (1-4). Hair 2-IV-VI usually mesad of hair 1 of corresponding segment and usually relatively close to caudal margin of segment; 2-V usually caudad of level of 3-V. Hair 5-IV single. *Paddle:* Index usually 1.4-1.5 (1.2-1.7).

LARVA (fig. 16). Head: 0.96 mm. Siphon: 0.99 mm. Anal Saddle: 0.38 mm. *Head:* Hair 5-C usually single (single or double). Hair 6-C single. Hair 14-C usually single (single or double). *Abdomen:* Hair 1-II-V usually 2,3b (1-4), the branches normal. Hair 2-11 usually single (1-4b). Hair **5-11-VII** usually 3,4b (2-4), the branches normal. Hair 13-11 usually 4,5b (3-6) and 13-III-V usually 2-4b (1-4), the branches normal; **13-VI** usually 6-8b (4-9), the branches much shorter and finer than those of 13-VII; hair 13-VII 2-4b. *Segment VIII:* Branches of hair 1 finer than branches of 1-X. Comb scales usually 24-38 (22-50); apex of larger scales fringed. *Siphon:* Index about 3.1-3.9. *Anal Segment:* Hair 4a-X long, at least 2.0 length of anal saddle.

SYSTEMATICS. *Aedes burgeri* is closely related to *kompi* and is distinguished from that species as follows: in the **adult** by (1) the entirely silver-white scaled mesoscutum of the male, (2) the more conspicuous light mesoscutal markings of the female, and (3) the presence of scales on the prosternum and metameron in both sexes; in the **pupa** by (1) the usual presence of numerous secondary branches on the primary branches of the float hair (14), and (2) the more weakly developed 10-C and 1-II; and in the **larva** by the weaker branches of hair 1-VIII. This species is the only one in the Kompi Group that has a well developed patch of scales on both the prosternum and metameron of the adult.

Except for variation in development of the lateral prescutal, acrostichal and posterior outer dorsocentral light scale lines in the female, *burgeri* is relatively uniform in all stages throughout most of its range. However, both the larva and pupa are extremely variable at the southernmost locality at which the species has been found, where it occurs with *niveoscutum.* Here the larva may have more highly branched hairs and a shorter siphon than is normal and the pupa may have more highly branched or abnormally developed hairs and a shorter paddle than usual. This variation is indicative of hybridization and introgression between *burgeri* and *niveoscutum.*

BIONOMICS. The immatures of *burgeri* are found in treeholes. In the northern portion of its range this species has been collected in oak-pine forest, riparian woodland and scattered groves of oaks where it has been associated 1 or more times with *Ae. (Abraedes) papago, Ae. (Kompia) purpureipes, Ae. (Ochlerotatus) monticola* Belkin & McDonald, 1957 and *Ae. (0.) muelleri.* In the southern portion of its range it has been collected in oak-pine forest where it has occurred alone or in association with another species of the Kompi Group, *niveoscutum.* Burger (1965 : 396) reported finding adults of *burgeri* (as *kompi)* resting on the sides of a treehole and on nearby leaves.

DISTRIBUTION (fig. 10). *Aedes burgeri* extends from southeastern Arizona in the United States to Jalisco in Mexico. In Arizona it has been collected at elevations between 1070 and 1530 meters and in Mexico between 1400 and 1770 meters. Material examined: 1204 specimens; 145 males, 173 females, 614 larvae, 272 pupae; 109 individual rearings (106 larval, 2 pupal, 1 incomplete).

MEXICO. *Jalisco:* El Mirador (2.4 km S Quililla), 8 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 669), 1 1pM (669-10), 2 1pF (669-13,15), 1 M, 1 M gen, 2 P, 2 L; same data (MEX 670), 1 M, 2 P, 3 L; same data (MEX 671), 1 1pM (671-13), 4 1pF (671-12,14-16), 4 M, 1 F, 5 P, 1 L; same data (MEX 675), 4 1pM (675-11-14), 6 1pF (675-15-17,19,22,23), 38 M, 1 M gen, 12 F, 56 P, 49 L [UCLA] ; same data (N-22-71), 3 1pM (3,5,6), 6 1pF (7,9,10-13); same data (N-23-71), 1 1pM (2), 1 1pF (1); same data (N-26-71), 2 1pM (1,2); same data (N-27-71), 5 1pF (1-3,4,7) [UTAH] . Guadalajara (24 km NW), 7 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 667), 1 1pM (667-10), 4 1pF (667-11-14), 3 M, 1 M gen, 5 P, 13 L [UCLA] . *Sinaloa:* Potrerillos (5.7 km E), 11 June 1971, L.T. Nielsen and T.J. Zavortink (MEX 700), 81pM (700-10-17), 4 1pF (700-18-21), 8 M, 2 M gen, 2 F, 15 P, 11 L [UCLA] ; same data (N-51-71), 5 1pM (1-4,6), 1 1pF (5) [UTAH] . *Sonora:* Nogales (14.4 km S), 22 Aug 1970, J.H. Arnell and L.T. Nielsen (HA-20-70), 7 M, 27 P, 50 L [UTAH] .

UNITED STATES. *Arizona:* Bodie Canyon, Lochiel (13 km E), type series, see above. Mendoza Canyon, Coyote Mountains, Pima Co., 23 Dec 1969, L.T. Nielsen (UCLA 550), 2 1pM (500-30,34), 2 1pF (550-31,32), 1 M gen, 9 L [UCLA] . Patagonia (3-6 km WSW), 18 Aug-17 Sept 1964, J.F. Burger, 2 M, 2 M gen, 59 F, 2 P [UCLA] , 3 M, 2 M gen, 7 F, 2 P [USNM] ; 13 Sept 1968, T.J. Zavortink (UCLA 454), 1 1pM (454-12), 1 M, 1 M gen [UCLA] .

6. *Aedes (Protomacleaya) kompi* Vargas & Downs

Figs. 10,13,17,18

1950. *Aedes (Gualteria) kompi* Vargas and Downs, 1950:167-170. TYPE: *Holotype* female, Teportlan, Morelos, Mexico, larva from treehole or rockhole, 29 June 1947, W.G. Downs [ISET] .

Aedes (Finlaya) kompi of Stone, Knight and Starcke (1959:165); Schick (1970a:16).

FEMALE (fig. 13). Wing: 3.84 mm. Proboscis: 2.38 mm. Forefemur: 2.36 mm. Abdomen: about 2.6 mm. *Head:* Erect scales moderately long, moderately broad, their width at apex 2-4 times greater than width at midheight. *Thorax:* Anterior dorsocentral bristles usually few and small or absent; humeral, lateral prescutal and posterior fossal bristles few or absent. Dark scaled areas of mesoscutum without scattered yellowish or whitish scales. Light mesoscutal lines relatively inconspicuous to conspicuous; acrostichal line usually present, narrow to moderately broad; lateral prescutellar line moderately broad; posterior outer dorsocentral line usually very narrow and incomplete; lateral marginal line narrow to very broad and then extending mesad to inner margin of fossa; posterior fossal line very narrow to broad, not broadened mesally and forming a conspicuous more or less isolated patch. Midlobe of scutellum with scales usually entirely or predominantly light. Most pleural patches very dense and well defined, consisting of broad flat to appressed imbricate silver-white scales. Upper anterior *ppn* with scales sparse to moderately dense, moderately broad to broad, flat to appressed; *pst* usually bare, rarely with scales near *ppl;* metameron bare. *Legs:* Posterior surface of forefemur and midfemur with white streak of basal portion extending to or near apex as a narrow line. Foretibia and midtibia dark scaled or streaked or speckled with white on posterior surface. Foretarsal segment 1 usually marked with white on

at least ventral and posterior surfaces in at least basal 0.4; midtarsal segment 1 usually marked with white on all surfaces in at least basal 0.5; hindtarsal segment 1 dark scaled.

MALE. Essentially as in female except for sexual characters. *Head:* Palpus subequal to proboscis in length or slightly longer; with relatively few long bristles from apex of segment 3 distad. *Thorax:* Conspicuous broad complete brown scaled dorsocentral line developed. *Wing:* Remigium (base of vein R) entirely dark scaled. *Abdomen:* Tergites without basal band.

MALE GENITALIA (fig. 17). Apparently indistinguishable from other species in group.

PUPA (fig. 17). Abdomen: about 3.2 mm. Trumpet: 0.55 mm. Paddle: 0.79 mm. *Cephalothorax:* Hair 10-C strongly developed, at least as stout and long as 12-C. *Abdomen:* Float hair (1-I) moderately to strongly developed, with longest branches usually extending to lateral margin of segment I, and with most primary branches unbranched; branches of 1-II usually 2-5 (2-7), strongly developed and as or nearly as stout as primary branches of **1-I;** hair **1-III-V** usually 1-3b (1-4). Hair 2-IV-VI usually mesad of hair 1 of corresponding segment and usually relatively close to caudal margin of segment; 2-V usually caudad of or at the level of 3-V, sometimes slightly cephalad of it. Hair 5-IV usually single (single or double). *Paddle:* Index usually 1.4-1.5 (1.2-1.6).

LARVA (fig. 18). Head: 0.92 mm. Siphon: 0.79 mm. Anal Saddle: 0.33 mm. *Head:* Hair 5-C usually single (single or double). Hair 6-C single. Hair 14-C usually single (single or double). *Abdomen:* Hair 1-II-V usually 2,3b (1-3), the branches normal. Hair 241 usually single (1-3b). Hair **5-II-VII** 2,3b, the branches normal. Hair 13-11 usually 3,4b (2-4) and 1341I-V usually 2,3b, the branches normal; 13-VI usually 6-9b (5-11), the branches much shorter and finer than those of 13-VII; hair 13-VII 2,3b. *Segment VIII:* Branches of hair 1 stronger than branches of 1-X. Comb scales usually 35-55 (16-65); apex of larger scales fringed. *Siphon:* Index usually 2.8-3.5 (2.5-3.9). *Anal Segment:* Hair 4a-X long, at least 2.0 length of anal saddle.

SYSTEMATICS. *Aedes kompi* is apparently most closely related to *burgeri* and is distinguished from it as follows: in the **adult** by (1) the broad longitudinal lines of dark scales on the mesoscutum of the male, (2) the more restricted light mesoscutal markings of the female, and (3) the usual absence of scales on either the prosternum or metameron; in the **pupa** by (1) the usual absence of secondary branches on most primary branches of the float hair (1-I), and (2) the more strongly developed 10-C and 1-II; and in the **larva** by the stronger branches of hair 1-VIII. *Aedes kompi* is conspicuously differentiated from all other species of the group by the ornamentation of the mesoscutum of the male.

BIONOMICS. The immatures of *kompi* have been collected in treeholes and holes in volcanic rock. In the former habitat they have been associated with 2 species of *Aedes (Protomacleaya)* in the Terrens Group, *gabriel* Schick, 1970 and *idanus* Schick, 1970; in the latter habitat they have been found only with *gabriel.* All known adults of *kompi* have been reared and nothing is known about their habits.

DISTRIBUTION (fig. 10). *Aedes kompi* is presently known from a single area along the Southern Escarpment of the Mesa Central in the State of Morelos, Mexico, at an elevation of about 1600 meters. Material examined: 170 specimens; 18 males, 12 females, 100 larvae, 40 pupae; 28 individual rearings (13 larval, 10 pupal, 5 incomplete).

MEXICO. *Morelos:* Vicinity of Teportlan (including Gabriel Mariaca), 29 June 1947, W.G. Downs, 1 M, 1 M gen, 1 F [USNM] ; 7 Sept 1965, D.A. Schroeder (MEX 346), 3 pF (346-10, 100,101), 5 L; same data (MEX 349), 1 pM (349-100), 1 pF (349-101), 1 M gen, 4 L; same data (MEX 350), 2 1pM (350-17,24), 1 1pF (350-25), 3 pM (350-93,106,112), 4 1p (350-12, 30-32), 4 M, 3 M gen, 11 P, 72 L; same data (MEX 351), 2 pM (351-100,101), 1 M gen, 1 P, 1 L; same data (MEX 352), 2 1pM (352-12,17); 11 Aug 1970, K. and D.A. Schroeder (MEX 619), 1 1pM (619-11), 5 1pF (619-16-19,25), 1 1p (619-27), 1 M; same data (MEX 620), 1 1pF (620-17); same data (MEX 624), 1 1pM (624-30) [UCLA].

7. Aedes (Protomacleaya) schicki Zavortink, n.sp.

Figs. 10,13,19,20

TYPES: *Holotype* male with associated larval and pupal skins (MEX 698-22), 4.8 km E of La Emerta, Durango, Mexico, elevation about 2620 m, larva from rothole in living oak tree, 11 June 1971, L.T. Nielsen and T.J. Zavortink [USNM]. *Allotype* female with associated larval and pupal skins (MEX 698-14), same data as holotype [USNM] . *Paratypes:* 11 1pM (698-10-13,15-19,21,23), 1 1pF (698-20), 4 F, 3 M gen, 3 L, same data as holotype (MEX 698) [UCLA, ISET, BM] ; 1 1pM (4), 2 1pF (1,2), 3 pM (3,7,8), 1 pF (5), same data as holotype (N-50-71) [UTAH] . This species is dedicated to Robert X. Schick in recognition of his contributions to the knowledge of *Protomacleaya.*

FEMALE (fig. 13). Wing: 4.53 mm. Proboscis: 2.80 mm. Forefemur: 2.59 mm. Abdomen: about 3.3 mm. *Head:* Erect scales moderately long and relatively narrow, width at apex 1.5-2.5 times width at midheight. *Thorax:* Anterior dorsocentral bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles numerous. Dark scaled areas of mesoscutum with numerous yellowish or whitish scales. Light mesoscutal lines relatively inconspicuous; acrostichal line absent, narrow and broken, or moderately broad; lateral prescutellar line narrow and broken to moderately broad; posterior outer dorsocentral line narrow and broken to moderately broad; lateral marginal line narrow; posterior fossal line narrow, sometimes broadened and denser mesally and then appearing as a patch. Midlobe of scutellum entirely or predominantly light scaled. Most pleural patches dense and moderately well defined, consisting of broad flat to outstanding somewhat disheveled white scales. Upper anterior *ppn* with scales moderately dense, narrow and curved to moderately broad and flat; *pst* sometimes with scales near *ppl;* metameron with patch of scales. *Legs:* Posterior surface of forefemur and midfemur with white streak usually extending from base to or near apex. Foretibia usually conspicuously streaked with white from near base to near apex on posterior surface; midtibia entirely dark scaled or posterior surface speckled or streaked or white. Foretarsal segment 1 marked with white on ventral and posterior surfaces in at least basal 0.6; midtarsal segment 1 marked with white on all surfaces in at least basal 0.6; hindtarsal segment 1 with a conspicuous white streak or patch at base of dorsal surface.

MALE. Similar to female except for sexual characters and mesoscutal ornamentation. *Head:* Palpus distinctly shorter than proboscis; with numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum usually entirely silver-white scaled, rarely with a few dark scales in posterior inner dorsocentral area. *Wing:* Remigium (base of vein R) partially to entirely light scaled. *Abdomen:* Tergites usually with conspicuous white scaled basal band.

MALE GENITALIA (fig. 19). Apparently indistinguishable from other species in group.

PUPA (fig. 19). Abdomen: about 4.2 mm. Trumpet: 0.72 mm. Paddle: 1.12 mm. Apparently indistinguishable from *chionotum*. *Cephalothorax:* Hair 10-C moderately to strongly developed, usually longer and stronger than 12-C. *Abdomen:* Float hair (1-I) moderately to very strongly developed, with longest branches sometimes extending beyond lateral margin of segment I, and with primary branches with or without secondary branches; branches of 1-II usually 6-8 (5-11), strongly developed and finer than or subequal in stoutness to primary branches of 1-I; hair 1-III-V usually 3-6b (2-6). Hair 2-IV-VI usually in line with or laterad of hair 1 of corresponding segment and usually relatively far from caudal margin of segment; 2-V far cephalad of level of 3-V. Hair 5-IV usually double (2,3b). *Paddle:* Index usually 1.4-1.6 (1.3-1.7).

LARVA (fig. 20). Head: 1.12 mm. Siphon: 1.17 mm. Anal Saddle: 0.41 mm. *Head:* Hair 5-C usually double (1-3b). Hair 6-C 3,4b (2-4). Hair 14-C usually double. *Abdomen:* Hair 1-II-V usually 3,4b (2-5), the branches relatively stout and coarse to near apex. Hair 2-II usually 2-4b. Hair 5-II-IV usually 3,4b (2-4) and 5-V-VII usually single or double (1-3b), the branches relatively stout and coarse to near apex. Hair 13-1I-V usually 3-5b (3-6), the branches relatively stout and coarse to near apex; 13-VI usually 8-15b (7-17), the branches much shorter and finer than those of 13-VII; hair 13-VII usually 3,4b. *Segment VIII:* Branches of hair 1 subequal in strength to or stronger than branches of 1-X. Comb scales usually 25-42 (24-49); apex of larger scales usually fringed. *Siphon:* Index about 3.9-4.6 (3.5-5.0). *Anal Segment:* Hair 4a-X long, usually at least 2.0 length of anal saddle.

SYSTEMATICS. *Aedes schicki* is readily separated from the most closely related species, *chionotum;* as follows: in the adult by (1) the shorter and broader erect scales on the head of the female, (2) the shorter palpus of the male, (3) the presence of scales on the metameron, and (4) the conspicuous patch of white scales at the base of hindtarsal segment 1; and in the larva by hairs 1-I-VI, 5-II-VII and 13-II-V, which have fewer, rigid, stout branches. Pupae of the 2 species are apparently indistinguishable. The presence of a definite patch of scales on the metameron but not on the prosternum of the adult and the stout rigid hairs of the larva of *schicki* are unique developments within the Kompi Group.

BIONOMICS. The immatures of *schicki* are found in treeholes where they may be associated with the immatures of *Aedes (Ochlerotatus) muelleri*. The habits of the adults are unknown. The species is apparently restricted to montane oak-pine forest.

DISTRIBUTION (fig. 10). *Aedes schicki* has been collected at elevations from 2350 to 2620 meters in the Sierra Madre Occidental in northcentral Mexico. Material examined: 83 specimens; 16 males, 12 females, 29 larvae, 26 pupae; 24 individual rearings (20 larval, 4 pupal).

MEXICO. *Durango:* Durango (52 km W), 3 July 1967, G.A. Schroeder (MEX 488), 3 1pF (488-11-13), 2 P, 6 L [UCLA] . La Emerta (4 km E), type series, see above.

8. *Aedes (Protomacleaya) chionotum* Zavortink, n.sp.

Figs. 10,13,21,22

TYPES: *Holotype* female with associated larval and pupal skins (MEX 304-20), 6.9 km N of Cuernavaca, Morelos, Mexico, elevation near 2080 m, larva from treehole, 19 Aug 1965,

R.X. Schick and D.A. Schroeder [USNM] . *Allotype* male with associated pupal skin and genitalia (MEX 304-11), same data as holotype [I.JSNM] . *Paratypes:* 2 1pF (304-19,22), 2 pM (304-10,12), 6 1p (304-15-18,21,23), 2 M gen, 1 **P,** 5 L, same data as holotype (MEX 304) [UCLA, ISET, **BM].**

FEMALE (fig. 13). Wing: 4.17 mm. Proboscis: 2.39 mm. Forefemur: 2.20 mm. Abdomen: about 2.7 mm. *Head:* Erect scales long and narrow, their width at apex scarcely greater than width at midheight. *Thorax:* Anterior dorsocentral bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles few. Dark scaled areas of mesoscutum with numerous scattered yellowish or whitish scales. Light mesoscutal lines relatively inconspicuous; acrostichal line absent to narrow and broken; lateral prescutellar line narrow and broken to moderately broad; posterior outer dorsocentral line narrow; lateral marginal line narrow; posterior fossal line narrow, sometimes broadened and denser mesally and then appearing as a patch. Midlobe of scutellum entirely or predominantly light scaled. Most pleural patches moderately dense and moderately well defined, consisting of broad flat to outstanding disheveled white scales. Upper anterior *ppn* with scales sparse, most narrow, curved; *pst* and metameron bare. *Legs:* Posterior surface of hindfemur and midfemur with white streak extending from base to or near apex. Foretibia and midtibia frequently streaked with white from near base to near apex on posterior surface. Foretarsal segment 1 usually marked with white on ventral and posterior surfaces in at least basal 0.4; midtarsal segment 1 usually marked with white on dorsal and posterior surfaces in at least basal 0.5; hindtarsal segment I sometimes with a few light scales at base of dorsal surface.

MALE. Similar to female except for sexual characters and mesoscutal ornamentation. *Head:* Erect scales not unusually long or narrow. Palpus subequal in length to or longer than proboscis; with numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum entirely silver-white scaled or with a few posterior inner dorsocentral scales dark. Pleural patches with scales less disheveled than in female. Upper anterior *ppn* with scales denser, broader and flatter than in female. *Wing:* Remigium (base of vein R) partially to entirely light scaled. *Abdomen:* Tergites with conspicuous white scaled basal band.

MALE GENITALIA (fig. 21). Apparently indistinguishable from other species in group.

PUPA (fig. 21). Abdomen: about 3.7 mm. Trumpet: 0.73 mm. Paddle: 0.95 mm. Apparently indistinguishable from *schicki. Cephalothorax:* Hair 10-C strongly developed, subequal in stoutness to and longer than 12-C. *Abdomen:* Float hair (1-I) strongly developed, with longest branches not extending to lateral margin of segment I, and with primary branches with or without secondary branches; branches of 1-II usually 6-8 (5-8), strongly developed, as stout as primary branches of 1-I; hair 1-III-V 3-6b. Hair 2-IV-VI usually in line with or laterad of hair 1 of corresponding segment and usually relatively far from caudal margin of segment; 2-V far cephalad of level of 3-V. Hair 5-IV usually double (1-4b). *Paddle:* Index 1.5-1.6.

LARVA (fig. 22). Head: 1.04 mm. Siphon: 1.11 mm. Anal Saddle: 0.40 mm. *Head:* Hair 5-C usually 3b (2-4). Hair 6-C usually 4,5b (4-7). Hair 14-C usually 2-4b (1-5). *Abdomen:* Hair 1-II-V usually 5-8b (5-10), the branches normal. Hair **2-II** usually 4-6b (3-8). Hair 5-II-IV usually 6-8h (5-10) and 5-V-VII usually 4,5b (3-6), the branches normal. Hair **13-II-V** usually 6-9b (4-11), the branches normal; 13-VI usually 9-14b (7-17), the branches much shorter and finer than those of 13-VII; hair 13-VII usually 5,6b (4-7). *Segment VIII:* Branches of hair 1 sub-

equal in strength to or finer than branches of 1-X. Comb scales usually 24-34 (21-40); apex of larger scales usually fringed. *Siphon:* Index about 3.5-4.1. *Anal Segment:* Hair 4a-X long, usually at least 2.0 length of anal saddle.

SYSTEMATICS. *Aedes chionotum* is closely related to *schicki* and may be distinguished from it as follows: in the **adult** by (1) the long narrow erect scales on the head of the female, (2) the longer palpus of the male, (3) the absence of scales on the metameron, and (4) the absence of a conspicuous patch of white scales at the base of hindtarsal segment 1; and in the **larva** by hairs 1-I-VI, 5-II-VII and 13-II-V, which have more numerous, flexible, tapering branches. The pupae of the 2 species appear to be indistinguishable. The long narrow erect scales on the head of the female and the highly branched larval hairs serve to separate *chionotum* from all other species of the Kompi Group.

BIONOMICS. The immature stages of *chionotum* have been found in treeholes; they have not been associated with any other species of mosquito. Habits of the adults are unknown. This species is apparently restricted to high elevation forests.

DISTRIBUTION (fig. 10). *Aedes chionotum* is known from the Mexican States of Morelos and Oaxaca at elevations of 2080 to 2210 meters. Material examined: 74 specimens; 3 males, 3 females, 55 larvae, 13 pupae; 12 individual rearings (3 larval, 3 pupal, 6 incomplete).

MEXICO. *Morelos:* Cuernavaca (6.9 km N), type series, cited above. *Oaxaca:* Vivero Rancho Teja, Ixtlan de Juarez, 3 July 1970, D.A. and K. Schroeder (MEX 518), 35 L; same data (MEX 521), 6 L [UCLA].

9. *Aedes (Protomacleaya) niveoscutum* **Zavortink, n.sp.**

Figs. 10,13,23,24

TYPES: *Holotype* male with associated larval and pupal skins (MEX 669-12), El Mirador (2.4 km S Quililla), Jalisco, Mexico, elevation about 1710 m, larva from rothole in living oak tree, 8 June 1971, T.J. Zavortink and L.T. Nielsen [USNM] . *Allotype* female with associated larval and pupal skins (MEX 675-18), same data as holotype [USNM]. *Paratypes: 1* 1pM (669-14), 2 1pF (669-11,16), 1 M, 1 P, same data as holotype (MEX 669); 2 1pM (670-10,11), 1 M gen, same data as holotype (MEX 670); 2 1pF (671-10,11), 1 M, 1 P, same data as holotype (MEX 671); 1 1pM (675-10), 3 1pF (675-20,21,24), 61 M, 3 M gen, 22 F, 83 P, 18 L, same data as holotype (MEX 675) [UCLA, BM, ISET] ; 2 1pM (1,2), 1 1pF (4), 1 pM (8), same data as holotype (N-22-71); 1 1pM (3), same data as holotype (N-23-71); 1 1pM (8), 2 1pF (5,6), same data as holotype (N-27-71) [UTAH] .

FEMALE (fig. 13). Wing: 4.21 mm. Proboscis: 2.73 mm. Forefemur: 2.55 mm. Abdomen: about 3.1 mm. *Head:* Erect scales moderately long and moderately broad, their width at apex 2 or 3 times greater than width at midheight. *Thorax:* Anterior dorsocentral bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles few. Dark scaled areas of mesoscutum without yellowish or whitish scales. Light mesoscutal lines predominantly inconspicuous; acrostichal line complete, narrow to moderately broad; lateral prescutellar line usually narrow and broken; posterior outer dorsocentral line poorly developed, narrow and incomplete; lateral marginal line usually moderately broad anteriorly, remainder narrow to moderately broad; posterior fossal line absent to weakly developed and narrow, never broadened mesally to form a patch. Midlobe of scutellum with scales predominantly dark. Most pleural patches dense and well defined, consisting of broad flat to appressed imbricate scales. Upper anterior *ppn*

with scales usually dense, moderately broad to broad, appressed; *pst* with well developed oblique patch of scales; metameron bare or with a few scales. *Legs:* Posterior surface of forefemur and midfemur with white streak extending from base to or near apex. Foretibia and usually midtibia streaked or speckled with white on posterior surface. Foretarsal segment 1 usually marked with white on at least posterior and ventral surfaces in at least basal 0.4; midtarsal segment 1 usually marked with white on at least dorsal, posterior and ventral surfaces in at least basal 0.4; hindtarsal segment 1 dark scaled.

MALE. Similar to female except for sexual characters and mesoscutal ornamentation. *Head:* Palpus shorter than proboscis; with relatively few long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum entirely silver-white scaled or rarely with a few posterior inner dorsocentral scales dark. *Wing:* Remigium (base of vein R) entirely dark scaled. *Abdomen:* Tergites without basal band.

MALE GENITALIA (fig. 23). Apparently indistinguishable from other species of group.

PUPA (fig. 23). Abdomen: about 3.2 mm. Trumpet: 0.58 mm. Paddle: 0.83 mm. Apparently indistinguishable from *sandrae*. *Cephalothorax:* Hair 10-C moderately to strongly developed, subequal in stoutness and length to 12-C or stouter and longer. *Abdomen:* Float hair (1-I) moderately to strongly developed, with longest branches sometimes extending to lateral margin of segment I, and with primary branches with or without secondary branches; branches of 1-II usually 4-6 (3-7), moderately to strongly developed and finer than or subequal in stoutness to primary branches of 1-I; hair 1-III-V usually 2-4b (2-5). Hair 2-IV-VI usually in line with or laterad of hair 1 of corresponding segment and usually moderately far from caudal margin of segment; 2-V usually slightly to greatly cephalad of level of 3-V. Hair 5-IV usually single (single or double). *Paddle:* Index usually 1.2-1.3 (1.2-1.4).

LARVA (fig. 24). Head: 1.07 mm. Siphon: 0.92 mm. Anal Saddle: 0.40 mm. *Head:* Hair 5-C usually double (1-3b). Hair 6-C usually single or double (1-3b). Hair 14-C usually double (single or double). *Abdomen:* Hair 1-II-V usually 3,4b (2-5), the branches normal. Hair 2-II usually 2,3b (2-4). Hair 5-II-VI usually 3-5b (3-6) and 5-VII usually 2,3b, the branches normal. Hair 13-II-V usually 3-5b (2-6), the branches normal; 13-VI usually 4-6b (4-8), the branches shorter and usually slightly finer than those of 13-VII; hair 13-VII 3,4b. *Segment VIII:* Branches of hair 1 finer to stouter than branches of 1-X. Comb scales usually 25-40 (22-50); apex of larger scales evenly fringed or 1 or 2 apical elements of fringe slightly enlarged. *Siphon:* Index usually 2.7-3.0 (2.5-3.1). *Anal Segment:* Hair 4a-X long, usually at least 2.0 length of anal saddle.

SYSTEMATICS. This species differs from the closely related *sandrae* as follows: in the adult by (1) the shorter and sparsely bristled palpus of the male, (2) the absence of a white scaled patch at the union of the posterior fossal and posterior outer dorsocentral lines on the mesoscutum of the female, (3) the presence of a patch of scales on the prosternum, and (4) the dark scaled remigium (base of vein R) of the wing of the male; and in the larva by (1) the absence of a definite moderate-sized spine at the apex of the larger comb scales, and (2) the longer hair 4a-X. Pupae of *niveoscutum* and *sandrae* are apparently indistinguishable. *Aedes niveoscutum* differs from all other members of the Kompi Group in the presence of a well developed patch of scales on the prosternum but not on the metameron of the adults and in the sparsely bristled palpus of the male.

There is considerable variation in the single population of *niveoscutum* that

has been studied. In the adults the normally short palpus of the male is occasionally as long as the proboscis, the usually narrow lateral prescutal line of the female is sometimes broadened, and the typically bare metameron often has a few scales. Since all of these variations are in the direction of *burgeri,* which occurs with this population of *niveoscuturn,* they are probably the result of hybridization with that species. In the immatures the branches of many hairs are frequently reduced in number and strength. This variability may also be due to hybridization with *burgeri* or, since variability of this type and degree is exhibited by the immatures of the closely related *sandrae,* it may be inherent in this lineage.

BIONOMICS. The immature stages of *niveoscutum* are found in treeholes where they may be associated with *burgeri.* Habits of the adults are unknown.

DISTRIBUTION (fig. 10). This species is presently known from only the type locality in the State of Jalisco, Mexico, at an elevation of about 1710 meters. It probably extends southward at appropriate elevations in the Sierra Madre del Sur. Material examined: 251 specimens; 74 males, 33 females, 38 larvae, 106 pupae; 21 individual rearings (20 larval, 1 pupal).

MEXICO. *Jalisco:* El Mirador, type series, cited above.

10. Aedes (Protomacleaya) sandrae Zavortink, n.sp.

Figs. 10,13,25,26

TYPES: *Holotype* female with associated larval and pupal skins (GUA 125-11), Hipodromo del Norte in Guatemala City, Guatemala, Guatemala, elevation near 1500 m, larva from cut or broken bamboo internode, 4 Sept 1964, V.P. Cowsill and W. Almengor [USNM]. *Allotype* male with associated pupal skin and genitalia (GUA 125-100), same data as holotype [USNM]. *Paratypes: 1* 1pF (125-12), 2 pF (125-103,105) (GUA 125), same data as holotype [UCLA]. This species is dedicated to Sandra J. Heinemann in recognition of her contributions to the project "Mosquitoes of Middle America."

FEMALE (fig. 13). Wing: 4.13 mm. Proboscis: 2.64 mm. Forefemur: 2.31 mm. Abdomen: about 3.0 mm. *Head:* Erect scales moderately long and moderately broad, their width at apex 2-4 times greater than width at midheight. *Thorax:* Anterior dorsocentral bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles few. Dark scaled areas of mesoscutum without scattered yellowish or whitish scales. Light mesoscutal lines conspicuous; acrostichal and posterior outer dorsocentral lines narrow; lateral prescutellar line narrow, frequently broken; lateral marginal line broadened anteriorly, remainder narrow to moderately broad; posterior fossal line broadened mesally, forming a conspicuous patch. Midlobe of scutellum predominantly dark scaled. Most pleural patches very dense and well defined, consisting of broad closely appressed imbricate silver-white scales. Upper anterior *ppn* with scales usually dense, moderately broad to broad, appressed and imbricate; *pst* and metameron bare. *Legs:* Posterior surface of forefemur and midfemur with white streak of basal portion narrowing and extending to or near apex. Foretibia and midtibia usually weakly marked with white on posterior surface. Foretarsal segment 1 marked with white on ventral and posterior surfaces in at least basal 03; midtarsal segment 1 marked with white on all surfaces in at least basal 0.3; hindtarsal segment 1 dark scaled.

MALE. Essentially as in female except for sexual characters and mesoscutal ornamentation. *Head:* Palpus subequal in length to proboscis; apparently with

numerous long bristles from apex of segment 3 distad. *Thorax:* Mesoscutum entirely silver-white scaled. *Wing:* Remigium (base of vein R) entirely light scaled. *Abdomen:* Some tergites without basal band, some with narrow light scaled band.

MALE GENITALIA (fig. 25). Apparently indistinguishable from other species in group.

PUPA (fig. 25). Abdomen: about 3.4 mm. Trumpet: 0.67 mm. Paddle: 0.82 mm. Apparently indistinguishable from *niveoscutum. Cephalothorax:* Hair 10-C moderately to strongly developed, usually slightly stouter and longer than 12-C. *Abdomen:* Float hair (1-I) very strongly developed, with longest branches extending at least to lateral margin of segment I, and with primary branches with or without secondary branches; branches of 1-II usually 4-6 (3-7), strongly developed and subequal in stoutness to primary branches of 1-I; hair 1-III-V usually 3-5b (1-5). Hair 2-IV-VI usually in line with or laterad of hair 1 of corresponding segment and usually relatively far from caudal margin of segment; 2-V far cephalad of level of 3-V. Hair 5-IV single. *Paddle:* Index 1.1-1.3.

LARVA (fig. 26). Head: 0.92 mm. Siphon: 0.83 mm. Anal Saddle: 0.32 mm. *Head:* Hair 5-C usually 2,3b (1-4). Hair 6-C usually 2-4b (1-5). Hair 14-C usually double. *Abdomen:* Hair 14I-V usually 2-4b (1-6), the branches normal. Hair 241 usually 2,3b (2-4). Hair 5-11-VII 3-5b, the branches normal. Hair 13-II-V usually 3-5b (2-6), the branches normal; 13-VI usually 4b (3-5), the branches similar in length and stoutness to those of 13-VII; hair 13-VII 3,4b. *Segment VIII:* Branches of hair 1 subequal in strength to or finer or stouter than branches of 1-X. Comb scales usually 24-33 (22-38); apex of larger scales produced into a moderate-sized spine. *Siphon:* Index about 2.7-3.9. *Anal Segment:* Hair 4a-X short, usually only 1.0-1.5 length of anal saddle.

SYSTEMATICS. *Aedes sandrae* is most• closely related to *niveoscutum* from which it differs as follows: in the adult by (1) the longer and densely bristled palpus of the male, (2) the presence of a conspicuous white scaled patch at the juncture of the posterior fossal and posterior outer dorsocentral lines on the mesoscutum of the female, (3) the absence of a patch of scales on the prosternum, and (4) the presence of light scales on the remigium (base of vein R) of the wing in the male; and in the larva by (1) the presence of a definite moderate-sized spine at the apex of the larger comb scales, and (2) the shortened hair 4a-X. Pupae of the 2 species appear to be indistinguishable. *Aedes sandrae* is differentiated from all other species in the Kompi Group by the 2 larval characters mentioned above.

There is considerable variability in the number and strength of the branches of many hairs in the larva and pupa. Particularly noticeable is the variation in hairs 5,6-C on the head of the larva. This variation is frequently, but not invariably, correlated with dimorphism of the antennae and mouthbrushes, as follows: larvae with hairs 5,6-C single or double usually have short antennae and pectinate mouthbrushes; those with hairs 5,6-C 3-5-branched usually have long antennae and simple mouthbrushes.

BIONOMICS. Larvae and pupae of *sandrae* have been collected in treeholes and broken or cut bamboo internodes. At lower elevations they have been associated with *Aedes (Protomacleaya) podographicus* Dyar and Knab, 1906, a member of the Terrens Group. The single female from Mexico was taken in a biting-landing collection with human bait at dusk; adults of *Ae. (P.) sumidero* Schick, 1970, another species of the Terrens Group, were associated with it.

DISTRIBUTION (fig. 10). *Aedes sandrae* has been found in southern Mexico

and western Guatemala at elevations of 200 to 2000 meters. Material examined: 35 specimens; 1 male, 5 females, 24 larvae, 5 pupae; 5 individual rearings (2 larval, 3 pupal).

GUATEMALA. *Esquintla:* Esquintla (7-8 km SW), 10 July 1964, V.P. Cowsill (GUA 41), 1 L [UCLA], *Guatemala:* Guatemala City, Bethania, 15 July 1964, T.J. Zavortink and V.P. Cowsill (GUA 44), 2 L [UCLA]. Guatemala City, Hipodromo del Norte, type series, see above. *SoIola:* San Andres Semetabal, 17 July 1964, V.P. Cowsill (GUA 51), 19 L [UCLA].

MEXICO. *Chiapas:* Sumidero (24 km N Tuxtla Gutierrez), 17 Aug 1964, E. Fisher and D. Verity (MEX 128), 1 F [UCLA].

KNABI GROUP

11. *Aedes (Protomacleaya) knabi* (Coquillett)

Figs. 10,27,28

1906. *Culex knabi* Coquillett, 1906b:183-184. TYPE: *Lectotype* female with associated pupal skin (291a), Tehuantepec, Oaxaca, Mexico, 1 July 1905, F. Knab [USNM; selection of Stone and Knight, 1956:220].

Aedes (Finlaya) knabi of Dyar (1928:226-227); Edwards (1932:152); Knight and Marks (1952: 538,563); Stone, Knight and Starcke (1959:164).
Aedes knabi of Dyar (1906:16); Dyar and Knab (1906:203); Howard, Dyar and Knab (1917: 841-842).
Aedes (?Gualteria) knabi of Dyar (1918:73).
Aedes (Ochlerotatus) knabi.of Dyar (1922d:160).
Ochlerotatus knabi of Coquillett (1906c:18,21).

FEMALE. Wing: 5.14 mm. Proboscis: 2.96 mm. Forefemur: 3.13 mm. Abdomen: about 3.7 mm. *Head:* Integument yellow to tan. Erect scales and narrow curved scales unicolorous, golden. *Thorax:* Integument yellow to tan. Acrostichal, anterior dorsocentral, humeral, lateral prescutal and posterior fossal bristles few, moderately to strongly developed. Mesoscutum entirely covered with small yellow or golden scales and larger cream-yellow, yellow or golden scales except for inconspicuous to conspicuous inner dorsocentral line of small bronzy or brown scales. Midlobe of scutellum with scales sparse or dense, narrow and curved or broad and flat, yellow to golden. *Ppn* scales broad and flat and/or narrow and curved, yellow to golden. Pleural scale patches silver-white; *psp* scales absent; *ssp* scales absent or few; *pst* and metameron bare. *Legs:* Posterior or ventral surface of forefemur and midfemur with light scales restricted to basal 0.5-0.7. Knee spot absent on foreleg, absent to small on midleg, small on hindleg. Tibiae dark scaled or with short pale streak at base of posterior surface on foreleg and midleg. Tarsal segment 1 of foreleg and midleg with poorly defined light ring in basal 0.5-1.0; tarsal segment 1 of hindleg with very poorly defined light streak or band in basal portion; tarsal segment 2 of all legs with light ring or band in basal 0.4-1.0; tarsal segments 3 and 4 of foreleg and midleg sometimes light scaled dorsally. Claws of hindleg with acute submedian tooth. *Wing:* Without light scales at base of costa or vein R. *Abdomen:* Tergites II-VIII dark scaled with basolateral light patch. Basal sternites light scaled, distal dark scaled with basolateral light patch or basal light band that is broader laterally.

MALE. Essentially as in female except for sexual characters. *Head:* Palpus en-

tirely dark scaled; palpal bristles not discernible. *Thorax:* Mesoscutum entirely golden scaled except for a very few posterior inner dorsocentral brown scales. *Legs:* Larger claw of foreleg and midleg with very small basal external tooth; claws of hindleg with an acute submedian tooth. *Wing:* Remigium (base of vein R) dark scaled.

MALE GENITALIA (fig. 27). *Sidepiece:* Apparently weakly to moderately pigmented. Basal tergomesal area slightly swollen; setae of basal tergomesal area relatively numerous, apparently arising from a moderately sclerotized plaque; median sternomesal sclerite moderately developed; median sternomesal tuft apparently moderately developed, the setae apparently strongly curved dorsad. *Claspette:* Filament angulate. *Phallosome:* Aedeagus relatively long and slender, length about 2.5 greatest width.

PUPA (fig. 27). Abdomen: about 4.0 mm. Trumpet: 0.60 mm. Paddle: 1.05 mm. Hairs moderately strong and moderately pigmented. *Cephalothorax:* Hairs 4,8-C weakly to moderately developed, short; 8-C shorter and finer than 9-C. *Trumpet:* Golden brown to brown. *Abdomen:* Hair 1-II with 4-6 moderately developed short branches; 1-III-V double. Hair 6-1,11 moderately developed, much finer than 3-1,11. Hair 9-III-VI fine, short. *Paddle:* Apex produced.

LARVA (fig. 28). Head: 1.25 mm. Siphon: 1.32 mm. Anal Saddle: 0.54 mm. *Head:* Labrum produced medially in dorsal aspect. Hair 1-C fine, arising relatively far from edge of labrum. Hair 4-C moderately developed, with 6-10 moderately long branches; located midway between midline and 6-C. Hairs 5,6-C single. Hair 7-C 2-4b. Hair 15-C enlarged, 25-35b. Mental plate not distinctly triangular; 1 or 2 of the more lateral teeth conspicuously enlarged. *Antenna:* Shaft with numerous small spicules. *Thorax:* Pigment absent. Hairs 1,5-P single. *Abdomen:* Hair 12-I present. *Segment VIII:* Comb scales 16-30, in an irregular patch. *Siphon:* Index about 3.0. Acus attached. Pecten teeth 28-47. Hair 1-S single. *Anal Segment:* Saddle large, extending 0.75-0.85 down lateral surface of segment; apparently without a narrow lightened or transparent ventral margin or submarginal area. Hair 1-X single. Ventral brush with 7 pairs of hairs; hairs 4b,4c-X 5-7b. Gills tapered distally; dorsal subequal to ventral in length, about 1.0-1.2 length of saddle.

SYSTEMATICS. *Aedes knabi* is characterized as follows: in the adult by (1) the yellow to tan integument of the head and thorax, (2) the predominantly yellow to golden scales of the head and mesoscutum, and (3) the toothed claws of the hindleg; in the male genitalia by the differentially sclerotized plaque from which the setae of the basal tergomesal area arise; in the pupa by the combination of (1) the short hairs 4,8-C, and (2) the pointed or produced paddle apex; and in the larva by (1) the produced labrum, (2) the fine hair 1-C, (3) the enlarged and many branched 15-C, and (4) the much enlarged lateral teeth of the mental plate.

Aedes knabi has so many unique developments, especially in the adult and larva, that I am placing it into a separate group. The many unusual characteristics of this species indicate a long history for the lineage leading to it.

Aedes knabi is known from only the small type series and 1 male with its associated pupal skin and 1 larva in the UCLA collection. All of the immatures and the only male genitalia are in very poor condition and inaccuracies may have been introduced into the illustrations reconstructed from these.

BIONOMICS. The immatures of *knabi* have been collected only in treeholes. They were associated with *Ae. (P.) tehuantepec* Schick, 1970 in 1 collection. All

known adults are reared and nothing is known about their habits.

DISTRIBUTION (fig. 10). *Aedes knabi* is known at present from only the vicinity of Tehuantepec, Oaxaca, Mexico, at elevations below 100 meters. Material examined: 14 specimens; 1 male, 5 females, 4 larvae, 4 pupae; 4 individual rearings (2 larval, 1 pupal, 1 incomplete).

MEXICO. *Oaxaca:* Salina Cruz, 15 July 1905, F. Knab (307), 2 1pF (307d,g), 1 1p (307c), 2 F (307a,b) [USNM] ; 9 Aug 1964, D. Verity (MEX 104), 1 pM (104-10), 1 M gen, 1 L [UCLA] . Tehuantepec, 1 July 1905, F. Knab (291), 1 F (291b) [USNM]

Subgenus KOMPIA Aitken

1941. *Kompia* Aitken, 1941:81-82. TYPE SPECIES: *Aedes (Kompia) purpureipes* Aitken, 1941, Mexico; monobasic and original designation.

12. *Aedes (Kompia) purpureipes* Aitken

Figs. 29-32

1941. *Aedes (Kompia) purpureipes* Aitken, 1941:82-84. TYPE: *Holotype* female, Triunfo, Baja California Sur, Mexico, 7 July 1938, A.E. Michelbacher and E.S. Ross [CAS] .

Aedes (Kompia) purpureipes of Aitken (1942:167); Belkin and McDonald (1957:190); McDonald (1957b:529-535); Mattingly (1961:38); Stone (1967:208); Zavortink (1970:8).

Aedes (Ochlerotatus) purpureipes of Vargas (1949:261-265; 1950:64-65); Carpenter and LaCasse (1955:220-221); Mattingly (1958:6); Stone, Knight and Starcke (1959:151).

FEMALE (fig. 30). Wing: 3.13 mm. Proboscis: 2.29 mm. Forefemur: 2.02 mm. Abdomen: about 2.9 mm. Dark scales of head, proboscis, palpus, legs and abdomen with metallic blue, violet or purple reflections. *Head:* Eyes broadly separated above antennae, the resulting space with broad flat silver scales. Integument light to dark brown. Frontal bristles absent. Orbital bristles relatively few, mesal 4-7 pairs strongly developed, lateral 3 or 4 pairs moderately developed. Vertex with relatively few black proclinate erect scales and with broad flat silver scales and sometimes appressed curved creamish-yellow to golden scales medially, broad flat black scales submedially and broad flat silver scales laterally. Occiput with numerous upright black and yellow erect scales and creamish-yellow to golden predominantly narrow and curved decumbent scales. Orbital line of broad flat silver scales present. Dorsolateral surface with black, silver and yellowish broad flat scales. Lateral and ventral surfaces with yellowish broad flat scales. Clypeus moderately large, bare. Proboscis relatively stout, longer than forefemur; entirely dark scaled; with a few basal bristles. Palpus moderately long, about 0.24-0.27 length of proboscis; 4-segmented; segment 4 moderate in size; segments 1-3 with bristles; entirely dark scaled. Antenna slightly shorter than proboscis; torus with conspicuous large patch of broad flat silver scales; flagellar segment 1 longer than 2, usually slightly swollen, with small dark scales; flagellar segments 2-13 usually with 6 moderate bristles in basal whorl; each of flagellar segments 3-6 or 7 slightly longer than preceding segment, segments 6 or 7-12 subequal. *Thorax:* Integument yellow to golden with light to dark brown areas. Acrostichal bristles usually restricted to anterior promontory; dorsocentral bristles present caudad to level of *ppn* bristles; prescutellar and supraalar bristles numerous and

well developed; humeral, lateral prescutal and posterior fossal bristles present, well developed; 1 parascutellar bristle present. Scutellum with 5-8 strong bristles on midlobe, 3-7 on lateral lobe. Mesoscutum completely but sparsely covered with narrow curved scales except for large anterior inner dorsocentral bare space and median and lateral prescutellar bare spaces; background of small black scales with a conspicuous pattern of slightly larger golden scales, as follows: (1) narrow acrostichal line from anterior promontory to prescutellar space, (2) entire fossal area, (3) narrow posterior outer dorsocentral line from scutal suture to scutellum, and (4) broad supraalar line from fossal area to parascutellum; lateral prescutellar line of broad flat silver scales weakly developed. Midlobe of scutellum with scales predominantly broad and flat, silver proximally, black distally; lateral lobe with scales predominantly narrow and curved, black. Paratergite moderately broad, bare. *Apn* not enlarged. *Ppn* separated from mesoscutum by strong suture. Meron large. Pleuron with bristles on *apn, ppn, ppl, pra, stp* and upper *mep; stp* bristles few, located above and below median *stp* scale patch; *ssp, psp* and lower *mep* bristles absent. Integument of pleuron frequently slightly to conspicuously darkened around pleural scale patches. *Apn* with broad flat silver scales; *ppn* with relatively small area of broad flat silver scales cephalad of mesothoracic spiracle; broad flat silver scales in patches on *ppl, psp, ssp, stp* below *pra, stp* caudad of *ssp* area, *stp* cephalodorsad of midcoxa, and in 1 large or 2 small separate patches on *mep; pst, pcx,* hypostigial area and metameron without scales. *Legs:* Hindcoxa subequal in size to or smaller than midcoxa, its base far below upper margin of meron. Legs moderately long, the forefemur about 1.26-1.32 times distance from top of thorax to tip of midcoxa. Forecoxa with light and dark scales on outer surface; midcoxa and hindcoxa with light scales on outer surface. Femora dark scaled with extensive areas of yellowish scales in basal portion of anterior surface of forefemur and sometimes hindfemur, in basal portion of posterior surface of midfemur and hindfemur and in long streak from base to or near apex of posterior surface of forefemur. Knee spots small, silver; largest on hindleg, sometimes absent on foreleg. Tibiae and tarsi dark scaled. Claws of foreleg and midleg with acute submedian tooth, claws of hindleg simple. *Wing:* Entirely dark scaled. Plume scales present on dorsum of veins Rs, R_{2+3}, R_2, R_3, M basad of furcation, and less conspicuously in apical portion of 1A. *Haltere:* Scales predominantly yellowish, usually some blackish. *Abdomen:* Tergite I with numerous scales middorsally. Laterotergite with large patch of silvery scales. Tergites and sternites VI and VII completely scaled. Outstanding scales absent. Tergites II-VII dark scaled with basolateral silver patch and sometimes with irregular indefinite yellowish basal band. Sternites extremely variable, proximal usually largely or entirely yellowish, distal dark scaled with distinct basolateral silver or yellowish-silver patch or indistinct basal yellowish area.

FEMALE GENITALIA (fig. 30). *Segment VIII:* Tergite narrowed apically, length along midline about 0.62-0.68 length of tergite VII; distal 0.64-0.74 with scales and bristles. Sternite long, about 1.2 length of tergite, broader distally; distal margin broadly emarginate; all but narrow basal and lateral areas with scales or bristles, the latter predominating; bristles more numerous along midline and distal margin, largely weakly developed and short but some moderately developed and elongate. *Tergite IX:* Deeply notched apically, maximum length about 0.57-0.67 of tergite VIII; moderately sclerotized; apical lobe with 11-17 relatively well developed bristles. *Insula:* Moderately sclerotized; connected to sigma; with 3-6 pairs of moderately developed setae. *Cercus:* Moderately long, length of dorsal

edge 0.70-0.75 of tergite VIII; compressed; apex rounded in lateral view; bristles numerous apically, the largest moderately developed; scales absent. *Postgenital Plate:* Moderately long and broad, length 0.45-0.55 of tergite VIII; index about 1.8-2.2; apex rounded or subtruncate in ventral view; distal portion with numerous weakly developed bristles; basal median longitudinal apodeme strongly sclerotized. *Cowl:* Strongly sclerotized. Atrial plates not developed. *Sigma:* Continuous with cowl; moderately sclerotized. Basal portion of spermathecal duct strongly sclerotized. Spermathecae 3, strongly sclerotized, more or less spherical, 1 noticeably larger than others.

MALE (fig. 30). Essentially as in female except for sexual characters. *Head:* Proboscis relatively stout. Palpus subequal in length to proboscis; 5-segmented; segments 2 and 3 ankylosed and long, making up 0.67-0.71 length of palpus; segment 4 short, 0.15-0.16 length of palpus; segment 5 short, 0.11-0.12 length of palpus; palpus slender except for swollen apex of segment 3 and swollen segment 4; apex of segment 3 upturned, segments 4 and 5 drooping; apex of segment 3 and all of segments 4 and 5 with long bristles, these relatively few in number; entirely dark scaled. Antenna slightly shorter than proboscis; torus much enlarged, with large conspicuous patch of silver scales; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment 1 slightly elongate, with scales; flagellar segments 12 and 13 elongate, subequal in length or penultimate longer, the 2 combined slightly shorter than total length of first 11 segments. *Legs:* Claws of foreleg and midleg enlarged, unequal; larger claw with blunt submedian tooth, smaller claw with acute submedian tooth. Claws of hindleg small, simple. *Abdomen:* Apical segments and genitalia not conspicuously bent ventrad. Tergites with more extensive yellow scaling basally.

MALE GENITALIA (fig. 31). Several shades of tan and/or brown; paraproct darkest; midportion of IX-T and most of sidepiece well pigmented; part of basal mesal area of both tergal and sternal surfaces of sidepiece usually very weakly pigmented. *Segment VIII:* Tergite long, 0.85-0.92 length of sternite; exserted, apical 0.52-0.58 scaled. *Segment IX:* Well developed; middorsal portion of tergite moderately to strongly sclerotized, caudad of or at the level of base of sidepiece; tergite lobes prominent, broadly connected middorsally, each with 8-17 strongly developed setae in several series; sternite large, with 2-5 setae distally. *Sidepiece:* Well developed, subcylindrical; mesal surface membranous from base to apex; basal tergomesal area slightly to moderately swollen, with very numerous short to moderately long fine setae and 1 moderately long and strong differentiated seta that is gently curved apically; setae of basal tergomesal area separated from remaining setae of tergal surface by long oblique bare area; apical lobe absent; median sternomesal sclerite and tuft absent; sternomesal surface without long broad striated scales; dorsal, lateral and ventral surfaces with numerous scales and bristles; numerous strong elongate setae in apical half of sternal surface mesally. *Claspette:* Well developed; stem short, more or less straight in dorsal aspect; spiculose; with 4-6 weakly developed setae; filament long, flattened apically, curved dorsad, usually with slight ridge on convex side. *Clasper:* Simple, moderately long, swollen subbasally, basal portion straight; median portion with longitudinal ridges or wrinkles; basal portion spiculose; apical portion with 2 or 3 fine setae, on both inner and outer surfaces; apical spiniform moderately long, 0.19-0.30 length of clasper. *Phallosome:* Aedeagus moderately large, without teeth; base subparallel-sided, apex bulbous. *Proctiger:* Strongly developed; not unusually long in dorsal aspect, the basolateral sclerotization vertical; paraproct well sclerotized, with

a single large heavily sclerotized apical tooth; cereal setae fine, short, 1-6.

PUPA (fig. 31). Abdomen: about 3.1 mm. Trumpet: 0.42 mm. Paddle: 0.74 mm. *Cephalothorax:* Weakly to strongly pigmented, lighter ventrally. Hair 5-C moderately to strongly developed, short to moderately long, never reaching more than 0.5 distance from its base to that of trumpet. *Trumpet:* Light to dark brown basally, becoming amber distally. Broadening gradually from base to apex; tracheoid sculpturing relatively well developed in basal 0.13-0.18; reticulate sculpturing strong. *Abdomen:* Weakly to strongly pigmented, lighter posteriorly. Tergites II-VII without a strong transverse ridge anteriorly. Hair 1-II moderately to strongly developed, usually 2-4b (2-8); hair 1-III moderately to strongly developed, usually 2-4b (2-5); hair 1-IV-VII moderately to strongly developed, subequal on all segments or 1-VI,VII smaller, usually single or double (1-3b). Hair 2-11I-V distinctly laterad of hair 1 of corresponding segment. Hair 5-IV,V 0.4-0.7 length of corresponding segment; 5-VII short to moderately long, single or double (1-3b); stronger and shorter or longer than 4-VII. Hair 6-III-V subequally developed, moderately long, usually fine; 6-VI longer and stronger than 6-III-V; hair 6-VII usually shorter than 6-III-V. Hair 8-VI,VII ventral. Hair 9-III-VI relatively long and stout, subequal on all segments or becoming longer on posterior segments or subequal on III-V and elongate on VI, usually cephalad of the level of or in line with hair 6 of corresponding segment; 9-VII far cephalad of caudolateral angle of segment, with 1 or 2 (1-3) moderately long to long primary branches; 9-VIII at or slightly cephalad or cephalomesad of caudolateral angle of segment, with 3-5 (3-7) long strong primary branches. Hair 10-VI usually relatively far mesad of 11-VI. *Terminal Segments:* Male genital lobe moderately large, about 1.2-1.3 length of tergite VIII. *Paddle:* Length greater than width. Apex emarginate or subtruncate. Midrib conspicuous to or nearly to apex; without wrinkled area near apex. Without long marginal spicules. Hair 1-P short, usually single (single or double).

LARVA (fig. 32). Head: 0.95 mm. Siphon: 0.71 mm. Anal Saddle: 0.29 mm. *Head:* Weakly to moderately pigmented, lightened in ocular area, darkened posteriorly. Labial plate distinctly narrowed anteriorly. Hair 1-C stout. Hairs 4,6-C displaced caudad, not near labrum. Hair 4-C weakly to strongly developed, 2-6b; mesad of or in line with 1-C and cephalad or caudad of level of 6-C. Hair 5-C single; more or less in line with 6-C. Hair 6-C single; distinctly laterad of 1-C. Hair 7-C 3-6b (2-8). Hair 15-C moderately long, usually 2,3b (2-4). Mental plate with 10 or 11 (10-12) teeth on each side of median tooth. *Antenna:* Shaft smooth or with a few minute spicules. Hair 1-A moderately long, single. *Thorax:* Epidermis and fat body without conspicuous pigmentation. Integument with a dense vestiture of simple spicules. Tubercles of hairs 5,6-P or 5-7-P sometimes united. Hair 1-M,T moderately long, branched. Hairs 4,5-P branched; 5-M usually double (1-3b). Hair 11-P,M,T much shorter than 9-P. Hair 13-T moderately to strongly developed, usually 3-6b (3-8); usually larger than 14-M. Hair 14-M weakly to strongly developed, usually 2,3b (1-5). *Abdomen:* Hair 1-I moderately to strongly developed, 3-5b; hair 1-IV,V moderately to strongly developed, 3-5b. Hair 2-III-V usually in line with or slightly laterad of hair 1 of corresponding segment; usually 3b (1-4). Hair 3-VII weakly to moderately developed, short, single. Hair 5-II-IV moderately to strongly developed, usually 3-5b (2-6). Hair 6-III-V usually 2,3b (2-4). Hair 9-III-V usually 2,3b (2-5). Hair 11-I moderately to strongly developed, usually 5-7b (4-9). Hair 12-I usually absent. Hair 13-I moderately to strongly developed, usually 3-6b (3-7); hair 13-IV,V strongly developed, usu-

ally 3,4b (2-4); hair 13-VI moderately to strongly developed, 3-5b, laterad and caudad of the level of 10-VI. *Segment VIII:* Hairs 1 and 2 separated. Hair 1 strongly developed, usually 4,5b (3-7). Comb scales large; with long apical spine and usually several very small basal spinules; few [5,6 (3-7)] in 1 row. *Siphon:* Weakly to moderately pigmented. Relatively short, index usually 2.3-2.9 (2.2-3.1). Acus large. Pecten teeth with 1 or more irregular basal denticles; 14-21 (13-25) in a more or less straight even row. Hair 1-S slightly distad of pecten; moderately to strongly developed, usually 2,3b (2-5). *Anal Segment:* Saddle large; without spines on caudal margin; weakly to moderately pigmented. Hair 1-X moderately to strongly developed, usually 3-5b. Hair 2-X usually 3-5b (2-7). Hair 3-X double or single. Ventral brush (4-X) moderately developed; with 7 pairs of hairs; all but most proximal 1 or 2 hairs from strongly sclerotized boss; hair 4a-X very short, usually 9-12b (5-15); hairs 4b,4c-X usually 2,3b (1-4). Anal gills sausage-shaped; dorsal curved ventrad, much longer than ventral and about 2.0-4.5 length of anal saddle.

SYSTEMATICS. *Aedes purpureipes* is distinguished from the other *Aedes* included in the present study as follows: in the adult by (1) the absence of post-spiracular bristles, (2) the ornamentation of the mesoscutum, which has golden longitudinal lines on a black background, and the combination of (3) the broad flat scales on the vertex, midlobe of the scutellum and between the eyes, (4) the bare paratergite, (5) the yellowish scales at the base of the femora and on the sternites, and (6) the entirely dark scaled palpus, proboscis, tibiae and tarsi; in the male genitalia by the combination of (1) the prominent IX tergite lobe which bears 8-17 strongly developed setae in several series, (2) the slightly to moderately swollen basal tergomesal area of the sidepiece which bears numerous fine setae and 1 moderately long and strong differentiated seta, (3) the numerous strong elongate setae along the apical portion of the sternomesal surface of the sidepiece, and (4) the apically expanded aedeagus; in the pupa by the combination of (1) the position of hair 2-III-V, which is laterad of hair 1 of the corresponding segment, (2) the short 5-IV,V, and (3) the long strong VI; and in the larva by (1) the spiculose integument of the thorax and abdomen, (2) the single row of 5 or 6 (3-7) large comb scales with a single long apical spine and several small spinules, (3) the development of the ventral brush, which arises from a strongly sclerotized boss, consists of 7 pairs of hairs, and has hair 4a-X very short and 9-12b (5-15), and (4) the characteristic development of the anal gills, with both the dorsal and ventral pairs sausage-shaped but the dorsal pair much longer than the ventral and curved ventrad.

I am following Aitken (1941:81-82), Belkin and McDonald (1957:190) and Mattingly (1961:38) in placing this very distinctive species in the monotypic subgenus *Kompia,* which shows no definite relationship to any other New World group. Some larval features, such as the absence of hair 12-I, the form and position of 13-VI, the single 3-VII, and the boss at the base of the ventral brush, suggest, however, that it may have been derived from the same stock as *Abraedes, Aztecaedes, Gymnometopa* and *Howardina. Kompia* is undoubtedly a relict that has been preserved at the periphery of the Neotropical Region.

Aedes purpureipes is quite uniform in all stages throughout its range except for the usually slightly weaker and more lightly pigmented hairs and spicules and the stouter siphon of larvae from Baja California.

BIONOMICS. The immatures of *purpureipes* are found in treeholes. In southeastern Arizona this species is commonly associated with *Ae. (Ochlerotatus) mont-*

icola, Ae. (0.) muelleri and *Ae. (Protomacleaya) burgeri* at moderate elevations (1500 to 1700 meters) in riparian woodland and oak-pine forest. It extends down into hotter and drier regions than any of these species, however, and is apparently the only treehole *Aedes* found in cottonwood trees *(Populus)* and hackberry trees *(Celtis)* growing in some washes at lower elevations (1100 to 1220 meters) and it is the only mosquito known to breed in rot cavities in palo verde trees *(Cercidium)* growing on the desert pediments (900 meters). In southern Sonora *purpureipes* is associated with *Ae. (Protomacleaya) podographicus,* a species of the Terrens Group, at moderate elevations in the tropical deciduous (short tree) forest. Again, it is apparently the only *Aedes* utilizing treeholes at lower elevations in this region, where it is found in cottonwood gallery forests to near sea level. In the cape region of Baja California *purpureipes* is the only treehole *Aedes* that has been collected in riverine and short tree forests at lower elevations; it has not been found in the oak-pine forest at higher elevations.

Adults of *purpureipes* have been found resting in treeholes and have been collected at artificial lights. Females have been taken in biting-landing collections with human bait during the day and at dusk. They were annoying biters among the palo verde trees along Mendoza Wash, Arizona, after the sun had set on 7 Sept 1969.

DISTRIBUTION (fig. 29). *Aedes purpureipes* has been collected in southeastern Arizona, northwestern Mexico and southern Baja California. In the northern portion of its range it occurs at elevations between 900 and 1700 meters; in the southern portion it has been collected at elevations between sea level and 1200 meters. Material examined: 3173 specimens; 390 males, 682 females, 1124 larvae, 977 pupae; 283 individual rearings (180 larval, 93 pupal, 10 incomplete).

MEXICO. *Baja California Sur:* El Pescadero, 1 June 1965, W.A. McDonald (UCLA 248), 3 1pM (248-10,31,32), 5 1pF (248-11,12,30,33,34), 3 F, 1 M gen, 3 P, 5 L [UCLA] . El Triunfo, 25 Aug 1970, J.H. Arnell and L.T. Nielsen (HA-24-70), 3 1pF (1,4,5), 1 M, 2 P, 9 L [UTAH] . Miraflores, 8 July 1938, A.E. Michelbacher and E.S. Ross, 1 F [USNM] . Todos Santos, 31 May 1965, W.A. McDonald (UCLA 243), 1 1pM (243-10) [UCLA] . Todos Santos, Rancho Santo Domingo, 2 June 1965, W.A. McDonald (UCLA 247), 6 1pM (247-10,11,13,31,33,39), 16 1pF (247-14-16,18,19,30,32,34-38,40-43), 2 1p (247-12,17), 59 M, 6 M gen, 56 F, 145 P, 45 L [UCLA] ; 26 Aug 1970, J.H. Arnell and L.T. Nielsen (HA-25-70), 11 M, 18 F, 91 P, 131 L [UTAH] . *Sonora:* Alamos (12 km SE), along Rio Cuchujaqui, 5 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 643), 3 1pM (643-10,13,15), 3 1pF (643-11,12,14), 3 M, 2 F, 5 P, 12 L; same data (MEX 648), 1 1pF (648-11), 2 M, 1 F, 3 P, 109 L [UCLA]. Alamos (12.4 km W), 5 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 644), 2 1pF (644-10,11); same data (MEX 645), 2 1pM (645-11,12), 4 1pF (645-10,13-15), 13 M, 7 F, 21 P, 20 L; same data (MEX 646), 3 1pM (646-12,14,17), 3 1pF (646-11,13,15), 2 M, 3 P, 8 L [UCLA] . Nogales (14.4 km S), 22 Aug 1970, J.H. Arnell and L.T. Nielsen (HA-20-70), 33 P, 14 L [UTAH].

UNITED STATES. *Arizona:* Alambre Wash, Baboquivari Mts., Pima Co., 7 Sept 1969, T.J. Zavortink (UCLA 628), 6 1pF (628-10-15), 1 pM (628-100), 5 pF (628-101-105), 2 F, 2 P, 13 L [UCLA] . Baboquivari Canyon, Baboquivari Mts., Pima Co., 31 Dec 1969, T.J. Zavortink (UCLA 558), 2 1pM (558-30,31), 1 1pF (558-33), 1 L; same data (UCLA 566), 26 L [UCLA] . Carr Canyon, Huachuca Mts., Cochise Co., 5 Sept 1966, T.J. Zavortink (UCLA 341), 1 1pF (341-11) [UCLA] . Cochise Stronghold Recreation Area, Dragoon Mts., Cochise Co., 26 Aug 1964, J.F. Burger (UCLA 256), 1 F; 4 Sept 1966, T.J. Zavortink (UCLA 326), 1 1pF (326-19), 2 M, 4 F, 1 M gen, 7 P; same data (UCLA 330), 4 1pF (330-12-14,16), 1 1p (330-11); 22 Mar 1966, T.J. Zavortink (UCLA 426), 1 pF (426-10); same data (UCLA 427), 1 M, 1 P, 1 L [UCLA]. Gardner Canyon, Santa Rita Mts., Pima Co., 24 Aug 1954, W.A. McDonald (UCLA 136), 1 P, 5 L [UCLA] . Lochiel (13 km E), Bodie Canyon, Santa Cruz Co., 27 Dec 1969, L.T. Nielsen and T.J. Zavortink (UCLA 549), 4 L; same data (UCLA 559), 1 1pF (559-30), 2 M, 3 P, 2 L; same

data (UCLA 562), 2 1pF (562-40,61), 1 F, 4 P, 13 L [UCLA] . Madera Canyon, Santa Rita Mts., Santa Cruz Co., 22 Aug 1954, W.A. McDonald (UCLA 135), 5 pF (135-206-208,212,214), 5 P, 20 L; 17,19 Aug 1955, W.A. McDonald (UCLA 171), 3 1pM (171-153,165,187), 60 1pF (171-103,108-112,115,117-119,130-137,146-148,150-152,154-159,161,166-171,184,186,192-206,214,234-236,238,239), 13 pM (171-121-123,126,127,129,140,160,162,177,179,182,208), 40 pF (171-124,125,142,163,164,172-176,178,180,181,183,188-191,209-211,215-232,237), 1 1M (171-116), 5 1p (171-106,139,185,213,240), 191 M, 328 F, 13 M gen, 255 P, 53 L; 30 June 1956, W.A. McDonald (UCLA 206), 1 1pM (206-101) [UCLA] . Mendoza Canyon, Coyote Mts., Pima Co., 28 Dec 1969, L.T. Nielsen (UCLA 550), 1 pM (550-35), 1 P, 6 L; 29 Dec 1969, T.J. Zavortink and L.T. Nielsen (UCLA 552), 1 M; same data (UCLA 555), 1 1pM (555-30), 3 1pF (555-32,34,35), 1 F, 10 P, 8 L; same data (UCLA 556), 3 P, 26 L; same data (UCLA 561), 1 1pM (561.36), 4 1pF (561-34,35,37,38), 2 P, 6 L; 30 Dec 1969, T.J. Zavortink and L.T. Nielsen (UCLA 553), 4 L; 24 Sept 1970, T.J. Zavortink (UCLA 576), 7 L [UCLA]. Mendoza Wash, Coyote Mts., Pima Co., 7 Sept 1969, T.J. Zavortink (UCLA 629), 1 1pM (629-11), 7 1pF (629-10,12-17), 7 pM (629-100-104,106,107), 3 pF (629-105,108,109), 1 M, 11 F, 12 P, 14 L; 24 Sept 1970, T.J. Zavortink (UCLA 582), 6 L [UCLA] . Nogales (21 km NW), Calabasas Picnic Ground, Santa Cruz Co., 21 Mar 1966, T.J. Zavortink (UCLA 429), 2 M, 3 F, 5 P, 6 L [UCLA]. Patagonia (3-6 km WSW), Santa Cruz Co., 24 Aug 1954, W.A. McDonald (UCLA 139), 2 L; 19 Aug 1955, W.A. McDonald (UCLA 174), 1 1pM (174-116), 5 1pF (174-108,120-123), 7 pM (174-101,106,107,111,112,117,118), 9 pF (174-102-104,109,110,113-115,119), 5 M gen, 1 P; 13 Sept 1968, T.J. Zavortink (UCLA 453), 1 pM (453-100); same data (UCLA 454), 2 1pF (454-10,11) [UCLA] . Sabino Canyon, Baboquivari Mts., Pima Co., 30 Dec 1969, T.J. Zavortink (UCLA 560), 1 L [UCLA]. Sierra Vista (15 km E), Cochise Co., 22 Mar 1966, T.J. Zavortink (UCLA 428), 26 M, 1 M gen, 26 F, 53 P, 27 L [UCLA] . Sycamore Canyon, Baboquivari Mts., Pima Co., 31 Dec 1969, T.J. Zavortink (UCLA 557), 3 1pM (557-11,12,19), 4 1pF (557-13, 20-22), 1 1p (557-23), 1 M, 1 F, 6 P, 69 L; same data (UCLA 563), 1 1pM (563-30), 2 L; same data (UCLA 564), 2 1pF (564-20,21), 1 F, 2 P, 13 L; same data (UCLA 565), 2 1pM (565-20,22), 6 1pF (565-21,23-27), 7 M, 6 F, 16 P, 246 L [UCLA] .

Additional Record From the Literature

MEXICO. *Sinaloa:* Esperanza Camp, San Blas (Vargas, 1949:261).

Subgenus ABRAEDES Zavortink

1970. *Abraedes* Zavortink, 1970:2-3. TYPE SPECIES: *Aedes (Abraedes) papago* Zavortink, 1970, United States of America; monobasic and original designation.

13. *Aedes (Abraedes) papago* Zavortink

Figs. 29,33,34

1970. *Aedes (Abraedes) papago* Zavortink, 1970:3-8. TYPE: *Holotype* male (UCLA 550-39) with associated larval and pupal skins and genitalia, Mendoza Canyon, Coyote Mountains, Pima Co., Arizona, United States of America, egg from treehole, 28 Dec 1969, L.T. Nielsen [USNM].

FEMALE. Wing: 3.15 mm. Proboscis: 2.06 mm. Forefemur: 1.65 mm. Abdomen: about 3.2 mm. Dark scales of head, proboscis, palpus and legs, and dark and silvery scales of abdomen with metallic silver, copper, green, blue or violet reflections. *Head:* Eyes broadly separated above antennae, the resulting space with broad flat silver scales. Integument dark brown to black. Frontal bristles absent. Orbital bristles moderately numerous, mesal 6 or 7 pairs strongly developed, lat-

eral 4-6 pairs moderately developed. Vertex with few black erect scales and numerous broad flat predominantly black scales; silver-white scales in broad median longitudinal line, usually some whitish scales posteriorly near occiput. Occiput with numerous entirely or predominantly black erect scales and few white narrow curved scales. Orbital line of broad flat silver scales developed. Dorsolateral scales broad and flat, white mesally, black laterally. Lateral and ventral surfaces with broad flat black and white or silver-white scales. Clypeus moderately large, bare. Proboscis moderately stout, much longer than forefemur; dark scaled with scattered white scales in at least middle portion, especially dorsally; with a few basal bristles. Palpus moderately long, about 0.26-0.29 length of proboscis; 4-segmented, segment 4 moderate in size; segments 1-3 with bristles; dark scaled with white scales in patch at apex, in patch at base of segment 3 and scattered or in patch on segment 2. Antenna subequal in length to proboscis; torus with conspicuous large patch of broad flat silver scales; flagellar segment 1 longer than 2, slightly swollen, with line of white scales; flagellar segments 2-13 usually with 6 moderate bristles in basal whorl; each of flagellar segments 3-7 or 8 slightly longer than preceding segment, segments 7 or 8-12 subequal in length. *Thorax:* Integument dark brown to black. Acrostichal and dorsocentral bristles in long rows; prescutellar and supraalar bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles present, well developed; 1 parascutellar bristle present. Scutellum with 4-6 strong bristles on midlobe, 3-7 on lateral lobe. Mesoscutum completely covered with predominantly small narrow curved scales except for anterior inner dorsocentral and median and lateral prescutellar bare spaces; dark brown or black with conspicuous pattern of white or silvery patches or lines, as follows: (1) median patch on anterior promontory, (2) para-acrostichal line from anterior promontory to near level of wing root that narrows and converges with its mate posteriorly, (3) median posterior acrostichal line, (4) lateral prescutal line, (5) posterior fossal line, (6) posterior outer dorsocentral line, (7) irregular patch above mesothoracic spiracle, (8) transverse supraalar patch, and (9) sometimes in lateral prescutellar line or anterior prescutellar patch. Scutellar lobes with broad flat silver scales. Paratergite moderately broad, with broad flat silver scales in lower anterior portion. A *pn* not enlarged. *Ppn* separated from mesoscutum by strong suture. Meron large. Pleural bristles on *apn, ppn, ppl, psp, pra, stp* and upper *mep; stp* bristles few, located between upper and lower scale patches; *ssp* and lower *mep* bristles absent. *Apn* with line of broad flat silver scales; *ppn* with small patch of broad flat silver scales in lower portion near *ssp* and sometimes with a large sparse oblique patch of silver and black scales; broad flat silver scales in patches on upper and lower *pst, ppl, pcx, ssp, pra,* in 2 parallel lines across middle *stp,* on *stp* cephalodorsad of midcoxa, and on upper and lower *mep;* hypostigial area, *psp* and metameron usually without scales. *Legs:* Hindcoxa smaller than or subequal in size to midcoxa, its base far below upper margin of meron. Legs short, forefemur about 1.03-1.10 times distance from top of thorax to apex of midcoxa. Forecoxa with silver and black scales; midcoxa and hindcoxa with silver scales. Femora black scaled with white scales in incomplete narrow subbasal oblique band on forefemur, in usually complete narrow subbasal oblique ring on midfemur and hindfemur and scattered, the scattered scales especially numerous on forefemur. Knee spots small, silver, usually incomplete on forefemur. Tibiae black scaled with white scales in narrow to moderately broad dorsally incomplete basal band, narrow ring or band about 0.25-0.33 distance from base of foretibia and midtibia and broad submedian ring on hindtibia. Tarsi black

scaled with white scales as follows: in moderately broad basal patch, band or ring on segment 1 and small basal patch on segment 2 and sometimes segment 3 of foretarsus and midtarsus; in moderately broad subbasal band or ring on segment 1, moderately broad basal band or ring on segments 2 and 3 and moderately broad basal patch or band on segments 4 and 5 of hindleg. Claws of all legs simple. *Wing:* Dark scaled except for white line in basal 0.16-0.20 of anterior surface of costa. Plume scales on dorsum of veins Rs, R_{2+3} R_2 R_3 middle 0.60-0.70 of M and sometimes apical portion of 1A. *Haltere:* Scales white and dark. *Abdomen:* Tergite I with numerous scales middorsally. Laterotergite with large patch of silver-white scales. Tergites VI and VII with large bristly submedian apical scaleless area. Outstanding scales present. Tergites II-VII predominantly black scaled, with lateral basal or subbasal silver patch; scales of silver patches and black scales distad of them becoming progressively denser and outstanding on distal segments; tergites VI and VII with additional outstanding black scales middorsally. Sternites variably scaled; proximal sternites sometimes largely bare, usually with at least a few dark scales apically, sometimes with small lateral subbasal or median silver patch; distal sternites usually at least partly bare basally, black scaled apically and with lateral median or preapical silver patch or band; scales becoming progressively denser and more outstanding on distal segments.

FEMALE GENITALIA. *Segment VIII:* Tergite narrowed apically, length along midline about 0.67 of tergite VII; distal 0.60-0.70 with scales and bristles. Sternite long, about 1.5 length of tergite, broader distally; distal margin nearly straight; all but narrow basal and lateral areas With scales or bristles, the latter predominating; bristles more numerous along midline and distal margin, largely weakly developed and short but some moderately developed and elongate. *Tergite IX:* Deeply notched apically; maximum length apparently about 0.45 of tergite VIII; moderately sclerotized; apical lobe with 1 fine bristle. *Insula:* Weakly sclerotized; possibly not connected to sigma; with 3 pairs of moderately developed setae. *Cercus:* Moderately long, length of dorsal edge about 0.83 of tergite VIII; compressed; apex rounded in lateral view; bristles numerous apically, the largest moderately long; scales present. *Postgenital Plate:* Moderately long and broad, length about 0.58 of tergite VIII; index about 1.6; apex rounded in ventral view; distal portion with numerous weakly developed bristles; basal median longitudinal apodeme strongly sclerotized. *Cowl:* Moderately to strongly sclerotized. Atrial plates not developed. *Sigma:* Possibly not continuous with cowl; very weakly sclerotized. Basal portion of spermathecal duct strongly sclerotized. Spermathecae 3, strongly sclerotized, more or less spherical, 1 noticeably larger than others.

MALE. Essentially as in female except for sexual characters. *Head:* Proboscis moderately stout; white speckling reduced or absent. Palpus subequal to proboscis in length; 5-segmented; segments 2 and 3 ankylosed and long, making up 0.67 length of palpus; segment 4 short, 0.16 length of palpus; segment 5 short, 0.12 length of palpus; palpus slender except for swollen apex of segment 3 and swollen segment 4; apex of segment 3 upturned, segments 4 and 5 slightly drooping; apex of segment 3 and all of segments 4 and 5 with relatively few bristles; dark scaled with large subbasal white patch or band on segment 2 and moderately broad basal white patch or band on segments 3-5. Antenna shorter than proboscis; torus much enlarged, with conspicuous patch of broad flat silver scales; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment I slightly elongate, with scales; flagellar segments 12 and 13 elongate, penultimate longer, the 2 combined shorter than total length of first 11

segments. *Legs:* Claws of foreleg and midleg enlarged, unequal; larger claw with blunt submedian tooth, smaller claw simple. Claws of hindleg small, simple. *Abdomen:* Apical segments and genitalia conspicuously bent ventrad.

MALE GENITALIA (fig. 33). Unusually colored; segment IX, proctiger, phallosome, claspette and clasper largely weakly pigmented, yellowish; sidepiece and spiniform moderately pigmented, light brown; apex of paraproct deeply pigmented, blackish. *Segment VIII:* Tergite short, 0.70-0.78 length of sternite; largely retracted, only apical 0.21 scaled. *Segment IX:* Poorly developed dorsally, the tergite short; middorsal portion of tergite moderately sclerotized, cephalad of level of base of sidepiece; tergite without lobes but with 1 or 2 fine submedian setae on each side; sternite large, with 8 setae distally. *Sidepiece:* Well developed, fusiform; mesal surface membranous from base to apex; basal tergomesal area not swollen, without clumped or enlarged setae, but with normal bristles of dorsal surface of sidepiece slightly shorter and more numerous; apical lobe not developed; median sternomesal sclerite and tuft absent; sternomesal surface without long broad striated scales; dorsomesal surface with short setae, remainder of dorsal surface and lateral and ventral surfaces with numerous scales and long bristles; bristles of ventral surface not specialized. *Claspette:* Well developed; stem short, bent mesad distally, spiculose, with 3-6 weakly developed setae; filament long, subterete, curved dorsad, without ridge or retrorse barb on convex side. *Clasper:* Simple, moderately long, broadest at base, basal portion straight; without conspicuous ridges or wrinkles; basal portion spiculose; apical portion with 2 setae on ventral surface; apical spiniform moderately long, 0.30-0.35 length of clasper. *Phallosome:* Aedeagus moderately large, without teeth; base subparallel-sided, apex bulbous. *Proctiger:* Strongly developed; unusually long in dorsal aspect, the basolateral sclerotization largely horizontal; paraproct well sclerotized, with a single large heavily sclerotized apical tooth; cercal setae fine, short, 2-4.

PUPA (fig. 33). Abdomen: about 4.0 mm. Trumpet: 0.54 mm. Paddle: 0.81 mm. Integument uniformly weakly pigmented, light straw yellow. *Cephalothorax:* Hair 5-C weakly developed, short, reaching 0.3-0.4 distance from its base to base of trumpet. *Trumpet:* Brown basally, bright yellow apically. Broadening gradually from base to apex; tracheoid sculpturing developed in basal 0.08; reticulate sculpturing strong. *Abdomen:* Tergites II-V usually without a strong transverse ridge anteriorly; tergites VI and VII usually with moderately strong transverse ridge near level of hair 0. Hair 1-II-VII usually weakly developed, single or double (1-3b). Hair 2-III-V mesad of hair 1 of corresponding segment. Hair 5-IV,V 0.8-1.0 length of corresponding segment; 5-VII short to moderately long, double or single, longer and stronger than 4-VII. Hair 6-III-V subequally developed, short, fine; 6-VI longer and stronger than 6-III-V; hair 6-VII shorter than 6-VI, but usually slightly longer and stronger than 6-III-V. Hair 8-VI,VII ventral. Hair 9411-VI relatively long and stout, becoming longer on posterior segments; usually cephalad of level of hair 6 of corresponding segment on III and IV, cephalad or caudad of level of hair 6 on V, caudad of level of hair 6 on VI; hair 9-VII mesad of caudolateral angle of segment, with 1 or 2 long primary branches; 9-VIII relatively far mesad of caudolateral angle of segment, with 2-5 long strong primary branches. Hair 10-VI relatively far mesad of 11-VI. *Terminal Segments:* Male genital lobe moderately large, about 1.3 length of tergite VIII. *Paddle:* Length greater than width. Apex deeply emarginate. Midrib conspicuous to wrinkled area basad of apical emargination. Long filamentous marginal spicules developed. Hair 1-P moderately long, single.

LARVA (fig. 34). Head: 0.97 mm. Siphon: 0.72 mm. Anal Saddle: 0.28 mm. *Head:* Weakly pigmented, largely medium straw-yellow. Labial plate subquadrate. Hair 1-C stout. Hairs 4,6-C relatively close to labrum. Hair 4-C weakly to moderately developed, 4-9b; mesad of 1-C and cephalad of level of 6-C. Hair 5-C single, laterad of 6-C. Hair 6-C single, in line with or laterad of 1-C. Hair 7-C 2,3b (1-3). Hair 15-C long, 3,4b. Mental plate with 8-10 teeth on each side of median tooth. *Antenna:* Shaft without spicules but sometimes with annular wrinkles. Hair 1-A short, usually single (single or double). *Thorax:* Epidermis and fat body without conspicuous pigmentation. Integument without spicules. Hairs 5-7-P arising from separate tubercles. Hair 1-M,T moderately long, usually branched. Hairs 4,5-P branched; 5-M single or double. Hair 11-P,M,T much shorter than 9-P. Hair 13-T moderately developed, 2-4b; subequal to or larger than 14-M. Hair 14-M weakly to moderately developed, 1-3b. *Abdomen:* Hair 1-I moderately developed, usually 3,4b (3-7); hair 1-IV,V moderately to strongly developed, 3,4b. Hair 2-11I-V usually distinctly mesad of hair 1 of the corresponding segment; usually single or double (1-3b). Hair 3-VII moderately developed, short, single. Hair 5-II-IV moderately to strongly developed, 3-5b. Hair 6-III-V double. Hair 9-III-V single or double. Hair 11-I moderately developed, usually 4-7b (3-8). Hair 12-I absent. Hair 13-I weakly to moderately developed, usually 3,4b (1-4); hair 13-IV,V strongly developed, 2-4b; hair 13-VI moderately to strongly developed, 2-4b, laterad and usually caudad of the level of 10-VI. *Segment VIII:* Hairs 1 and 2 separated. Hair 1 moderately to strongly developed, usually 4,5b (3-5). Comb scales large; with 1 or 2 long spines and several shorter spines; few (4 or 5) in 1 row. *Siphon:* Moderately pigmented, largely light yellow-brown to light brown. Relatively short; index about 1.9-2.3. Acus absent. Pecten teeth with 2-4 irregular basal denticles; 12-14 (12-18) in a more or less straight even row. Hair 1-S slightly distad of pecten; moderately developed, 2,3b. *Anal Segment:* Saddle moderately large; without spines on caudal margin; moderately pigmented, light yellow-brown to light brown. Hair 1-X strongly developed, usually 2,3b (1-4). Hair 2-X usually 3,4b (3-7). Hair 3-X single. Ventral brush (4-X) weakly developed; with 5 pairs of hairs; all hairs or all but most proximal 1 or 2 hairs from weakly sclerotized boss; hair 4a-X short, usually 4,5b (4-6); hairs 4b,4c-X single or double. Anal gills sausage-shaped; dorsal and ventral subequal in length, 3.0-4.2 of anal saddle.

SYSTEMATICS. *Aedes papago* is one of the most distinctive New World *Aedes* and is easily separated from all other container-breeding species as follows: in the adult by (1) the ornamentation of the mesoscutum, which has narrow white and silver lines and patches in a pattern superficially similar to that of *Aedes aegypti,* (2) the presence of 2 narrow diagonal lines of silver scales across the middle portion of the sternopleuron, (3) the ornamentation of the femora, which have white scales in a narrow, diagonal, subbasal band, (4) the pair of large, bristly, submedian, apical, scaleless areas on tergites VI and VII, and the combination of (5) the broad flat scales on the vertex, paratergite, all 3 scutellar lobes and between the eyes, (6) the white band 0.25-0.50 the distance from the base on all tibiae, (7) the subbasal white band of hindtarsal segment 1, and (8) the simple claws of the female; in the male genitalia by (1) the yellowish color of segment IX and the proctiger, phallosome, claspette and clasper, (2) the fusiform sidepiece without any indication of a basal or apical lobe, (3) the apically bulbous aedeagus, and (4) the long paraproct with a nearly horizontal basolateral sclerotization; in the pupa by (1) the long, filamentous, marginal spicules of the

paddle, and the combination of (2) the uniform light straw-yellow pigmentation, (3) the position of hair 2-11I-V, which is mesad of hair 1 of the corresponding segment, and (4) the long strong 9-III-VI; and in the larva by (1) the single row of 4 or 5 large comb scales with 1 or 2 long and several shorter spines, (2) the development of the ventral brush, which arises from a weakly sclerotized boss, consists of 5 pairs of hairs, and has 4a-X short and 4-6b, and the combination of (3) the subquadrate labial plate, (4) the absence of 12-1, (5) the position of 2-III-V, which is usually mesad of hair 1 of the corresponding segment, (6) the short single 3-VII, (7) the absence of an acus on the siphon, and (8) the 4 long, subequal, sausage-shaped gills.

Aedes papago is so different from any other New World *Aedes* that it undoubtedly deserves to be placed in the monotypic subgenus *Abraedes.* The definite relationships of *Abraedes* are unknown, but some larval features suggest that it may be remotely related to *Aztecaedes, Gymnometopa,.Howardina* and *Kompia.* The pleural ornamentation and simple claws of the female are reminiscent of *Howardina.* The nearly horizontal basolateral sclerotization of the paraproct in the male genitalia is found elsewhere in the New World Aedini only in *Haemagogus.* The chaetotaxy of the larva is most similar to that of *Kompia. Abraedes* is a relict that has been preserved at the periphery of the Neotropics or, possibly, in a highly specialized habitat (see below).

BIONOMICS. The small series of reared specimens of *papago* was obtained from eggs collected in a rothole in an oak tree *(Quercus* sp.). Associated species were *Ae. (Kompia) purpureipes* and *Ae. (Protomacleaya) burgeri.* Females have been taken attacking humans; John Burger (in litt.) caught 3 that were attempting to bite him in bright sunlight between the hours of 0930 and 1100 on 20 August 1970 at an elevation near 900 meters in the desert several kilometers southeast of Sahuarita, Pima Co., Arizona. This collection is of particular significance because it indicates that *papago* is a denizen of the lower Sonoran desert and that the normal habitat of the immature stages remains to be discovered.

DISTRIBUTION (fig. 29). *Aedes papago* has been found at elevations between 900 and 1100 meters in Pima County, Arizona. Material examined: 16 specimens; 2 males, 4 females, 5 larvae, 5 pupae; 5 individual larval rearings.

UNITED STATES. *Arizona:* Mendoza Canyon, Coyote Mts., Pima Co., 13 Aug 1968, M.L. Nailer, 1 F [ARIZ] ; 28 Dec 1969, L.T. Nielsen (UCLA 550), holotype 1pM and gen (550-39), allotype 1pF (550-33) [USNM] , 1 1pM and gen (550-36), 2 1pF (550-37,38) [UCLA] .

Additional Record

UNITED STATES. *Arizona:* Sahuarita (19 km SE), Pima Co., 20 Aug 1970, J.F. Burger, 3 F (J.F. Burger, in litt.).

AZTECAEDES, new subgenus

TYPE SPECIES: *Aedes (Gualter:a) ramirezi* Vargas & Downs, 1950.

DIAGNOSIS. *Aztecaedes* may be distinguished from all other New World subgenera of *Aedes* as follows: in the adult by (1) the ornamentation of the mesoscutum, which has small, broad flat white scales in a narrow median acrostichal line that is continued as a median prescutellar line through the prescutellar space to the scutellum, a narrow posterior outer dorsocentral line, and a narrow, complete lateral marginal line, (2) the ornamentation of the pleuron, which has 2

nearly horizontal lines of white scales in the upper portion, (3) the scaling of the scutellum, the midlobe having a median longitudinal line of broad flat white scales bordered by dark narrow curved scales and the lateral lobe having dark narrow curved scales, and the combination of (4) the presence of numerous erect scales and few to numerous moderately broad flat scales on the vertex, (5) the absence of humeral and lateral prescutal bristles, (6) the bare paratergite, (7) the restricted scaling of the posterior pronotum, which has narrow curved dark scales along the upper edge and broad flat white scales in a line across the lower portion, (8) the presence of hypostigial scales, and (9) the entirely dark scaled proboscis, palpus, tibiae and tarsi; in the male genitalia by (1) the pair of very strongly developed setae arising from the dorsal surface of the distal portion of the claspette stem, and by the combination of (2) the long sub cylindrical aedeagus with a median constriction, (3) the numerous long strong setae on the sternomesal surface of the sidepiece, and (4) the absence of a tuft of setae or a single long, strongly differentiated seta at the base of the tergomesal surface of the sidepiece; in the pupa by (1) the long, strong, irregular transverse ridge slightly caudad of the level of hair 0 on tergites II-VI or VII, (2) the broad paddle with the midrib conspicuous in only the basal portion, and (3) the fine but elongate 9-III-VI; and in the larva by (1) the very large ocular lobe of the head, (2) the single hair 7-C, (3) the strongly developed and few branched 13-T,I and 14-M, (4) the very short siphon, (5) the short pecten that is conspicuously curved dorsad distally or oblique, (6) the numerous basal denticles or serrations of the pecten teeth, (7) the long, strong single 1-X, (8) the development of the ventral brush, which arises from a strongly sclerotized boss, usually consists of 8 pairs of hairs, and has 4a-X very short, fine and usually single, and (9) the large to very large inflated, tapering anal gills.

DISCUSSION. See *ramirezi* below.

14. *Aedes (Aztecaedes) ramirezi* Vargas & Downs

Figs. 29,35-37

1950. *Aedes (Gualteria) ramirezi* Vargas and Downs, 1950:164-167. TYPE: *Holotype* female, Gabriel Mariaca, Morelos, Mexico, larva from rockhole, 29 June 1947, W.G. Downs [ISET].

Aedes (Finlaya) ramirezi of Stone, Knight and Starcke (1959:170).

FEMALE (fig. 35). Wing: 4.35 mm. Proboscis: 3.24 mm. Forefemur: 2.75 mm. Abdomen: about 4.2 mm. Dark scales of palpus, proboscis, legs and abdomen with green, blue or violet reflections. *Head:* Eyes narrowly separated above antennae, the resulting space with moderately broad white scales. Integument dark brown to black. Frontal bristles present, weakly to strongly developed, 1 or 2 pairs. Orbital bristles moderately numerous, mesal 5-9 pairs strongly developed, lateral 3-5 pairs moderately developed. Vertex with numerous black erect scales and few to numerous moderately broad flat scales that are entirely or predominantly black, some along midline sometimes white. Occiput with numerous black erect scales and relatively few narrow curved scales that are small and black and white laterally, enlarged and white along midline. Orbital line of moderately broad flat white scales present. Dorsolateral scales broad flat, white mesally, black later-

ally. Lateral and ventral surfaces with broad flat whitish scales. Clypeus large, bare. Proboscis relatively stout, longer than forefemur; entirely dark scaled; with a few basal bristles. Palpus short, about 0.18-0.21 length of proboscis; 4-segmented, segment 4 moderately long; segments 1-3 with bristles; entirely dark scaled. Antenna shorter than proboscis; torus with conspicuous large patch of broad flat silver-white scales; flagellar segment 1 longer than 2, slightly swollen, with small dark and sometimes whitish scales; flagellar segments 2-13 usually with 6 moderate bristles in basal whorl; each of flagellar segments 3-5 or 6 slightly longer than preceding segment, segments 4, 5 or 6-12 subequal in length. *Thorax:* Integument dark brown to black. Acrostichal bristles restricted to anterior promontory or extending caudad in long row; dorsocentral bristles in well developed complete row; prescutellar and supraalar bristles numerous and well developed; humeral and lateral prescutal bristles absent; posterior fossal bristles present, well developed; 1 parascutellar bristle present. Scutellum with 4-6 strong bristles on midlobe, 6-9 on lateral lobe. Mesoscutum completely covered with scales except for anterior inner dorsocentral and submedian and lateral prescutellar bare spaces; background of small narrow curved black scales with broader flatter white scales in conspicuous narrow longitudinal lines, as follows: (1) acrostichal line from anterior promontory through prescutellar space to scutellum, (2) posterior outer dorsocentral line from scutal suture to scutellum, and (3) lateral marginal line from anterior promontory to parascutellum. Midlobe of scutellum with broad flat white scales in median longitudinal line and narrow curved black scales laterally; lateral lobe with narrow curved black scales. Paratergite moderately broad, bare. *Apn* not enlarged. *Ppn* separated from mesoscutum by strong suture. Meron large. Pleuron with bristles on *apn, ppn, ppl, psp, pra, stp* and upper *mep; stp* bristles few, located above and below median *stp* scale patch; *ssp* and lower *mep* bristles absent. *Apn* with line of broad flat white scales; *ppn* with narrow curved black scales along upper edge and broad flat white scales in linear patch below level of mesothoracic spiracle; broad flat white scales in patches on *ppl,* hypostigial area, *psp, ssp, stp* below *pra, stp* caudad of *ssp* area, *stp* cephalodorsad of midcoxa, and in 1 large oblique patch or rarely 2 small patches in upper half of *mep; pst, pcx* and usually metameron bare. *Legs:* Hindcoxa smaller than or subequal in size to midcoxa, its base far below upper margin of meron. Legs long, forefemur about 1.40-1.48 distance from top of thorax to apex of midcoxa. Forecoxa with light and dark scales; midcoxa and hindcoxa with light scales. Femora dark scaled with white scales in streak in basal portion of lower anterior surface of forefemur, basal portion of anterior surface of hindfemur and rarely midfemur, basal portion of posterior surface of midfemur and hindfemur and in long streak from base to or near apex of posterior surface of forefemur. Knee spots moderate in size, white, largest on hindleg. Tibiae and tarsi entirely dark scaled. Claws of foreleg and midleg with acute submedian tooth, claws of hindleg simple. *Wing:* Entirely dark scaled. Plume scales present on dorsum of veins Rs, $R2+3$, $R2$, $R3$, M basad of furcation and apical portion of 1A. *Haltere:* Scales white and black. *Abdomen:* Tergite I with numerous scales middorsally. Laterotergite with large patch of white scales. Segments VI and VII completely scaled. Outstanding scales absent. Tergites and sternites II-VI' dark scaled with basolateral silver-white patch, patches of sternites usually larger.

FEMALE GENITALIA (fig. *35). Segment VIII:* Tergite much narrowed apically; length along midline about 0.54-0.61 of tergite VII; distal 0.63-0.71 with scales and bristles. Sternite long, about 1.3-1.4 length of tergite, broadened distally; dis-

tal margin broadly emarginate; all but narrow basal and lateral areas with scales and bristles, the latter predominating; bristles more numerous along midline and distal margin, largely weakly developed and short but some moderately developed and elongate. *Tergite IX:* Deeply notched apically, maximum length about 0.64-0.73 of tergite VIII; moderately sclerotized; apical lobe with 9-12 setae. *Insula:* Rather strongly sclerotized; with 5-9 pairs of moderately developed setae. *Cercus:* Moderately long, dorsal length about 0.80-0.90 length of tergite VIII; compressed; apex pointed in lateral view; bristles numerous apically, the largest moderately developed; without scales. *Postgenital Plate:* Moderately long and broad, 0.60-0.62 length of tergite VIII; index about 1.7-1.8; apex shallowly emarginate in ventral view; distal portion with numerous weakly developed bristles; basal median longitudinal apodeme strongly sclerotized. *Cowl:* Strongly sclerotized. Atrial plates not developed. *Sigma:* Not sclerotized. Basal portion of spermathecal duct moderately sclerotized. Spermathecae 3, strongly sclerotized, more or less spherical, 1 slightly larger than others.

MALE (fig. 35). Essentially as in female except for sexual characters. *Head:* Proboscis relatively stout. Palpus subequal in length to or longer than proboscis; 5-segmented; segments 2 and 3 ankylosed and long, making up 0.56-0.58 length of palpus; segment 4 moderately long, 0.19-0.20 length of palpus; segment 5 moderately long, 0.17-0.18 length of palpus; palpus slender except for swollen apex of segment 3 and swollen segment 4; apex of segment 3 upturned, segments 4 and 5 drooping slightly; apex of segment 3 and all of segment 4 with moderately numerous long bristles, all of segment 5 with shorter bristles; entirely dark scaled. Antenna shorter than proboscis; torus much enlarged, with large conspicuous patch of white scales; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment 1 slightly elongate, with scales; flagellar segments 12 and 13 elongate, subequal in length, the 2 combined subequal to total length of first 11 segments. *Legs:* Light scaling of femora less extensive than in female. Claws of foreleg and midleg enlarged, unequal; larger claw with blunt submedian tooth and acute basal external tooth, smaller claw with acute submedian tooth. Claws of hindleg small, simple. *Abdomen:* Apical segments and genitalia not conspicuously bent ventrad. Light scaling less extensive than in female.

MALE GENITALIA (fig. 36). Various shades of brown or tan, IX-T lobe and proctiger darkest, clasper lightest; basal sternomesal area of sidepiece with conspicuous nonpigmented area. *Segment VIII:* Tergite long, 0.83-0.90 length of sternite; exserted, apical 0.50-0.54 scaled. *Segment IX:* Well developed; middorsal portion of tergite moderately to strongly sclerotized, caudad of or at the level of base of sidepiece; tergite lobes prominent, very broadly connected middorsally, each with 4-9 strongly developed setae in a single or partially double series; sternite large, with 4-9 setae distally. *Sidepiece:* Well developed, subcylindrical; mesal surface membranous from base to apex; basal tergomesal area slightly to moderately swollen, without differentiated setae; apical lobe absent; median sternomesal sclerite and tuft absent; sternomesal surface without specialized scales; dorsal, lateral and ventral surfaces with numerous scales and bristles; numerous long strong setae on sternomesal surface. *Claspette:* Well developed; stem short, more or less straight in dorsal aspect; spiculose; 2 very strong, elongate setae arising from dorsal surface distally; with 1 or 2 additional fine setae; filament long, slightly flattened apically, curved dorsad, without ridge or retrorse barb on convex side. *Clasper:* Simple, moderately long, curved in apical portion, basal portion swollen; spiculose and with longitudinal ridges or wrinkles; apex with 2-4 fine setae,

on both inner and outer surfaces; apical spiniform moderately long, 0.21-0.28 length of clasper. *Phallosome:* Aedeagus moderately large, without teeth; subcylindrical with median constriction. *Proctiger:* Strongly developed; not unusually long in dorsal aspect, the basolateral sclerotization vertical; paraproct well sclerotized, with a single strongly sclerotized apical tooth; cercal setae fine, short, 3-9.

PUPA (fig. 36). Abdomen: about 3.2 mm. Trumpet: 0.44 mm. Paddle: 0.74 mm. *Cephalothorax:* Weakly to strongly pigmented, lighter ventrally. Hair 5-C weakly to moderately developed, short to moderately long, reaching 0.3-0.6 distance from its base to that of trumpet. *Trumpet:* Light to dark brown basally, becoming lighter apically. Broadening gradually from base to apex; tracheoid sculpturing relatively well developed in basal 0.08-0.13; reticulate sculpturing strong. *Abdomen:* Weakly to strongly pigmented, lighter posteriorly. Tergites II-VI or VII with a strong irregular transverse ridge anteriorly, usually slightly caudad of level of hair 0 of corresponding segment. Hair 1-II usually strongly developed, usually 2,3b (1-5); hair 1-III,IV moderately to strongly developed, 1-3b (1-4); hair 1-V-VII weakly to moderately developed, smallest on VII, single. Hair 2 laterad of 1 on III, mesad or laterad of 1 on IV and V. Hair 5-IV,V 0.7-1.1 length of corresponding segment; 5-VII usually moderately long, single, usually of same strength as 4-VII, but shorter. Hair 6-III-V subequally developed, short to moderately long, fine; 6-VI,VII subequally developed or 6-VI more strongly developed, similar to 6-III-V or longer and/or stronger. Hair 8-VI,VII ventral. Hair 9-III-VI fine, moderately long, sometimes slightly longer on VI, usually caudad of level of hair 6 of corresponding segment; 9-VII relatively close to caudolateral angle of segment, with 1 or 2 (1-3) long primary branches; 9-VIII at or slightly mesad or cephalad of caudolateral angle of segment, with 3-5 (3-6) long strong primary branches. Hair 10-VI usually relatively far mesad of 11-VI. *Terminal Segments:* Male genital lobe moderately large, about 1.2-1.4 length of tergite VIII. *Paddle:* Length subequal to or greater than width. Apex emarginate, subtruncate or rounded. Midrib conspicuous only basally; no conspicuously wrinkled area near apex. No long marginal spicules. Hair 1-P moderately long, single.

LARVA (fig. 37). Head: 0.98 mm. Siphon: 0.55 mm. Anal Saddle: 0.35 mm. *Head:* Moderately pigmented, ocular area lighter, posterior surface darker. Anterior portion of head shortened. Ocular lobe very prominent. Labial plate conspicuously narrowed anteriorly. Hair 1-C very stout. Hairs 4,6-C relatively close to labrum. Hair 4-C weakly developed, single (single or double); distinctly mesad of 1-C, cephalad or slightly caudad of level of 6-C. Hair 5-C single; distinctly laterad of 6-C. Hair 6-C single; mesad of 1-C. Hair 7-C single. Hair 15-C moderately long, usually double (1-4b). Mental plate variable in shape, with 4-6 (3-7) large blunt teeth on each side of median tooth. *Antenna:* Shaft usually without spicules. Hair 1-A moderately long, single. *Thorax:* Dorsal fat body usually weakly pigmented. Integument without spicules. Tubercles of hairs 5,6-P usually separate, that of 7-P always separate. Hair l-M,T short to moderately long, usually branched. Hair 4-P usually single (single or double). Hair 5-P usually double (1-4b); hair 5-M usually single (single or double). Hair 11-P,M,T distinctly shorter than 9-P. Hair 13-T strongly developed, usually 3-5b (2-6); subequal to 14-M or somewhat shorter. Hair 14-M strongly developed, usually 2,3b (1-4). *Abdomen:* Hair 1-I usually moderately developed, 2,3b (2-5); hair 1-IV,V moderately to strongly developed, usually single or double (1-3b). Hair 2-11I-V slightly to distinctly mesad of hair 1 of corresponding segment; usually double (1-4b). Hair 3-VII weakly developed, short, single. Hair 5-II-IV moderately developed, usually 2,3b (2-5).

Hair 6-111-V usually 2,3b (2-6). Hair 9-III-V usually double (1-3b). Hair 114 moderately to strongly developed, usually 4,5b (3-8). Hair 12-I absent. Hair 13-I strongly developed; 1-3b (1-4); hair 13-IV,V strongly developed, 1-3b; hair 13-VI weakly to moderately developed, 1-3b, cephalad of 10-VI. *Segment VIII:* Hairs 1 and 2 separated. Hair 1 moderately to strongly developed, 3-5b (2-6). Comb scales moderate in size; usually fringed with several apical elements of fringe enlarged; relatively few [9-14 (7-18)] in 1 regular to irregular row. *Siphon:* Weakly to moderately pigmented, frequently lighter apically. Short, index 1.3-1.6. Acus very large. Pecten teeth with numerous basal denticles or serrations; 11-17 (10-20) in a short even row that is conspicuously curved dorsad or oblique. Hair 1-S distad of pecten; moderately developed, usually 3,4b (3-5). *Anal Segment:* Disproportionately large. Saddle large; without spines on caudal border; weakly to moderately pigmented. Hair 1-X very strongly developed, long, single. Hair 2-X 4,5b (3-5). Hair 3-X 2,3b. Ventral brush (4-X) moderately developed; usually with 8 pairs of hairs; all but most proximal 1 or 2 pairs of hairs from strongly sclerotized boss; hair 4a-X very short and fine, usually single (single or double); 4b, 4c-X 2,3b. Anal gills large to very large, inflated, tapering distally; dorsal subequal in length to or somewhat longer than ventral, about 1.0-1.9 (1.0-3.6) of anal saddle.

SYSTEMATICS. *Aedes ramirezi* is so different from all other New World *Aedes* that the subgenus *Aztecaedes* is being erected for it. The most conspicuous distinguishing features of *ramirezi* can be found in the diagnosis of the subgenus.

Aztecaedes shows no definite relationship to any other New World group. The shape of the aedeagus of the male genitalia and several larval features, such as the absence of hair 12-I, the single 3-VII, the curved pecten, the branched 3-X, and the boss at the base or the ventral brush, suggest a possible remote relationship with *Gymnometopa. Aztecaedes* is apparently another relict group that has persisted at the edge of the Neotropics.

The most striking variation in the adults of *ramirezi* involves the acrostichal bristles, which may be present in a long complete row or restricted to the anterior promontory. In the larva the mental plate is quite variable in shape; some of this variation appears to be due to abrasion.

BIONOMICS. The immatures of *ramirezi* have been collected in holes in volcanic rock and on 1 occasion in a rothole in a tree. In the former habitat they have been associated 1 or more times with the immatures of *Ae. (Ochlerotatus) epactius, Ae. (Protomacleaya) gabriel* Schick, 1970 and *Ae. (P.) idanus* Schick, 1970. In the latter habitat they were associated with *gabriel* only. One male has been collected from the surface of the water in a rockhole and 1 female has been taken in a biting-landing collection with human host between 1330 and 1600 hours.

DISTRIBUTION (fig. 29). *Aedes ramirezi* is presently known from the Mexican States of Jalisco and Morelos at elevations between 1600 and 1900 meters. Material examined: 242 specimens; 24 males, 27 females, 134 larvae, 57 pupae; 44 individual rearings (27 larval, 15 pupal, 2 incomplete).

MEXICO. *Jalisco:* Las Animas, 9 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 678), 1 1pM (678-10), 1 M gen [UCLA] . *Morelos:* Vicinity of Teportlan (including Gabriel Mariaca), 29 June 1947, W.G. Downs, 1 M, 1 F [USNM] ; 7 Sept 1965, D.A. Schroeder (MEX 347), 1 L; same data (MEX 348), 1 1pM (348-14), 1 1pF (348-13), 1 M gen, 4 L; same data (MEX 354), 3 L; 28 June 1970, D.A. and K. Schroeder (MEX 506), 1 1pM (506-17), 1 1pF (506-18); same data (MEX 512), 1 1pF (512-10), 57 L; same data (MEX 513), 1 Ip (513-10), 2 L; 11 Aug 1970, D.A. and K. Schroeder (MEX 616), 2 1pM (616-10,11), 1 1pF (616-12), 1 P, 5 L; same data (MEX 621), 1 pF (621-100); same data (MEX 623), 5 1pM (623-11,14-17,18,19), 2 1pF (623-

18,19), 1 M gen, 1 L; same data (MEX 625), 1 F; same data (MEX 626), 5 1pM (626-11,14,15, 19,21), 6 1pF (626-12,13,18,20,22,23), 1 1p (626-16), 4 pM (626-100,103,106,108), 10 pF (626-101,102,104,105,107,109-113), 3 M, 3 M gen, 1 F, 10 P, 26 L; same data (MEX 627), 1 M; same data (MEX 628), 1 F, 4 L; 6 Aug 1970, C. Machado-Allison and A. Barrera (UCLA 579), 2 P, 2 L [UCLA] .

Subgenus GYMNOMETOPA Coquillett

1906. *Gymnometopa* Coquillett, 1906b:183. TYPE SPECIES: *Stegomyia mediovittata* Coquillet, 1906, Dominican Republic; original designation.

15. *Aedes (Gymnometopa) mediovittatus* (Coquillett)

Figs. 29,38-40

1906. *Stegomyia mediovittata* Coquillett, 1906a:60. TYPE: *Holotype* male (99.4) with associated larval and pupal skins, San Domingo [Dominican Republic] , Aug, A. Busck [USNM; see Stone and Knight, 1956:221] .

1907. *Aedes uncatus* Grabham, 1907:25. TYPE: *Lectotype* male (210) with slide of male genitalia, near Kingston, Jamaica, M. Grabham [USNM; selection of Stone and Knight, 1956:226] . Synonymy with *mediovittatus* by Howard, Dyar and Knab (1917:821).

Aedes (Finlaya) mediovittatus of Bonne and Bonne-Wepster (1925:420-421); Dyar (1928:227-228); Edwards (1932:152); Knight and Marks (1952:530,531,558); Lane (1953:695-697); Perez Vigueras (1956:248-257); Stone, Knight and Starcke (1959:167); Forattini (1965:394. 395); Cova Garcia, Sutil and Rausseo (1966a:57; 1966b:12,332); Belkin, Heinemann and Page (1970:171-175).

Aedes mediovittata of Dyar and Knab (1906:196); Dyar (1906:15); Howard, Dyar and Knab (1917:821-824).

Aedes (Gualteria) mediovittata of Dyar (1918:73,79).

Gymnometopa mediovittata of Coquillett (1906c:25).

Stegomyia mediovittata of Grabham (1907:25).

FEMALE (fig. 38). Wing: 3.19 mm. Proboscis: 2.56 mm. Forefemur: 2.22 mm. Abdomen: about 2.7 mm. Dark scales without conspicuous metallic reflections. *Head:* Eyes broadly separated above antennae, the resulting space with a divided row of narrow curved or broad flat white to silver-white scales. Integument light to dark brown. Frontal bristles absent. Orbital bristles relatively few, mesal 3-5 pairs strongly developed, lateral 3 or 4 pairs moderately developed. Vertex and anterior portion of occiput with a few predominantly dark proclinate erect scales and with numerous broad flat decumbent scales that vary from predominantly dark anteriorly and predominantly yellow or dingy-yellow laterally and posteriorly to entirely dark except for a small dorsolateral whitish to yellowish patch. Posterior portion of occiput with upright erect scales that vary from predominantly yellow or dingy-yellow to predominantly dark and with yellow narrow curved decumbent scales. Complete coronal line of white or silver narrow curved scales developed. Complete orbital line not developed, but with 3 patches of broad flat silver scales at margin of eye. Dorsolateral and lateral surfaces with broad flat predominantly cream-colored to yellowish scales. Ventral surface setose, with only a few scattered broad flat scales. Clypeus large, bare. Proboscis slender, longer than forefemur; dark scaled with scattered light scales in middle portion; with

a few basal bristles. Palpus short, about 0.20-0.22 length of proboscis; 4-segmented, segment 4 moderate in size; segments 1-3 with bristles; dark scaled with white scales in patch at base of segment 3, covering all of segment 4 and sometimes scattered on segment 2. Antenna shorter than proboscis; torus with conspicuous large patch of broad flat silver scales; flagellar segment 1 longer than 2, slightly swollen, with small dark scales; flagellar segments 2-10 usually with 8 moderate bristles in basal whorl, segments 11-13 usually with 6; flagellar segment 3 slightly longer than 2, segments 3-12 more or less subequal in length. *Thorax:* Integument brown. Acrostichal bristles restricted to anterior promontory; dorsocentral bristles present in complete row; prescutellar and supraalar bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles present, strongly developed; parascutellar bristle absent. Scutellum with 3-5 very strong bristles on midlobe, 3 or 4 on lateral lobe. Mesoscutum completely but sparsely covered with scales except for anterior inner dorsocentral, lateral fossal and median and lateral prescutellar bare spaces; small narrow curved background scales varying from entirely brown except for a few golden in supraalar area to brown only mesad of dorsocentral, lateral prescutal and supraalar bristles and largely golden or coppery in and behind fossa; highly ornamented with narrow longitudinal lines of silver-white, silver and golden scales, as follows: (1) acrostichal line of small narrow curved silver-white scales from small patch of similar scales on anterior promontory to prescutellar space, (2) short line or patch of broad flat silver scales in caudolateral portion of fossa, (3) supraalar line of broad flat silver scales, (4) short diagonal line of broad flat silver scales above *pra,* (5) lateral prescutellar line of broad flat silver scales, (6) anterior inner dorsocentral line of small narrow curved golden scales, line sometimes broadened on humeral angle, slightly convergent with its mate posteriorly, and (7) posterior outer dorsocentral line of small narrow curved scales, varying from entirely golden to partially or entirely silver-white. Scutellum with broad flat scales on all lobes; scales of midlobe dark basally, silver apically; scales of lateral lobe all silver. Paratergite moderately broad, with broad flat silver scales along lower edge. *Apn* not enlarged. *Ppn* separated from mesoscutum by strong suture. Meron large. Pleuron with bristles on *apn, ppn, ppl, psp, pra, stp* and upper *mep; stp* bristles few, above and below median *stp* scale patch, 1 of lower bristles very strong; *ssp* and lower *mep* bristles absent. Integument of pleuron frequently darkened around scale patches. *Apn* with line of broad flat silver scales; *ppn* with short line or patch of broad flat silver scales in front of mesothoracic spiracle and with narrow curved dark scales along upper edge; broad flat silver scales in patches on *ppl,* upper *pcx, ssp, stp* caudad of *ssp, stp* dorsad of midcoxa and in 2 small distinctly separated to contiguous patches or 1 large oblique patch in upper *mep; pst,* hypostigial area, *psp, pra,* upper *stp,* lower *mep* and metameron without scales. *Legs:* Hindcoxa subequal in size to or smaller than midcoxa, its base far below upper margin of meron. Legs long, the forefemur about 1.50-1.55 times distance from top of thorax to tip of midcoxa. Forecoxa with light and dark scales on outer surface; midcoxa and hindcoxa with light scales on outer surface. Femora dark scaled with extensive light markings, as follows: forefemur with white to yellowish scales scattered in distal portion, in streak at base of ventral surface, sometimes in streak at base of dorsal surface and in broad streak from base to apex of posterior surface; midfemur with white scales few and scattered in basal portion of anterior surface or numerous and forming complete or broken line from base to or near apex of anterior surface and scattered in distal portion of posterior surface and

with white to yellowish scales in streak in basal portion of posterior surface and in narrow complete or medially broken streak along entire ventral surface; hindfemur with white scales in complete line from base to near apex of anterior surface and scattered in distal posterior surface and with white to yellowish scales in streak in basal portion of posterior surface and in short streak at base and apex of ventral surface. Knee spots small to large, white, largest on hindleg. Tibiae dark scaled with white scales in small patch about 0.22-0.33 distance from base of foretibia and midtibia and in large patch about 0.31-0.43 distance from base of hindtibia and sometimes with pale scales streaked at base of ventral and/or posterior surfaces of all tibiae. Tarsi dark scaled with white patches, bands or rings, as follows: moderately broad band at base of segments 1 and 2 of foretarsus and midtarsus; sometimes small patch at base of segment 3 of foretarsus and midtarsus; broad band at base of segment 1 of hindtarsus; broad ring at base of segments 2 and 3 of hindtarsus; very broad ring at base of segment 4 of hindtarsus; and broad patch, band or ring at base of segment 5 of hindtarsus. Claws of foreleg and midleg with acute submedian tooth, claws of hindleg simple. *Wing:* Entirely dark scaled or with small patch of silver-white scales at base of leading edge or underside of costa. Plume scales present on dorsum of veins Rs, R_{2+3}, R_2, R_3 and M basad of furcation. *Haltere:* Scales silver-white and dark. *Abdomen:* Tergite I with numerous scales middorsally. Laterotergite with large patch of silver scales. Tergites and sternites VI and VII completely scaled. Slightly outstanding scales present. Tergites II-VII dark scaled with basolateral or submedian lateral silver patch and frequently with irregular yellowish or whitish basal band on at least segments III-VI; distal scales of silver patches slightly outstanding. Sternites quite variable; proximal (1) entirely whitish or yellowish scaled, (2) predominantly whitish or yellowish scaled with submedian lateral silver patch and/or apicolateral dark patch or apical dark band, or (3) predominantly dark scaled with submedian lateral silver patch; distal sternites with whitish, yellowish or dark scales basally, with postmedian lateral patch or transverse band of silver scales and with apicolateral patch or apical band of dark scales.

FEMALE GENITALIA (fig. 38). *Segment VIII:* Tergite narrowed apically, length along midline about 0.62-0.66 of tergite VII; distal 0.60-0.70 with scales and bristles. Sternite long, about 1.3-1.5 length of tergite, broader distally; distal margin more or less straight; all but narrow basal and lateral areas with bristles, these more numerous along midline and distal margin, most weakly developed and fine but some moderately developed and elongate; scales relatively few, present laterally, usually more numerous distally. *Tergite IX:* Deeply notched apically, maximum length about 0.63-0.71 of tergite VIII; moderately sclerotized; apical lobe with 2-4 fine setae. *Insula:* Moderately sclerotized; connected to sigma; with 3 or 4 pairs of moderately developed setae. *Cercus:* Moderately long, length of dorsal edge 0.72-0.82 length of tergite VIII; compressed; apex pointed to rounded in lateral view; bristles numerous distally, the largest moderately developed; numerous scales present. *Postgenital Plate:* Moderately long and broad, length 0.54-0.60 of tergite VIII; index about 1.8; apex rounded or subtruncate in ventral view; distal portion with numerous weakly to moderately developed setae; basal median longitudinal apodeme not developed. *Cowl:* Strongly sclerotized. Atrial plate large, strongly sclerotized. *Sigma:* Continuous with cowl; weakly sclerotized. No part of spermathecal duct strongly sclerotized. Spermathecae 3, strongly sclerotized, more or less spherical, 1 enlarged.

MALE (fig. 38). Essentially as for female except for sexual characters. *Head:*

Erect scales of occiput predominantly dark. Proboscis relatively slender. Palpus subequal in length to proboscis; 5-segmented; segments 2 and 3 ankylosed, relatively short, comprising 0.48-0.53 length of palpus; segment 4 moderately long, 0.20-0.23 length of palpus; segment 5 moderately long, 0.20-0.22 length of palpus; palpus slender except for slightly swollen apex of segment 3 and base of segment 4; palpus curved dorsad from apex of segment 3 distad, segments 4 and 5 not drooping; apex of segments 3 and 5 and all of segment 4 with few moderately long bristles; palpus dark scaled with white scales in broad basal band on segment 2, moderately broad basal band on segment 3 and narrow basal band on segments 4 and 5. Antenna much shorter than proboscis; torus greatly enlarged, with large conspicuous patch of silver scales; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment 1 elongate, with scales; flagellar segments 12 and 13 elongate, penultimate longer, the 2 combined shorter than total length of segments 1-11. *Legs:* Claws of foreleg and. midleg enlarged, unequal; larger claw with blunt submedian tooth, smaller with small acute submedian tooth. Claws of hindleg small, simple. *Abdomen:* Apical segments and genitalia not bent ventrad. Sternites with dark scales basally.

MALE GENITALIA (fig. 39). Very lightly to moderately pigmented, various shades of straw-yellow and brown, except for deeply pigmented apex of paraproct. *Segment VIII:* Tergite long, 0.92-0.96 length of sternite; largely retracted, only distal 0.34-0.43 scaled. *Segment IX:* Well developed; middorsal portion of tergite weakly sclerotized, caudad of or at the level of base of sidepiece; tergite lobes moderately prominent, narrowly to moderately broadly connected middorsally, each with 2-4 weakly to moderately developed setae in 1 or 2 series; sternite large, with 5-8 setae distally. *Sidepiece:* Well developed, subcylindrical; mesal surface membranous from base to near apex, the membranous area unusually broad and extending far ventrad in basal half of sidepiece; basal tergomesal area not or slightly swollen, with a single long strong differentiated seta that arises from a tubercle and is gently curved apically, and with an elongate sclerotized area that extends ventrad and caudad into mesal membrane and that bears many moderately long fine setae; apical lobe not developed; median sternomesal sclerite and tuft not developed; sternomesal surface without differentiated scales; dorsolateral, lateral and basal ventral surfaces with numerous scales; dorsomesal, lateral and distal ventral surfaces with numerous bristles; apical half of sternomesal surface with numerous elongate setae, many of the dorsalmost of these moderately stout to near apex and sinuous. *Claspette:* Well developed; stem long, angled laterad distally in dorsal aspect; spiculose in basal half; with 1-4 fine setae; filament long, curved dorsad, expanded near middle and with retrorse angle on convex side. *Clasper:* Simple, short; middle portion slightly to moderately swollen, straight or slightly curved inward; basal and median portions with longitudinal ridges and wrinkles; spicules very inconspicuous; apex of inner surface with small alveolus or papilla that only rarely bears a fine seta; apical spiniform long, 0.5-0.7 of clasper. *Phallosome:* Aedeagus moderately large, without teeth; base subparallel-sided or narrowing distally in dorsal aspect, apex bulbous. *Proctiger:* Strongly developed; not unusually long in dorsal aspect, the basolateral sclerotization vertical; paraproct well sclerotized, with a single heavily sclerotized apical tooth; cereal setae fine, short, 3-5.

PUPA (fig. 39). Abdomen: about 3.3 mm. Trumpet: 0.41 mm. Paddle: 0.65 mm. *Cephalothorax:* Weakly to moderately pigmented, lighter ventrally. Hair 5-C moderately developed, moderately long, reaching 0.3-0.5 distance from its base

to that of trumpet. *Trumpet:* Light golden brown to brown. Broadening gradually from base; tracheoid sculpturing virtually absent; reticulate sculpturing strong. *Abdomen:* Weakly to moderately pigmented, lighter posteriorly. Tergite II with a strong irregular transverse ridge near level of hair 0; tergites III-VII without a strong transverse ridge anteriorly. Hair 1-II moderately developed, usually 3-13b (2-22); hair 1-III moderately developed, usually 2-6b (1-12); hair 1-IV,V moderately to weakly developed, usually 1-3b (1-5); hair 1-VI,VII weakly to moderately developed, single or double (1-3b). Hair 2-III-V far laterad of hair 1 of corresponding segment. Hair 5-IV,V 0.5-0.8 length of corresponding segment; 5-VII moderately long, usually single (single or double), stronger and as long as or longer than 4-VII. Hairs 6-III-V fine, moderately long, all subequally developed; 6-VI usually longer and stronger than 6-III-V, rarely subequal to 6-III-V; hair 6-VII usually much longer and stronger than 6-VI, usually strongly barbed or dendritically branched. Hair 8-VI,VII ventral. Hair 9-III-VI moderately long to long, fine to stout, subequal on all segments or becoming longer on posterior segments or 9-VI much longer and stronger than 9-III-V and then sometimes 2,3b, usually cephalad of the level of hair 6 of the corresponding segment; 9-VII far cephalad of caudolateral angle of segment, with 2-4 long primary branches; 9-VIII at or slightly mesad of caudolateral angle of segment, with 6-16 long strong primary branches. Hair 10-VI far mesad of 11-VI. *Terminal Segments:* Male genital lobe moderately large, about 1.2-1.3 length of tergite VIII. *Paddle:* Length greater than width. Apex rounded, subtruncate or emarginate. Midrib conspicuous to or nearly to apex; usually no wrinkled area near apex. Without long marginal spicules. Hair 1-P long, usually single (single or double).

LARVA (fig. 40). Head: 0.79 mm. Siphon: 0.52 mm. Anal Saddle: 0.26 mm. *Head:* Lightly to moderately pigmented. Labial plate subquadrate. Hair 1-C very stout. Hairs 4,6-C near labrum. Hair 4-C strongly developed, 9-14b; distinctly mesad of 1-C, caudad of level of 6-C. Hair 5-C single; distinctly laterad of 6-C. Hair 6-C single, in line with or mesad of 1-C. Hair 7-C usually double (1-3b). Hairs 11,14-C and *bmh* stellate. Hair 12-C not stellate, 1-3b. Hair 15-C long, 2-4b. Mental plate with 8-11 teeth on each side of median tooth. *Antenna:* Shaft without spicules. Hair 1-A short, single. *Thorax:* Fat body pigmented. Integument without conspicuous spicules. Tubercles of hairs 5,6-P joined, that of 7-P separate. Hair 1-M,T relatively short, stellate. Hair 4-P stellate, 6-14b. Hair 5-P usually double (1-3b); hair 5-M double. Hair 11-P,M,T shorter than 9-P. Hairs 13-T and 14-M strongly developed, stellate, subequal, 5-14b. *Abdomen:* Hair 1-I,IV,V moderately to strongly developed, stellate, 6-15b. Hair 2-11I-V distinctly laterad of hair 1 of corresponding segment; stellate, 5-11 b. Hair 3-VII strongly developed, long, single. Hair 5-II-IV strongly developed, stellate, 6-16b. Hair 641I-V usually double (2,3b). Hair 941I-V stellate, 4-9b. Hair 11-I moderately to strongly developed, stellate, usually 5-14b. Hair 12-I absent. Hair 13-I strongly developed, stellate, 6-13b; hair 13-IV,V strongly developed, stellate, 5-14b; hair 13-VI strongly developed, stellate, 5-10b, cephalolaterad or laterad of 10-VI. *Segment VIII:* Hairs 1 and 2 separated. Hair 1 moderately to strongly developed, stellate, 5-11 b. Comb scales large; consisting of 1 or 2 long and usually 1-3 shorter unfringed spines from a large plate, the long spines usually becoming longer on more ventral comb scales; relatively few [5-8 (4-9)] in a curved row. *Siphon:* Lightly to moderately pigmented, base much darker. Short; index 1.8-2.3. Acus not developed. Pecten teeth simple or laciniate at apex; becoming conspicuously larger distad; 17-30 in a long even row that is arcuate dorsad distally. Hair

1-S distad of pecten; moderately developed, single, rarely double. *Anal Segment:* Saddle large; caudal margin with several large spines dorsad of hair 1-X; lightly to moderately pigmented. Hair 1-X strongly developed, usually 3-5b (2-6). Hair 2-X 4-6b. Hair 3-X 3,4b. Ventral brush moderately developed, with 5 or 6 pairs of hairs; all hairs or all but most proximal 1 or 2 hairs from strongly sclerotized boss; hair 4a-X long, usually 3,4b (3-6); hairs 4b,4c-X usually 3,4b (3-6). Anal gills small, tapering distally; dorsal longer than ventral, about 0.5-1.0 length of anal saddle.

SYSTEMATICS. *Aedes mediovittatus* is easily separated from the other New World members of the genus as follows: in the adult by (1) the ornamentation of the mesoscutum, which has a silver-white narrow median acrostichal line, a golden anterior inner dorsocentral line, a golden to silver-white posterior outer dorsocentral line, silver supraalar and lateral prescutellar lines, and a silver patch or short line in the caudolateral portion of the fossa and above the prealar knob, (2) the absence of a patch of scales on or below the prealar knob, (3) the presence of a long narrow white line on the anterior surface of the hindfemur, (4) the absence of a complete light orbital line, the eye bordered by 3 separate patches of broad flat silver scales, (5) the presence of 8 bristles in the basal whorl of flagellar segments 2-10 in the female, and the combination of (6) the broad flat scales on the vertex of the head, the paratergite and all 3 lobes of the scutellum, (7) the absence of a parascutellar bristle, (8) the scaling of the posterior pronotum, which has narrow curved dark scales along the upper edge and broad flat silver scales in front of the mesothoracic spiracle, and (9) the palpus of the male, which has segments 4 and 5 long, slender, upturned and sparsely bristled; in the male genitalia by (1) the retrorse angle on the convex side of the claspette filament, (2) the large membranous basal sternomesal area of the sidepiece, (3) the specialized setae, which are sinuous and coarse to near their apices, along the distal sternomesal margin of the sidepiece, and the combination of (4) the single long strongly differentiated seta that arises from a tubercle on the dorsal surface of the basal tergomesal area of the sidepiece, (5) the long spiniform of the clasper, (6) the long stem of the claspette, and (7) the distally expanded aedeagus; in the pupa by (1) the strongly developed and long hair 6-VII, and the combination of (2) the position of 2-III-V, which is far laterad of hair 1 of the corresponding segment, (3) the short 5-IV,V, which is only 0.5-0.8 the length of the corresponding tergite, (4) the usually elongate and strong 9-III-VI, and (5) the 6-16 long strong primary branches of 9-VIII; and in the larva by (1) the 5-8 (4-9) comb scales with 1 or 2 long and usually 1-3 shorter unfringed spines from a large basal plate, (2) the simple or apically laciniate pecten teeth, (3) the dorsally curved row of pecten teeth, and the combination of (4) the absence of hair 12-I, (5) the long, strong, single 3-VII, (6) the moderately to strongly developed stellate 9-III-V, (7) the absence of a distinct acus at the base of the siphon, (8) the large spines on the caudal margin of the anal saddle, (9) the 3- or 4-branched 3-X, and (10) the strongly sclerotized boss at the base of the ventral brush.

Aedes mediovittatus has so many unique features or unique combinations of characters in all stages that I believe it should be placed in a separate subgenus and I am, therefore, resurrecting *Gymnometopa*. *Gymnometopa* is definitely related to *Howardina,* as was pointed out many years ago by Dyar (1928:228), and possibly related to the monotypic subgenera of *Aedes* occuring north of the tropics in Mexico and the southwestern United States. As indicated by Belkin

(1962:347), the Old World species placed in Group E (Mediovittatus Group) of *Finlaya* by Edwards (1932:151-152) and Knight and Marks (1952:530-531) have very little in common with *mediovittatus* and are not related to it. *Gymnometopa* is apparently a relict that has survived with success only in the Greater Antillean area, possibly because of the absence of direct competition from other treehole and rockhole aedines in this area where the culicid fauna breeding in such habitats is depauperate.

Aedes mediovittatus is a highly variable species in all stages. Although much of the variation occurs in all populations, some of it is regional. In the adults, which are available from Cuba, Cayman Brae, Jamaica, Hispaniola, Puerto Rico, the Virgin Islands, and Venezuela, the scales of the head are largely yellowish in the Jamaican and Venezuelan populations, and predominantly or entirely dark in all other populations; the posterior outer dorsocentral lines are usually entirely golden scaled in the Jamaican and Puerto Rican populations and partially or entirely silver or varying from golden to silver in the other populations; the fossal scales are dark in the populations in Hispaniola and Puerto Rico, and more golden to coppery in the others; the white line on the anterior surface of the midfemur is strongly developed in only the Jamaican and Venezuelan populations; the pale scales at the base of the femora are partially yellowish in the Jamaican population, and white in all other populations; and, the sternites of the abdomen of the female are predominantly white to yellow scaled in the Cuban, Grand Cayman, and Jamaican populations, and dark in the other populations in which the female is known. In the pupae, available only from Jamaica, Hispaniola and Puerto Rico, hair 1-IV,V is usually stronger and more highly branched in the Jamaican population. In the larvae, available from Jamaica, Hispaniola, Puerto Rico and St. Croix, hairs 1-M,T and 3-T are slightly weaker, 2-11-VII slightly stronger and the siphon slightly longer in the Jamaican population; the pecten teeth are more frequently simple in the population in Hispaniola; and, the smaller spines of the comb scales are, on the average, weakly developed or absent in the population in Jamaica, moderately developed in the populations in Puerto Rico and St. Croix, and strongly developed in the population in Hispaniola. In summary, the Jamaican population is the most highly differentiated in the islands and the Venezuelan population, at least on the basis of the adults, appears to be closest to the one in Jamaica.

BIONOMICS. Immatures of *mediovittatus* have been found in a wide variety of habitats; among these are treeholes, broken or cut bamboo internodes, artificial containers, bromeliad leaf axils, rockholes and ground pools. Adults of *mediovittatus* have been collected resting in treeholes and crabholes and females have been collected while biting humans and donkeys.

DISTRIBUTION (fig. 29). *Aedes mediovittatus* is found in the West Indies, from Cuba and the Cayman Islands eastward and southward through Jamaica, Hispaniola and Puerto Rico to the Virgin Islands, and also in northcentral Venezuela. Belkin, Heinemann and Page (1970:174) thought the record of this species from Venezuela reported in Dyar (1928:228) was erroneous and was based on misidentification of a sibling species or on mislabeled material. I have examined 2 males and their associated genitalia from Venezuela that are in the USNM collection and have found them to fall within the range of variation of the insular populations. Since *mediovittatus* was first reported from Venezuela by the resident Nunez-Tovar (1924; see Cova Garcia, Sutil and Rausseo, 1966b:332), Dyar (1928:228) states: "The occurrence of the species on the mainland has been ver-

ified by the receipt of a pair from Dr. M. Nunez-Tovar;" and the specimens I have examined exhibit a combination of variations unknown in any of the insular populations, I am inclined to believe that the specimens in the USNM are not mislabeled and that *mediovittatus* does occur in Venezuela. It has not, however, been recovered by either UCLA team that has collected in northcentral Venezuela and is apparently rare. Material examined: 2835 specimens; 488 males, 515 females, 1062 larvae, 770 pupae; 588 individual rearings (288 larval, 249 pupal, 51 incomplete).

CAYMAN ISLANDS. Cayman Brae, July 1967, M. Giglioli (CAY 17), 3 F [UCLA] .

CUBA. *La Habana:* Cantiles Cayo, 21 Sept 1930, H.S. Peters, 1 F [USNM] . La Habana, 1909, P. Serre, 1 F [USNM]. San Antonio de los Banos, J.H. Pazos, 4 F [USNM] . *Oriente:* Guantanamo Bay, U.S. Naval Station, 26-29 Oct 1953, K.L. Knight (444,448,450,452,460,463), 15 F [UCLA] . Santiago de Cuba, 4 M, 49 F [USNM] . *Pinar del Rio:* Mariel, J.H. Pazos, 7 F [USNM] . *Province not Specified:* H.P. Carr (1,12,13,102), 12 M, 1 F, 2 M gen [UCLA].

DOMINICAN REPUBLIC. *Distrito Nacional:* Santo Domingo, Aug-Sept 1905, A. Busck, 8 M, 3 F, 3 M gen [USNM] ; F.E. Campbell, 1 M [USNM] . Santo Domingo, near El Embajador Hotel, 9 July 1971, E. Drake and T. Rogers (RDO 103), 5 1pM (103-13,53,57-59), 6 1pF (103-12,50-52,55,56), 1 1p (103-11), 8 pM (103-84,87,92,98,102,103,108,111), 21 pF (103-81-83,85,86, 88-91,94,95,97,99-101,105,107,110,112-114), 8 P, 8 L; same data (RDO 104), 1 1pF (104-10); same data (RDO 105), 1 1pF (105-10), 8 pF (105-102-109), 2 P; same data (RDO 106), 3 M; same data (RDO 107), 1 F; same data except 23 July 1971 (RDO 151), 1 1pM (151-18), 1 pM (151-106), 1 L [UCLA]. Santo Domingo, Finca Engombe, 2 July 1971, T. Rogers (RDO 74), 1 1p (74-10); 5 July 1971, E. Drake and T. Rogers (RDO 83), 1 1pM (83-11), 2 1pF (82-12,13); 13 July 1971, T. Rogers (RDO 123), 1 1pM (123-10), 1 1pF (123-11), 1 pM (123-100), 1 pF (123-101); 22 July 1971, E. Drake (RDO 147), 1 pF (147-111); 7 Aug 1971, E. Drake (RDO 210), 5 1pM (210-21,22,24-26), 5 1pF (210-20,27-29,31), 9 pM (210-100,104,105,107-109,111-113), 2 pF (210-102,103), 6 P, 5 L; 20 Aug 1971, T. Rogers (RDO 250), 4 L; same data (RDO 251), 1 1pM (251-10); 26 Aug 1971, T. Rogers (RDO 262), 4 1pM (262-10-13), 1 1pF (262-14), 8 L [UCLA]. *El Seibo:* El Valle (11 km S), 30 June 1971, J.N. Belkin and T. Rogers (RDO 66), 1 1pM (66-20) [UCLA] . *San Cristobal:* San Cristobal, near bridge over Canada Boruga, 27 July 1971, T. Rogers (RDO 170), 1 1pM (170-15), 8 1pF (170-10,11,13,16,19,21-23), 4 1p (170-12,14,17,18), 8 pM (170-102,103,105,107,108,111-113), 7 pF (170-100,101,104,106,109, 110,114), 3 M, 4 F, 10 P, 15 L [UCLA] . San Cristobal, La Cueva, 18 July 1971, T. Rogers (RDO 138), 3 1pM (138-30,34,35), 2 1pF (138-31,36), 1 1p (138-33), 3 L; same data (RDO 143), 1 1pF (143-10) [UCLA] . San Cristobal and Hato Damas (between), 18 July 1971, T. Rogers (RDO 140), 5 1pM (140-22,26,27,30,31), 1 F, 7 L [UCLA] . San Francisco Mines, Sept 1905, A. Busck, 19 M, 10 F [USNM] ; 2 July 1971, E. Drake and T. Rogers (RDO 70), 3 1pM (70-12-14), 6 1pF (70-10,11,15-18); same data (RDO 73), 1 1pM (73-24), 3 1pF (73-20-22), 2 L; same data except 3 July 1971 (RDO 77), 4 1pM (77-14,16,18,23), 14 1pF (77-10-12,15,17,19, 21,22,24-29), 2 1p (77-13,20), 4 pM (77-100-103), 1 M, 5 L; same data (RDO 78), 1 1pM (78-10), 1 1pF (78-12); same data (RDO 79), 15 1pM (79-10-14,17-19,21-25,27,28), 4 1pF (79-15,20,26,29), 6 pM (79-101,107-111), 6 pF (79-100,102-106), 7 M, 8 F, 17 P, 44 L; same data except 6 July 1971 (RDO 95), 5 1pM (95-20,21,25,27,28), 4 1pF (95-22,24,26,32), 3 1p (95-29,31,33), 5 L; 8 July 1971, E. Drake (RDO 96), 5 1pM (96-10,14-16,19), 3 pM (96-103-105), 2 1p (96-18,40), 4 M, 9 F, 5 P, 14 L; 12 July 1971, E. Drake (RDO 116), 3 1pM (116-26,28, 29), 6 1pF (116-20,21,23-25,27), 1 1p (116-22), 5 M, 3 F, 3 L; same data (RDO 118), 5 1pM (118-10,12-14,22), 8 1pF (118-11,15-18,23-25), 1 1p (118-19), 4 L; same data (RDO 119), 1 1pF (119-12), 1 pM (119-102); 26 July 1971, E. Drake (RDO 163), 1 1pM (163-24), 1 1pF (163-45), 4 1p (163-29,46-48), 4 pM (163-102,103,105,106), 3 pF (163-100,101,104), 1 F, 2 P, 19 L; 28 July 1971, E. Drake (RDO 175), 1 1pM (175-41), 4 1pF (175-13,15,18,19), 3 1p (175-40,42,44), 3 pM (175-95,97,98), 2 pF (175-96,99), 6 M, 1 P, 16 L; same data (RDO 177), 9 1pF (177-10-16,18,19), 3 pM (177-107,109,110), 5 pF (177-103-106,108), 1 M, 5 L; same data (RDO 179), 1 1pF (179-19) [UCLA] .

HAITI. Jeremie, 7 July 1941, 1 pM, 1 M [USNM] . Port-au-Prince, road to Petionville, 7 July

1968, D.C. Watson (HAT 13), 34 L [UCLA] . Trou Zombie, 25 May 1932, S.S. Cook, 2 F [USNM] .

JAMAICA. *Clarendon:* Balcarres, 7 Nov 1967, T.H. Farr (JA 902), 1 pM (902-103), 1 P [UCLA] . Goshen, 18 Aug 1965, W.A. Page (JA 235), 1 pM (235-104); same data (JA 236), 1 pM (236-28), 2 1p (236-20,21), 10 L; same data (JA 238), 1 1pF (238-33), 1 Ip (238-32), 3 pF (238-105A,110,111), 1 M, 1 F, 2 P, 6 L; same data (JA 239), 1 1pF (239-20); 10 Sept 1965, J.N. Belkin and W.A. Page (JA 352), 2 P; 6 Sept 1966, D.C. Watson (JA 602), 4 L [UCLA] . Macho, 6 Sept 1966, D.C. Watson (JA 603), 11pM (603-19), 1 1M (603-18), 5 M, 11 F, 2 M gen, 14 L [UCLA] . Locality not specified, Jan 1946, G.A. Thompson, 1 F [USNM]. *Kingston and St. Andrew:* Constant Spring, 18 July 1964, J.N. Belkin and W.A. Page (JA 82), 7 L; 24 Aug 1965, D.C. Watson (JA 248), 1 P, 4 L; 7 Sept 1965, J.N. Belkin and W.A. Page (JA 327), 3 1pM (327-13,15,17), 2 1pF (327-11,26), 3 pM (327-105,106,113), 8 pF (327-93-95,97, 98,102,109,112), 3 Ip (327-10,12,18), 6 M, 4 F, 2 M gen, 16 P, 67 L; same data (JA 328), 11pM (328-30); 25 Sept 1965, W.A. Page (JA 387), 1 1pF (387-11), 3 pF (387-101,102,106), 6 M, 3 F, 6 P, 4 L; 3 Dec 1965, W.A. Page (JA 408), 1 1pF (408-13), 2 pM (408-100,101), 3 pF (408-102, 103,105); 16 Nov 1966, O.G.W. Berlin and D.C. Watson (JA 699), 4 1pM (699-11-13,18), 5 1pF (699-14,16,17,19,20), 7 pM (699-30,101-103,106,112,114), 6 pF (699-31,104,108,110,111,113), 2 M, 2 M gen, 2 P, 2 L [UCLA] . Hermitage Dam Road, 10 Aug 1965, W.A. Page (JA 286), 1 L; same data (JA 288), 1 1pF (288.11); 13 Aug 1965, W.A. Page (JA 296), 1 L; 29 Oct 1965, W.A. Page (JA 390), 3 1pM (390-12,14,18), 3 1pF (390-10,13,19), 1 Ip (390-11), 2 pM (390-103,104), 1 pF (390-100), 5 L; same data (JA 391), 1 1pF (391-30); 29 Oct 1965, W.A. Page (JA 397), 1 1pF (397-12), 4 pM (397-101,102,104,107), 1 pF (397-100), 1 L; 21 Sept 1966, D.C. Watson (JA 623), 5 pM (623-100-104), 4 M, 2 M gen, 74 L; same data (JA 624), 2 IpM (624-12,14), 2 1pF (624-10,11), 5 pM (624-100,101,104,106,107), 6 pF (624-103,105, 108-111), 1 P, 1 L; same data (JA 627), 1 M, 1 F [UCLA] . Kingston, M. Grabham, 4 M, 2 F [USNM] ; 22 June 1906, 1 M, 1 F [CU] , 1 M gen [USNM] . Red Hills, 24 July 1967, W.A. Page (JA 845), 1 IpM (845-10), 1 pF (845-101), 1 P, 10 L [UCLA] . Rockfort, 21 Aug 1968, R.H. Hochman (JA 949), 1 F; 22 Aug 1968, R.H. Hochman (JA 952), 2 F [UCLA] . Temple Hall, 25 Aug 1965, W.A. Page (JA 252), 1 pF (252-110) [UCLA] . *Manchester:* Kendal, 16 Sept 1945, 1 L [CU] . Mandeville, 24 Oct 1966, O.G.W. Berlin and D.C. Watson (JA 638), 3 1pM (638-11,13,15), 2 1pF (638-16,17), 3 pM (638-100-102), 3 Ip (638-10,12,14), 2 M, 2 M gen, 5 P, 13 L [UCLA] . *St. Catherine:* Bog Walk, 4 Aug 1968, R.H. Hochman (JA 913), 1 F; 5 Aug 1968, R.H. Hochman (JA 914), 1 F [UCLA] . Rio Cobre Dam, 10 Sept 1965, J.N. Belkin and W.A. Page (JA 351), 1 1pF (351-20,21), 1 pF (351-100), 2 P; 17 Sept 1965, D.C. Watson (JA 373), 1 1pM (373-10), 4 pM (373-104,105,107,108), 1 pF (373-106), 1 M, 2 F, 3 M gen, 2 P, 7 L; 9 Sept 1966, D.C. Watson (JA 605), 3 1pM (605-10-12), 1 1p (605-13), 3 pM (605-101,103, 104), 2 pF (605-100,106), 2 L [UCLA] . *St. Thomas:* Arcadia, 6 Dec 1962, T.H.G. Aitken (42), 1 F [UCLA] . Grants Pen, 10 Dec 1965, W.A. Page (JA 410), 2 Ip (410-10,11), 6 L; 6 July 1967, W.A. Page (JA 801), 1 pM (801-100) [UCLA] . New Pera, 5 Dec 1962, T.H.G. Aitken (55), 1 pM (5), 1 pF (6), 4 M, 3 P, 3 L; same data (56), 7 L; 12 Dec 1962, T.H.G. Aitken (119), 2 1pM (1,3), 2 1pF (2,4), 3 Ip (6-8) [UCLA]. *Westmoreland:* Negril, 24 July 1965, W.A. Page (JA 230), 1 P [UCLA] . *Parish not Specified:* R.B. Hill, 5 M, 1 F; M. Grabham, 23 L [USNM] .

PUERTO RICO. *Mona:* 15 Nov 1954, M.L. Kuns, W.F. Pippin and J. Maldonado, 2 L; 9 June-6 July 1955, W.F. Pippin and R. Bestgek, 6 L [USNM] . *Puerto Rico:* Aguadilla, 26 Sept 1959, I. Fox and A. Boike, 1 L [USNM] . Barranquitas, km 24.8 Hwy 156, M.J. Nelson and J.N. Belkin (PR 185), 5 IpM (185-10,12,15-17), 5 1pF (185-11,13,14,18,19), 6 pM (185-100,101, 103,104,106,107), 2 pF (185-102,105), 2 M, 2 P, 4 L [UCLA] . Carolina, 9 May 1942-18 Sept 1943, H.D. Pratt, 19 M, 13 F [UCLA] , 2 M, 2 F, 6 L [USNM] . El Verde Field Station, 30 Aug 1970, J.N. Belkin et al. (PR 141), 1 pM (141-103), 6 pF (141-70,72,100,101,104,105), 1 P; 6 Sept 1970, J.N. Belkin (PR 174), 2 pF (174-100,102) [UCLA] . El Yunke, 30 Aug 1942, T.H.G. Aitken and G.E. Bohart, 7 P, 5 L [UCLA] . Luquillo Forest, near end W branch Hwy 915, 29 Aug 1970, M.J. Nelson (PR 134), 1 1pM (134-12), 5 1pF (134-10,11,13-15), 1 pM (134-103), 3 pF (134-100-102), 1 M gen, 1 P, 4 L; km 3.2 E branch Hwy 915, 29 Aug 1970, J.N. Belkin and M.J. Nelson (PR 136), 1 1pM (136-15), 5 1pF (136-10-14), 4 pM (136-102,106,107, 109), 6 pF (136-100,101,103-105,110), 11 M, 14 F, 1 M gen, 25 P, 30 L [UCLA] . Mameyes,

3 Aug 1964, K. and B. Bartholomew (PR 1), 2 IpM (1-12,14), 2 1pF (1-13,15), 1 L [UCLA]. Mayaguez, Sept, W.V. Tower, 20 M, 13 F, 3 L [USNM] ; 24 July-15 Dec 1935, G.S. Tulloch, 2 F [UCLA] , 10 M, 7 F, 1 L [USNM]. Naguabo, 10 Aug 1964, R. Koford and K. and B. Bartholomew (PR 11), 2 1pM (11-14,18), 4 1pF (11-10,12,15,19), 1 IF (11-13), 2 1p (11-16,20), 4 pM (11-100-103); same data (PR 12), 2 1pM (12-10,17), 4 1pF (12-12-15), 1 1p (12-16), 2 pM (12-100,101); same data (PR 13), 2 1pM (13-14,21), 8 1pF (13-10-12,15,16,18-20), 2 1p (13-13,17), 1 M, 2 L; same data (PR 15), 3 1pM (15-13,20,24), 2 1pF (15-18,22), 1 1p (15-16), 1 pM (15-101), 3 pF (15-17,21,102), 6 M, 3 F, 1 M gen, 13 P, 105 L [UCLA] . Palmas Abajo, 17 Feb 1931, 2 L [CU] . Patillas, km 8.5 Hwy 184, 5 Sept 1970, M.J. Nelson (PR 173), 2 1pM (173-10,13), 3 1pF (173-11,12,14), 4 pM (173-100-102,104), 1 pF (173-103), 1 M gen, 2 L [UCLA]. Playa de Humacao, 17 Aug 1964, K. and B. Bartholomew (PR 22), 1 1pM (22-10), 2 1pF (22-12,13), 1 1p (22-11), 3 pM (22-101-103), 1 P, 1 M gen [UCLA] . Toro Negro Forest, km 31 Hwy 143, 7 Sept 1970, M.J. Nelson (PR 184), 3 1pM (184-11,13,15), 5 1pF (184-14,16-19), 2 pM (184-101,104), 3 pF (184-100,102,103), 2 1p (184-10,12), 9 M, 1 M gen, 9 P, 12 L [UCLA]. Vega Baja, km 6 Hwy 160, 19 Aug 1970, J.N. Belkin et al. (PR 101), 5 1pM (101-10,11,13,15, 18), 7 1pF (101-12,14,16,17,19-21), 10 pM (101-100-109), 16 M, 8 F, 2 M gen, 29 P, 25 L [UCLA] . Locality not specified, 7 M, 8 F [UCLA]. *Vieques:* 1942, H.S. Hurlbut, 2 M, 1 F, 1 M gen, 1 1p [CU] .

VENEZUELA. *Aragua:* Maracay, M. Nunez-Tovar, 2 M, 2 M gen [USNM] .

VIRGIN ISLANDS. *St. Croix:* Frederiksted, July 1929 (LAR 4), 2 M, 1 F, 1 M gen [UCLA]. Sally's Fancy, 5 Dec 1966, R.D. Walsh (VI 16), 31 L [UCLA] . Locality not specified, Oct 1934-Aug 1938, H.A. Beatty, 2 F, 6 L [USNM]. *St. Thomas:* Locality not specified, 1921, F.D. Walker, 3 F; 9 Jan 1920, Peterson, 2 M, 2 F [USNM]

LOCALITY UNKNOWN. 1 M gen (G 82) [USNM] .

Subgenus OCHLEROTATUS Lynch Arribalzaga

1891. *Ochlerotatus* Lynch Arribalzaga, 1891a:374; 1891b:143. TYPE SPECIES: *Ochlerotatus confirmatus* Lynch Arribalzaga, 1891, Argentina; second of 2 species, selection of Coquillett (1910:577).

For complete synonomy see Stone, Knight and Starcke (1959).

PULCHRITARSIS SECTION

MUELLERI GROUP

16. *Aedes (Ochlerotatus) muelleri* Dyar

Figs. 41-44

1920. *Aedes (Heteronycha) muelleri* Dyar, 1920:81-82. TYPE: *Lectotype* male with genitalia slide, Mexico City, Distrito Federal, Mexico, J. Muller [USNM; selection of Stone and Knight, 1956:222] .

1922. *Aedes iridipennis* Dyar, 1922a:92. TYPE: *Holotype* female, head of Indian Creek, south base of Cochise Head, Chiricahua Mountains, Arizona, United States of America, 17 Aug 1917, C.H.T. Townsend [USNM] . Synonymy with *muelleri* by Dyar (1922c:193).

Aedes (Ochlerotatus) muelleri of Dyar (1928:172); Edwards (1932:145); Carpenter and LaCasse (1955:206); Belkin and McDonald (1957:188,190); McDonald (1957a:505-511); Stone, Knight and Starcke (1959:149).

Aedes muelleri of Dyar (1922c:193); Breland (1958:206); Nielsen, Arnell and Linam (1967: 75); Nielsen, Linam, Arnell and Zavortink (1968:362-363); Arnell and Nielsen (1972:4,16, 18,20).
Aedes (Gualteria) muelleri of Vargas (1950:62).
Aedes (Heteronycha) iridipennis of Dyar (1922b:55).

FEMALE (fig. 42). Wing: 4.22 mm. Proboscis: 3.24 mm. Forefemur: 2.37 mm. Abdomen: about 4.0 mm. Dark scales of proboscis, palpus, legs and wings with slight metallic blue, purple or violet reflections. *Head:* Eyes separated above antennae, the resulting space with narrow curved white scales and usually also small setae. Integument brown to dark brown. Frontal bristles well developed, 1-3 pairs. Orbital bristles relatively few, mesal 4-8 pairs strongly developed, lateral 3-5 pairs moderately developed. Vertex with relatively few erect scales that are white to dingy white mesally and white and/or black laterally and numerous narrow curved decumbent scales that are enlarged and white mesally and white and/or black laterally. Occiput with numerous white and/or black erect scales and with few to numerous white or white and black narrow curved scales. Orbital line developed, scales broad, flat, white. Dorsolateral surface with broad flat white and usually also black scales. Lateral and ventral surfaces with broad flat white scales. Clypeus moderately large, bare. Proboscis slender, much longer than forefemur; entirely dark scaled; with a few basal bristles. Palpus short, about 0.18-0.23 length of proboscis; 3- or 4-segmented, segment 4 minute to small when present; segments 1-3 with bristles; entirely dark scaled. Antenna much shorter than proboscis; torus with large patch of flat white scales; flagellar segment 1 longer than 2, not swollen, with white scales mesally; flagellar segments 2-13 usually with 6 moderate bristles in basal whorl; each of flagellar segments 3-7 slightly longer than preceding segment, segments 7-12 subequal. *Thorax:* Integument predominantly dark brown to blackish. Acrostichal and dorsocentral bristles numerous, in long complete rows; prescutellar and supraalar bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles present, well developed; 1 parascutellar bristle present. Scutellum with 4-8 strong bristles on midlobe, 5-7 on lateral lobe. Mesoscutum completely covered with narrow curved scales except for the anterior inner dorsocentral and median and lateral prescutellar bare spaces; with a conspicuous yet variable pattern of white to tannish-white scales on a background of dark brown to black scales, as follows: light scales in (1) broad acrostichal line from anterior promontory to prescutellar space, (2) broad dense lateral prescutellar line, (3) broad anterior dorsocentral line that may or may not be continuous with (4) narrow posterior outer dorsocentral line, (5) very broad lateral marginal line, and (6) broad posterior fossal line that meets posterior outer dorsocentral line mesally; light lateral marginal line sometimes much broadened and extending mesad to dorsocentral area and then entire lateral third of mesoscutum light scaled. Scutellar lobes with narrow curved white scales, those on midlobe enlarged. Paratergite rather narrow, with or without scales. *Apn* not enlarged. *Ppn* separated from mesoscutum by strong suture. Meron large. Pleuron with bristles very numerous on *apt?, ppn, ppl, psp, pra, stp* and upper *mep; ppn* bristles sometimes present along entire upper and posterior margins of sclerite; *stp* bristles numerous, in complete row from near *psp* to midcoxa; *ssp* bristles absent, few or numerous; lower. *mep* bristles absent, but median anterior *mep* bristles sometimes present. *Apn* with narrow curved white scales; *ppn* nearly totally covered with narrow curved scales, these entirely white or many in upper portion black; broad flat to semierect white scales in large disheveled

frequently contiguous patches on *pst, ppl,* hypostigial area, *psp, ssp, pra,* upper half of *stp,* lower posterior *stp,* nearly all of *mep* and metameron; *pcx* scales present or absent; *ssp* scale patch sometimes extended dorsad toward patch on *ppn* and/or hypostigial area. *Legs:* Hindcoxa subequal in size to midcoxa, its base far below upper margin of meron. Legs moderately long, the forefemur about 1.19-1.32 times distance from top of thorax to tip of midcoxa. All coxae with extensive area of white scales on outer surface. Femora dark scaled with extensive areas of white scales, as follows: forefemur and midfemur with white scales in streak from base to apex on posterior surface, in streak in basal half of dorsal and ventral surfaces and at extreme base of anterior surface; hindfemur entirely or predominantly white scaled on all surfaces in basal half, sometimes white to apex on ventral surface. Knee spots moderately large, white; smallest on foreleg, largest on hindleg. Tibiae and tarsi entirely dark scaled or foretibia and sometimes midtibia weakly streaked or speckled with white on ventral surface. Claws of all legs simple. *Wing:* Entirely dark scaled or with small light patch at base of costa. Plume scales present on dorsal side of veins Rs, R_2+3, R_2 R_3 M basad of furcation, and sometimes apical portion of IA. *Haltere:* Scales white. *Abdomen:* Tergite I with numerous scales middorsally. Laterotergite with large patch of white scales. Tergites and sternites VI and VII completely scaled. Outstanding scales absent. Tergites II-VII dark scaled with white scales in basolateral patch and narrow basal band. Sternites variable, sometimes entirely white scaled, sometimes most or only most distal with separate or joined median basal and apicolateral dark patches.

FEMALE GENITALIA (fig. 42). *Segment VIII:* Tergite narrowed apically, length along midline about. 0.53-0.57 of tergite VII; distal 0.67-0.72 with scales and bristles. Sternite long, about 1.3-1.4 length of tergite, broader distally; distal margin shallowly emarginate; all but narrow basal and lateral areas with scales or bristles, these occurring in about equal proportions; bristles denser along midline distally and along distal margin; bristles weakly developed and short to moderately developed and elongate, the larger ones predominating. *Tergite IX:* Notched apically, maximum length about 0.34-0.47 of tergite VIII; moderately sclerotized; apical lobe with 2-7 weakly developed bristles. *Insula:* Well sclerotized; connected to sigma; with 2 or 3 pairs of moderately developed setae. *Cercus:* Moderately long, length of dorsal edge 0.67-0.78 of tergite VIII; compressed; apex rounded in lateral view; bristles numerous, the largest moderately developed; scales present. *Postgenital Plate:* Short and broad, length 0.44-0.52 of tergite VIII; index about 1.3-1.4; apex subtruncate in ventral view; distal portion with weakly developed bristles; basal median longitudinal apodeme moderately to strongly sclerotized. *Cowl:* Strongly sclerotized. Atrial plates absent. *Sigma:* Continuous with cowl; strongly sclerotized. Basal portion of spermathecal duct strongly sclerotized. Spermathecae 3, strongly sclerotized, more or less spherical, 1 noticeably larger than others.

MALE (fig. 42). Essentially as in female except for sexual characters. *Head:* Decumbent scales on dorsum usually all white; greater proportion of erect scales white. Proboscis long and slender. Palpus variable in length, 0.78-0.97 of proboscis; 5-segmented, segments 2 and 3 ankylosed and long, making up 0.58-0.63 length of palpus; segment 4 short, 0.18-0.21 length of palpus; segment 5 short, 0.15-0.16 length of palpus; palpus slender except for slightly swollen apex of segment 3 and basal portion of segment 4; palpus nearly straight, joint between segments 3 and 4 slightly raised; apex of segment 3 and all of segment 4 with

numerous long bristles; segment 5 with fewer shorter bristles; dark scaled. Antenna much shorter than proboscis; torus much enlarged, with large patch of white scales; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment 1 slightly elongate, with scales; flagellar segments 12 and 13 elongate, the penultimate longer, the 2 combined slightly shorter than total length of first 11 segments. *Thorax:* Lateral marginal line almost always extending mesad to dorsocentral area so that lateral third of mesoscutum is entirely light scaled. *Legs:* Anterior claw of foreleg and midleg enlarged and with blunt submedian tooth, the claw larger on midleg than foreleg; posterior claw of foreleg enlarged, simple; posterior claw of midleg and both claws of hindleg small, simple. *Abdomen:* Apical segments and genitalia not bent ventrad. Sternites usually predominantly dark scaled with basolateral light patch.

MALE GENITALIA (fig. 43). Various shades of tan and/or brown; paraproct darkest; midportion of IX-T, most of sidepiece and claspette filament well pigmented. *Segment VIII:* Tergite long, 0.90-1.00 length of sternite; exserted, apical 0.53-0.71 scaled. *Segment IX:* Well developed; middorsal portion of tergite moderately to strongly sclerotized, caudad of or at the level of base of sidepiece; tergite lobes prominent, broadly connected middorsally, each with 2-6 strongly developed setae in 1 or 2 series; sternite large, with 4-7 setae distally. *Sidepiece:* Well developed, dorsal surface expanded basally and apically; mesal surface membranous from base to apex; basal tergomesal area moderately swollen, with a few short to moderately long fine setae and 1 long strong differentiated seta that is bent beyond middle and usually hooked at apex; apical lobe absent, but dorsal surface of sidepiece expanded at apex and bearing short fine setae mesally; median sternomesal sclerite and tuft absent; sternomesal surface without long broad striated scales; middle portion of tergomesal surface without scales or setae, remainder of tergal surface and lateral and ventral surfaces with numerous scales and bristles; few to moderately numerous strong elongate setae in apical half of sternomesal surface. *Claspette:* Well developed; stem short, more or less straight; spiculose; with 1-3 weakly developed setae; filament long, flattened apically, angled dorsad, with ridge on convex side, without retrorse barb. *Clasper:* Simple, moderately long; slightly expanded beyond base, gently curved in basal portion; median portion with longitudinal ridges or wrinkles; spiculose; apical portion with 2 or 3 setae on outer surface and sometimes 1 finer seta on inner surface; apical spiniform moderately long, 0.23-0.30 length of clasper. *Phallosome:* Aedeagus small, without teeth; usually dolioform with rounded base and apex, sometimes broadest near base or near apex. *Proctiger:* Strongly developed; not unusually long in dorsal aspect, the basolateral sclerotization vertical; paraproct well sclerotized, with a single large heavily sclerotized apical tooth; cereal setae fine, short, 1-6.

PUPA (fig. 43). Abdomen: about 3.9 mm. Trumpet: 0.60 mm. Paddle: 1.17 mm. *Cephalothorax:* Weakly to moderately pigmented, lighter ventrally. Hair 5-C moderately developed, short to moderately long, reaching 0.22-0.35 distance from its base to base of trumpet. *Trumpet:* Amber or very light brown to light brown, extreme base and sometimes apex darker. Broadening gradually from base to apex; tracheoid sculpturing relatively well developed in basal 0.13-0.17; reticulate sculpturing strong. *Abdomen:* Weakly to moderately pigmented, lighter posteriorly. Tergite II usually with 1 or 2 strong transverse ridges anteriorly, tergite III and sometimes IV and V with 1 strong transverse ridge anteriorly, tergites VI and VII usually without transverse ridge. Hair 1-II-IV moderately to strongly developed, usually becoming longer and stronger on IV, usually double (1-4b) on

II, single or double (1-3b) on III, usually single (single or double) on IV; hair 1-V weakly to strongly developed, single; 1-VI,VII weakly developed, single. Hair 2-III-V mesad or laterad of hair 1 of corresponding segment. Hair 5-IV,V 1.0-1.5 length of corresponding segment; 5-VII short to moderately long, single, weaker and shorter or stronger and longer than 4-VII. Hair 6-III-VI moderately long and strong, subequally developed or becoming slightly weaker posteriorly; 6-VII shorter and finer than 6-III-VI. Hair 8-VI,VII ventral. Hair 9-III-VI relatively stout, short to moderately long, subequal on all segments or slightly lengthened on VI, cephalad or caudad of level of hair 6 on III, usually caudad of level of hair 6 of corresponding segment on IV-VI; hair 9-VII slightly to considerably cephalad of caudolateral angle of segment, with 1 or 2 (1-3) moderately long primary branches; 9-VIII at or slightly mesad of caudolateral angle of segment, with 2-4 (1-6) long, strong primary branches. Hair 10-VI relatively close to 11-VI. *Terminal Segments:* Male genital lobe large, about 1.5-1.7 length of tergite VIII. *Paddle:* Length greater than width. Apex emarginate, subtruncate or rounded. Midrib usually conspicuous to or nearly to apex; without wrinkled area near apex. Long marginal spicules absent. Hair 1-P short, usually single (single or double).

LARVA (fig. 44). Head: 0.98 mm. Siphon: 1.02 mm. Anal Saddle: 0.28 mm. *Head:* Lightly to moderately pigmented, lightened in ocular area, darkened posteriorly. Labial plate distinctly narrowed anteriorly. Hair 1-C stout. Hairs 4,6-C not near labrum. Hair 4-C moderately to strongly developed, 4-11 b; mesad of 1-C and at the same level as 6-C or slightly cephalad or caudad of it. Hair 5-C usually single (single or double); usually slightly mesad of 6-C. Hair 6-C single; far laterad of 1-C. Hair 7-C 3-8b. Hair 15-C moderately long, 2,3b. Mental plate with 8-11 (8-13) teeth on each side of median tooth. *Antenna:* Shaft with few to numerous small spicules. Hair 1-A moderately long, usually single (1-3b). *Thorax:* Epidermis and fat body without conspicuous pigmentation. Integument without spicules. Tubercles of hairs 5-7-P separate. Hair 1-M,T moderately long, branched. Hairs 4,5-P branched; 5-M single. Hair 11-P,M,T much shorter than 9-P. Hair 13-T usually moderately developed, usually 4-6b (3-9); subequal to or slightly larger than 14-M. Hair 14-M moderately developed, usually 3-7b. *Abdomen:* Hair 1-I moderately to strongly developed, usually 5,6b (4-9); hair 1-IV,V strongly developed, usually 3-5b. Hair 2-III-V mesad or laterad of hair 1 of corresponding segment; single. Hair 3-VII moderately developed, short, usually single (single or double). Hair 5-II-IV moderately to strongly developed, usually 3-6b (2-8). Hair 6411-V normally double (2,3b). Hair 9-III-V usually single (1-3b). Hair 11-I moderately to strongly developed, usually 4-7b (3-9). Hair 12-I absent. Hair 13-I moderately developed, usually 3-5b (2-8); hair 13-IV,V strongly developed, usually 3,4b (2-4); hair 13-VI weakly developed, 5-13b, cephalad of 10-VI. *Segment VIII:* Hairs 1 and 2 separated. Hair 1 moderately to strongly developed, usually 3,4b (2-6). Comb scales moderate in size; with single long apical spine and basal fringe; relatively few [8-10 (8-12)] , usually in 1 regular slightly curved row, sometimes in irregular row. *Siphon:* Moderately to very strongly pigmented. Relatively short to moderately long; index 2.3-4.5. Acus large. Pecten teeth with irregular basal denticles; 12-20 (10-25) in more or less straight even row. Hair 1-S distad of pecten; strongly developed, with 3 (3-5) spreading branches. *Anal Segment:* Saddle moderate in size; without spines on caudal margin; moderately to strongly pigmented. Hair 1-X moderately to strongly developed, usually 2,3b (2-4). Hair 2-X usually 4,5b (3-6). Hair 3-X single, but frequently with 1 to several conspicuous barbs or short branches near base on dorsal surface. Ventral brush (4-X)

moderately developed; usually with 7 pairs of hairs; all but most proximal 2-4 hairs from grid; hair 4a-X short, usually 3-5b; hairs 4b,4c-X double. Anal gills sausage-shaped; dorsal and ventral subequal, about 2.5-6.5 times length of anal saddle.

SYSTEMATICS. *Aedes muelleri* is distinguished as follows: in the adult by (1) the ornamentation of the mesoscutum, which has white to tannish-white scales in distinct acrostichal, lateral prescutellar, anterior dorsocentral, posterior outer dorsocentral, lateral marginal and posterior fossal lines or in distinct acrostichal and lateral prescutellar lines and covering the entire lateral third of the mesoscutum, (2) the extensive vestiture of scales and bristles on the pleuron,and by the combination of (3) the long, slender proboscis, (4) the entirely dark scaled proboscis, palpus, tibiae and tarsi, (5) the simple claws of the female, and (6) the narrow curved scales between the eyes, on the vertex, all 3 scutellar lobes, the entire posterior pronotum, and sometimes the paratergite; in the male genitalia by the combination of (1) the single long, strong, apically hooked differentiated seta in the basal tergomesal area of the sidepiece, (2) the numerous scales among the shorter setae on the tergal surface of the sidepiece, (3) the absence of a retrorse barb on the filament of the claspette, and (4) the usually more or less barrel-shaped aedeagus; in the pupa by the combination of (1) the development of hair 1-II-VII, which is usually moderately to strongly developed on II-IV or V and usually very conspicuously more weakly developed on V or VI to VII, (2) the relatively strongly developed and long 6-III-VI, (3) the strong and usually elongate 9-III-VI, and (4) the relatively long, ovate paddle; and in the larva by the combination of (1) the 8-10 (8-12) moderate-sized comb scales with a single long apical spine that is fringed basally, (2) the ventral brush, which arises from a grid, usually has 7 pairs of hairs, and has hair 4a-X short and 3-5b, (3) the absence of 12-I, and (4) the short, usually single 3-VII.

Aedes muelleri is a very distinctive species in the adult stage. Dyar (1920:81-82) described it in the subgenus *Ochlerotatus* (as *Heteronycha)* and later (Dyar, 1928:172) indicated its relationship to *pullatus* (Coquillett, 1904). Belkin and McDonald (1957:190) retained *muelleri* in *Ochlerotatus* and assigned it to the Pulchritarsis-Varipalpus Group on the basis of the larva and male genitalia. Arnell and Nielsen (1972:4) thought that the similarities between the Varipalpus Group and *muelleri* that led Belkin and McDonald to postulate a relationship between these taxa might be due to convergence and stressed the many differences in the adults as evidence for their conclusions. Throughout most of this study I was also impressed by the numerous differences between the adults of *muelleri* and the Varipalpus Group and doubted that these taxa were related. However, I have come to agree fully with Belkin and McDonald and now believe that *muelleri* and the Varipalpus Group are collateral American developments from the same stock as the Old World Pulchritarsis Group. Although the mesoscutal ornamentation of the females of *muelleri* is very different from that of species of the Varipalpus Group which occur in the southwestern United States, it is not much different from that of *laguna* Arnell and Nielsen, 1972 which occurs in southern Baja California and is apparently the most primitive species of the Varipalpus Group. The pupa of *muelleri* is almost indistinguishable from that of *varipalpus* (Coquillett, 1902) and is very similar to the other species of the Varipalpus Group. The larva of *muelleri* differs from that of the Varipalpus Group only in form of the comb scales, structure of the ventral brush, and development of hairs 1,13-III-V. The distributions of *muelleri* and the Varipalpus Group

are essentially complementary, which also suggests a close relationship between them. The subgeneric placement of *muelleri* has never been challenged, largely because the habitat of the immatures remained unknown and several features of the female, such as the simple claws and large, prominent sternite VIII, passed unnoticed until recently (Belkin and McDonald, 1957:190; McDonald, 1957a:505-511). This has not been the case with the Varipalpus Group, which has been shuffled back and forth between *Finlaya* and *Ochlerotatus* in recent times (see Arnell and Nielsen, 1972:3-5). I am placing *muelleri* into a monotypic group, allying it with the Pulchritarsis and Varipalpus Groups in the more inclusive Pulchritarsis Section and leaving this assemblage in *Ochlerotatus* (sens. lat.) until the relationships of the numerous other lineages presently included in this subgenus are worked out and until the systematics of the Old World Pulchritarsis Group is put on a par with that of its American counterparts.

Aedes muelleri, as I am interpreting it, is a highly variable species. In the adults, apparently nongeographical variation includes the presence or absence of bristles along the upper edge of the posterior pronotum and in the middle anterior portion of the mesepimeron and the color of the scales in the fossal area, laterad of the posterior outer dorsocentral scale line, and along the upper edge of the posterior pronotum. Apparently geographical variation includes the presence of numerous subspiracular bristles, the reduced number or absence of scales on the paratergite and in the postcoxal area, the absence of a dorsal extension from the subspiracular scale line, the purer white color of the light mesoscutal scales, and the shorter and more sparsely bristled palpus of the male in some or all individuals of some Mexican populations. In the male genitalia the setae of the IX tergite are longer, the setae of the apical half of the sternomesal surface of the sidepiece are shorter and finer, and the aedeagus is narrower in the Texas populations. In the pupa the pigmentation is stronger and the paddle longer in all Mexican populations. And, in the larva, the siphon is longer and has more pecten teeth in all Mexican populations.

BIONOMICS. The immatures of *muelleri* are usually found in treeholes; they have also been found in artificial containers in Arizona and, on 1 occasion, in the leaf axils of maguey *(Agave)* in Mexico. In Arizona the species occurs most commonly in oak-pine forest and cottonwood *(Populus)* gallery forest at higher elevations (1680 to 2320 meters), but it has been found in riparian woodland and groves of oaks *(Quercus)* at moderate or even low elevations (as low as 1220 meters). It is associated with *Ae. (Kompia) purpureipes, Ae. (Ochlerotatus) monticola* Belkin & McDonald, 1957 and *Ae. (Protomacleaya) burgeri* in the southern part of the state and with *Ae. (0.) varipalpus* (Coquillett, 1902) in the northern part. In Texas *muelleri* is common in the oak-pine forest at the higher elevations (above 1770 meters) in the Chisos Mountains, but again it does occur in groves of oaks at lower elevations (1400 meters). It is associated with only 1 other species of *Aedes* in Texas, *Ae. (Protomacleaya) brelandi.* In Mexico *muelleri* has been found in gallery forest of willow *(Salix)* or cottonwood, dense oak-pine forest and relatively sparse oak-juniper scrub at higher elevations only (1900 to 2500 meters). It has been associated with the montane species *Ae. (Protomacleaya) schicki* in the western part of the State of Durango. Females of *muelleri* are attracted to and bite humans. Dyar (1922a:92) and McDonald (1957a:511) both reported the collection of a single female biting during the day. I found the females to be common and irritating for a brief period before darkness in Cave Creek Canyon, Chiricahua Mountains, Arizona, in late August 1969.

DISTRIBUTION (fig. 41). *Aedes muelleri* extends from northwestern Arizona, southwestern New Mexico and southwestern Texas southward at least to the Federal District of Mexico. In the United States it occurs at elevations between 1220 and 2320 meters; in Mexico, between 1900 and 2500 meters. Material examined: 2250 specimens; 279 males, 341 females, 947 larvae, 683 pupae; 394 individual rearings (255 larval, 120 pupal, 19 incomplete).

MEXICO. *Distrito Federal:* Mexico City, J. Muller, 1 F [USNM]. Mexico City (NW), 10 Nov 1955, W.E. Snow, 1 pF [USNM]. *Durango:* Durango (29 km E), 10 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 694), 1 M, 1 P [UCLA]. Durango (53 km W), 3 July 1967, G. Schroeder (MEX 488), 2 1pM (488-10,14), 2 pF (488-100,101), 1 M gen; same data (MEX 489), 1 1pM (489-10) [UCLA]. Navios (6 km E), 11 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 696), 14 1pF (696-10-23), 1 M, 1 M gen, 2 P, 2 L; same data (MEX 697), 1 1pF (697-10) [UCLA]. *Hidalgo:* Real del Monte, 11 May 1962, D. Peniche, 3 L [USNM]. *Mexico:* Zitacuaro (45 km E), 3 Sept 1964, E. Fisher and D. Verity (MEX 167), 1 L; 23 July 1966, D. Verity (MEX 394), 2 1pM (394-10,11), 1 1pF (394-12), 7 pM (394-16,17,21,100-103), 4 pF (394-13, 15,18,19), 1 1p (394-14), 4 M gen, 8 L [UCLA]. *Zacatecas:* Felipe Angeles, 9 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 680), 1 1pM (680-10); same data (MEX 682), 4 1pM (682-10,12,13,18), 6 1pF (682-11,14-17,19), 22 M, 1 M gen, 6 F, 29 P, 26 L; same data (MEX 683), 8 1pM (683-13-19,21), 7 1pF (683-10-12,20,22-24), 3 M, 1 M gen, 3 F, 14 P, 33 L [UCLA]. Rancho Grande, 10 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 685), 1 M; same data (MEX 687), 4 1pM (687-10-12,14), 3 1pF (687-13,15,16), 1 M, 1 M gen, 1 P, 1 L [UCLA]. San Martin, 10 June 1971, T.J. Zavortink and L.T. Nielsen (MEX 690), 2 1pM (690-10,11), 1 L; same data (MEX 691), 8 1pM (691-10,12-14,16-18,21), 3 1pF (691-11,15,19), 1 1p (691-20), 6 M, 1 M gen, 2 F, 7 P, 14 L [UCLA].

UNITED STATES. *Arizona:* Bisbee (4 km NW), 22 Mar 1966, T.J. Zavortink (UCLA 313), 3 1pM (313-10,11,16), 5 1pF (313-12-15,17), 2 1p (313-18,19), 9 M, 2 F, 3 M gen, 13 P, 22 L [UCLA]. Carr Canyon, Huachuca Mts., Cochise Co., 5 Sept 1966, T.J. Zavortink (UCLA 339), 1 1pM (339-14), 1 1pF (339-18), 2 pM (339-31,114), 3 pF (339-30,112,113), 1 M, 1 M gen, 8 P, 1 L; same data (UCLA 340), 2 pF (340-100,101) [UCLA] . Cochise Stronghold Cmpg., Dragoon Mts., Cochise Co., 26 Aug 1954, J.F. Burger (UCLA 254), 7 M, 54 F, 53 P, 9 L; 4 Sept 1966, T.J. Zavortink (UCLA 327), 6 1pF (327-10-12,14-16), 5 pM (327-103,104,107, 108,110), 12 pF (327-20,24,100-102,105,106,109,111-114), 1 1p (327-13), 4 M, 10 F, 23 P, 11 L; same data (UCLA 328), 2 1pM (328-33,36), 1 1p (328-34), 1 M gen, 2 F, 2 P, 6 L; same data (UCLA 329), 1 F; same data (UCLA 330), 4 1pF (330-15,17-19), 4 pM (330-102,104,109,110), 10 pF (330-100,101,103,105-108,112-114), 5 M, 1 F, 2 L; 22 Mar 1966, T.J. Zavortink (UCLA 426), 5 1pM (426-11-14,18), 4 1pF (426-15-17,19); same data (UCLA 427), 11 M, 12 F, 24 P, 13 L [UCLA]. Hualpai Mts., Mohave Co., 4 Aug 1956, J.N. Belkin and W.A. McDonald (UCLA 210), 1 L [UCLA]. Kitt Peak, Quinlan Mts., Pima Co., 8 Sept 1969, T.J. Zavortink (UCLA 631), 1 1pM (631-10), 2 1pF (631-11,12) [UCLA]. Lochiel (13 km E), Bodie Canyon, Santa Cruz Co., 27 Dec 1969, T.J. Zavortink and L.T. Nielsen (UCLA 559), 2 L; same data (UCLA 562), 3 1pM (562-41-43), 8 1pF (562-45,49,51,55,56,66,69,78), 1 pM (562-102), 1 1p (562-48), 8 M, 2 F, 15 P, 152 L; same data (UCLA 567), 1 1pM (567-22), 8 1pF (567-21,25,27,28,30,31, 33,35), 5 pM (567-100-104), 6 M, 19 P, 171 L [UCLA]. Madera Canyon, Santa Rita Mts., Santa Cruz Co. or Pima Co., 25 Aug 1954, W.A. McDonald (UCLA 140), 1 F; 18 Aug 1955, W.A. McDonald (UCLA 173), 2 1pF (173-203,206), 9 pM (173-208,209,211,212,216,217,221,223, 224), 5 pF (173-210,214,215,218,219), 3 M, 9 M gen, 2 F, 4 P, 2 L; 13 or 14 Aug 1960, C.L. Hogue (UCLA 232), 2 M, 8 F [UCLA]. Mendoza Canyon, Coyote Mts., Pima Co., 29 Dec 1969, T.J. Zavortink and L.T. Nielsen (UCLA 551), 1 L; same data (UCLA 568), 1 L [UCLA]. Onion Saddle, Chiricahua Mts., Cochise Co., 6 Sept 1966, T.J. Zavortink (UCLA 344), 3 pM (344-101,102,104), 2 pF (344-100,103), 1 1p (344-10), 1 M gen, 1 F, 2 P [UCLA] . Patagonia (3-6 km WSW), 14 Sept 1968, T.J. Zavortink (UCLA 458), 2 1pF (458-20,21); same data (UCLA 460), 2 1pM (460-11,13), 2 1pF (460-14,15); 13 Sept 1968, T.J. Zavortink (UCLA 480), 2 1pM (480-12,14), 2 1pF (480-10,13), 1 1p (480-11) [UCLA]. Williams, 4 Aug 1956, J.N. Belkin and W.A. McDonald (UCLA 212), 19 1pM (212-115,118,120-122,128,130,158,169,180,185,187,191,

192,195,196,201,205,216), 451pF (212-113,117,123,125-127,129,131,133-136,138-142,159,167, 171-173,175-177,181-184,188-190,193,194,200,202,204,207-209,211,213-215,219),17 pM (212-101,105-112,144,146,147,150,152,156,157,203), 2 pF (212-103,104), 6 1p (212-114,119,124, 132,137,206), 4 M gen, 4 P, 35 L; same data (UCLA 214), 1 1pM (214-101), 2 1pF (214-102, 103), 1 pM (214-108), 5 L; 5 Aug 1956, J.N. Belkin and W.A. McDonald (UCLA 215), 4 1pM (215-112,113,117,124), 7 1pF (215-109-111,119,121-123), 3 pM (215-114-116), 6 pF (215-101-105,108), 1 1M (215-118), 1 1p (215-120), 1 F, 1 M gen, 5 P, 43 L [UCLA] . *Texas:* Alpine (30 km S), 7 Sept 1957, *O.P.* Breland, 3 M, 3 F, 4 M gen, 4 P, 4 L [UCLA]. Chisos Mts., Big Bend National Park, Brewster Co., 31 Aug 1969, T.J. and J.A. Zavortink (UCLA 602), 6 L; same data (UCLA 603), 6 1pM (603-10-15), 6 1pF (603-16-19,24,25), 3 pM (603-105-107), 4 L; same data (UCLA 604), 3 1pM (604-10,11,13), 8 1pF (604-14-21), 1 pM (604-100), 1 1p (604-12), 1 P, 7 L; same data (UCLA 607), 1 pF (607-100), 1 L; 1 Sept 1969, T.J. Zavortink (UCLA 609), 1 1pM (609-14), 7 1pF (609-15-21), 5 pM (609-106,107,109-111), 23 M, 2 M gen, 12 F, 55 P, 52 L; same data (UCLA 610), 4 1pF (610-12-15), 1 pM (610-100), 3 M, 3 P; same data (UCLA 611), 1 1pM (611-10), 3 1pF (611-16,19,20), 5 L; same data (UCLA 613), 1 1pF (613-13), 1 pM (613-101), 1 P, 14 L [UCLA] . Fort Davis (6 km W), Davis Mts. State Park, 2 Sept 1969, T.J. Zavortink (UCLA 615), 2 1pM (615-10,11), 1 1p (615-12), 4 L; same data (UCLA 617), 1 1pF (617-13), 1 pF (617-17); same data (UCLA 618), 1 1pF (618-10) [UCLA] . Fort Davis (19 km NE), Limpia Canyon, 28 Aug 1969, T.J. and J.A. Zavortink (UCLA 600), 1 pM (600-101) [UCLA] .

Additional Records From the Literature

UNITED STATES. *New Mexico:* Animas (24 km S), Cat Walk Cmpg. (8 km E Glenwood) and Reserve (Nielsen, Linam, Arnell and Zavortink, 1968:362-363).

ATROPALPUS SECTION

FEMALES. Dark scales of proboscis, palpus, legs, wings and abdomen with very slight metallic coppery, green, blue or violet reflections. *Head:* Eyes narrowly to broadly separated above antennae, the resulting space with narrow curved scales and elongate setae. Integument light to dark brown. Frontal bristles numerous. Orbital bristles moderately numerous, 8-15 pairs, varied in development. Vertex usually without erect scales, with decumbent scales broad and flat except along midline where they are narrow and curved. Occiput with numerous erect scales and narrow curved scales. Orbital line of narrow curved scales developed. Dorsolateral, lateral and ventral surfaces with broad flat scales. Clypeus moderately large, bare. Proboscis slender, longer than forefemur; entirely dark scaled; with a few basal bristles. Palpus short, about 0.17-0.20 length of proboscis; 4-segmented, segment 4 minute to moderate in size; segments 1-3 with bristles; usually entirely dark scaled. Antenna shorter than proboscis; torus with moderate to large patch of small flat scales, with fine setae or with a mixture of scales and setae; flagellar segment 1 longer than 2, slightly swollen, with patch of scales; flagellar segments 2-13 usually with 6 moderate bristles in basal whorl; each of flagellar segments 3-5 slightly longer than preceding segment, segments 5-12 subequal in length. *Thorax:* Integument tan to dark brown or blackish. Acrostichal and anterior dorsocentral bristles well developed only on anterior promontory, absent or few and weak on disc; posterior dorsocentral bristles absent to well developed; prescutellar and supraalar bristles numerous and well developed; humeral, lateral prescutal and posterior fossal bristles present, strongly to weakly developed, or absent; 1 parascutellar bristle present, strongly to weakly developed, or absent. Scutellum with 5-10 strong bristles on midlobe, 5-16 on lateral lobe. Mesoscutum completely cov-

ered with narrow curved scales of various sizes except for normal anterior inner dorsocentral and median and lateral prescutellar bare spaces; ornamentation varied. Scutellar lobes with narrow curved scales of varied color. Paratergite narrow, with or without scales. *Apn* not enlarged. *Ppn* separated from mesoscutum by strong suture. Meron large. Pleural bristles on *apn, ppn, ppl, psp, pra, stp* and upper *mep; stp* bristles usually numerous, in continuous row from near *psp* to below level of lower edge of *mep; ssp* and lower *mep* bristles absent. *Apn* with predominantly semierect, narrow curved and broad scales; *ppn* with large area covered with narrow curved and sometimes broad flat scales; broad flat appressed and semierect scales on *ppl,* in long *ssp* line, in 3 patches on *stp,* 1 below *pra,* 1 in middle and 1 above midcoxa, and usually in separate or joined upper and middle *mep* patches; *pcx* and *psp* with or without scales; *pst,* hypostigial area and metameron without scales. *Legs:* Hindcoxa smaller than or subequal in size to midcoxa, its base far below upper margin of meron. Legs short to moderately long, the forefemur 1.06-1.37 times distance from top of thorax to tip of midcoxa. Forecoxa with light or light and dark scales; midcoxa and sometimes hindcoxa with light scales. Forefemur and midfemur predominantly dark scaled, with light scales in narrow basal band and in variable streaks on posterior, dorsal and/or ventral surfaces. Hindfemur dark scaled with variable light markings basally. Knee spots very small to moderately large, dingy-white to silver, subequal on all legs. Tibiae dark scaled with light scales in narrow basal band or ring and sometimes in very narrow to moderately broad apical patch or band; sometimes pale scales scattered or streaked on posterior and/or ventral surface of all tibiae. Tarsi predominantly dark scaled with at least proximal segments of all legs with basal or basal and apical light patch, band or ring. Claws of foreleg and midleg with acute submedian tooth; claws of hindleg simple. *Wing:* Dark scaled except usually for patch or short line of white scales at base of costa. Plume scales on dorsum of veins Rs, R_{2+3}, R_2 R_3 middle portion of M and apical portion of IA. *Haltere:* Scales white and/or dark. *Abdomen:* Tergite I with numerous scales middorsally. Laterotergite with or without scales. Tergites VI and VII completely scaled. Outstanding scales absent. Ornamentation of tergites and sternites varied.

FEMALE GENITALIA (figs. 48,51). *Segment VIII:* Tergite narrowed apically, length along midline about 0.57-0.82 of tergite VII; distal 0.57-0.82 with scales and bristles. Sternite relatively short; about 1.2-1.4 length of tergite, slightly broader distally; distal margin distinctly convex; all but lateral and basal areas with scales and bristles, the scales at least as numerous as bristles; bristles more numerous along midline and distal margin, predominantly moderately developed. *Tergite IX:* Reduced, consisting of a pair of separate dorsolateral plates; maximum length of plate about 0.15-0.22 length of tergite VIII; plate weakly sclerotized, without setae. *Insula:* Moderately sclerotized; connected to sigma; with 2 or 3 pairs of moderately developed setae. *Cercus:* Relatively short, length about 0.62-0.71 of tergite VIII; compressed; apex rounded to acute in lateral view; bristles numerous apically, the largest moderately developed; scales present or absent. *Postgenital Plate:* Moderately long and broad, length about 0.37-0.50 of tergite VIII; index about 1.3-1.4; apex slightly to conspicuously emarginate in ventral view; distal portion with numerous weakly developed bristles and 1 pair of elongate moderately developed bristles; basal median longitudinal apodeme not developed, but with more strongly sclerotized depression at base. *Cowl:* Strongly sclerotized. Atrial plates small to large, rather weakly sclerotized. *Sigma:* Connected to cowl; moderately sclerotized. Basal portion of spermathecal duct usually strongly scle-

rotized. Spermathecae 3, strongly sclerotized, more or less spherical, subequal *(fluviatilis)* or 1 greatly enlarged *(atropalpus).*

MALES. Similar to females except for sexual characters. *Head:* Proboscis slender. Palpus variable, about 0.66-0.95 length of proboscis; 5-segmented; segments 2 and 3 ankylosed and long, making up 0.58-0.71 length of palpus; segment 4 short, 0.14-0.19 length of palpus; segment 5 short, 0.11-0.16 length of palpus; palpus slender except for slightly swollen apex of segment 3 and sometimes swollen segment 4; apex of segment 3 very slightly upturned, segments 4 and 5 very slightly drooping; apex of segment 3 and all of segments 4 and 5 with bristles; entirely dark scaled or with light patch at base of some segments. Antenna shorter than proboscis; torus much enlarged, without scales or with an inconspicuous patch of small scales; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment 1 slightly elongate, with scales; flagellar segments 12 and 13 elongate, more or less subequal or penultimate longer, the 2 combined slightly shorter than or subequal to total length of first 11 segments. *Legs:* Claws of foreleg and midleg enlarged, unequal; larger claw with long blunt submedian tooth and acute basal tooth, smaller claw with acute subbasal tooth. Claws of hindleg small, simple. *Abdomen:* Apical segments and genitalia not bent ventrad.

MALE GENITALIA. Various shades of straw-yellow, tan and brown; apex of paraproct blackish. *Segment VIII:* Tergite long, 1.08-1.40 length of sternite; exserted, apical 0.54-0.69 scaled. *Segment IX:* Poorly developed dorsally, the tergite short to moderately long; middorsal portion of tergite weakly sclerotized, at level of base of sidepiece or caudad of it; tergite without lobes or setae; sternite large, with 3-12 setae distally. *Sidepiece:* Well developed, conical; mesal surface membranous from base to apex; basal tergomesal area slightly to conspicuously swollen, with a clump of setae; apical lobe not developed; median sternomesal tuft and sclerite absent; sternomesal surface without long broad striated scales; dorsomesal surface with short or short and long setae; dorsolateral, lateral and ventral surfaces with numerous strong setae and scales; setae of sternomesal surface specialized, enlarged. *Claspette:* Well developed; stem moderately long to long, straight to slightly curved mesad in dorsal aspect, sometimes strongly curved dorsad apically; spiculose; with weakly developed setae and sometimes 1 specialized seta near apex; filament long, terete to flattened, curved, without ridge or retrorse barb on convex side, sometimes expanded and striate. *Clasper:* Simple, long; broadest at or slightly beyond base, distal portion strongly curved; with or without ridges or wrinkles; with or without. spicules; 1 or 2 setae near apex on outer surface, 1 near apex of inner surface; apical spiniform short, 0.19-0.31 length of clasper. *Phallosome:* Aedeagus small, without teeth; base parallel-sided, apex expanded, rounded. *Proctiger:* Strongly developed; not unusually long in dorsal aspect, the basolateral sclerotization vertical; paraproct well sclerotized, with 1 large heavily sclerotized apical tooth; cereal setae fine, short, 3-5.

PUPAE. *Cephalothorax:* Weakly to strongly pigmented, lighter ventrally. Hair 5-C weakly to moderately developed, short, reaching 0.25-0.40 distance from its base to base of trumpet. *Trumpet:* Very light brown to dark brown. Broadening from base to apex; tracheoid sculpturing poorly developed in basal 0.09-0.16; reticulate sculpturing strong. *Abdomen:* Weakly to strongly pigmented, sometimes lighter posteriorly. More anterior of tergites II-VII sometimes with a transverse ridge near level of hair 0. Hair **1-II-IV** moderately developed, with 4-39b on II, 1-15b on **III** and 1-6b on IV; hair 1-V-VII weakly to moderately developed, 1-6b on V, 1-4b on VI and **VII.** Hair **2-III-V** mesad of hair 1 of corresponding seg-

ment. Hair 54V,V 0.9-2.2 length of corresponding segment; 5-VII short to moderately long, 1-4b, shorter and usually finer than 4-VII. Hair 6-III,IV and sometimes V usually moderately long, fine; 6-VI and sometimes V usually slightly longer and stronger than 6411,IV; hair 6-VII short to moderately long, fine. Hair 8-VI,VII dorsal or ventral. Hair 9-III-VI short to moderately long, fine, subequal on all segments or slightly longer on VI, cephalad or caudad of level of hair 6 of corresponding segment; 9-VII cephalad of caudolateral angle of segment, with 2-5 (2-8) moderately long primary branches; 9-VIII usually mesad of caudolateral angle of segment, with 4-12 moderately long primary branches. Hair 10-VI relatively close to 11-VI. *Terminal Segments:* Male genital lobe moderately large to large, about 1.0-1.9 length of tergite VIII. *Paddle:* Very broad, width subequal to length. Apex rounded to deeply emarginate. Midrib conspicuous to or nearly to apex; sometimes with conspicuous wrinkles along midrib near apex. Long marginal spicules absent. Hair 1-P usually long and single.

LARVAE. *Head:* Lightly to strongly pigmented, the pattern varied. Labial plate narrowed anteriorly. Hair 1-C fine. Hairs 4,6-C removed from labrum. Hair 4-C weakly developed, 2-6b; mesad or laterad of 1-C and usually caudad of level of 6-C. Hair 5-C 1-5b, mesad or laterad of 6-C. Hair 6-C 1-3b, laterad of 1-C. Hair 7-C 2-9b. Hair 15-C short, 1-6b. Mental plate with 7-12 teeth on each side of median tooth. *Antenna:* Shaft usually with small spicules. Hair 1-A long, usually 2-4b (1-4). *Thorax:* Epidermis moderately pigmented. Integument without spicules. Tubercles of hairs 5,6-P sometimes joined; tubercle of 7-P separate. Hair 1-M moderately long to long, single or branched; 1-T short to moderately long, single to branched. Hair 4-P usually single (single or double). Hair 5-P 1-3b; hair 5-M single or double. Hair 11-P,M,T much shorter than 9-P. Hairs 13-T and 14-M weakly to moderately developed, 3-30b. *Abdomen:* Hair 1-I weakly developed, usually 5-13b (4-20); hair 1-IV,V weakly to strongly developed, I-5b. Hair 2-III-V mesad of hair 1 of corresponding segment; single. Hair 3-VII weakly to moderately developed, short, usually 2,3b (1-4). Hair 5-II-IV weakly developed, usually 2-6b (1-7). Hair 641I-V 1-6b. Hair 941I-V usually single (single or double). Hair 11-I weakly developed, 1-5b. Hair 12-I present. Hair 13-I weakly developed, usually single or double (1-3b); hair 134V,V strongly developed, 1-4b; hair 13-VI weakly developed, 3-22b, cephalad of level of 10-VI. *Segment VIII:* Hairs 1 and 2 relatively close together. Hair 1 moderately developed, usually single or double (1-3b). Comb scales small; cleft and/or fringed; many (7-110) in patch. *Siphon:* Lightly to strongly pigmented, yellowish to brown, except for slightly darker apex and much darker basal band. Short to moderately long; index 1.9-3.1. Acus present, sometimes weakly developed. Pecten teeth with 1-6 basal denticles; 9-28 in a more or less straight row; apical teeth sometimes detached. Hair 1-S arising within or beyond pecten; moderately developed, 4-10b. *Anal Segment:* Saddle small to moderate; without spines on caudal margin; lightly to moderately pigmented, yellowish to brownish. Hair 1-X weakly developed, short, usually single or double (1-3b). Hair 2-X usually 5-8b (4-11). Hair 3-X single. Ventral brush (4-X) moderately to strongly developed, usually with 6 (5-7) pairs of hairs; all hairs or all but most proximal 1 or 2 hairs arising from well developed grid; hair 4a-X long, 2-7b; hairs 4b,4c-X 2-8b. Anal gills tapered distally; dorsal and ventral usually subequal in length, 2.0-5.0 of anal saddle.

DISCUSSION. The Atropalpus Section is characterized as follows: in the adults by the combination of (1) the broad flat scales on all but the median portion of the vertex, (2) the presence of narrow curved scales and numerous bristles be-

tween the eyes, (3) the usual absence of acrostichal and anterior dorsocentral bristles from the disc of the mesoscutum, (4) the narrow curved scales on all 3 scutellar lobes, (5) the absence of scales from the paratergite and laterotergite or their restriction to the lower edge of these areas, (6) the scaling of the posterior pronotum, which is usually largely covered with narrow curved scales or narrow curved and broad flat scales, (7) the slender proboscis, and (8) the basally or basally and apically banded tarsi; in the male genitalia by the combination of (1) the absence of lobes or setae on tergite IX, (2) the clump of few to numerous enlarged setae in the basal tergomesal area of the sidepiece, (3) the absence of a retrorse barb on the claspette filament, (4) the presence of 1 or 2 setae near the apex of the outer surface of the clasper, and (5) the nearly vertical basolateral sclerotization of the proctiger; in the pupae by the combination of (1) the very broad paddle, (2) the fine, moderately long branches of hair 1-II, (3) the position of 2-III-V, which is mesad of hair 1 of the corresponding segment, (4) the fine 9-III-VI, and (5) the relatively numerous (4-12), moderately long primary branches of 9-VII; and, in the larvae by the combination of (1) the fine hair 1-C, (2) the weakly developed 1,11,13-I, 1-X and 5-II-IV, (3) the position of 2-III-V, which is mesad of hair 1 of the corresponding segment, (4) the small to moderate-sized anal saddle, (5) the development of the ventral brush, which usually has 6 pairs of hairs (5-7) from a grid, and (6) the 4 subequal, moderately long to long, tapered anal gills.

I am tentatively placing the Atropalpus Section in *Ochlerotatus* (sens. lat.) largely on the basis of features of the immature stages. The affinities of this section and the rank at which it should be recognized cannot be determined until this composite subgenus is revised.

The Atropalpus Section contains 2 groups, the boreal bitypic Atropalpus Group and the austral monotypic Fluvialitis Group, which are easily separated in all stages.

The immature stages of all species in this section are largely restricted to rockholes, rockpools and those artificial containers in which the composition of the water is similar to that of the natural habitats.

The Atropalpus Section extends from Canada to Argentina and Brazil, but is absent from the West Indies. The 2 included groups overlap in Central America.

KEYS TO GROUPS

ADULTS

1. Outer surface of hind coxa with large patch of scales; paratergite and laterotergite bare; hindtarsal segment 5 usually entirely light scaled dorsally ..... Atropalpus Group

   Outer surface of hindcoxa bare; paratergite and laterotergite usually scaled; hindtarsal segment 5 entirely dark scaled or with a small basal light patch (19. *fluviatilis)* ..... Fluviatilis Group

MALE GENITALIA

1. Basal tergomesal area of sidepiece with numerous enlarged setae; claspette filament terete ..... Atropalpus Group

Basal tergomesal area of sidepiece with few enlarged setae; claspette filament usually flattened, sometimes broadened (19. *fluviatilis)* . . Fluviatilis Group

PUPAE

1. Paddle usually deeply emarginate at apex; hair 5-IV,V about 0.9-1.2 length of corresponding tergite; male genital lobe 1.6-1.9 length of tergite VIII ..... Atropalpus Group
Paddle usually rounded, sometimes slightly emarginate at apex; hair 5-IV,V about 1.3-2.2 length of corresponding tergite; male genital lobe 1.0-1.2 length of tergite VIII (19. *fluviatilis)* ..... Fluviatilis Group

LARVAE

1. Distal pecten teeth strongly detached; hair 5-C single; 6-IILIV usually 4,5b (2-6) ..... Atropalpus Group
Distal pecten teeth more or less evenly spaced; hair 5-C 3-5b; hair 6-III-IV usually single or double (1-3b) (19. *fluviatilis)* ..... Fluviatilis Group

ATROPALPUS GROUP

FEMALES. *Head:* Eyes narrowly to broadly separated above antennae. Orbital bristles moderately numerous, 11-15 pairs, not obviously separated into mesal and lateral groups by their strength or direction of projection. Ornamentation of head varied. Proboscis much longer than forefemur. Torus with moderate-sized patch of scales, with fine setae, or with mixture of scales and setae; flagellar segment 1 with light or dark scales. *Thorax:* Integument varied. Acrostichal and anterior dorsocentral bristles absent from disc or few and weak; posterior dorsocentral bristles well developed; humeral, lateral prescutal and posterior fossal bristles present or absent; parascutellar bristle sometimes absent. Mesoscutum with background of very small to small scales, uniform or varicolored dark bronzy-brown to coppery-brown, yellow or golden, with a conspicuous to inconspicuous pattern of larger, lighter (white, cream, dingy, yellow or light golden) scales in complete or vestigial longitudinal lines or patches, as follows: (1) median patch on anterior promontory, (2) broad anterior lateral more or less crescent-shaped mark formed from joined lateral prescutal and posterior fossal lines, (3) narrow posterior outer dorsocentral line, (4) usually broad supraalar line, and (5) separate or joined anterior and lateral prescutellar patches. Scutellar scales white, yellowish, golden or brown. Paratergite bare. *Apn* scales white to dingy-white; *ppn* with white to yellowish or dingy-yellow narrow curved scales along upper margin, at least a few dark broad flat scales on disc and white to dingy-white broad flat scales below *ppn* bristles and sometimes in upper anterior portion; pleural patches white to silver-white; *ssp* line usually not broadened or extended dorsad anteriorly; *psp* with scales; *pcx* membrane and adjacent ridge without scales. *Legs:* Outer surface of hindcoxa with white scales. Forefemur and midfemur usually with light scales in long streak on posterior surface and shorter streak at base of dorsal and/or ventral surface; hindfemur varied. Knee spots moderately large. Tibiae with light scales in very narrow to moderately broad apical patch or band. Foretarsus with white scales in narrow ring or band at base of segment 1, in narrow band or patch over joint between segments 1 and 2 and rarely in smaller dorsal patch

over joint between segments 2 and 3; midtarsus with white scales in narrow to moderately broad band or ring at base of segment 1, in narrow to moderately broad ring or band over joint between segments 1 and 2 and in smaller band or dorsal patch over joint between segments 2 and 3 and sometimes 3 and 4; hindtarsus with white scales in moderately broad to broad ring or band at base of segment 1, in moderately broad to broad ring over joint between segments 1 and 2, in progressively narrower rings or bands over joints between segments 2 and 3 and 3 and 4, at apex of segment 4 and covering all of segment 5. *Wing:* Costa with patch or short line of white scales at base. *Haltere:* Scales white or white and dark. *Abdomen:* Laterotergite bare. Tergites II-VII dark scaled with white scales usually in broad basal band that is widened laterally, white scaling sometimes reduced to basolateral patches; tergite II white scaled to apex laterally. Sternites varying from predominantly light scaled with small apicolateral dark patch on distal segments to light scaled with complete broad apical dark band.

MALES. Similar to females except for sexual characters. *Head:* Palpus about 0.66-0.87 length of proboscis; segment 4 slender; apex of segment 3 and all of segments 4 and 5 with few bristles; entirely dark scaled. Torus with or without scales; flagellar segments 12 and 13 subequal in length. *Wing:* Costa sometimes without light scales at base.

MALE GENITALIA. *Sidepiece:* Relatively long; basal tergomesal area slightly swollen, with a clump of moderately numerous to very numerous enlarged setae; setae of sternomesal surface strong, straight or curved dorsad. *Claspette:* Stem long; with 1-3 weakly developed setae near base and 1 normal or specialized seta near apex; filament terete, never expanded or striate. *Clasper:* Broadest slightly beyond base.

PUPAE. *Cephalothorax:* Moderately to strongly pigmented, lighter ventrally. *Trumpet:* Uniformly light brown to dark brown. *Abdomen:* Moderately to strongly pigmented, lighter posteriorly. Hair 1-II,III moderately developed, with variable number of fine branches (4-39 on II and 3-15 on III); hair 1-IV moderately developed, usually 3-5b (2-6); hair 1-V weakly to moderately developed, usually 2-5b (2-6); hair 1-VI,VII weakly developed, usually single or double (1-4b). Hair 5-IV,V 0.9-1.9 length of corresponding segment. Hair 8-VI,VII usually ventral. *Terminal Segments:* Male genital lobe large, about 1.6-1.9 length of tergite VIII. *Paddle:* Apex usually deeply emarginate. Sometimes with conspicuous wrinkles along midrib near apex.

LARVAE. *Head:* Hair 5-C single, slightly mesad or laterad of 6-C. Hair 6-C single. Hair 7-C 3-5b (2-7). *Thorax:* Hairs 1-3-P not arising from an alveolar plate. Hairs 5,6-P arising from separate tubercles. Hair 1-M moderately long to long, branched. Hair 5-P usually 2,3b (1-3). Hairs 13-T and 14-M weakly to moderately developed, 3-6b (3-8). *Abdomen:* Hair 1-IV,V weakly to moderately developed, usually 2-4b (2-5). Hair 6-III,IV usually 4,5b (2-6); hair 6-V usually 2-4b (2-6). Hair 13-IV,V usually 3,4b (2-4). *Segment VIII:* Comb scales usually evenly fringed; 7-90 in number. *Siphon:* Short; index 1.9-2.7. Acus sometimes weakly developed and/or detached. Distal 1-5 pecten teeth detached. Hair 1-S arising within pecten. *Anal Segment:* Saddle small. Ventral brush moderately developed; hair 4a-X usually 2,3b (2-4); hair 4b-X usually 2,3b (2-5); hair 4c-X usually 3,4b (3-5).

DISCUSSION. The Atropalpus Group is easily distinguished from the Fluviatilis Group in all stages, as follows: in the adults most conspicuously by (1) the presence of well developed posterior dorsocentral bristles, (2) the usual presence of

scales on the postspiracular area and the outer surface of the hindcoxa, (3) the usual absence of scales on the paratergite, postcoxal area and adjacent ridge, and laterotergite, (4) the larger light tarsal markings that involve both ends of the segments, (5) the usually white scaled hindtarsal segment 5, and (6) the sparse vestiture of bristles on palpal segment 4 of the male; in the male genitalia by (1) the more numerous enlarged setae in the basal tergomesal area of the sidepiece, and (2) the terete claspette filament; in the pupae by (1) the shorter hair 5-IV,V which is only 0.9-1.2 times as long as the corresponding tergite, (2) the larger male genital lobe, which is 1.6-1.9 times longer than tergite VIII, and (3) the usually deeply emarginate apex of the paddle; and in the larvae most conspicuously by (1) the single hair 5-C, (2) the 4- or 5-branched (2-6) hair 6-III,IV, (3) the 3- or 4-branched (2-4) hair 13-IV,V, (4) the usually evenly fringed comb scales, and (5) the strongly detached distal pecten teeth that extend far beyond 1-S.

I have concluded that the Atropalpus Group has been derived from the Fluviatilis Group because of the reduced ventral brush (fewer branches in each hair) and reduced extent of sclerotization (smaller anal saddle, absence of plates at base of hairs 1-3-P and 5,6-P) in the larvae of the former and its more boreal distribution.

I am not following the recent treatment of the Atropalpus Group by O'Meara and Craig (1970a,b), who recognized 4 subspecies, *atropalpus atropalpus, atropalpus epactius, atropalpus nielseni* and *atropalpus perichares.* Instead, I am recognizing 2 species, *atropalpus* and *epactius,* and am synonymizing *nielseni* and *perichares* with the latter. *Aedes atropalpus* and *epactius* differ in several characteristics of the adult, male genitalia and larva, as indicated in the keys below and the systematics section of each species. The differences in the male genitalia are particularly reliable for separating the species.

The immatures of both species in the Atropalpus Group are characteristically found in rockholes and rockpools. Females of both species readily bite humans.

This group extends from southeastern Canada to Panama. The 2 included species are allopatric.

KEYS TO SPECIES

ADULTS

1. Eyes narrowly to moderately separated above antennae, the shortest distance between them 1.0-2.0 times the diameter of 1 ommatidium; anterior lateral light-scaled crescent of mesoscutum (lateral prescutal, posterior fossal and sometimes fossal scales) narrow to broad, usually white or whitish, *if* yellowish *then* background scales of mesoscutum usually entirely or predominantly yellow or golden; female with 1 or more moderately to strongly developed posterior fossal bristles; male with palpus 0.74-0.87 length of proboscis ..... 17. *epactius*

   Eyes broadly separated above antennae, the shortest distance between them 2.5-4.0 times the diameter of 1 ommatidium; anterior lateral light-scaled crescent of mesoscutum very broad, extending mesad to dorsocentral area, yellowish-cream to pale golden, *and* background scales of mesoscutum entirely or predominantly dark bronzy-brown; female without posterior fos-

sal bristles; male with palpus 0.66-0.72 length of proboscis (fig. 48) ..... 18. *atropalpus*

MALE GENITALIA

1. Specialized setae of basal tergomesal area of sidepiece very numerous, arranged in a nearly circular to broadly elliptical patch of 5 or 6 rows, the setae of the more distal rows nearly as long and strong as setae of basal rows; many setae of mesal half of tergal surface of sidepiece elongate and directed dorsad or dorsomesad; apical seta of claspette stem long, moderately strong, strongly curved dorsad (fig. 46) ..... 17. *epactius*

Specialized setae of basal tergomesal area of sidepiece moderately numerous, arranged in a narrowly elliptical patch of 2-4 rows, the setae of the more distal 1 or 2 rows fine and shortened; setae of mesal half of tergal surface of sidepiece predominantly short, fine and curved toward apex of sidepiece; apical seta of claspette stem relatively short, fine, and straight or slightly curved dorsad (fig. 49) ..... 18. *atropalpus*

LARVAE

1. Antenna and anterior portion of head capsule concolorous with or slightly darker or lighter than antennal prominence; comb scales usually moderately numerous, 18-34 (7-41); base of siphon of mature larva usually not irregularly sclerotized ventrally between the 2 rows of pecten teeth, so that there is usually no extensive basal ventral membranous area; hair 1-M usually weakly to moderately developed, usually short to moderately long (fig. 47) ..... *17. epactius*

Antenna and anterior portion of head capsule much more strongly pigmented than antennal prominence; comb scales usually numerous, 34-62 (24-90); base of siphon of mature larva irregularly sclerotized ventrally between the 2 rows of pecten teeth, so that there is an extensive basal ventral membranous area; hair 1-M moderately to strongly developed, long (fig. 50) ..... 18. *atropalpus*

17. Aedes (Ochlerotatus) epactius Dyar & Knab

Figs. 45-47

1908. *Aedes epactius* Dyar and Knab, 1908:53-54. TYPE: *Lectotype* female (416.25), Cordoba, Veracruz, Mexico, larva from rockhole, 18 Feb 1908, F. Knab [USNM; selection of Stone and Knight, 1956:217] . Synonymized with *atropalpus* by Dyar (1928:213-214); considered a variety of *atropalpus* by Knight and Marks (1952:546); elevated to specific rank by Lane (1953:691); resynonymized with *atropalpus* by Carpenter and LaCasse (1955:253); treated as a subspecies of *atropalpus* by O'Meara and Craig (1970a: 1398).

1921. *Aedes (Culiselsa) perichares* Dyar, 1921b:36. TYPE: *Lectotype* female, Ciruelas, Alajuela, Costa Rica, larva from rockhole, 29 Oct 1920, A. Alfaro [USNM; selection of Stone and Knight, 1956:223] . Synonymized with *fluviatilis* (Lutz, 1904) by Bonne and Bonne-Wepster (1925:415,418); resurrected by Dyar (1928:221); synonymized with *atropalpus* by Edwards (1932:153); synonymized with *epactius* by Knight and Marks (1952:546); treated as a subspecies of *atropalpus* by O'Meara and Craig (1970a:1399); NEW SYNONYMY.

1970. *Aedes (Finlaya) atropalpus nielseni* O'Meara and Craig *in* Carpenter, 1970:53 (June). NOMEN NUDUM.

1970. *Aedes atropalpus nielseni* O'Meara and Craig, 1970a:1399 (Sept). TYPE: *Holotype* female, along Colorado River near Moab, Grand Co., Utah, United States of America, larva from rockpool, Oct 1968, L.T. Nielsen [USNM] . NEW SYNONYMY.

Aedes (Finlaya) epactius of Lane (1953:691-692).
Aedes epactius of Howard, Dyar and Knab (1917:642-644).
Aedes (Taeniorhynchus) epactius of Dyar (1918:74,79; 1922b:85).
Aedes (Finlaya) atropalpus var. *epactius* of Knight and Marks (1952:525,546).
Aedes atropalpus epactius of O'Meara and Craig (1970a:1398-1399).
Aedes (Finlaya) atropalpus in part of Edwards (1932:153); Aitken (1942:166-167); Matheson (1944:186-187); Carpenter, Middlekauff and Chamberlain (1946:220-224); Carpenter and LaCasse (1955:253-255); Stone, Knight and Starcke (1959:159); Harmston and Lawson (1967: 16-17).
Aedes atropalpus of Dyar and Knab (1906:192, in part); Carpenter (1941:40-42); Rozeboom (1942:31); Hedeen (1953:1-10).
Aedes (Taeniorhynchus) atropalpus in part of Dyar (1928:213-214).
Aedes (Taeniorhynchus) perichares of Dyar (1928:221).
Aedes atropalpus perichares of O'Meara and Craig (1970a:1399).
Aedes atropalpus nielseni of O'Meara and Craig (1970a:1399).
Aedes (Culicelsa) fluviatilis in part of Bonne and Bonne-Wepster (1925:415-418).
For additional references see Carpenter and LaCasse (1955:254) and Carpenter (1968:83) (records of *atropalpus* from the southcentral and southwestern United States of America).

FEMALE. Wing: 3.88 mm. Proboscis: 2.64 mm. Forefemur: 2.23 mm. Abdomen: about 3.1 mm. *Head:* Eyes narrowly to moderately separated above antennae, the shortest distance between them about equal to 1.0-2.0 times the diameter of I ommatidium. Erect scales usually white to dingy-white or yellowish mesally and brown laterally, sometimes predominantly or entirely light. Decumbent scales white or some lateral ones tinged with tan or gold. Dorsolateral surface usually with small to large brown patch. Torus with small hairs only or with small hairs and few to numerous small light to dark scales. Scales of flagellar segment I white. *Thorax:* Integument of mesoscutum light to dark brown. Weakly developed acrostichal and anterior dorsocentral bristles sometimes developed on disc; I or more weakly to moderately developed humeral and/or lateral prescutal bristles sometimes developed; 1 or more moderately to strongly developed posterior fossal bristles usually present. Background scales of mesoscutum varying from entirely very dark bronzy-brown or coppery-brown through brown with extensive areas of pale yellowish or golden to nearly entirely yellow or golden; scales of median anterior patch, anterior lateral crescent, posterior outer dorsocentral line, supraalar area and prescutellar area usually white or whitish, sometimes some or most yellowish or golden; anterior lateral crescent narrow to moderately broad. Scutellar scales white or some or all yellowish or pale golden, sometimes some or most on midlobe brown. Narrow curved scales along upper edge of *ppn* white and/or yellowish, sometimes some brown. *Legs:* Hindfemur usually with dark scales extending to near base dorsally. *Wing:* White scaling at base of costa variable, sometimes absent, usually in moderately large patch, sometimes in line extending to or slightly beyond crossvein *h*. *Abdomen:* Sternite II usually entirely white scaled; sternites III-VII variable, white with very small to large lateral subapical or apical dark-scaled patch or more distal or most with complete narrow to broad apical dark band.

MALE. Similar to female except for sexual characters. *Head:* Palpus about 0.74-0.87 length of proboscis. *Thorax:* Anterior lateral light-scaled crescent of mesoscutum sometimes broader than in female.

MALE GENITALIA (fig. 46). Claspette filament usually yellowish to light tan, concolorous with claspette stem or nearly so and lighter than sidepiece. *Segment VIII:* Bristles of tergite more numerous and finer than in *atropalpus*. *Sidepiece:* Specialized setae of basal tergomesal area very numerous, arranged more or less in a nearly circular to broadly elliptical patch of 5 or 6 rows, the setae of the more distal rows nearly as long and strong as setae of basal rows; many setae of mesal half of tergal surface elongate and directed dorsad or dorsomesad; several of the more basal enlarged setae of sternomesal surface conspicuously curved dorsad. *Claspette:* Apical setae of stem long, moderately strong, strongly curved dorsad.

PUPA (fig. 46). Abdomen: about 3.1 mm. Trumpet: 0.54 mm. Paddle: 0.78 mm. *Paddle:* Distal portion of inner half usually with small submarginal spicules.

LARVA (fig. 47). Head: 1.07 mm. Siphon: 0.74 mm. Anal Saddle: 0.34 mm. *Head:* Moderately to rather strongly pigmented, tan to brown, uniform or anterior and posterior portions slightly darker. Mental plate usually with 10 or 11 (9-12) teeth on each side of median tooth. *Antenna:* Moderately pigmented, tan to brown, its base usually concolorous with or slightly lighter or darker than antennal prominence. *Thorax:* Hair 1-M weakly to moderately developed, usually short to moderately long. *Segment VIII:* Comb scales moderately numerous, usually 18-34 (7-41). *Siphon:* Base in mature larva usually not irregularly sclerotized ventrally between rows of pecten teeth, so that there is usually no extensive basal ventral membranous area. Pecten teeth usually 11-17 (9-19), those at base of row usually not noticeably irregular in size, shape or position, and usually arising from sclerotized portion of siphon.

SYSTEMATICS. *Aedes epactius* differs from *atropalpus* as follows: in the adult by (1) the more closely approximated eyes, which are separated by less than 2.0 ommatidial diameters, (2) the ornamentation of the mesoscutum (see below), (3) the ornamentation of the hindfemur, which is usually dark scaled to near base dorsally, (4) the usual presence of posterior fossal bristles, and (5) the usually longer palpus of the male, which is 0.74-0.87 length of the proboscis in all but depauperate individuals; in the male genitalia by (1) the more numerous specialized setae of the basal tergomesal area of the sidepiece and their arrangement in a broadly elliptical to nearly circular patch of 5 or 6 rows, (2) the setae of the mesal half of the tergal surface of the sidepiece, many of which are elongate and directed dorsad or dorsomesally, (3) the relatively long, moderately strong, and strongly dorsally curved apical seta of the claspette stem, and (4) the more numerous and finer bristles on tergite VIII; and in the larva by (1) the more uniformly pigmented head and antenna, (2) the usually fewer comb scales (usually fewer than 34), (3) the usual absence of an extensive unsclerotized area at the base of the ventral surface of the siphon of the mature fourth instar larva, and (4) the usually weaker and shorter hair 1-M. Pupae of *epactius* and *atropalpus* are, for the most part, apparently indistinguishable, but small submarginal spicules are more frequently developed on the distal portion of the inner half of the paddle in *epactius*.

The mesoscutal ornamentation of *epactius* is extremely variable. In Costa Rica, where the darkest individuals occur, the mesoscutum is always dark bronzy-brown scaled with a conspicuous pattern of silver-white scales in a narrow anterior lateral

crescent-shaped mark made up of the joined lateral prescutal and posterior fossal lines, in a median anterior patch, among the supraalar bristles, in a broken posterior outer dorsocentral line, and in separate small anterior and lateral prescutellar patches. In Utah, where the lightest individuals occur, the mesoscutum is frequently predominantly yellowish to golden scaled with an indistinct and incomplete pattern of lighter yellow or whitish scales similar to that outlined above for individuals from Costa Rica. Intermediates between these extremes in ornamentation occur in other populations of this species. Individuals from southeastern Arizona and Texas may be fully as light as those from Utah or may have the mesoscutum coppery-brown scaled with a conspicuous pattern of yellowish, golden and/or white scales identical in extent to that of specimens from Costa Rica. Individuals from southern Mexico may be as dark as those from Costa Rica except for the more coppery color of the dark mesoscutal scales or may have many of the dark scales of the anterior portion of the mesoscutum replaced by pale yellowish or golden scales.

At the level of populations the variation in mesoscutal ornamentation of *epactius* is more or less clinal, with the more austral populations averaging progressively darker. However, at the level of individuals this same variation is to some extent nonregional, with individuals from a particular place as light as those from several hundred kilometers to the north or as dark as those from great distances to the south.

In a recent study of the Atropalpus Group, O'Meara and Craig (1970a,b) described a new subspecies, *atropalpus nielseni,* for the Utah population of *epactius* and resurrected *perichares* Dyar to subspecific status for the populations of *epactius* from Costa Rica and El Salvador. These subspecies differed from their *atropalpus epactius* in ornamentation of the mesoscutum and in a number of other adult characteristics (O'Meara and Craig, 1970a:1395). As indicated above, the differences in ornamentation of the mesoscutum cannot be used to diagnose subspecies. Variation in some of the other colorational characteristics used by O'Meara and Craig is more or less correlated with that of the mesoscutum. Variation in many of the other characteristics listed by them is far greater than indicated, even in the laboratory strains examined by these authors, and, consequently, these characteristics are of no value in diagnosing different populations. It appears then that *epactius* is not divisible into geographical races and, as a result, I am reducing *nielseni* and *perichares* to synonymy with it.

BIONOMICS. The immatures of *epactius* are usually found in holes in rock and concrete and in rock-filled pools, but have also been collected 1 or more times in ground pools, stream pools, Indian mortars, artificial containers (particularly those made of concrete, fired clay or metal), treeholes and cavities in agave leaves. The species is sometimes associated with *Ae. (Ochlerotatus) fluviatilis, Ae. (Aztecaedes) ramirezi* and *Ae. (Protomacleaya) gabriel* Schick, 1970 in the southern part of its range and with *Ae. (P.) hendersoni* and *Ae. (P.) zoosophus* in the northern part. Adults of both sexes have been taken at artificial lights and in "biting-landing-swarming" collections with human hosts. Females bite humans readily.

DISTRIBUTION (fig. 45). *Aedes epactius* is found from the southwestern and southcentral United States to Panama. Material examined: 3560 specimens; 629 males, 582 females, 1202 larvae, 1147 pupae; 271 individual rearings (166 larval, 89 pupal, 16 incomplete).

COSTA RICA. *Alajuela:* Alajuela, 30 July 1921, A. Alfaro, 9 F [USNM]. Ciruelas, 29 Oct 1920-26 July 1921, A. Alfaro, 21 M, 24 F, 4 M gen [USNM] ; 29 July 1971, A. Berrios Arias

(CR 296), 2 L; 4 Nov 1971, D. Schroeder (CR 516), 2 1pM (516-10,11), 2 L [UCLA] . *Guanacaste:* Liberia, H.W. Kumm, 15 M, 5 F [UCLA] , 4 M, 2 L [USNM]. Liberia and Santa Cruz, Nov 1970, M. Dunn (UCLA 581), 3 1pM (581-11,14,15), 4 1pF (581-10,12,13,16), 6 M, 2 M gen, 2 F, 11 P, 13 L [UCLA]. Miravalles, 20 July 1922, A. Alfaro, 2 M, 1 F [USNM] .

EL SALVADOR. Alegria, 1 M [USNM]. La Muralla, 13 Oct 1941, 2 M, 2 F, 1 M gen [USNM]. Metapan, Oct 1968, S. Breeland (UCLA 580), 141pM (580-10,13,14,16,17,19-23,26,28.30), 9 1pF (580-11,12,15,18,24,25,27,31,32), 314 M, 3 M gen, 217 F, 606 P, 481 L [UCLA] , 5 M, 5 F, 2 M gen [USNM] . Locality not specified, 1 L [USNM] .

GUATEMALA. *Guatemala:* Guatemala City, Oct 1957, H.D. Pratt, 1 P, 1 L [CDC].

MEXICO. *Chiapas:* Sumidero (24 km N Tuxtla Gutierrez), 23 July 1963, E. Fisher (MF 8), 14 M, 2 M gen, 8 F; 16 Aug 1964, E. Fisher (MEX 115), 1 F; 17 Aug 1964, E. Fisher and D. Verity (MEX 119), 2 1pM (119-15,16), 1 pF (119-10), 16 L; same data (MEX 128), 3 M, 1 M gen, 4 F; 18 Aug 1964, D. Verity (MEX 129), 3 1pM (129-10,11,14), 2 1p (129-12,13), 9 L [UCLA] . *Guerrero:* Chilpancingo, 25 Aug 1949, A. Paoliello, 2 M, 2 F [USNM] . Chilpancingo (1.6 km S), 29 Aug 1964, D. Verity (MEX 139), 2 1pF (139-14,16), I pM (139-12), 1 pF (139.13), 1 1p (139-15), 1 M, 1 L [UCLA] . *Morelos:* Cuernavaca, 6 Nov 1938, H.W. Kumm, 3 M, 1 F [UCLA] . Vicinity of Teportlan, 7 Sept 1965, D.A. Schroeder (MEX 348), 1 1p (348-10), 1 L; same data (MEX 353), 2 1pM (353-10,11), 1 pF (353-100), 2 1p (353-12,13), 1 P, 11 L; 28 June 1970, K. and D.A. Schroeder (MEX 506), 2 IpM (506-10,11), 2 1pF (506-12,13); same data (MEX 510), 5 1pM (510-10-12,14,18), 6 1pF (510-13,15-17,19,90), 2 pF (510-102,103), 1 P, 13 L; same data (MEX 512), 1 L; 11 Aug 1970, K. and D.A. Schroeder (MEX 623), 3 1pF (623-10,12,13), 1 M, 1 P, 1 L; same data (MEX 626), 1 1pF (626-17), 1 F, 1 P; same data (MEX 629), 4 IpM (629-11-14), I 1pF (629-15), 1 pF (629-10); same data (MEX 630), 1 1pF (630-10); same data (MEX 631), 7 1pM (631-10,14,16,23,25,28,29), 14 1pF (631-11-13,15,17-22,24,26, 27,30), 8 pM (631-31,100,103,105-109), 4 pF (631-32,101,102,104), 2 M, 1 F, 9 P, 16 L; same data (MEX 632), 2 1pF (632-12,13), 3 pM (632-100,101,103), 2 1p (632-10,11), 1 M, 4 F, 3 P, 6 L; same data (MEX 633), 3 1pF (633-10,12,14), 2 Ip (633-11,13), 2 M, 2 P [UCLA]. *Nuevo Leon:* Sabinas Hidalgo, 6-16 Oct 1943, B. Brookman, 2 F [UCLA] . *Oaxaca:* Almoloya, 20 July 1905, F. Knab (310), 1 1pF (310c), 1 M, 1 M gen, 3 F [USNM]. Oaxaca, 21 June 1944, B. Brookman, 1 M, 3 F [UCLA] . *Puebla:* Izucar de Matamoros, 16 Aug 1944, B. Brookman, 4 M [UCLA]. *Veracruz:* Cordoba, 4 Jan 1908, F. Knab, 2 M, 2 F, 2 L [USNM] ; 22 July 1964, E. Fisher and D. Verity (MEX 73), 1 1pM (73-12), 1 pF (73-11), 1 P, 34 L; 26 July 1965, D.A. Schroeder (MEX 234), 3 1pM (234-32-34), 3 pM (234-30,31,109), 4 pF (234-103-105,108), 1 M gen, 22 L [UCLA] . Fortin de las Flores, 27 July 1965, R.X. Schick and D.A. Schroeder (MEX 236), 1 1pM (236-21), 9 1pF (236-20,22-29), 7 pM (236-102-104,110-113), 8 pF (236-100,101,105-109,114), 2 M gen, 16 P, 33 L; 3 Aug 1965, D.A. Schroeder (MEX 269), 3 1pM (269-10,11,13), 2 1pF (269-12,14), 1 pM (269-16), 1 pF (269-17), 1 1p (269-15), 1 M gen, 3 L; 7 Aug 1965, R.X. Schick and D.A. Schroeder (MEX 278A), 1 pF (278A-100); 9 Aug 1965, R.X. Schick and D.A. Schroeder (MEX 288), 3 1pF (288-10-12), 1 P; 21 Aug 1966, D.A. Schroeder (MEX 440), 1 pF (440-100), 1 L [UCLA] . Orizaba, 11 Aug 1965, R.X. Schick and D.A. Schroeder (MEX 292), 1 1pM (292-21), 1 1pF (292-20), 1 pM (292-22), 5 pF (292-23-25,100,101), 1 P, 2 L [UCLA] .

PANAMA. *Panama:* Pacora, 1 Aug 1950, 10 L [UCLA] .

UNITED STATES. *Arizona:* Grand Canyon, Grand Canyon National Monument, Mohave Co., May 1970, M.J. Nelson, I M, 1 M gen, 1 F [UCLA]. Madera Canyon, Santa Rita Mts., Santa Cruz Co., 22 Aug 1954, W.A. McDonald (UCLA 134), 2 1pM (134-103,104), 1 pM (134-102), 2 pF (134-101,105), 2 M gen, 4 P, 2 L [UCLA]. Mendoza Canyon, Coyote Mts., Pima Co., 5 Sept 1969, T.J. Zavortink (UCLA 620), 2 1pM (620-10,17), 7 1pF (620-11-14,16,19,20), 2 Ip (620-15,18), 1 pM (620-100), 7 M, 2 M gen, 3 F, 10 P, 21 L; 6 Sept 1969, T.J. Zavortink (UCLA 625), 1 1pM (625-10), 5 1pF (625-11-15), 6 pM (625-100-102,104,106,108), 8 pF (625-103,105,107,109-113), 23 M, 22 F, 52 P, 86 L [UCLA]. Sabino Basin, Santa Catalina Mts., Pima Co., 23 Aug, C.H.T. Townsend, 1 F [USNM] Sabino Canyon, Santa Catalina Mts., Pima Co., 7 Aug 1963, J.F. Burger (UCLA 396), 10 M, 20 F, 3 M gen, 8 L; 25 July 1965, J.F. Burger (UCLA 279), 39 P, 57 L; 12 Sept 1968, T.J. Zavortink (UCLA 447), 1 IpM (447-12), 3 1pF (447-10,14,15), 1 Ip (447-13), 8 pM (447-100-102,105,106,110,111,113), 2 pF (447-

103,104), 15 M, 22 F, 56 P, 18 L; same data (UCLA 479), 10 1pM (479-10,12,13,16-18,20, 23,24,29), 14 1pF (479-11,14,19,21,22,25-28,40-44), 1 1p (479-15), 4 pM (479-101-104), 2 pF (479-100,105), 2 M gen, 10 L [UCLA]. *Arkansas:* Locality not specified, 1938 (Florida No. 2145), 1 M, I F, 10 L [USNM]. *Missouri:* Neosho, Camp Crowder, 26 July-26 Aug 1942, A.B. Gurney, 6 M, 2 F, 1 M gen [USNM]. Shoal Creek near Redings Mill, Newton Co., 1-26 Aug 1942, A.B. Gurney, 7 M, 1 F, 1 M gen, 2 L [USNM]. Table Rock Reservoir, 15 July 1959, L.D. Beadle, 2 L [CDC]. *New Mexico:* Last Chance, in mountains of SE New Mexico, Aug-Oct 1938, H.W. Kumm, 1 F [UCLA]. *Oklahoma:* Locality not specified, June 1951, 1 M gen [CDC]. *Texas:* Austin, 23 Oct 1901, A.L. Melander, 7 F [USNM]. Buchanan Dam, central Texas, 30 Apr 1938, C.P. Coogle, 2 F [USNM]. Canyon, Sept 1933, 2 F [USNM]. Chisos Mts., Big Bend National Park, Brewster Co., I Sept 1969, T.J. Zavortink (UCLA 608), 4 1pF (608-10-13), 1 1p (608-14) [UCLA]. New Braunfels, 26 July-3 Aug 1942, E.S. Ross, 3 M, 3 F, 3 L [USNM]. Onion Creek, Travis Co., 4 Sept 1943, D. Eyles, 15 M, 5 F [USNM], 1 L [CDC]. Travis Co., Oct 1967, B. Hoffmann, 5 M, 5 F, 2 M gen, 10 L [USNM]. *Utah:* Arches National Monument, Grand Co., Sept 1969 (Univ. Utah lab colony, F_6), 15 M, 45 F, 3 M gen, 60 P, 106 L [UCLA].

Additional Records From the Literature

MEXICO. *Baja California Sur:* Triunfo (Aitken, 1942:166-167; as *atropalpus).*

NICARAGUA. (Dyar, 1928:221, as *perichares).*

UNITED STATES. *Colorado:* Arboles, Archuleta Co. and Uravan, Montrose Co. (Harmston and Lawson, 1967:17; as *atropalpus). Kansas:* (See Carpenter and LaCasse, 1955:254; as *atropalpus).*

18. *Aedes (Ochlerotatus) atropalpus* (Coquillett)

Figs. 45,48-50

1902. *Culex atropalpus* Coquillett, 1902:292. TYPE: *Lectotype* female, Plummer's Island, Montgomery Co., Maryland, United States of America, 16 July 1902, H.S. Barber [USNM; selection of Stone and Knight, 1956:215].

Aedes (Finlaya) atropalpus of Edwards (1932:153, in part); Matheson (1944:186-187, in part); Carpenter, Middlekauff and Chamberlain (1946:220-224, in part); Carpenter (1949:173; 1950: 64); Darsie (1951:15); Knight and Marks (1952:525,546); Carpenter and LaCasse (1955:253-255, in part); Stone, Knight and Starcke (1959:159, in part).

Aedes atropalpus of Dyar and Knab (1906:192, in part; 1908:54); Howard, Dyar and Knab (1917:638-642); Gibson (1937:105); Owen (1937:30-31); Davis (1940:49); Jakmauh (1940: 17); Knutson (1943:318); Headlee (1945:142-147); Chamberlain, Sikes, Nelson and Sudia (1954:281,283); Steward and McWade (1960:143); Shaw and Maisey (1961:12-16); James (1964:325-329).

Aedes atropalpus atropalpus of O'Meara and Craig (1970a:I398).

Aedes (Taeniorhynchus) atropalpus of Dyar (1918:74,79; I922b:85; 1928:213-214, in part).

Aedes (Gualteria) atropalpus of Vargas (1950:62); Vargas and Downs (1950:171).

Ochlerotatus atropalpus of Coquillett (1906c:20).

For additional references see Howard, Dyar and Knab (1917:638-639), Carpenter and LaCasse (1955:254) and Carpenter (1968:83).

FEMALE (fig. 48). Wing: 3.37 mm. Proboscis: 2.60 mm. Forefemur: 2.02 mm. Abdomen: about 3.0 mm. *Head:* Eyes broadly separated above antennae, the shortest distance between them 2.5-4.0 times the diameter of 1 ommatidium. Erect scales usually dingy-yellow to golden mesally and brown laterally, sometimes entirely dingy-yellow or entirely brown. Decumbent scales white, dingy-white, cream

or yellowish, usually more intensely pigmented laterally. Dorsolateral surface with small to large brown patch. Torus with patch of small white to dingy-white or dark scales. Scales of flagellar segment 1 whitish to yellowish, sometimes some brown. *Thorax:* Integument of mesoscutum brown to dark brown. Acrostichal and anterior dorsocentral bristles absent from disc; humeral, lateral prescutal and posterior fossal bristles absent. Background scales of mesoscutum entirely or predominantly dark bronzy-brown, sometimes a golden acrostichal line or transverse anterior band developed; scales of median anterior patch, anterior lateral crescent, posterior outer dorsocentral line, supraalar area and prescutellar area predominantly pale yellowish-cream to light golden; anterior lateral crescent very broad, extending mesad to dorsocentral area. Scutellar scales yellowish to golden. Narrow curved scales along upper edge of *ppn* usually entirely pale yellowish to golden, sometimes some or all bronzy-brown. *Legs:* Hindfemur usually entirely white scaled in basal 0.3-0.5 and with the white scales extending farther toward apex ventrally. *Wing:* White scales at base of costa extending distad to crossvein *h* at least on ventral and leading surfaces. *Abdomen:* Sternite II white scaled; more proximal of sternites III-VII with moderately large to large lateral apical or subapical dark patch, more distal with complete broad apical dark band.

MALE (fig. 48). Similar to female except for sexual characters. *Head:* Palpus about 0.66-0.72 length of proboscis. *Thorax:* One posterior fossal bristle frequently developed.

MALE GENITALIA (fig. 49). Claspette filament usually brownish and more deeply pigmented than claspette stem and sidepiece. *Segment VIII:* Bristles of tergite fewer and shorter than in *epactius. Sidepiece:* Specialized setae of basal tergomesal area moderately numerous, arranged more or less in a narrowly elliptical patch of 2-4 rows, the setae of the more distal 1 or 2 rows fine and shortened; setae of mesal half of tergal surface predominantly short, fine and curved toward apex of sidepiece; usually none of the enlarged setae of sternomesal surface conspicuously curved dorsad. *Claspette:* Apical seta of stem relatively short, fine, straight or slightly curved dorsad.

PUPA (fig. 49). Abdomen: about 3.6 mm. Trumpet: 0.52 mm. Paddle: 0.74 mm. *Paddle:* Distal portion of inner half usually without submarginal spicules.

LARVA (fig. 50). Head: 1.04 mm. Siphon: 0.71 mm. Anal Saddle: 0.33 mm. *Head:* Weakly and moderately to strongly pigmented, largely yellow to tan, darker posteriorly and much darker, brown to blackish, anteriorly. Mental plate usually with 8 or 9 (8-10) teeth on each side of median tooth. *Antenna:* Strongly pigmented, largely dark brown to blackish, its base much darker than antennal prominence. *Thorax:* Hair 1-M moderately to strongly developed, long. *Segment VIII:* Comb scales usually numerous, 34-62 (24-90). *Siphon:* Base in mature larva irregularly sclerotized ventrally between rows of pecten teeth, so that there is an extensive basal ventral membranous area. Pecten teeth usually 18-25 (15-28), those at base of row frequently irregular in size, shape and position, and frequently arising from separate small sclerotizations or from the membranous area.

SYSTEMATICS. *Aedes atropalpus* differs from *epactius* as follows: in the **adult** by (1) the more widely-spaced eyes, which are separated by at least 2.5 ommatidial diameters, (2) the ornamentation of the mesoscutum (see below), (3) the ornamentation of the hindfemur, which is usually entirely white scaled in the basal 0.3-0.5, (4) the usual absence of posterior fossal bristles in the female, and (5) the shorter palpus of the male, which is usually 0.66-0.72 length of the proboscis; in the **male genitalia** most conspicuously by (1) the fewer specialized setae

of the basal tergomesal area of the sidepiece and their arrangement in a narrowly elliptical patch of 2-4 rows, (2) the setae on the mesa! half of the tergal surface of the sidepiece, which are predominantly short, fine and curved toward the apex of the sidepiece, (3) the relatively short, fine and usually straight or but slightly curved apical seta of the claspette stem, and (4) the fewer but stouter bristles on tergite VIII; and in the larva by (1) the darkly pigmented antenna and anterior portion of the head capsule that contrast with the more lightly pigmented antenna] prominence, (2) usually greater number of comb scales (usually more than 34), (3) the almost universal presence of an extensive unsclerotized area at the base of the ventral surface of the siphon in the mature fourth instar larva, and (4) the usually more strongly developed and longer hair 1-M. Pupae of *atropalpus* and *epactius* are usually indistinguishable, but there is a greater tendency for the small submarginal spicules on the distal portion of the inner half of the paddle not to be developed in *atropalpus.*

The mesoscutal ornamentation of *atropalpus* is variable, but there are always dark bronzy-brown scales in a broad median longitudinal stripe or pair of paraacrostichal lines and laterad of the posterior dorsocentral bristles, and there are always yellowish-cream to light golden scales extending from the dorsocentral area to the lateral edge in the anterior 0.50-0.67 of the mesoscutum, in a median anterior patch, among the supraalar bristles, in a broken or complete posterior outer dorsocentral line, and in separate or united anterior and lateral prescutellar patches. There may be additional yellowish to golden scales in a broken or complete acrostichal line and/or a transverse anterior band.

I believe *atropalpus* is more primitive than *epactius* because it shares several characters with *fluviatilis* that *epactius* does not and because it is restricted to a stable area of ancient rock.

BIONOMICS. The immatures of *atropalpus* are found in holes in rock and concrete and in rock-filled pools. They are rarely associated with the immatures of *Ae. (Protomacleaya) triseriatus.* Adults of *atropalpus* are attracted to lights and females are attracted to humans and bite freely in the vicinity of their breeding sites.

In the laboratory, this species has been found to be an efficient vector of eastern equine encephalomyelitis (Davis, 1940:49; Jakmauh, 1940:17; Chamberlain et al., 1954:281,283) and western equine encephalomyelitis (Chamberlain et al., ibid.).

DISTRIBUTION (fig. 45). *Aedes atropalpus* occurs in southeastern Canada and the eastern United States where it extends from Minnesota and Maine south to Alabama and Georgia. Material examined: 748 specimens; 238 males, 303 females, 151 larvae, 56 pupae; 6 individual rearings (5 larval, 1 pupal).

CANADA. *Quebec:* Mouth of Metamelt River, 28 July 1928, J.0. Maloney, 2 M, 2 M gen, 7 F [USNM] .

UNITED STATES. *Alabama:* Auburn, Chewacla State Park, 27 Apr 1953, W.L. Seal, 3 L [USNM] . *Connecticut:* Double Beach, 24 Aug 1904, P.L. Butrick, 2 M, 1 M gen [USNM] *District of Columbia:* Catholic University, July 1905-7 Oct 1906, T. Pergande, 4 M, 2 F [USNM]. Chain Bridge, Sept 1906, T. Pergande, 4 M, 7 F; 17 Aug 1914, H.G. Dyar, 1 M, 2 F [USNM]; 11 June 1943, N.E. Good, 29 L [UCLA] . Locality not specified, 20-21 May 1903, W.V. Warner, 1 M, 1 F; 10 Apr 1945, N.E. Good, 2 M, 1 F [USNM] ; 8 May 1937,10 M; 16 Oct 1941, 1 M; June-Aug 1943, N.E. Good, 19 M, 9 F [UCLA] . *Georgia:* Atlanta, 24 Mar-7 Apr 1950, H.D. Pratt, 3 M, 1 F [CDC] . Furman Shoals, Oconee River, Baldwin Co., 21 Mar 1948, D. Eyles, 5 M, 2 F [CDC] , 2 M, 1 M gen, 2 F, 4 L [USNM] . Milledgeville, H.D. Pratt, 3 L [CDC] . Tallulah Gorge, 29 Mar 1950, Cole and Wall, 7 M, 13 F, 3 M gen, 5 L [CDC] . *Kentucky:* Cumberland Falls,

12 Aug 1948, N.E. Good, 1 M, 2 F, 1 M gen [CDC] . *Maine:* Georgetown, 24 July 1945, J.L. Bean, 3 F [CDC] . Islesboro, Aug 1928, J.M. Aldrich, 1 M [USNM] . Mt. Desert Island, 12-25 July 1955, 2 M, 1 M gen [CDC] ; 1-12 July 1955, F.R. Shaw, 6 L [USNM] . Orono, 18 July 1911, 1 F [CU]. Locality not specified, Sept 1922, 1 F [CU]. *Maryland:* Bethesda, Oct 1946, 9 L; 1950, H.L. Trembly, 5 M, 12 F [CDC] . Great Falls, Sept 1903, J. Kotinsky, 10 P, 1 L [USNM] . Potomac River, May 1930, 1 M, 1 M gen [CU] ; 11 P, 15 L [USNM]. Plummer's Island, 18 May 1902-20 June 1905, H.S. Barber, 14 F; 29 Aug 1912, A.N. Caudell, 2 F; 9-24 June 1902, R.P. Currie, 6 F; 2 July-26 Aug, R.P. Currie, 5 F; May 1904, H.G. Dyar, 2 L; Oct, H.G. Dyar, 2 M, 2 M gen; 30 May 1909, F. Knab, 1 F; 24 Aug 1907-14 July 1912, W.L. McAtee, 3 F; 7 June-24 July 1903, W.V. Warner, 1 M, 2 F; 24 June 1906, 1 F; 2 M, 3 F [USNM] ; 27 June 1965, W. Grimm (UCLA 283), 5 1pF (283-11-15), 1 pM (283-101), 7 M, 4 M gen, 13 F, 9 P, 6 L [UCLA] . Stubblefield Falls, Slagu Island, May 1903, W.V. Warner, 1 M, 1 F; May 1904, H.G. Dyar, 9 L [USNM] . *Maryland ?:* NIH Colony, H.L. Trembly, 24 M, 27 F [USNM] . *Massachusetts:* Cummington, July 1903, F. Knab (39), 6 M, 8 F, 1 M gen, 5 P, 3 L; same data (41), 1 M, 1 M gen, 1 L [USNM] . Essex Co., June 1967, G.F. O'Meara, 5 M, 5 F, 10 L [USNM] . *Michigan:* Isle Royale, 25 July 1957, R.W. Hodges, 1 F [USNM] . *Minnesota:* Gooseberry Falls, Lake Co., 13 July 1952, A.R. Barr, 1 P, 1 L [USNM]. Jay Cooke State Park, Carlton Co., 18 July 1932 and 25 July 1934, W.B. Owen, 3 M, 2 F, 2 M gen [USNM] . *New Hampshire:* Center Harbor, H.G. Dyar, 1 F [USNM] . White Mts., Morrison, 3 F [USNM] . *New York:* Deferiet, 30 June 1934, 1 M gen [CU]. Forestport, 8-June 1933-18 June 1938, R. Matheson, 1 M, 1 F, 1 L [CDC] , 2 M, I F, 1 M gen [UCLA] , 5 M, 1 M gen, I F, 13 L [CU] , 1 L [USNM] . New Rochelle, 3 Aug 1945, 5 M, 2 F [CDC] . Old Forge, Long Lake, 23 Aug 1922, R.C. Shannon and Sibley, I F [CU] . Plattsburg, 25-30 July 1905, 2 F, I M gen, 1 L [CU] ; 21 July 1905, J.M. Aldrich, 1 F [USNM] . Tupper Lake, H.G. Dyar, 2 P, 2 L [USNM] . Wilmington, 31 July 1929, A.L. Melander, 4 M [USNM] *North Carolina:* Chimney Rock, June 1921, H.P. Barret, 4 F [USNM] . *Pennsylvania:* Shenk's Ferry, 21 Oct 1901, S.E. Weber, 2 F [USNM]. *Tennessee:* DuPont Springs, 19 May 1935, ⅂ L [USNM] . *Vermont:* Pittsford, 5,6 Aug 1916, 7 M, 2 F [CU] ; 5 Aug 1916, G.W. Herrick, 2 M, 1 M gen, 2 F [USNM] . Readsboro, 15 June 1934, 2 F [USNM] . *Virginia:* Dead Run, 7 July, R.C. Shannon, 1 F [USNM] . Difficult Run, 11 July 1906, H.S. Barber and F. Knab, 5 F [USNM] . Great Falls, Oct 1904-May 1907, T. Pergande, 24 M, 29 F; Aug 1920, C.T. Greene, 10 M, 12 F; Sept 1913, E. Martini, 4 M, 6 F; 14 Sept 1913, F. Knab, 8 M, 3 F; 8 May 1949, C.W. Sabrowsky, 1 F; Aug 1903, J. Kotinsky, 2 F; June 1911, 2 M, 4 F; 4 Oct 1936, 3 L; Conrad, 1 M; 1 M, 7 F [USNM] . Mt. Solon, 20 June 1950, A. Stone, 1 F [USNM] . Occoquam, 29 Sept 1935, A. Stone, 1 M, 1 F, 8 L [USNM] . Plummer's Island, Maryland (near), 20 May 1914, R.C. Shannon, 1 M gen [USNM]. Richmond, 26 Sept 1901, E.G. Williams, 3 M, 2 F; 22 May 1947, W.E. Bickley, 1 M, 1 F [USNM] Rosslyn, July 1910, T. Pergande, ⅂ F [USNM] . Locality not specified, Aug 1903, T. Pergande, 21 M, 2 M gen, 30 F [USNM] .

LOCALITY UNKNOWN. W.V. Warner, 3 M, 3 F; Florida No. 1922, 1 M, 3 F; 2 M, 2 M gen, 12 P, 8 L [USNM] ; 1 F [CDC] ; ⅂ M gen, 1 L [CU] .

Additional Records From the Literature

CANADA. *Labrador:* (Steward and McWade, 1960:143). *Ontario:* Cordova Mines (James, 1964:325-329). Ottawa River, Fitzroy Harbour (Gibson, 1937:105). *Quebec:* Chaadiere River, Beauceville (Carpenter, 1949:173). Norway Bay, St. Gedeon and Tadoussac (Shaw and Maisey, 1961:12-16).

UNITED STATES. *New Jersey:* (Headlee, 1945:142-147). *Rhode Island:* Narragansett (Knutson, 1943:318). *South Carolina:* Chattooga River, Long Creek, Oconee Co. (Carpenter, 1950:64). *West Virginia:* Shenandoah River, Charles Town, Jefferson Co. (Carpenter, 1950:64). *Wisconsin:* Jim Falls, Chippewa Co. (O'Meara and Craig, 1970a:1398).

FLUVIATILIS GROUP

19. *Aedes (Ochlerotatus) fluviatilis* (Lutz)

Figs. 45,51-53

1904. *Culex fluviatilis* Lutz, 1904a:8, 1904c:4. TYPE: *Lectotype* female, the *holotype* of *tripunctata* Theobald, 1907, Franca, Rio Grande, Sao Paulo, Brazil, 23 Sept 1903, A. Lutz [BM; selection of Belkin,1971:20].

1907. *Danielsia mediomaculata* Theobald, 1907:245-246. TYPE: *Lectotype* male, Para [= Belem], Para, Brazil, E.A. Goeldi [BM; selection of Belkin, 1968:6] . Synonymy with *fluviatilis* (Lutz, 1904) by Howard, Dyar and Knab (1917:717).

1907. *Danielsia tripunctata* Theobald, 1907:247-248. TYPE: *Holotype* female, Franca, Rio Grande, Sao Paulo, Brazil, 23 Sept 1903, A. Lutz [BM; see Belkin, 1968:8]. Synonymy with *fluviatilis* (Lutz, 1904) by Bonne-Wepster and Bonne (1921:23) and Belkin (1971: 20).

1907. *Aedes lithoecetor* Dyar and Knab, 1907:201. TYPE: *Lectotype* female (101.5), upper Rio Chagres between Alhajuela and San Juan, Panama, Panama, larva from rockhole, 20 May 1907, A. Busck [USNM; selection of Stone and Knight, 1956:220] . Synonymized with *fluviatilis* (Lutz, 1904) by Howard, Dyar and Knab (1917:717); resurrected by Dyar (1928:220); NEW SYNONYMY.

1922. *Aedes draconarius* Dyar, 1922c:194-195. TYPE: *Lectotype* female, St. Laurent du Maroni, Guyane, French Guiana, 1909, E. Brimont [USNM; selection of Stone and Knight, 1957:201]. Synonymy with *fluviatilis* (Lutz, 1904) by Dyar (1928:219).

Aedes (Finlaya) fluviatilis of Edwards (1932:153); Knight and Marks (1952:538,562); Lane (1953:692-695); Stone, Knight and Starcke (1959:162); Forattini and Rabello (1960:87-94); Forattini (1965:383-388).

Aedes (Taeniorhynchus) fluviatilis of Dyar (1918:74,79; 1925:146; 1928:219-220); Davis and Shannon (1931:24-25,27-28); Soper, Penna, Cardoso, Serafim, Frobisher and Pinheiro (1933: 583).

Aedes (Culicelsa) fluviatilis of Dyar (1921 b:36); Bonne and Bonne-Wepster (1925:415-418).

Aedes fluviatilis of Howard, Dyar and Knab (1917:717-721); Bonne-Wepster and Bonne (1921: 23); Dyar (1922c:195).

Gualteria fluviatilis of Peryassu (1908:181-182).

Culicada fluviatilis of Theobald (1907:342-344).

Culex fluviatilis of Lutz (1905:48-49).

Aedes (Taeniorhynchus) lithoecetor of Dyar (1928:220).

Aedes (Finlaya) lithoecetor of Lane (1953:697-699); Stone, Knight and Starcke (1959:166); Forattini (1965:393-394).

Aedes (Gualteria) lithoecetor of Vargas (1950:62).

Aedes lithoecetor of Kumm, Komp and Ruiz (1940:417).

Aedes mediomaculata of Dyar and Knab (1907:201).

Aedes tripunctata of Dyar and Knab (1907:201).

For additional references see Howard, Dyar and Knab (1917:717); Dyar (1928:219,220); Lane (1953:692,697-698); and Travis and Labadan (1967:8-9).

FEMALE (fig. 51). Wing: 2.73 mm. Proboscis: 2.20 mm. Forefemur: 1.68 mm. Abdomen: about 2.8 mm. *Head:* Eyes moderately to broadly separated above antennae. Orbital bristles moderately numerous, 4-7 mesal pairs strongly developed, 4 or 5 lateral pairs moderately developed. Head scales predominantly cream-colored, light ash-gray or very pale golden, usually some lateral erect scales and some dorsal and dorsolateral broad flat scales brown. Proboscis longer than forefemur. Torus with moderate to large patch of light or light and dark scales; flagellar seg-

ment 1 with patch of light scales. *Thorax:* Integument tan to dark brown. Acrostichal and dorsocentral bristles usually absent from disc, rarely a few weak anterior acrostichals and posterior dorsocentrals developed; 1 or 2 strong humeral bristles usually developed, lateral prescutal and posterior fossal bristles absent; parascutellar bristle present. Mesoscutal ornamentation extremely varied: anterior half of mesoscutum ranging from (1) predominantly silver-white, light ash-gray and/or very pale golden scaled with slightly darker, more distinctly golden or coppery scales in anterior dorsocentral area and sometimes fossal area to (2) predominantly dark bronzy-brown scaled with a few yellowish to cream-colored scales in median and lateral patches on anterior promontory and slightly to conspicuously lighter and more distinctly golden or coppery scales in lateral prescutal and posterior fossal areas and sometimes anterior dorsocentral area; posterior half of mesoscutum predominantly coppery to dark bronzy-brown scaled with silver-white, cream-colored and/or pale golden scales in small to large supraalar patch and separate or united median and lateral prescutellar patches and sometimes in posterior acrostichal and posterior outer dorsocentral lines. Scutellar scales silver to pale golden. Paratergite usually with few to numerous scales in lower anterior portion, sometimes bare. *Apn* scales usually predominantly pale golden to golden but sometimes predominantly or entirely coppery to brown; *ppn* with scales entirely or predominantly narrow curved, usually cream-colored to pale golden or golden along upper and posterior margins or in upper anterior and lower posterior portions and coppery to dark bronzy-brown on disc, but varying from entirely light ash-gray or pale golden to entirely dark bronzy-brown; additional patch of dingy-white broad flat scales frequently developed in lower portion of *ppn;* pleural patches white to tlingy-white or pale golden; *ssp* line usually broadened or extended dorsad anteriorly; *psp* usually without scales; upper posterior portion of *pcx* membrane and/or adjacent ridge usually with a few scales. *Legs:* Outer surface of hindcoxa predominantly bare. Forefemur with light scales in moderately long streak on dorsal and/or upper part of posterior surface and sometimes in short streak at base of ventral surface; midfemur with light scales in moderately long to long streak on posterior surface and sometimes in short streak at base of dorsal and/or ventral surface; hindfemur usually entirely light scaled in basal 0.4-0.5 and dark scaled apically, dark scales sometimes scattered along dorsal surface in basal portion. Knee spots very small to moderate. Tibiae sometimes with light scales in very small patch or band at apex. Tarsi with white to dingy or pale golden scales in dorsal patch or band at base of segments 1-3, 4 or 5 and sometimes in small dorsal patch at apex of segment 1 or segments 1 and 2; light marking progressively smaller on more distal segments, usually progressively larger on more caudal legs; additional pale scales sometimes in streak on posterior and/or ventral surface of tarsal segment 1 of foreleg and midleg and tarsal segments 1 and 2 of hindleg. *Wing:* Costa usually with small white patch at base. *Haltere:* Scales dark or dark and light. *Abdomen:* Laterotergite with scales along lower edge. Tergites II-VII dark scaled with white to dingy-white or pale golden scales in basolateral patch that extends to or nearly to apex of segment laterally, usually in middorsal basal or submedian patch or middorsal streak to near apex of segment on all or only more proximal and/or more distal segments, and sometimes in narrow incomplete to moderately broad complete basal band on more proximal segments. Sternites light scaled with dark scales usually in small to moderate lateral or sublateral apical to median patch or streak and sometimes in very narrow apical band on more distal segments.

MALE (fig. 51). Similar to female except for sexual characters. *Head:* Palpus about 0.70-0.95 length of proboscis; segment 4 swollen; apex of segment 3 and all of segment 4 with numerous bristles, segment 5 with few bristles; dark scaled with inconspicuous to conspicuous light patch at base of segment 5, segments 4 and 5, or segments 3-5. Torus with scales; flagellar segment 12 longer than segment 13. *Thorax:* Mesoscutum usually more extensively light scaled than in female from same collection. *Abdomen:* Tergites frequently with basal light band.

MALE GENITALIA (fig. 52). *Sidepiece:* Moderately long; basal tergomesal area slightly to conspicuously swollen, with a clump of setae, but with only a few (3-9) of the more dorsal and basal of these setae enlarged; setae of sternomesal surface strong and straight or very strong, sinuous and conspicuously curved dorsad. *Claspette:* Stem moderately long to long; with weakly developed setae; filament terete to flattened, sometimes conspicuously expanded and striate. *Clasper:* Broadest at base.

PUPA (fig. 52). Abdomen: about 2.8 mm. Trumpet: 0.46 mm. Paddle: 0.61 mm. *Cephalothorax:* Weakly to strongly pigmented, lighter ventrally. *Trumpet:* Very light brown to brown, usually slightly darkened toward apex. *Abdomen:* Weakly to strongly pigmented, sometimes lighter posteriorly. Hair 1-II moderately developed, usually 7-20b (5-25); hair 1-III-V moderately developed, usually 2-4b (1-6); hair 1-VI,VII weakly to moderately developed, usually 1-3b (1-4) on VI, single or double on VII. Hair 5-IV,V 1.3-2.2 length of corresponding segment. Hair 8-VI,VII frequently dorsal. *Terminal Segments:* Male genital lobe moderately large, about 1.0-1.2 length of tergite VIII. *Paddle:* Apex usually rounded, sometimes slightly emarginate. Paddle without conspicuous wrinkles near apex of midrib.

LARVA (fig. 53). Head: 1.01 mm. Siphon: 0.83 mm. Anal Saddle: 0.33 mm. *Head:* Weakly to strongly pigmented, ocular area lighter, collar darker. Hair 5-C 3-5b, mesad of 6-C. Hair 6-C usually single or double (1-3b). Hair 7-C 5-8b (4-9). Mental plate usually with 9-11 (7-11) teeth on each side of median tooth. *Antenna:* Weakly to strongly pigmented. *Thorax:* Hairs 1-3-P arising from alveolar plate. Tubercles of hairs 5,6-P sometimes joined. Hair 1-M long, usually single (1-3b). Hair 5-P usually single (single or double). Hairs 13-T and 14-M weakly developed, 5-30b. *Abdomen:* Hair 1-IV,V moderately to strongly developed, usually single or double (1-4b). Hair 6-III-V usually single or double (1-3b). Hair 13-IV,V single or double. *Segment VIII:* Comb scales irregularly cleft and fringed; 30-110 in number. *Siphon:* Moderately long; index 2.5-3.1. Acus well developed, attached. Pecten teeth 9-23, in an even row, the apical teeth not detached. Hair 1-S arising near or beyond end of pecten. *Anal Segment:* Saddle small to moderate in size. Ventral brush strongly developed; hair 4a-X usually 4-6b (3-7); hair 4b-X usually 4-6b (3-8); hair 4c-X usually 6-8b (5-8).

SYSTEMATICS. *Aedes fluviatilis* is distinguished from the species of the related Atropalpus Group by the following characters: in the adult by (1) the absence of well developed posterior dorsocentral bristles, (2) the usual absence of scales on the postspiracular area and the outer surface of the hindcoxa, (3) the usual presence of scales on the lower anterior portion of the paratergite, on the upper portion of the postcoxal membrane and/or the adjacent ridge, and on the lower edge of the laterotergite, (4) the smaller light tarsal markings that are largely restricted to the base of the segments, (5) the predominantly dark scaled hindtarsal segment 5, and (6) the relatively dense vestiture of bristles on palpal segment 4 of the male; in the male genitalia by (1) the relatively few enlarged setae that are largely restricted to the more basal and dorsal portions of the clump

of setae in the basal tergomesal area of the sidepiece, and (2) the usually flattened and sometimes broadened and striate claspette filament; in the **pupa** by (1) the longer hair 5-IV,V, which is about 1.3-2.2 times longer than the corresponding tergite, (2) the smaller male genital lobe, which is 1.0-1.2 times as long as tergite **VIII,** and (3) the rounded or but slightly emarginate apex of the paddle; and in the **larva** most conspicuously by **(1)** the 3-5-branched hair 5-C, (2) the usually single or double (1-3b) hair **6-III,IV,** (3) the single or double 13-IV,V, (4) the irregularly cleft and fringed comb scales, and (5) the evenly spaced pecten teeth that do not extend far distad of 1-S.

The ornamentation of the adult of *fluviatilis* is extremely variable. The palpus of the male may have a single inconspicuous light patch at the base of segment 5 or conspicuous light patches at the base of segments 3-5. The anterior portion of the mesoscutum of the female varies from predominantly pale golden to light ash-gray or silver-white with slightly darker, more distinctly golden or coppery scales in the dorsocentral area to predominantly dark bronzy-brown with slightly lighter, more distinctly golden or coppery scales in the lateral prescutal and posterior fossal areas and cream-colored to yellowish scales on the anterior promontory. Scales on the head and anterior and posterior pronotal lobes vary from entirely light to partially dark (head) or entirely dark *(apn* and *ppn);* the color tends to vary along with that of the scales on the mesoscutum. The light markings on the tarsi may be basal or partially overlap the joints between segments 1 and 2 and 2 and 3. The abdominal tergites may be entirely dark scaled dorsally or have light scales in a basal band, a middorsal basal or submedian patch or a middorsal streak. Except for the palpus of the male, which is consistently darker in specimens from the northern portion of the range (Mexico to Colombia and Venezuela), these variations are largely nongeographical and specimens approaching the extremes can frequently be found in the same collection or in different collections from the same general area.

The male genitalia of specimens from the Guianas and extreme southern Brazil and adjacent northern Argentina differ in 2 important respects from those of specimens from throughout the rest of the range. In both these areas the filament of the claspette is much broadened and conspicuously striate and the setae of the sternomesal surface of the sidepiece are very strong and conspicuously curved dorsad distally. The significance of these variations is not known.

Larvae from the upper Amazon drainage in Ecuador tend to be slightly neotenic, with fewer teeth on the mental plate (7 or 8 on each side instead of the usual 9-11) and frequently only 5 pairs of hairs in the ventral brush. Again, the significance of these variations is unknown.

In light of the considerable unexplained variability in *fluviatilis,* it is possible that I am confusing 2 or more species. However, I prefer this broad treatment until much more material, particularly adults reared under uniform conditions and with associated larval and pupal skins, is available from South America.

BIONOMICS. The immature stages of *fluviatilis* are usually found in rockholes, rockpools and stream pools, but are also found in ground pools, holes in concrete, treeholes and artificial containers. There is 1 record of them having been found in association with *epactius* in Mexico. Females readily bite humans.

Davis and Shannon (1931:24-25,27-28) showed that *fluviatilis* was a fairly effective vector of yellow fever in the laboratory and Soper et al. (1933:583) believed that this species may actually have been a vector of sylvan yellow fever in Valle do Chanaan, Espirito Santo, Brazil, in 1932.

DISTRIBUTION (fig. 45). *Aedes fluviatilis* extends from the Mexican State of Veracruz south to Ecuador, Bolivia, northern Argentina and southern Brazil. Material examined: 1489 specimens; 332 males, 322 females, 515 larvae, 320 pupae; 183 individual rearings (72 larval, 92 pupal, 19 incomplete).

ARGENTINA. *Misiones:* Iguazu, Cataratas, 7 May 1967, 0. Casal and M. Garcia (ARG 480), 2 1pF (480-14,16), 1 pM (480-101), 2 pF (480-100,103), 1 M gen, 62 L [UCLA] . Iguazu, Sept 1923, 6 F [USNM]

BOLIVIA. *Cochabamba:* Chapare, El Palmar, 9 Oct 1943, Torres-Munoz, 1 F [USNM] . *Santa Cruz:* Cachuela, Vaca Diez, H.P. Carr (2801), 1 M gen [USNM] , 1 F [UCLA] .

BRAZIL. *Bahia:* Aratu, 17-20 May 1943, D. MacCreary, 1 M, 2 F, 1 M gen [USNM] . Rio do Cobre, 1 L [USNM] Ilheus, July 1930, D.E. Davis and R.C. Shannon, 1 F [USNM] . Rio Joanes, 93 M, 1 F, 2 M gen [UCLA] . Piraja, Dec 1928-Dec 1929, D.E. Davis and R.C. Shannon, 5 M gen, 3 L; 1930, 1 M, 1 M gen [USNM] . Locality not specified, May 1933, 1 M, 1 F [CU] . *Goias:* Anapolis, Mar 1936-Dec 1937, R.C. Shannon, 6 M, 2 F, 1 M gen [USNM] , 1 M, 1 F [UCLA] . *Guanabara:* Rio de Janeiro, 8 July 1907, 2 F [USNM] . *Minas Gerais:* Agua Limpa, 26 Mar 1925, F.M. Root, 1 M gen [USNM] . *Para:* Belterra, Santarem, June 1938, 2 F [USNM] . Boa Vista, Rio Tapajos, C.H.T. Townsend, 2 M, 2 F, 2 M gen [USNM] . *Rio de Janeiro:* Iguacu, 2 L [USNM]. *Sao Paulo:* Atibaia (1097), 2 M, 1 M gen [UCLA] , 2 M, 1 M gen, 2 F [USNM] , 1 M, 1 M gen, 1 F [CU] . *Sergipe:* Aracaju, 2 L [USNM] .

COLOMBIA. *Boyaca:* Muzo, Rio Minero, 2 Sept 1941, 1 F [USNM]. *Cundinamarca:* Fusagasuga, Rio Cuja, 29 Oct 1964, E. Osorno et al. (COB 1), 1 1pM (1-29), 1 M gen, 6 P, 4 L [UCLA]. *Meta:* Neiva, Salto de Angostura, 9 Jan 1966, C.J. Marinkelle (COM 54), 28 P, 38 L; same data (COM 55), 23 L [UCLA] . Villavicencio, 9 June 1943, M. Bates, 1 M, 1 M gen [USNM]

COSTA RICA. *A lajuela:* Desamparados, Rio Machuca, 1 Nov 1971, D. Schroeder (CR 495), 4 1pM (495-50,52,55,56), 5 1pF (495-11,12,51,57,58), 1 1p (495-10), 13 pM (495-80,81,85,89, 93,100-102,104,107,112-114), 11 pF (495-82,86-88,90,91,92,94,103,105,111), 9 P, 12 L; same data (CR 506), 7 1pM (506-10,11,13,14,19,34,37), 9 1pF (506-16-18,30,32,33,35,36,38), 5 pM (506-100-104), 2 1p (506-15,31), 2 F, 3 P, 11 L [UCLA] . *Cartago:* Peralta, 4 M, 3 F [USNM] . Turrialba, 2 M, 1 M gen [USNM] ; 19 Oct 1971, D. Schroeder (CR 489), 1 1pM (489-20), 1 L [UCLA] . *San Jose:* San Jose, Hatillo, 23 July 1971, S.J. Heinemann (CR 284), 1 1pM (284-10), 1 L [UCLA]. *Province Unknown:* Suerre, 22 July 1923, A. Alfaro, 1 M [USNM] .

ECUADOR. *Zamora:* Zamora (10 km E), Zamora River, 4 Apr 1965, L.E. Pena (ECU 6), 1 1pF (6-10), 9 pM (6-101-105,107,108,110,111), 5 pF (6-100,106,109,112,113), 4 1p (6-11-14), 2 M gen, 16 P, 57 L [UCLA] . Zamora, Zamora Canyon, 5 Apr 1965, L.E. Pena (ECU 7), 3 pM (7-102,105,106), 4 pF (7-100,103,104,107), 2 M gen, 25 L [UCLA] .

FRENCH GUIANA. *Guyane:* Cayenne, Apr 1943, H. Floch, 3 M, 1 F [USNM] . Le Gallion, 25 Mar 1967, R.X. Schick (FG 189), 1 pF (189-100) [UCLA] . St. Laurent, Maroni River, E. Brimont, 1 M, 1 M gen [USNM] . *Mini:* Petit Saut, 20-21 Mar 1967, R.X. Schick (FG 167), 21pM (167-13,41), 2 1pF (167-40,42), 1 M, 1 F, 2 M gen, 4 L [UCLA] . Petit Saut, Orstom Camp, 20 Mar 1967, R.X. Schick (FG 163), 2 1pM (163-20,22), 5 1pF (163-21,23-26), 1 1p (163-27), 1 M, 2 M gen, 2 F, 3 P, 19 L; same data (FG 164), 2 1pM (164-20,21), 2 1pF (164-22,23), 1 1p (164-24), 1 M, 1 M gen, 1 P, 14 L [UCLA] .

GUYANA. *Essequibo:* Mazaruni, 3 July 1936, W.H.W. Komp, 1 M, 2 F [USNM] .

HONDURAS. *Colon:* Trujillo, 7 Mar 1945, H.H. Crowell, 2 M, 4 F, 2 M gen [USNM] .

MEXICO. *Veracruz:* Cordoba, 4-16 Jan 1908, F. Knab, 13 M, 10 F, 3 M gen, 3 L [USNM] .

NICARAGUA. *Zelaya:* Bluefields, W.F. Thornton, 3 F [USNM].

PANAMA. *Canal Zone:* Ancon, 6 Dec 1917, 1 F [USNM]. Flamenco Island, 12 Aug 1921, C.S. Ludlow, 1 M, 1 M gen; 3 Aug 1923, J.B. Shropshire, 1 F [USNM] . Fort Sherman, 19 May 1939, J.B. Shropshire, 7 F [UCLA]. Madden Dam, 10 Jan 1943, H.C. Mathes, 2 M, 2 F, 3 L [USNM] Sabanas, 8 Oct 1921, J.B. Shropshire, 4 M, 3 F [USNM] . *Chiriqui:* Bambito, 5 Oct 1944, P. Galindo, 2 M, 2 F [USNM] . *Code:* El Valle, 5 June 1945, W.H.W. Komp, 2 M, 13 F, 3 P, 27 L [USNM] , 2 M, 4 F [UCLA] . El Valle, Pozo de las Mozas, 13 Aug 1963 (PA 505), 1 pF (505-101) [UCLA] . Rio Faralloncito, Rio Hato, 12 Oct 1939, 2 F [UCLA] , 2 L [USNM] . Penonome, 6 May 1950, P. Galindo, 1 1p [UCLA] . La Pintada, 30 Sept 1949, 1 M [GML]

Colon: Caldera Island, Portobelo Bay, 4 Jan-8 Apr 1908, A.H. Jennings, 1 M, 4 F [USNM] . Portobelo, 4 Dec 1963 (PA 581), 1 1pF (581-104), 5 pM (581-102,103,105,107,112), 9 pF (581-101,106,108,110,111,113-116), 1 F, 3 M gen [UCLA] . *Darien:* Pucro, Tacarcuna River Valley, 14 June 1963 (PA 388), 1 1pF (388-107), 1 pM (388-106), 3 pF (388-101,103,105), 1 1F (388-104), 1 M gen, 1 P, 12 L [UCLA] . *Panama:* Bella Vista, 15 Oct 1921, J.B. Shropshire, 3 M, 2 F; 18-30 June 1923, J.B. Shropshire, 30 M, 70 F [USNM] . Rio Chagres, A. Busck, 3 M [USNM] . Nuevo Sitio, 10 May 1949, 1 F [GML] . Pacora, La Zumbadora, 15 Feb 1963, (PA 97), 1 1pM (97-101), 1 1pF (97-102) [UCLA] . Paitilla Point, 7 Oct 1936, 8 M, 4 F, 1 M gen; 7 Oct-9 Nov 1939, 4 M, 6 F, 9 P, 11 L; 24 Aug 1941, 2 M, 5 F, 1 M gen [UCLA] ; 10-25 Feb 1922, J.B. Shropshire, 9 M, 8 F; 1-5 Aug 1923, H.G. Dyar and R.C. Shannon, 1 M, 1 F; 15 July 1926, D.P. Curry, 1 M, 1 M gen; May 1935, 1 M gen, 17 L; 7 Oct 1939, 6 L; 24 Aug 1941, 1 1p; no date, 1 L [USNM] . San Carlos, Rio Teta, 22 Aug 1963 (PA 531), 6 1pM (531-102,104-106,112,124), 6 1pF (531-107-111,129), 2 1F (531-103,117), 3 1p (531-115,125,126), 2 M gen, 6 L [UCLA] . *Province not Specified:* 1 F [GML] , 19 Oct 1939, 1 M, 5 F [UCLA] .

SURINAM. *Suriname:* Paramaribo, J. Bonne-Wepster, 2 M, 3 F, 1 M gen, 15 L [USNM] *Province not Specified:* Mar 1946, H.H. Stage, 2 M, 4 F, 2 M gen, 4 L [USNM] .

VENEZUELA. *Aragua:* Rancho Grande (9 km N), 28 July 1969, J. Pulido and J. Valencia (VZ 283), 1 pM (283-101), 1 pF (283-102), 1 F; same data (VZ 284), 2 1pM (284-40,41), 1 1pF (284-42), 1 1p (284-43), 1 M gen; (10 km N), 5 Aug 1969, J. Valencia (VZ 309), 11pM (309-11), 4 1pF (309-10,12-14), 3 pM (309-100,103,104), 2 pF (309-101,102), 4 M, 6 F, 1 M gen, 15 P, 8 L; (14 km N), 28 July 1969, J. Pulido and J. Valencia (VZ 281), 2 pM (281-100,101), 1 M gen, 2 L; same data (VZ 282), 1 1pF (282-10), 3 M, 3 F, 1 M gen, 7 P, 10 L; (20 km N), 5 Aug 1969, J. Valencia (VZ 310), 1 1pF (310-10), 5 pM (310-100,102,103,105,110), 5 pF (310-101,104,107-109), 1 1p (310-11), 13 M, 1 M gen, 16 F, 39 P, 16 L [UCLA] . Turmero, Macaro, 12 Aug 1969, J. Valencia and J. Pulido (VZ 336), 1 F [UCLA] . *Distrito Federal:* Caracas, Nov 1937, P.J. Anduze, 1 F, 1 L; P.J. Anduze, 1 M gen [USNM] . *Territorio Amazonas:* Puerto Ayacucho, May 1950, J. Maldonado-Capriles, 1 L [USNM] .

LOCALITY UNKNOWN. 2 M, 1 F [USNM]

Genus HAEMAGOGUS Williston

1896. *Haemagogus* Williston, 1896:271. TYPE SPECIES: *Haemagogus splendens* Williston, 1896, St. Vincent; monobasic.

For complete synonymy see Stone, Knight and Starcke (1959).

Subgenus CONOPOSTEGUS Dyar

1925. *Conopostegus* Dyar, 1925:141. TYPE SPECIES: *Aedes leucocelaenus* Dyar and Shannon, 1924; monobasic. - As subgenus of *Aedes.* The type species of *Conopostegus* was misidentified by Dyar; this case has not been referred to the International Commission on Zoological Nomenclature because, as the name is used here, it does not matter if the type species is *leucocelaenus,* the species designated by Dyar, or *leucotaeniatus,* the only species he knew in the male, the sex upon which the subgenus was diagnosed.

Haemagogus in part of Lutz (1904a:13; 1904b :4); Dyar (1922c:195-196); Lima (1930:259-260); Pinto (1932:295).
Stegoconops in part of Lutz (1905:101-102); Peryassu (1908:169-172).
Aedes (Conopostegus) of Dyar (1925:137,141,143; 1928:153-154); Shannon (1931:147).
Aedes (Finlaya) in part of most authors.
Aedes (Gualteria) in part of Dyar (1918:73).

FEMALES. Dark scales of head, proboscis, palpus, legs, wing and abdomen with slight coppery, green, blue or violet reflections; dark scales of mesoscutum with dark bronzy brown, coppery or slight violet reflections. *Head:* Eyes broadly separated above antennae, the resulting space with broad flat silver scales. Integument dark brown to black. Frontal bristles absent. Orbital bristles moderately numerous, mesal 3-5 pairs strongly developed, lateral 3-5 pairs moderately developed. Erect scales confined to single row on occiput, entirely dark brown to black or some light. Decumbent scales broad, flat, blackish except for silver-white in orbital line, usually in large patch dorsolaterally, and usually in median coronal line. Lateral and ventral surfaces with broad flat silver-white scales. Clypeus moderately large, bare. Proboscis slender, longer than forefemur; entirely dark scaled, with a few subbasal bristles. Palpus short, about 0.14-0.16 length of proboscis; 3- or 4-segmented, segment 4 minute to small when present; segments 1-3 with bristles; entirely dark scaled. Antenna shorter than proboscis; torus with inconspicuous fine setae and small dark scales; flagellar segment 1 longer than 2, slightly swollen distally, with inconspicuous small dark scales; flagellar segments 2-13 usually with 6 moderate bristles in basal whorl; each of flagellar segments 3-12 longer than preceding segment. *Thorax:* Integument brown to black. Acrostichal and dorsocentral bristles restricted to anterior promontory; prescutellar and supraalar bristles numerous and well developed; 1 or 2 humeral bristles present; lateral prescutal and posterior fossal bristles absent; 1 parascutellar bristle present. Scutellum usually with 3 or 4 strong bristles on midlobe, 3 on lateral lobe. Mesoscutum completely covered with scales except for relatively inconspicuous anterior inner dorsocentral and median and lateral prescutellar bare spaces; background of moderately broad, pointed, predominantly flat, deep brown to black scales; broader silver or silver-white scales in conspicuous pattern, as follows: (1) very broad to moderately broad anterior acrostichal patch or acrostichal line that becomes narrower or fades out posteriorly, (2) in large antealar patch above paratergite, and (3) usually in prescutellar line. Scutellum with broad flat scales; scales of midlobe dark and silver or all dark, those of lateral lobe dark. Paratergite moderately broad to broad, with broad flat silver scales. *Apn* slightly enlarged. *Ppn* separated from mesoscutum by relatively weak suture. Meron moderately large. Pleural bristles reduced in number on all sclerites, present on *apn, ppn, ppl, psp, pra, stp* and upper *mep; stp* bristles present only in middle of sclerite and near midcoxa; *ssp* and lower *mep* bristles absent. Pleuron with 3 nearly vertical arcs of silver scales, the anterior extending from *apn* to forecoxa, the middle extending from *ppn* to midcoxa, and the posterior extending from antealar area to hindcoxa. Upper inner portion of *apn* bare, lower portion with broad flat silver scales; *ppn* with broad flat silver scales in posterior half; broad flat silver scales on *ppl, ssp,* posterior portion of *psp,* on *stp* below *pra,* in nearly vertical arc on *stp* from near *ssp* area to midcoxa, in long nearly vertical patch on *mep,* and sometimes in large patch on *pst;* hypostigial area, *pcx* and metameron bare. *Legs:* Hindcoxa larger than midcoxa, its base relatively close to upper edge of meron. Legs moderately long to long, the forefemur about 1.36-1.50 times distance from top of thorax to tip of midcoxa. All coxae with silver scales. Femora dark scaled with white to silver-white scales in separate short to long streaks at base of posterior and ventral surfaces of forefemur, in long streak on ventral surface and patch on anterior surface at level of end of streak on midfemur, and on all but dorsal surface in basal 0.5-0.7 of hindfemur. Knee spots present on at least midfemur and hindfemur; usually restricted to anterior sur-

face on midfemur and, when present, on forefemur. Tibiae and tarsi entirely dark scaled. Claws of foreleg and midleg with an acute submedian tooth, claws of hindleg simple. *Wing:* Entirely dark scaled. Plume scales on dorsum of Rs, R_{2+3}, R_2, R_3 and sometimes less conspicuously on middle portion of M. *Haltere:* Scales black and silver-white. *Abdomen:* Tergite I with numerous scales dorsally. Laterotergite with large patch of silver-white scales. Tergites VI and VII completely scaled. Outstanding scales absent. Tergites II-VII dark scaled with basolateral silver-white patch; silver-white patch on II and III usually extending to apex of segment laterally; silver-white patch on V-VII extended dorsally, frequently forming a medially broken or complete subbasal band on VI and VII. Sternites dark scaled with basolateral silver-white patch, patches usually extending to near apex of segment laterally, usually joining mate basally.

FEMALE GENITALIA (fig. 59). *Segment VIII:* Tergite narrowed apically, length along midline about 0.65-0.70 of tergite VII; distal 0.87-0.93 with scales and bristles. Sternite long; about 1.4-1.6 length of tergite VIII, broader distally; distal margin straight to slightly rounded; all but basolateral area and extreme base with bristles; basolateral area with scales; bristles more numerous along midline distally and distal margin, predominantly weakly developed distally, some proximal bristles moderately developed, elongate. *Tergite IX:* Well developed, divided distally, more or less V-shaped. Maximum length about 0.53-0.57 of tergite VIII; moderately to strongly sclerotized, without setae. *Insula:* Weakly sclerotized; connected to sigma; with 2-4 pairs of moderately developed setae. *Cercus:* Relatively short, length about 0.61-0.67 of tergite VIII; compressed; apex truncate in lateral view; bristles numerous, several apical ones strongly developed; a few scales present. *Postgenital Plate:* Moderately long and broad, length about 0.49-0.62 of tergite VIII; index about 1.4; apex straight or very slightly emarginate in ventral aspect; distal portion with numerous weakly developed bristles; basal median longitudinal apodeme not developed. *Cowl:* Strongly sclerotized. Atrial plates absent. *Sigma:* Connected to cowl; weakly to moderately sclerotized. Basal portion of spermathecal duct strongly sclerotized. Spermathecae 3, strongly sclerotized, more or less spherical, 1 slightly enlarged.

MALES. Essentially as in females except for sexual characters. *Head:* Clypeus much smaller than in females. Proboscis slender. Palpus about 0.67-0.94 length of proboscis; 5-segmented; segments 2 and 3 ankylosed and long, making up 0.56-0.62 length of palpus; segment 4 short, 0.18-0.22 length of palpus; segment 5 short, 0.15-0.17 length of palpus; palpus slender; straight throughout or slightly upturned apically; apex of segment 3 and all of segments 4 and 5 with very few bristles; entirely dark scaled. Antenna shorter than proboscis; torus much enlarged, without scales or with inconspicuous small scales; flagellum strongly plumose, segments 1-12 with very numerous long bristles; flagellar segment 1 slightly elongate, with small dark scales; flagellar segments 12 and 13 elongate, the penultimate longer, the 2 combined shorter than total length of first 11 segments. *Legs:* Claws of foreleg and midleg enlarged, unequal; larger claw of foreleg with large blunt submedian tooth, smaller claw with acute subbasal tooth; larger claw of midleg with or without large blunt submedian tooth, smaller claw usually with acute subbasal tooth. Claws of hindleg small, simple. *Abdomen:* Apical segments and genitalia not bent ventrad.

MALE GENITALIA. Not unusually colored; various shades of straw, tan and brown. *Segment VIII:* Tergite moderately long, 0.72-0.98 length of sternite; exserted, apical 0.61-0.70 scaled. *Segment IX:* Poorly developed dorsally, the ter-

gite short; middorsal portion of tergite absent, membranous or well sclerotized; tergite without setae, sometimes with pair of membranous lobes; sternite large, with 5-9 setae distally. *Sidepiece:* Well developed, short, conical, dorsal surface constricted distad of middle; mesal surface membranous from base to apex; basal tergomesal area conspicuously swollen, with large area of moderately long setae; apical lobe not developed, but sometimes with subapical tuft of setae distad of dorsal constriction; median sternomesal tuft and sclerite absent; sternomesal surface with long broad striated scales; dorsolateral surface with moderately long setae and scales, lateral and ventral surfaces with moderately long to long setae and scales; sternomesal surface usually with a few enlarged setae ventrad or laterad of specialized scales. *Claspette:* Well developed; stem long, bowed outward in middle in dorsal aspect, curved dorsad apically; spiculose; with 1 or 2 short to moderately long fine setae in basal portion and 1-3 short and fine to long and strong setae distally at level of end of spiculose portion; filament moderately long, simple and slightly flattened or expanded and sometimes with triangular barb. *Clasper:* Simple, short, broadest at or beyond base, curved at apex; without wrinkles or with weak wrinkles; with at least a few spicules basally; apex of inner surface with alveolus or papilla that only sometimes bears a seta; apical spiniform long, 0.43-0.55 length of clasper. *Phallosome:* Aedeagus moderate to large, without teeth, but with a pair of sclerotized flaps on the sternal surface apically; obconical or pandurate; tip excavated, not beaked. *Proctiger:* Strongly developed, unusually long in dorsal aspect, the basolateral sclerotization nearly horizontal; paraproct well sclerotized, with a broad curved striated knob at apex; cereal setae 3-8, short and fine or 1 proximal enlarged.

PUPAE. *Cephalothorax:* Weakly to moderately pigmented, usually lighter ventrally. Hair 5-C strongly developed, long, as long as or longer than distance from its alveolus to base of trumpet. *Trumpet:* Light to dark brown basally, yellowish apically; slender, fusiform, cylindrical or slightly broadening from base to apex; tracheoid sculpturing poorly developed in basal 0.06-0.10; reticulate sculpturing weak to moderate. *Abdomen:* Weakly to moderately pigmented. Tergites without a transverse ridge anteriorly. Hair 1-II-VII moderately to strongly developed, subequal on all segments or longer and stronger on middle or more posterior segments, 1-6b. Hair 241I-V in line with or laterad of hair 1 of corresponding segment. Hair 5-IV,V 0.6-3.0 length of corresponding segment; 5-VII long to very long, 1-5b, longer and stronger than 4-VII. Hair 6411-VI moderately long to long, fine, subequal on all segments or 6-VI slightly longer and stronger; 6-VII short to moderately long, fine to strong. Hair 8-VI,VII ventral. Hair 9-11I-VI short, fine, subequal on all segments, usually cephalad of level of hair 6 of corresponding segment; 9-VII cephalad of caudolateral angle of segment, with 1-5 long primary branches; 9-VIII at or mesad of caudolateral angle of segment, with 2-12 long to very long primary branches. Hair 10-VI usually far mesad of 11-VI. *Terminal Segments:* Male genital lobe moderately large, about 1.0-1.2 length of tergite VIII. *Paddle:* Shape varied, but always longer than broad. Apex pointed to deeply emarginate. Midrib conspicuous to apex; without wrinkles near apex. Without long marginal spicules. Hair 1-P very strongly developed, very long, single to multiple.

LARVAE. *Head:* Lightly to moderately pigmented, yellowish to brown, with darker collar and lighter ocular area; sometimes mottled dorsally. Labial plate subquadrate. Hair 1-C stout. Hairs 4,6-C removed from labrum. Hair 4-C strongly developed, 10-20b; mesad of 1-C and cephalad of level of 6-C. Hair 5-C single

or double, mesad or laterad of 6-C. Hair 6-C single or double, in line with or laterad of 1-C. Hair 7-C 2-9b. Hair 15-C very long, 2-4b. Mental plate with 9-11 (7-11) teeth on each side of median tooth. *Antenna:* Moderately to strongly pigmented, uniform or lightened apically. Shaft with small spicules. Hair 1-A long, usually single (single or double). *Thorax:* Pigmentation unknown. Integument without conspicuous spicules. Tubercles of hairs 5-7-P free or joined. Hair 1-M,T moderately long, branched. Hair 4-P 2-10b. Hair 5-P 1-3b; hair 5-M single. Hair 11-P,M,T enlarged, moderately long, 3,4b (2-4), similar to 9-P. Hairs 13-T and 14-M moderately to strongly developed, 3-12b. *Abdomen:* Hair 1-I moderately to strongly developed, 4-11b; hair 1-IV,V strongly developed, 1-7b. Hair **2-111-V** apparently in line with or laterad of hair 1 of corresponding segment, 3-10b. Hair **3-VII** strongly developed, long, single (single or double). Hair 5-II-V moderately to strongly developed, 4-11 b. Hair 6-III-V single or double. Hair 9-III-V 3-5b. Hair 11-I moderately to strongly developed, 4-12b. Hair 12-I present. Hair 13-I moderately to strongly developed, 3-9b; hair 13-IV,V strongly developed, 3-9b; hair 13-VI strongly developed, 3-6b, displaced caudad, at about same level as 10-VI. *Segment VIII:* Hairs 1 and 2 separated. Hair 1 moderately to strongly developed, 2-7b. Comb scales moderate in size; with single minutely fringed spine; few (5-9) in a single even row. *Siphon:* Moderately to strongly pigmented, light to dark brown except for darker basal band and sometimes lighter apex. Moderately long; index about 2.5-3.9. Acus distinct, free or attached, or indistinct, fused with base of siphon. Pecten teeth with 1-4 basal denticles; 12-19 in a more or less straight even row; apical teeth not detached. Hair 1-S arising distad of pecten; moderately to strongly developed, 2-4b. *Anal Segment:* Saddle moderately large to large; with spines on caudal margin; moderately to strongly pigmented, light to dark brown with darker basal band. Hair 1-X moderately to strongly developed, long, 1-4b (1-7). Hair 2-X 2-5b. Hair 3-X single. Ventral brush (4-X) moderately well developed, with 5 or 6 pairs of hairs; all hairs or all but most proximal 1 or 2 hairs arising from strongly sclerotized boss; hair 4a-X long, 2-5b; hairs 4b,4c-X double. Anal gills tapered distally; dorsal and ventral subequal in length or dorsal slightly longer than ventral, 0.9-2.6 length of anal saddle.

DISCUSSION. The subgenus *Conopostegus* is separated from the other members of the genus *Haemagogus* as follows: most conspicuously in the **adults by** (1) the absence of metallic scales on the mesoscutum, (2) the presence of silver acrostichal scales, (3) the presence of prescutellar bristles, (4) the presence of well developed postspiracular bristles, (5) the presence of 2 very conspicuous, nearly vertical bands of silver scales on the pleuron, and (6) the presence of a patch of silver-white scales on the anterior surface of the midfemur about 0.5-0.7 the distance from its base; in the **male genitalia by** (1) the excavated, rather than beaked or produced, tip of the aedeagus, and (2) the presence of a pair of sclerotized flaps or plates on the sternal surface of the aedeagus; in the **pupae** by the strongly developed and long hairs 5-C and 1-P; and, in the **larvae** possibly by the combination of (1) the absence of spicules on the integument of the thorax and abdomen, (2) the presence of hair 12-I, (3) the single row of 5-9 comb scales, and (4) the strongly sclerotized boss of the ventral brush.

Although numerous authors (Dyar and Shannon, 1924:484; Dyar, 1922c:195-196, 1925:137 and 1928:154; Lima, 1930:259-260; Edwards, 1932:178; Komp, 1938:266) have commented on the close relationship between *leucocelaenus* and *Haemagogus* or included it in that genus, this species has remained in *Aedes (Finlaya)* since Edwards' catalog (1932:154). On the basis of the very numerous sim-

ilarities in all stages between *leucocelaenus* and *Haemagogus,* I am, however, removing *leucocelaenus* and the species near it from *Aedes,* resurrecting the name *Conopostegus* for them, and treating *Conopostegus* as a subgenus of *Haemagogus.* This placement is provisional, pending a revision of the metallic *Haemagogus.* The species of *Conopostegus* are most similar to some species presently placed in the subgenera *Longipalpifer* and *Stegoconops.*

This subgenus contains 4 named species that are known in all stages and 4 unnamed forms that are known from 1 or more females each. The named species are most reliably separated in the larval and pupal stages and least reliably separated as females. The unnamed forms differ from the described species by 1 or more unique developments of the females and, I am quite sure, represent additional species. They are not named because of inadequate material.

The relationships of the species in this group are, for the most part, not obvious. *Haemagogus leucotaeniatus* has several notable features in the male genitalia and larva and *leucophoebus* has several in the male genitalia, pupa and larva; these species may not be closely related to each other or to *leucocelaenus* or *clarki.* Although these last 2 species differ in many respects, they agree in so many others that I believe they are related. The unnamed species 21 and 22 are possibly related to *leucotaeniatus* and the unnamed species 26 and 27 are definitely akin to *clarki.*

The immature stages of *Conopostegus* are found in treeholes, bamboo internodes and artificial containers. Females have been collected in horse traps and biting humans.

The subgenus *Conopostegus* extends from Honduras to Argentina and Brazil. The group is too poorly known to make any meaningful generalizations about the sympatry or allopatry of the included species, but *leucotaeniatus* and *clarki* do occur together in Costa Rica and Panama and the large and small Colombian forms (species 21 and 26) have been taken in the same collection.

Because of the difficulty of determining what species was actually involved, numerous papers reporting *leucocelaenus* from localities in South America have not been included in the literature citations and the localities have not been included in the Additional Records From the Literature section of any species.

KEYS TO SPECIES

FEMALES

1. Mesoscutum with broad silver acrostichal patch in anterior 0.25-0.45; *ppl* usually with 1 (1 or 2) long strong dark bristle and 1 (0-2) weak light bristle; knee spot of hindleg extended basad along ventral surface of femur; *mep* scale patch simple, without any caudal extension 2

   Mesoscutum with narrow to broad acrostichal line that extends beyond anterior 0.50; *ppl* usually with more numerous bristles and some of long strong bristles light in color; knee spot of hindleg not extended basad along ventral surface of femur *and/or mep* scale patch with caudal extension from upper end 4

2(1). Forefemur without white line extending basad from apex along ventral surface; knee spot of midleg not extended basad along ventral surface of

femur; lateral prescutellar silver line absent or weak; dorsolateral silver patch of head usually very large ..... 25. *clarki*

Forefemur with white line extending basad from apex along ventral surface; knee spot of midleg extended basad along ventral surface of femur; lateral prescutellar silver line present or absent; dorsolateral silver patch of head small to moderate in size 3

3(2). Lateral prescutellar silver line well developed, conspicuous .... 26. Small Colombian form

Lateral prescutellar silver line absent ..... 27. Peruvian lowland form

4(1). Lateral prescutellar silver line scarsely separated from its mate, the 2 forming a median prescutellar line; knee spot of midleg and hindleg extended basad along ventral surface of femora . . . . 21. Large Colombian form

Lateral prescutellar silver line distinctly separated from its mate; knee spot of midleg and hindleg usually not extended basad along ventral surface of femora 5

5(4). *Pst* with large oblique patch of scales; *mep* scale patch with a long caudal extension from dorsal end; foreleg without knee spot .... 22. Peruvian highland form

Pst usually with only a few scales near *ppl; mep* scale patch with a shorter caudal extension *or* foreleg with a knee spot on anterior surface 6

6(5). Forefemur with small knee spot on anterior surface; *mep* scale patch with long caudal extension from upper end 20 *leucotaeniatus*

Forefemur without knee spot; *mep* scale patch simple or with short to moderately long caudal extension from upper end 7

7(6). *Mep* scale patch with a moderately long caudal extension from upper end; erect scales of head entirely dark brown to blackish; *ppl* with 2 or 3 long strong bristles 23 *leucophoebus*

Mep scale patch simple or with a short caudal extension from upper end; erect scales of head sometimes entirely light brown or partially white; *ppl* with 1 or 2 long strong bristles (fig. 59) 24 *leucocelaenus*

MALES

(Species 21, 22, 26 and 27 unknown)

1. Stem of claspette with 2 or 3 long strong setae distally; tergite IX with a pair of large membranous lobes; aedeagus large, more or less obconical (fig. 55) 20 *leucotaeniatus*

Stem of claspette with 1-3 short to moderately long fine setae distally; tergite IX without membranous lobes; aedeagus moderate in size, more or less pandurate 2

2(1). Stem of claspette with 1 short preapical seta; sidepiece without subapical tuft of setae; expanded lateral portions of tergite IX joined by strongly scierotized bar (fig. 57) 23 *leucophoebus*

Stem of claspette with 1-3 moderately long preapical setae; sidepiece with weakly developed subapical tuft of 2-5 setae from prominent tubercles along tergomesal edge; expanded lateral portions of tergite IX joined, if at all, by weakly sclerotized strip 3

3(2). Larger claw of midleg with large blunt submedian tooth; tergite VIII usually with 2-4 rows of enlarged setae along distal margin; clasper usually not swollen or slightly swollen in middle portion (fig. 60) ..... 24 *leucocelaenus*

Larger claw of midleg without submedian tooth; tergite VIII usually with 1 irregular row of enlarged setae along distal margin; clasper usually distinctly swollen near base (fig. 62) ..... 25. *clarki*

PUPAE

(Species 21, 22, 26 and 27 unknown)

1. Primary branches of float hair (1-I) with secondary branches; 5-III weakly developed, short, arising nearer lateral edge of segment than to 1-III; hair 6-VII much stronger than 6-III-VI 2

Primary branches of float hair predominantly simple; 5-111 strongly developed, long, arising near 1-III; hair 6-VII not more strongly developed than 6-III-VI 3

2(1). Paddle large, with normal narrow dark midrib; hairs 1-P and 1-3-C single (fig. 55) 20 *leucotaeniatus*

Paddle small, with broad colorless midrib; hairs 1-P and 1-3-C multiple (fig. 57) 23 *leucophoebus*

3(1). Float hair with 9-12 (7-14) long branches; paddle slightly asymmetrical; middorsal portion of tergite I not more strongly pigmented than segment II (fig. 60) 24 *leucocelaenus*

Float hair with 3-6 very long branches; paddle strongly asymmetrical; middorsal portion of tergite I more strongly pigmented than segment II (fig. 62) ..... 25. *clarki*

LARVAE

(Species 21, 22, 26 and 27 unknown)

1. Ventral brush (4-X) with 6 pairs of hairs; hairs 5,6-C single; 5-P single and 7-P 3,4b (fig. 56) 20 *leucotaeniatus*

Ventral brush with 5 pairs of hairs; hair 6-C and sometimes 5-C double; 5-P single (single or double) and 7-P double (single or double) or both 5,7-P 3,4b 2

2(1). Tubercles of hairs 5-7-P very strongly joined and 5,7-P 3,4b; hair 14-P 24-26b; hairs 2,4a-X double (fig. 58) 23 *leucophoebus*

Tubercles of hairs 5-7-P free or but weakly joined, 5-P usually single (single or double) and 7-P usually double (single or double); 14-P 3-6b; hairs 2,4a-X 3-5b 3

3(2). Siphon usually with distinct small to large acus; hair 641I-V double; 741 moderately long, moderately strong, 5-8b, its tubercle never joined with that of 641 (fig. 61) 24 *leucocelaenus*

Siphon usually without distinct projecting acus; hair 641I-V usually single (single or double); 741 long, strong, usually 1-3b (1-5), its tubercle frequently joined to that of 641 by sclerotization (fig. 63) . . .25. *clarki*

20. *Haemagogus (Conopostegus) leucotaeniatus* (Komp)

Figs. 54-56

1938. *Aedes leucotaeniatus* Komp, 1938:261-263. TYPE: *Holotype* male with associated genitalia (1689), Comacho, Canal Zone, Panama, 22 Apr 1922, J.B. Shropshire [USNM].

Aedes (Finlaya) leucotaeniatus of Galindo, Trapido and Carpenter (1950:547,566); Galindo, Carpenter and Trapido (1951:120-121; 1953:529,531,536-538,540,541; 1955:160,161,163); Knight and Marks (1952:515,518,542,570); Lane (1953:685); Galindo and Trapido (1955: 546); Trapido, Galindo and Carpenter (1955:534); Stone, Knight and Starcke (1959:166).
Haemagogus (Stegoconops) leucomelas of Dyar (1922c:195-196).
Aedes (?Gaulteria) leucomelas in part of Dyar (1918:73).
Aedes leucomelas in part of Howard, Dyar and Knab (1917:810-812).
Aedes (Conopostegus) leucocelaenus in part of Dyar (1925:137,141,143; 1928:153-154).
Aedes (Finlaya) leucocelaenus in part of Edwards (1932:148,154,178).
Aedes leucocelaenus in part of Dyar and Shannon (1924:484).

FEMALE. Wing: 3.55 mm. Proboscis: 2.94 mm. Forefemur: 2.64 mm. Abdomen: about 3.0 mm. Large species. *Head:* Erect scales entirely dark brown or blackish. Dorsolateral silver patch large. Coronal silver line usually well developed and complete. *Thorax:* Acrostichal silver scales in a long narrow line in anterior 0.55-0.70 that fades out posteriorly. Lateral prescutellar silver line well developed, conspicuous, usually distinctly separated from its mate. Midlobe of scutellum with silver scales. *Ppl* with 2 or 3 (1-4) long strong light or dark bristles and 1-3 (1-5) weak light bristles. *Pst* usually with only a few scales near *ppl. Mep* scale patch with a long caudal extension from upper end. *Legs:* Femora without a white line extending basad from apex along ventral surface. Knee spot small and restricted to anterior surface on foreleg, moderately large on midleg, large on hindleg, not extended basad on midleg or hindleg.

MALE. Similar to female except for sexual characters. *Head:* Palpus about 0.87-0.92 length of proboscis. *Legs:* Larger claw of midleg with large blunt submedian tooth.

MALE GENITALIA (fig. 55). *Segment VIII:* Tergite about 0.72 length of sternite; with several rows of enlarged setae. *Segment IX:* Lateral portions of tergite joined by relatively broad, moderately well sclerotized strip; tergite with a pair of large membranous spiculose lobes extending mesocaudad. *Sidepiece:* Basal tergomesal area with very numerous setae, the more ventral gently curved dorsad apically; subapical tuft of setae conspicuous, well developed; specialized scales of sternomesal surface numerous (at least 15), predominantly narrowly lanceolate, longest ones longer than clasper; general vestiture of scales and setae very dense, basal portion of tergal surface with numerous long setae directed over IX-T. *Claspette:* Stem with 2 or 3 long strong distal setae. Filament expanded, contorted, with a distinct triangular barb near base. *Clasper:* Middle portion swol-

len. *Phallosome:* Aedeagus large, more or less obconical. *Proctiger:* Apical knob of paraproct with numerous (about 24) fine striations.

PUPA (fig. 55). Abdomen: about 3.8 mm. Trumpet: 0.54 mm. Paddle: 0.84 mm. *Cephalothorax:* Pigmentation lighter ventrally, leg cases not as deeply pigmented as middorsal area. Hairs 1-3-C usually single. Hair 5-C single or double, extending to or slightly beyond base of trumpet. *Trumpet:* Reticulate sculpturing usually moderately strong. *Abdomen:* Weakly to moderately pigmented; posterior segments usually uniformly pigmented, lighter than anterior segments, but sometimes with small anterior middorsal area darkened; middorsal portion of segment I not more strongly pigmented than segment II. Float hair (1-I) with 9-14 (6-16) long, secondarily branched primary branches; 14I-VII moderately to strongly developed, usually single or double and subequal on all segments or slightly longer and stronger on middle or more posterior segments, sometimes 3-8b, especially on anterior segments. Hair 5-11,111 weakly developed, single, nearer lateral edge than to hair 1 of corresponding segment; 5-IV 1.0-1.2 length of segment IV, usually single (1-3b), located about midway between hair 1 and lateral edge of segment; 5-V-VII usually single (1-3b). Hair 6-VII much stronger than 6-III-VI. Hair 9-VIII with 4-6 branches, the more central branches sometimes elongate. *Paddle:* Large, inner and outer parts subequal in width, distal portion nearly symmetrical. Apex rounded, pointed or produced. Midrib normal, narrow, dark, extending to or nearly to apex. Hair 1-P single.

LARVA (fig. 56). Head: 0.88 mm. Siphon: 0.98 mm. Anal Saddle: 0.42 mm. *Head:* Hairs 5,6-C single. Hair 7-C 3-6b. *Thorax:* Tubercles of hairs 5-7-P weakly to strongly joined. Hair 4-P 6-8b. Hair 5-P single. Hair 7-P 3,4b. Hair 14-P 4-10b. *Abdomen:* Hair 1-III-V usually 2-4b (1-6). Hair 641I-V double. Hair 7-II moderately long and moderately strong, 5-8b, its tubercle never joined with that of 641. *Siphon:* Index about 2.7-2.9. Acus distinct, large. Pecten teeth usually with 1 or 2 large and 1-3 small denticles. Hair 1-S strongly developed, long, extending beyond apex of siphon, double. *Anal Segment:* Hair 2-X 3-5b. Ventral brush with 6 pairs of hairs; all hairs arising from boss; hair 4a-X 3-5b.

SYSTEMATICS. *Haemagogus leucotaeniatus* is distinguished from *clarki, leucocelaenus* and *leucophoebus* as follows: in the female by (1) the small knee spot on the anterior surface of the forefemur, and (2) the long caudal extension from the upper end of the mesepimeral scale patch; in the male by (1) the large membranous lobes on tergite IX, (2) the strongly developed subapical tuft of setae on the sidepiece, (3) the long strong distal setae on the claspette stem, (4) the expanded, contorted and barbed claspette filament, and (5) the large obconical aedeagus; in the pupa by (1) the large, distally symmetrical paddle with a normal midrib, (2) hair 5-III which is weakly developed and single, and (3) the 9-14 (6-16) long, secondarily branched primary branches of the float hair (1-I); and in the larva by (1) the single hairs 5,6-C, (2) the combination of a single hair 5-P and a 3- or 4-branched 7-P, (3) the strongly developed, long 1-S, and (4) the ventral brush which has 6 pairs of hairs.

BIONOMICS. The immatures of *leucotaeniatus* have been collected in treeholes and females have been collected biting humans and in horse traps.

DISTRIBUTION (fig. 54). *Haemagogus leucotaeniatus* is known from Costa Rica and Panama. Material examined: 58 specimens; 3 males, 33 females, 8 larvae, 14 pupae; 14 individual rearings (8 larval, 6 pupal).

PANAMA. *Canal Zone:* Camacho, 1 June 1922, J.B. Shropshire, 1 F [USNM] ; 1 M gen [USNM] . Chiva Chiva, 4 May 1945, 1 F [UCLA] . Empire, 21 Aug, 1 F [USNM] . Fort Sherman,

29 June 1950, S.J. Carpenter (4620), 1 pM (4620-11), 1 pF (4620-12), 1 M gen [UCLA] . *Colon:* Caldera Island, Portobelo Bay, 23 May 1908, R.L. Turner, 1 F [USNM]. *Darien:* Pucro, Tacarcuna River Valley, 5 July 1963 (PA 438), 2 pF (438-104,105); 8 July 1963 (PA 442), 1 pF (442-106) [UCLA]. *Panama:* Cerro La Victoria, 11 May 1949-3 Jan 1950, 1 1pM (D-8), 2 1pF (B-14, D-4), 2 F [GML]. Pacora, 9 June 1949-3 Aug 1950, 13 F; 29 June 1950, S.J. Carpenter (4681), 1 1pF (4681-2A), 1 F (4681-2B); 6 July 1950, S.J. Carpenter (4874), 2 1pF (4874-1, 4874); same data (4893), 1 1pF (4893-4); 20 July 1950, S.J. Carpenter (5121), 1 1pF (5121-2); 3 Aug 1950, S.J. Carpenter (5345), 1 pM (5345-4), 1 M gen [UCLA]. *Province not Specified:* Buena Vista, 20 Sept 1949, Si. Carpenter, 1 F [UCLA].

LOCALITY UNKNOWN. 1 F (514) [USNM]; 1 M gen (00029) [GML].

Additional Records From the Literature

COSTA RICA. (Galindo, Carpenter and Trapido, 1953:531; Galindo and Trapido, 1955:546; Trapido, Galindo and Carpenter, 1955:534).

21. *Haemagogus (Conopostegus)* sp., Large Colombian form

?Aedes (Finlaya) leucocelaenus in part of Forattini (1965:378-382).
?Aedes leucocelaenus in part of Komp (1936:62; 1938:260,261,263-266; 1956:37-38); Bugher, Boshell-Manrique, Roca-Garcia and Osorno-Mesa (1944:45,47,48).
?Aedes (Finlaya) n.sp. of Galindo, Carpenter and Trapido (1953:531).

FEMALE. Wing: 3.45 mm. Proboscis: 2.80 mm. Forefemur: 2.43 mm. Abdomen: about 2.9 mm. Large species. *Head:* Erect scales entirely dark brown or blackish. Dorsolateral silver patch large. Coronal silver line usually well developed and complete. *Thorax:* Acrostichal silver scales in a long narrow line that weakens posteriorly but extends to prescutellar space. Lateral prescutellar silver line well developed, conspicuous, very slightly separated from its mate and forming a median prescutellar line. Midlobe of scutellum with silver scales. *Ppl* with 2 or 3 long strong light or dark bristles and 2 weak light bristles. *Pst* with only a few scales near *ppl*. *Mep* scale patch with a long caudal extension from upper end. *Legs:* Femora without a white line extending basad from apex along ventral surface. Knee spot absent from foreleg, large on midleg and hindleg, extended basad along ventral surface on midleg and hindleg.

MALE, **PUPA, LARVA.** Unknown.

SYSTEMATICS. The large Colombian form is similar to *leucotaeniatus* and the Peruvian highland form but differs from these species in the female by (1) the lateral prescutellar scale lines of the mesoscutum which are very close to each other and form a median prescutellar line, and (2) the basally extended knee spot on the midfemur and hindfemur. It also differs from *leucotaeniatus* by the absence of a knee spot on the forefemur and from the Peruvian highland form by the absence of a large patch of scales on the prosternum.

BIONOMICS. The habitat of the immatures is unknown. The females were presumably obtained in biting-landing collections. The species occurs with the small Colombian form "in the mountains by the coast."

The yellow fever isolation reported by Bugher et al. (1944:45,47,48) may have been from this species.

DISTRIBUTION. The large Colombian form is known from 2 unspecified localities in Colombia. Material examined: 3 females.

COLOMBIA. *Locality Unknown:* "In the mountains by the coast," 22 Dec 1936, J.A. Kerr, 1 F; "Minas," 12 Apr-12 May 1936, 2 F [UCLA] .

22. *Haemagogus (Conopostegus)* sp., Peruvian highland form

Fig. 54

FEMALE. Wing: 3.12 mm. Proboscis: 2.45 mm. Forefemur: 2.31 mm. Abdomen: about 2.6 mm. Moderate in size. *Head:* Visible erect scales all dark brown. Dorsolateral silver patch large. Coronal silver line well developed and complete. *Thorax:* Acrostichal silver scales in a long narrow line that weakens posteriorly but extends to prescutellar space. Lateral prescutellar silver line well developed, separated from its mate. Midlobe of scutellum with silver scales. *Ppl* with 3 long strong light bristles and 1 weak light bristle. *Pst* with large oblique patch of scales. *Mep* scale patch with a long caudal extension from upper end. *Legs:* Femora without a white line extending basad from apex along ventral surface. Knee spot absent on foreleg, small on midleg, large on hindleg, not extended basad on midleg or hindleg.

MALE, PUPA, LARVA. Unknown.

SYSTEMATICS. The Peruvian highland form is similar to *leucotaeniatus* and the large Colombian form but may be distinguished from both these species in the female by the large patch of scales on the prosternum. It is further distinguished from *leucotaeniatus* by the absence of a knee spot on the forefemur and from the large Colombian form by (1) the separated lateral prescutellar scale lines of the mesoscutum, and (2) the knee spot of the midfemur and hindfemur, which is not extended basad along the ventral surface.

BIONOMICS. Unknown.

DISTRIBUTION (fig. 54). The Peruvian highland form is known from the upper Amazon drainage in the Peruvian Andes. Material examined: 1 female.

PERU. *Cajamarca:* Bagua, 10-15 Jan 1954, W. Ebeling, 1 F [UCLA] .

23. *Haemagogus (Conopostegus) leucophoebus* (Galindo, Carpenter & Trapido)

Figs. 54,57,58

1953. *Aedes (Finlaya) leucophoebus* Galindo, Carpenter and Trapido, 1953:535-536. TYPE: *Holotype* male (1763.2) with associated larval and pupal skins and genitalia, Feijo, Acre, Brazil, 4 Aug 1949 [FH] .

Aedes (Finlaya) leucophoebus of Stone, Knight and Starcke (1959:165).

Aedes (Finlaya) leucocelaenus in part of Knight and Marks (1952:517,518,542,569); Lane (1953: 682-685).

Aedes leucocelaenus in part of Kumm and Cerqueira (1951:195-200).

FEMALE. Wing: 3.46 mm. Proboscis: 2.72 mm. Forefemur: 2.46 mm. Abdomen: about 3.1 mm. Large species. *Head:* Erect scales entirely dark brown. Dorsolateral silver patch very large. Coronal silver line well developed, conspicuous. *Thorax:* Acrostichal silver scales in a broad line of unknown length, but extending throughout at least anterior 0.5 of mesoscutum. Lateral prescutellar silver line well developed, conspicuous, distinctly separated from its mate. Midlobe of scutellum with silver scales. *Ppl* with 3 long strong light or dark bristles and 1 weak light or dark bristle. *Pst* with scales only near *ppl. Mep* scale patch with a moderately long caudal extension from upper end. *Legs:* Femora without a white line

extending basad from apex along ventral surface. Knee spot absent on foreleg, large on midleg and hindleg, not extended basad on either midleg or hindleg.

MALE. Similar to female except for sexual characters. *Head:* Palpus about 0.84 length of proboscis. *Thorax:* Acrostichal silver scales in a conspicuous broad line extending to prescutellar space. *Legs:* Larger claw of midleg with large blunt submedian tooth.

MALE GENITALIA (fig. 57). *Segment VIII:* Tergite about 0.92 length of sternite; apparently with 3 or 4 rows of enlarged setae along distal margin. *Segment IX:* Lateral portions of tergite joined by strongly sclerotized bar; tergite without membranous lobes. *Sidepiece:* Basal tergomesal area with numerous setae, the more ventral gently curved dorsad; subapical tuft not developed; specialized scales of sternomesal surface moderately numerous (7-9), predominantly broadly elliptic, the longest as long as clasper; general vestiture of scales and setae apparently quite dense, basal portion of tergal surface apparently with numerous moderately long setae directed over IX-T. *Claspette:* Stem with 1 short fine distal seta. Filament expanded, especially basally, but apparently not contorted and without triangular barb. *Clasper:* Without distinct swollen area. *Phallosome:* Aedeagus moderate in size, more or less pandurate. *Proctiger:* Not seen.

PUPA (fig. 57). Abdomen: about 3.4 mm. Trumpet: 0.49 mm. Paddle: 0.51 mm. *Cephalothorax:* Pigmentation lighter ventrally, leg cases not as strongly pigmented as middorsal area. Hairs 1-3-C multiple (7-19b). Hair 5-C 3b, extending to base of trumpet. *Trumpet:* Reticulate sculpturing moderately strong. *Abdomen:* Moderately pigmented; posterior segments uniformly pigmented, lighter than anterior segments; middorsal portion of segment I not more strongly pigmented than segment II. Float hair (1-I) with 17-19 moderately long, secondarily branched primary branches; 1-II-VII moderately to strongly developed, longer and stronger on middle segments, 3-5b. Hair 5-11,111 weakly developed, 2,3b, nearer lateral edge than to hair 1 of corresponding segment; 5-IV 0.6-0.7 length of segment IV, 3-5b, located about midway between hair 1 and lateral edge of segment; 5-V-VII 3-5b. Hair 6-VII much stronger than 6-III-VI. Hair 9-VIII with 11 or 12 equally long branches. *Paddle:* Small, outer part slightly wider than inner part, distal portion nearly symmetrical. Apex rounded. Midrib represented by broad colorless strip extending to apex. Hair 1-P 31-35b.

LARVA (fig. 58). Head: 0.78 mm. Siphon: 0.86 mm. Anal Saddle: 0.38 mm. *Head:* Hairs 5,6-C double. Hair 7-C 8,9b. *Thorax:* Tubercles of hairs 5-7-P strongly joined. Hair 4-P 10b. Hairs 5,7-P 3,4b. Hair 14-P 24-26b. *Abdomen:* Hair 1-III-V 5,6b. Hair 6-III-V double. Hair 7-II moderately long and moderately strong, 7,8b, its tubercle never joined with that of 6-11. *Siphon:* Index about 2.5-2.6. Acus distinct, small. Pecten teeth usually with 1 or 2 large and 1-3 small denticles. Hair 1-S moderately developed, moderately long, 3b. *Anal Segment:* Hair 2-X double. Ventral brush with 5 pairs of hairs; most proximal 2 hairs basad of boss; 4a-X double.

SYSTEMATICS. *Haemagogus leucophoebus* may be separated from the other described species of the subgenus *Conopostegus* as follows: in the female by the combination of (1) the dark brown head scales, (2) the relatively numerous propleural bristles, (3) the moderately long caudal extension from the upper end of the mesepimeral scale patch, and (4) the absence of a knee spot on the forefemur; in the male by (1) the strongly sclerotized bar connecting the lateral portions of tergite IX, (2) the total absence of a subapical tuft of setae on the side-

piece, (3) the single short fine distal seta on the claspette stem, and (4) the basally expanded but not contorted or barbed claspette filament; in the pupa by (1) the small paddle with a broad colorless midrib, (2) the 17-19 moderately long, secondarily branched primary branches of the float hair (1-I), and (3) the multiple hairs 1-3-C and 1-P; and in the larva by (1) the very strongly joined tubercles of hairs 5-7-P, (2) the 3- or 4-branched 5,7-P, (3) hair 14-P which has more than 20 branches, (4) the double 2,4a-X, and (5) the most proximal hair (4e-X) of the ventral brush which is proximad of the boss.

The slide of larval and pupal skins bearing the same number (1762.1) as the allotype female of *leucophoebus* is incorrectly associated with that specimen since the pupal skin is male. This set of skins must belong to either the paratype male or the holotype, both of which were collected at Feijo rather than Tarauaca.

BIONOMICS. Unknown.

DISTRIBUTION (fig. 54). *Haemagogus leucophoebus* is known from the Brazilian State of Acre. Material examined: 4 specimens; 1 male, 1 female, 1 larva, 1 pupa; possibly 1 larval rearing.

BRAZIL. *Acre:* Feijo, 4 Aug 1949, 1 M (1763-3), 1 M gen, 1 Ip (labeled 1762.1) [USNM]. Tarauaca, 26 July 1949, 1 F (1762.1) [USNM].

24. *Haemagogus (Conopostegus) leucocelaenus* (Dyar & Shannon)

Figs. 54,59-61

1904. *Haemagogus leucomelas* Lutz, 1904a:13, 1904b:4. TYPE: *Lectotype* female, Franca, Sao Paulo, Brazil, 23 Sept 1903 [BM; selection of Belkin, 1971:20]. Rejected as junior secondary hononym of *leucomelas* (Meigen, 1804) in *Aedes* by Dyar and Shannon (1924:484).

1924. *Aedes leucocelaenus* Dyar and Shannon, 1924:484. *Nomen novum* for *leucomelas* Lutz, 1904.

Aedes (Conopostegus) leucocelaenus of Dyar (1928:153-154, in part); Shannon and Del Ponte (1928:70-71); Shannon (1931:147).

Aedes (Finlaya) leucocelaenus of Edwards (1932:148,154,178, in part); Knight and Marks (1952: 517,518,542,569, in part); Lane (1953:682-685, in part); Stone, Knight and Starcke (1959: 165); Forattini (1965:378-382, in part).

Aedes (Finlaya) leucocelaenus leucocelaenus of Galindo, Carpenter and Trapido (1953:531,538, 539,540).

Aedes leucocelaenus of Dyar and Shannon (1924:484, in part); Komp (1938:260,261,263-266, in part); Shannon, Whitman and Franca (1938:110-111); Waddell (1949:569-570,572,573, 574); Kumm and Cerqueira (1951:195-200, in part); Causey, Casals, Shope and Udomsakdi (1963:778).

Haemagogus (Stegoconops) leucomelas of Lima (1930:259-260); Pinto (1932:295).

Stegoconops leucomelas of Lutz (1905:101-102); Peryassu (1908:169-172).

For additional references see Howard, Dyar and Knab (1917:810); Dyar (1928:153); Kumm and Cerqueira (1951:195-200); Cova Garcia, Sutil and Rausseo (1966b:331-332); and Travis and Labadan (1967:11).

FEMALE (fig. 59). Wing: 2.77 mm. Proboscis: 2.37 mm. Forefemur: 2.07 mm. Abdomen: about 2.7 mm. Moderate in size. *Head:* Erect scales entirely dark brown (Trinidad), entirely light brown (Brazil), or entirely amber or light brown laterally and white mesally (Argentina). Dorsolateral silver patch large to very large. Coronal silver line usually well developed and complete. *Thorax:* Acrostichal silver

scales in a long narrow to broad line that narrows posteriorly but usually reaches prescutellar space. Lateral prescutellar silver line usually well developed and conspicuous, distinctly separated from its mate. Midlobe of scutellum with silver scales. *Ppl* with 1 or 2 long strong light or dark bristles and 1 or 2 weak light bristles. *Pst* usually with only a few scales near *ppl*. *Mep* scale patch simple or with a short to moderately long caudal extension from upper end. *Legs:* Femora without a white line extending basad from apex along ventral surface. Knee spot absent on foreleg, moderate to large on midleg, large on hindleg, not or only slightly extended basad on midleg and hindleg.

MALE (fig. 59). Similar to female except for sexual characters. *Head:* Palpus 0.87-0.94 length of proboscis. *Thorax:* Acrostichal silver line usually strong to prescutellar space. *Legs:* Larger claw of midleg with large blunt submedian tooth.

MALE GENITALIA (fig. 60). *Segment VIII:* Tergite about 0.80-0.98 length of sternite; with 2-4 rows of enlarged setae along distal margin. *Segm'ent IX:* Lateral portions of tergite joined by very narrow weakly sclerotized or membranous strip; tergite without membranous lobes. *Sidepiece:* Basal tergomesal area with numerous setae, the more ventral usually strongly curved dorsad at apex; subapical tuft inconspicuous, weakly developed, represented by only 2-5 setae; specialized scales of sternomesal surface moderately numerous (8-15), predominantly broadly lanceolate to elliptic, the longest ones shorter than clasper; general vestiture of scales and setae moderately dense, basal portion of tergal surface with a few moderately long setae directly over IX-T. *Claspette:* Stem with 1-3 moderately long fine distal setae. Filament simple, slightly flattened. *Clasper:* Usually without any conspicuous swelling or with middle portion slightly swollen. *Phallosome:* Aedeagus moderate in size, more or less pandurate. *Proctiger:* Apical knob of paraproct with about 13-17 fine or moderately coarse striations.

PUPA (fig. 60). Abdomen: about 3.1 mm. Trumpet: 0.45 mm. Paddle: 0.62 mm. *Cephalothorax:* Pigmentation lighter ventrally, leg cases not as strongly pigmented as middorsal area. Hairs 1-3-C single. Hair 5-C single, extending far beyond base of trumpet. *Trumpet:* Reticulate sculpturing usually moderately strong. *Abdomen:* Weakly to moderately pigmented; posterior segments uniformly pigmented, lighter than anterior segments, or with small anterior middorsal area or large middorsal area darkened, the darkened areas sometimes coalescing to form a median longitudinal streak; middorsal portion of segment I not more strongly pigmented than segment **II.** Float hair (1-I) with 9-12 (7-14) long, predominantly simple primary branches; 1-II-VII moderately developed, usually single or double and subequal on all segments or slightly longer and stronger on middle or posterior segments, sometimes 3-6b, especially on anterior segments. Hair 5-II weakly to moderately developed, usually single or double (1-5b), located nearer lateral edge than to hair I or about halfway between hair 1 and lateral edge; 5-HI strongly developed, single, arising near hair 1; hair 5-IV 1.6-2.0 length of segment IV, single, arising near hair 1; hair 5-V-VII single. Hair 6-VII not stronger than 6-III-VI. Hair 9-VIII with 2-5 branches, some elongate. *Paddle:* Large, inner part wider than outer part and usually extending farther distad, distal portion slightly asymmetrical. Apex rounded to slightly emarginate. Midrib normal, narrow, dark, extending to or nearly to apex. Hair 1-P single.

LARVA (fig. 61). Head: 0.77 mm. Siphon: 0.78 mm. Anal Saddle: 0.33 mm. *Head:* Hair 5-C usually single (single or double). Hair 6-C double. Hair 7-C 3-5b. *Thorax:* Tubercles of hairs 5-7-P usually free, sometimes weakly joined. Hair 4-P usually 5,6b (4-8). Hair 5-P usually single (single or double). Hair 7-P usu-

ally double (single or double). Hair 14-P 3-6b. *Abdomen:* Hair 1-III-V usually 4-6b (3-7). Hair 641I-V double. Hair 741 moderately long and moderately strong, 5-8b, its tubercle never joined with that of 6-II. *Siphon:* Index 2.5-3.7. Acus usually distinct, small to large. Pecten teeth usually with 1 large basal denticle. Hair 1-S moderately developed, moderately long to long, but not attaining apex of siphon, 2,3b. *Anal Segment:* Hair 2-X 3,4b. Ventral brush with 5 pairs of hairs; all hairs arising from boss; hair 4a-X 3-5b.

SYSTEMATICS. *Haemagogus leucocelaenus* is distinguished from the 3 other described species in the subgenus *Conopostegus* as follows: in the female by the combination of (1) the strongly developed lateral prescutellar scale line of the mesoscutum, (2) the reduced number of propleural bristles, (3) the shape of the mesepimeral scale patch, which is simple or has a short caudal extension from the upper end, (4) the absence of a knee spot on the forefemur, and (5) the knee spot of the hindfemur, which is not extended basad; in the male by the combination of (1) the weakly developed subapical tuft of setae on the sidepiece, (2) the 1-3 moderately long fine distal setae on the claspette stem, (3) the simple claspette filament, (4) the 2-4 rows of enlarged setae along the distal margin of tergite VIII, (5) the shape of the clasper which is not swollen or only slightly swollen in the middle, (6) the 13-17 fine to moderately coarse striations at the apex of the paraproct, and (7) the presence of a submedian tooth on the large claw of the midleg; in the pupa by (1) the 9-12 (7-14) long simple branches of the float hair (14), (2) the large paddle which is slightly asymmetrical distally, and the combination of (3) a strongly developed hair 5411, (4) a weakly to moderately developed 541 that is not located close to 1-II, and (5) the relatively lightly pigmented leg cases and middle portion of tergite I; and in the larva by the combination of (1) the free or weakly joined tubercles of hairs 5-7-P, (2) the usually single (single or double) 5-P and the usually double (single or double) 7-P, (3) the few (3-6) branched 14-P, (4) the 5 pairs of hairs in the ventral brush, (5) the double 6-III-V, (6) the 5-8 branched 711 which never arises from the same alveolar plate as 6-11, and (7) the presence of a distinct acus at the base of the siphon.

The population of *leucocelaenus* in northwestern Argentina differs from the other populations of this species in several features: in the female the erect scales of the head are lighter and the patch of scales on the mesepimeron has a longer caudal extension from the upper end; in the male the subapical tuft of setae on the sidepiece is more strongly developed and the specialized scales on the sternomesal surface of the sidepiece are broader and fewer in number; and in the larva the siphon and anal gills are longer. The population from Trinidad differs in the female by the very dark erect scales of the head and the basally extended knee spot of the hindleg. Too few specimens are available to determine the significance of the variations in these populations.

BIONOMICS. The immatures of *leucocelaenus* have been collected in treeholes, broken or cut bamboo intemodes and artificial containers. There are several records of females biting humans during the day.

This species has been found infected with the virus of yellow fever at Affonso Arinhos, Rio de Janeiro, Brazil (Shannon, Whitman and Franca, 1938:110-111) and with the virus Una at Belem, Para, Brazil (Causey et al., 1963:778). In the laboratory it has been found to be a more efficient vector of yellow fever than *Aedes aegypti* (Waddell, 1949:569-570,572,573-574).

DISTRIBUTION (fig. 54). *Haemagogus leucocelaenus* extends from Trinidad to

southern Brazil and northern Argentina. Material examined: 239 specimens; 47 males, 62 females, 64 larvae, 66 pupae; 64 individual rearings (60 larval, 2 pupal, 2 incomplete).

ARGENTINA. *Misiones:* Iguazu, 5 Oct 1927, R.C. and E.M. Shannon, 1 F [USNM]. *Salta:* General Enrique Mosconi (Vespucio), 18 Feb 1967, H. Fernandez, M. Garcia and O. Casal (ARG 601), 1 1pF (601-12), 1 pM (601-100), 1 M gen; General Enrique Mosconi (Vespucio) (about 7 km from Tablillas), 15 Feb 1967, H. Fernandez, M. Garcia and O. Casal (ARG 619), 1 1pM (619-10) [UCLA]. *Tucuman:* Raco, 13 Feb 1927, R.C. Shannon, 1 M, 3 F, 1 M gen [USNM]. Trancas, Nov 1960, 2 M, 2 F, 2 M gen [USNM]. Vipos, 4 Feb 1927, R.C. Shannon and E. Del Ponte, 1 M, 1 F, 1 M gen, 1 P [USNM].

BRAZIL. *Goias:* Anapolis, Mar 1936, 2 M, 1 M gen [USNM]. *Guanabara:* Paineiras, Nov 1939, 1 M, 1 M gen [GML]. Rio de Janeiro, Aug 1938, R.C. Shannon, 1 M, 1 M gen; 1 Feb 1907, 1 F; 1 L [USNM]. Sao Conrado, 2-13 Dec 1946 (Lots 15,24,26,27,31), 4 1pM (24-1, 26-1, 27-4, 31-1), 7 1pF (15-5, 26-2,3, 27-2,3, 31-3,4), 1 M (27-1), 1 F (15-4), 2 M gen [UCLA]. *Mato Grosso:* Cuiaba, Feb 1935, 2 F [CU]. Maracaju, 1 F [USNM]. *Rio de Janeiro:* Duque de Caxias, 2-12 Dec 1946, 2 1pM (2 Dec, 12 Dec), 2 M gen; 29-30 May 1951, 1 1pF (30 May), 1 M (29 May), 1 M gen [GML] ; 2 Dec 1946-18 Jan 1947 (Lots 1,3,6,8-10,14,17,42,50,57,59, 69,72,823,836,840), 24 1pM (1-1, 3-2, 6-1, 8-1, 9-3, 10-1, 14-1, 17-1, 42-1, 50-1, 57-1, 69-1-4, 72-1,2, 823-1-4, 836-1,2, 840-1), 14 1pF (3-7, 6-3, 8-5, 10-2, 14-3,4, 17-4, 42-3,4, 50-3, 59-3, 72-3,4, 836-8), 1 1M (57-6), 5 F (1-5, 9-5, 17-3, 69-5, 836-7), 4 M gen [UCLA except 14-3 and 42-3 at USNM]. Sto. Eduardo, Jan 1939, 6 F [USNM]. *Sao Paulo:* Avare, J. Lane, 2 F [CU]. Buri, 1 F [UCLA]. Itapira, 3 F [CU]. Rocinha, 20 Feb 1937, A. Ramos, 1 F [UCLA]. *State and Locality Unknown:* 1 1pM (P-246) and associated gen (P-122), 1 1pF (1.287 n.2), 1 1p (G-204) [USNM].

TRINIDAD. *Caroni:* Flanagin Town, Apr 1964, R. Manuel and R. Martinez (TR 513), 1 F [UCLA]. Todds Road, 19 June 1941, L.E. Rozeboom (TRR 10), 1 F [UCLA] . *Nariva:* Tabaquite, Charuma Forest, Oct 1964, A. Guerra (TR 753), 1 1pM (753-107), 1 M gen [UCLA]. *St. George:* Arima, Brasso Seco, Apr 1964, A. Guerra (TR 270), 1 F [UCLA]. Arima, St. Pats Estate, Mar 1955, T.H.G. Aitken, 1 M, 1 F, 1 M gen [UCLA]. Arima, Verdant Vale, 10 Sept 1964, A. Guerra (TR 672), 1 L; Sept 1964, A. Guerra (TR 674), 2 1pM (674-101,102), 1 1pF (674-103), 1 M gen; 9 Apr 1965, A. Guerra (TR 1097), 1 F [UCLA]. Chaguaramas, 11 June 1961, T.H.G. Aitken, 1 pF (11-VI-61-1), 1 p [UCLA]. Port of Spain, St. Ann's, 9 Sept 1945, W.H.W. Komp, 1 P (5-T-68) [USNM]. *County not Specified:* 6 June 1906, F.W. Urich, 1 F [USNM].

Additional Records From the Literature

BRAZIL. *Rio Grande do Sul:* Taquara (Pinto, 1932:295).
PARAGUAY. *Itapua:* Villa Encarnacion (Shannon and Del Ponte, 1928:71).

25. *Haemagogus (Conopostegus) clarki* (Galindo, Carpenter & Trapido)

Figs. 54,62,63

1953. *Aedes (Finlaya) leucocelaenus clarki* Galindo, Carpenter and Trapido, 1953:531-534. TYPE: *Holotype* male with associated larval and pupal skins and genitalia, Tucue, Code, Panama, reared from egg laid by female taken biting human on 5 Sept 1950 [USNM] .

Aedes (Finlaya) leucocelaenus clarki of Galindo, Carpenter and Trapido (1955:160,161,163); Galindo and Trapido (1955:546,548); Trapido and Galindo (1955:671); Trapido, Galindo and Carpenter (1955:529); Stone, Knight and Starcke (1959:165, in part).

Aedes (Finlaya) leucocelaenus of Edwards (1932:148,154,178, in part); Galindo, Trapido and Carpenter (1950:547,563,566,571-572); Knight and Marks (1952:517,518,542,569, in part);

Lane (1953:682-685, in part); Forattini (1965:378-382, in part).
Aedes (Conopostegus) leucocelaenus in part of Dyar (1925:137,141,143; 1928:153-154).
Aedes (Finlaya) n.sp. of Galindo, Carpenter and Trapido (1951:119-120,121).
Aedes leucocelaenus in part of Dyar and Shannon (1924:484); Komp (1938:260,261,263-266).
Aedes leucomelas in part of Howard, Dyar and Knab (1917:810-812).
Aedes (?Gualteria) leucomelas in part of Dyar (1918:73).
Aedes leucotaeniatus in part of Komp (1938:261-263).

FEMALE. Wing: 2.26 mm. Proboscis: 2.09 mm. Forefemur: 1.81 mm. Abdomen: about 2.0 mm. Small species. *Head:* Erect scales usually entirely dark brown or blackish. Dorsolateral silver patch usually very large. Coronal silver line usually moderately well developed, moderately long. *Thorax:* Acrostichal silver scales in a broad patch restricted to anterior 0.25-0.35 of mesoscutum. Lateral prescutellar silver line usually absent, sometimes poorly developed and incomplete, distinctly separated from its mate when present. Midlobe of scutellum usually without silver scales. *Ppl* with only 1 (1 or 2) long strong dark bristle and 1 (0-2) weak light bristle. *Pst* with only a few scales near *ppl. Mep* scale patch simple, without a caudal extension from dorsal end. *Legs:* Femora without a narrow white line on ventral surface extending basad from apex. Knee spot absent on foreleg, large but not extended basad on midleg, large and extended basad along ventral surface on hindleg.

MALE. Similar to female except for sexual characters. *Head:* Palpus about 0.67-0.82 length of proboscis. *Thorax:* Silver scaling more extensive than in female; acrostichal patch longer, sometimes extending through anterior 0.50 of mesoscutum; lateral prescutellar line well developed; midlobe of scutellum with silver scales. *Legs:* Larger claw of midleg without submedian tooth.

MALE GENITALIA (fig. 62). *Segment VIII:* Tergite about 0.90 length of sternite; usually with only 1 irregular row of enlarged setae along distal margin. *Segment IX:* Lateral portions of tergite not joined or joined by very narrow membranous or weakly sclerotized strip; tergite without membranous lobes. *Sidepiece:* Basal tergomesal area with numerous setae, the more ventral straight or gently or strongly curved dorsad; subapical tuft inconspicuous, weakly developed, represented by only 3-5 setae; specialized scales of sternomesal surface moderately numerous (11-15), predominantly elliptic, the longest ones much shorter than clasper; general vestiture of scales and setae moderately dense, basal portion of tergal surface without setae directed over IX-T. *Claspette:* Stem with 1-3 moderately long fine distal setae. Filament simple, slightly flattened. *Clasper:* Usually distinctly swollen near base. *Phallosome:* Aedeagus moderate in size, more or less pandurate. *Proctiger:* Apical knob of paraproct with 10-14 moderately coarse to coarse striations.

PUPA (fig. 62). Abdomen: about 3.2 mm. Trumpet: 0.56 mm. Paddle: 0.95 mm. *Cephalothorax:* Pigmentation not uniformly lighter ventrally, leg cases as dark as or darker than middorsal area. Hairs 1-3-C single. Hair 5-C single, extending far beyond base of trumpet. *Trumpet:* Reticulate sculpturing usually weak. *Abdomen:* Weakly pigmented with middorsal area of most segments usually darker, the darker areas usually forming a median longitudinal streak; middorsal portion of segment I more strongly pigmented than segment II. Float hair (1-I) with 3-6 very long, simple primary branches; hair 1 moderately to strongly developed on II and III, strongly developed on IV-VII, usually single or double (1-3b). Hair 541 moderately to strongly developed, single, arising nearer hair 1 than to lateral edge of segment; 5411 strongly developed, single, arising near hair 1; hair

5-IV 2.3-3.0 length of segment IV, single, arising near hair 1; hair 5-V-VII single. Hair 6-VII not stronger than 6-III-VI. Hair 9-VIII with 3 or 4 branches, some elongate. *Paddle:* Large, inner part much broader than outer part and extending farther distad, distal portion strongly asymmetrical. Apex emarginate. Midrib normal, narrow, dark, extending to or nearly to apex. Hair 1-P single.

LARVA (fig. 63). Head: 0.78 mm. Siphon: 0.88 mm. Anal Saddle: 0.31 mm. *Head:* Hair 5-C usually double (single or double). Hair 6-C double. Hair 7-C 2,3b (2-4). *Thorax:* Tubercles of hairs 5-7-P usually free, sometimes weakly joined. Hair 4-P usually 3,4b (2-5). Hair 5-P usually single (single or double). Hair 7-P usually double (single or double). Hair 14-P 3-5b. *Abdomen:* Hair 1-III-V usually 2-4b (2-5). Hair 6-III-V usually single (single or double). Hair 7-11 long and strong, usually 1-3b (1-5), its tubercle often joined to that of 6-11 by sclerotization. *Siphon:* Index 3.2-3.9. Acus usually indistinct, fused with base of siphon. Pecten teeth usually with 1 large basal denticle. Hair 1-S moderately developed, moderately long to long, not attaining apex of siphon, 3,4b. *Anal Segment:* Hair 2-X 3,4b. Ventral brush with 5 pairs of hairs; all hairs arising from boss; hair 4a-X 3-5b.

SYSTEMATICS. *Haemagogus clarki* may be distinguished from *leucotaeniatus, leucophoebus* and *leucocelaenus* as follows: in the female by (1) the broad silver acrostichal patch that is restricted to the anterior 0.25-0.45 of the mesoscuturn, (2) the absent or weakly developed lateral prescutellar silver line, (3) the reduced number of propleural bristles, (4) the simple mesepimeral scale patch, and (5) the knee spot of the hindfemur which is conspicuously extended basad along the ventral surface; in the male by (1) the shorter palpus, (2) the absence of a submedian tooth on the larger claw of the midleg, (3) the single row of enlarged setae along the distal margin of tergite VIII, and (4) the 10-14 moderately coarse to coarse striations at the apex of the paraproct; in the pupa by (1) the 3-6 very long simple branches of the float hair (1-I), (2) the large paddle which is strongly asymmetrical distally, (3) the moderately to strongly developed hair 5-11 which may be displaced mesad and arise near 1-II, and (4) the relatively darkly pigmented leg cases and middle portion of tergite I; and in the larva by (1) the usually single hair 6-III-V, (2) the long, strong, usually 1-3b (1-5) hair 7-II that frequently arises from the same sclerotization as 6-11, and (3) the absence of a distinct acus at the base of the siphon.

The single female from Guyana has a much smaller dorsolateral silver patch on the head than typical females from Panama. Since this patch is small in both the forms (species 26 and 27) segregated from *clarki,* it is possible that this specimen represents another undescribed species.

BIONOMICS. The immatures of *clarki* have been found in treeholes and bamboo traps. There are many records of females biting humans during daylight hours.

DISTRIBUTION (fig. 54). *Haemagogus clarki* extends from Honduras to Panama and possibly to Guyana. Material examined: 187 specimens; 32 males, 75 females, 40 larvae, 40 pupae; 35 individual rearings (17 larval, 8 pupal, 10 incomplete).

GUYANA. *Essequibo:* Mazaruni, 25 June 1936, W.H.W. Komp, 1 F (203A-23) [UCLA] .

PANAMA. *Bocas del Toro:* Chiriqui Grande, Chiriquicito, 22 Apr 1963 (PA 250), 2 F [UCLA] . *Canal Zone:* Barro Colorado Island, 8-9 July 1923, R.C. Shannon, 6 F [USNM] ; 1-31 May 1943 and 15 May-26 June 1945, W.H.W. Komp, 5 1pM (203A-12=43-184, 203A-13=43-123, 203A-15=43-154, 203A-30=45-230, 203A-32=45-223), 2 1pF (203A-15=43-154, 203A-34=45-459), 3 pM (203A-4), 2 1M (203A-11=43-234, 203A-16=43-232), 1 IF (203A-8=43-224), 3 M (203A-3, 203A-6=43-168, 203A-28), 1 F (203A-26), 2 1p (43-133), 21 (45-140, 45-247), 1 p (203A-1=43.196), 1 M, 2 L, 1 P, 1 M gen [USNM] , 4 1pM (203A-2=43-175, 203A-22=43-144,

203A-27=43-228), 2 1pF (203A-31=45-248, 203A-33=45-225), 1 pM (203A-18=43-119), 1 pF (203A-18=43-119), 2 1M (203A-17=43-163, 203A-25=43-199), 1 M, 2 F (203A-9), 2 L (43-102, 43-220) [UCLA] . Barro Colorado Island (?), 2 F [UCLA] . Corozal, 8 Jan 1943, W.H.W. Komp, 4 F [USNM] . Corozal Dam Site, 28 July 1943, W.H.W. Komp, 1 F (203A-21) [UCLA] . Fort Clayton, 8-15 Nov 1951, S.J. Carpenter, 3 F [UCLA] . Fort Davis, 15-29 Nov 1951, S.J. Carpenter, 1 F [UCLA] . Fort Gulick, 27 Dec 1951, S.J. Carpenter, 1 F [UCLA] . Fort Sherman, 9 Dec 1949, 1 F [UCLA] . *Cock:* Tucue, 5 Sept 1950, 1 1pF (467-1) [USNM] , 1 F, 1 Ip, 1 L [GML] . *Darien:* La Palma, 29 Nov 1966, 0.G.W. Berlin (PA 958), 1 pF (958-101), 1 L [UCLA] . Paya, 1 Mar 1958, 1 1pM (GG1-117), 1 1pF (GG1-124), 1 pF (GG1-120) [UCLA] . Pucro, Tacarcuna River Valley, 20 June 1963 (PA 406), 1 F; 8 July 1963 (PA 444), 1 F; 12 July 1963 (PA 457), 1 F [UCLA] . *Panama:* Arriajan, 10 July 1950, S.J. Carpenter, 3 M, 3 M gen, 1 F [UCLA] . Cerro La Victoria, 1949, H. Trapido, 9 F [UCLA] ; 23 Aug 1949-5 Sept 1950, 1 1pM (00081), 1 M, 2 M gen, 5 F, 2 1p, 4 P, 4 L [USNM] , 3 M, 2 F, 4 P, 1 L [GML] . Pacora, 16 Oct 1946, W.H.W. Komp, 1 F [USNM] ; 13 July 1950, S.J. Carpenter (5019), 1 pF (5019-3) [UCLA] ; 7 Feb-12 Dec 1950, 1 M, 1 M gen, 17 F [UCLA] .

Additional Records From the Literature

COSTA RICA. (Galindo, Carpenter and Trapido, 1953:531; Galindo and Trapido, 1955: 546,548; Trapido, Galindo and Carpenter, 1955:529.)

HONDURAS. Yaruca (Trapido and Galindo, 1955:671).

26. *Haemagogus (Conopostegus)* sp., Small Colombian form

Fig. 54

?Aedes (Finlaya) leucocelaenus in part of Forattini (1965:378-382).
?Aedes leucocelaenus in part of Komp (1936:62; 1938:260,261,263-266; 1956:37-38); Bugher, Boshell-Manrique, Roca-Garcia and Osorno-Mesa (1944:45,47,48).
?Aedes (Finlaya) n.sp. of Galindo, Carpenter and Trapido (1953:531).

FEMALE. Wing: 2.79 mm. Proboscis: 2.46 mm. Forefemur: 2.31 mm. Abdomen: about 2.6 mm. Moderate in size. *Head:* Erect scales usually entirely dark brown or blackish. Dorsolateral silver patch reduced, small to moderate in size. Coronal silver line reduced in extent, present only anteriorly. *Thorax:* Acrostichal silver scales in a broad long patch in anterior 0.40-0.45 of mesoscutum. Lateral prescutellar silver line well developed, conspicuous, distinctly separated from its mate. Midlobe of scutellum with silver scales. *Ppl* with 1 long strong dark bristle and 0 or 1 weak light bristle. *Pst* with a few scales near *ppl. Mep* scale patch simple, without a caudal extension at dorsal end. *Legs:* All femora with a relatively long white line extending basad from apex along ventral surface. Knee spot absent from foreleg, moderate on midleg, large on hindleg, that of midleg and hindleg continuous with white line extending basad from apex of femora.

MALE. Unknown.

MALE GENITALIA (not figured). Possibly indistinguishable from *clarki.*

PUPA, LARVA. Unknown.

SYSTEMATICS. The small Colombian form is similar to *clarki* and to the Peruvian lowland form. It differs from the former species in the female by (1) the reduced silver scaling on the head, (2) the strongly developed lateral prescutellar silver line on the mesoscutum, and (3) the presence of a relatively long white line on the ventral surface of the apical portion of the forefemur and midfemur; and from the latter species by character (2) mentioned above and by the longer white line on the ventral surface of the apical portion of the forefemur and midfemur.

There is a male genitalia slide labeled Tena, Ecuador, in the USNM that may be this species. The genitalia appear to be indistinguishable from *clarki.*

BIONOMICS. The habitat of the immatures is unknown. The females were presumably obtained in biting-landing collections. This species is sympatric with the large Colombian form "in the mountains by the coast."

The yellow fever isolation reported by Bugher et al. (1944:45,47,48) may have been from this species.

DISTRIBUTION (fig. 54). The small Colombian form is known from 2 unspecified localities in Colombia and possibly also from Ecuador. Material examined: 3 specimens; 2 females, 1 male genitalia.

COLOMBIA. *Locality Unknown:* "In the mountains by the coast," 22 Dec 1936, J.A. Kerr, 1 F; M. Bates, 1 F [UCLA].

ECUADOR. *Napo Pastaza:* Tena, 1 M gen [USNM].

27. *Haemagogus (Conopostegus)* sp., Peruvian lowland form

Fig. 54

FEMALE. Wing: 2.23 mm. Proboscis: 1.90 mm. Forefemur: 1.74 mm. Abdomen: about 2.0 mm. Small species. *Head:* Erect scales entirely dark brown. Dorsolateral silver patch reduced, small. Coronal silver line absent. *Thorax:* Acrostichal scales in a broad patch of undetermined length. Lateral prescutellar silver line absent. Midlobe of scutellum without silver scales. *Ppl* with at least 1 long strong amber bristle. Scalation of *pst* unknown. *Mep* scale patch simple, without a caudal extension at dorsal end. *Legs:* All femora with a short white line extending basad from apex along ventral surface. Knee spot absent on foreleg, moderate on midleg, large on hindleg, that of midleg and hindleg continuous with white line extending basad from apex of femora.

MALE, PUPA, LARVA. Unknown.

SYSTEMATICS. The Peruvian lowland form is similar to *clarki* and the small Colombian form. It differs from *clarki* in the female by (1) the reduced silver scaling on the head, and (2) the presence of a relatively short white line on the ventral surface of the apex of the forefemur and midfemur; and it differs from the small Colombian form in the female by (1) the absence of a lateral prescutellar silver scale line, and (2) the shorter white line on the ventral surface of the apex of the forefemur and midfemur.

BIONOMICS. Unknown.

DISTRIBUTION (fig. 54). The Peruvian lowland form is known from the Amazon Basin in eastern Peru. Material examined: 1 female.

PERU. *Loreto:* Iquitos, Mar-Apr 1931, R.C. Shannon, 1 F [USNM].

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FIGURES

47. *Aedes (0.) epactius;* larva
48. *Aedes (0.) atropalpus;* adult morphology
49. *Aedes (0.) atropalpus;* male genitalia and pupa
50. *Aedes (0.) atropalpus;* larva
51. *Aedes (O.) fluviatilis;* adult morphology
52. *Aedes (O.) fluviatilis;* male genitalia and pupa
53. *Aedes (O.) fluviatilis;* larva
54. Distribution of the species of *Conopostegus*
55. *Haemagogus (C.) leucotaeniatus;* male genitalia and pupa
56. *Haemagogus (C.) leucotaeniatus;* larva
57. *Haemagogus (C.) leucophoebus;* male genitalia and pupa
58. *Haemagogus (C.) leucophoebus;* larva
59. *Haemagogus (C.) leucocelaenus;* adult morphology
60. *Haemagogus (C.) leucocelaenus;* male genitalia and pupa
61. *Haemagogus (C.) leucocelaenus;* larva
62. *Haemagogus (C.) clarki;* male genitalia and pupa
63. *Haemagogus (C.) clarki;* larva

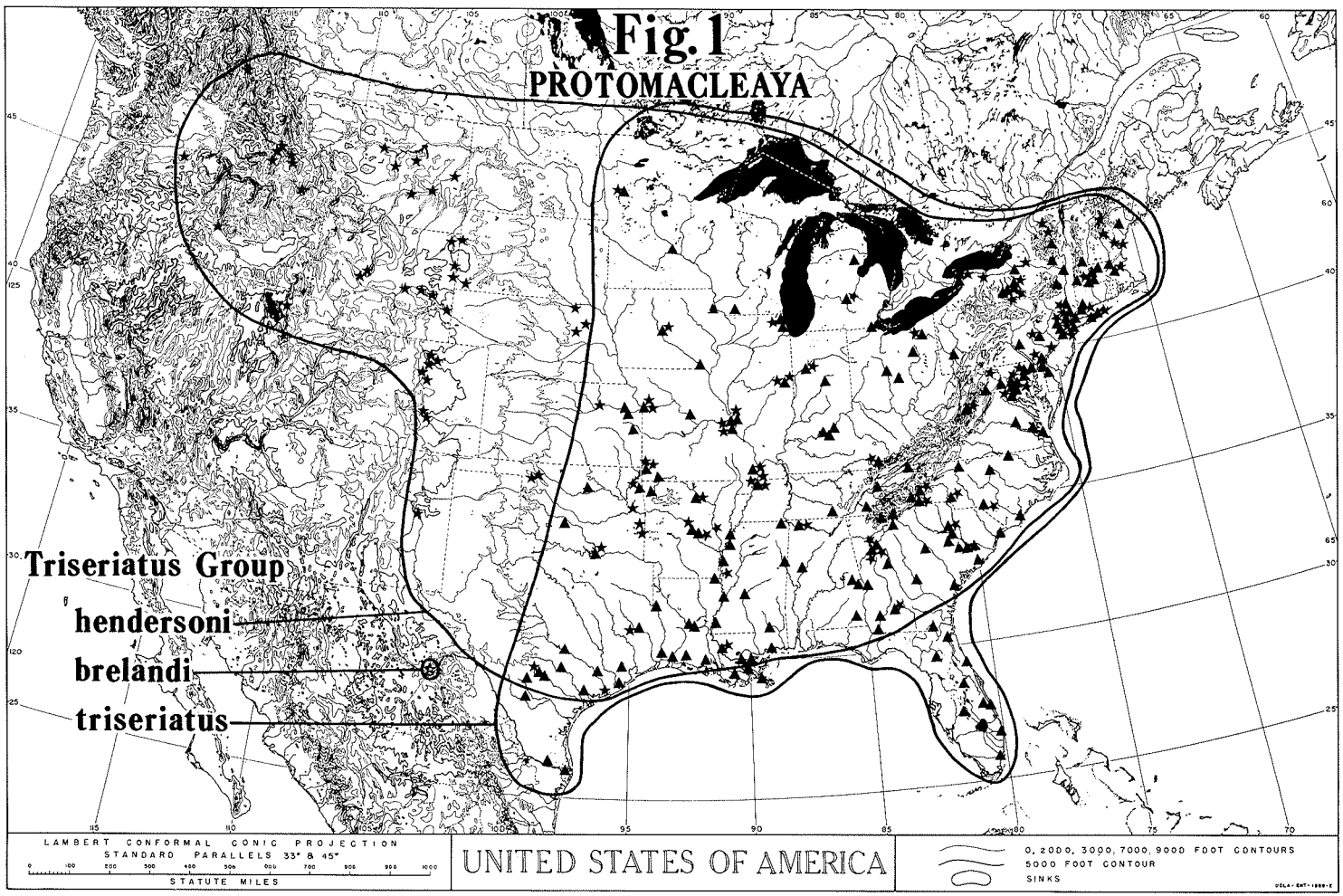
Fig. 1
PROTOMACLEAYA
Triseriatus Group
hendersoni
brelandi
triseriatus
LAMBERT CONFORMAL CONIC PROJECTION
STANDARD PARALLELS 33° & 45°
STATUTE MILES
UNITED STATES OF AMERICA
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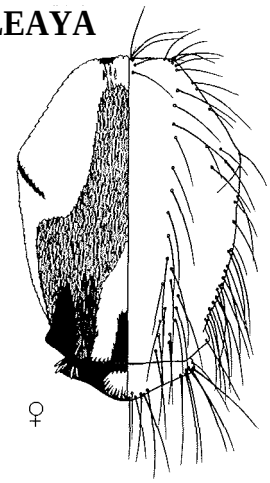
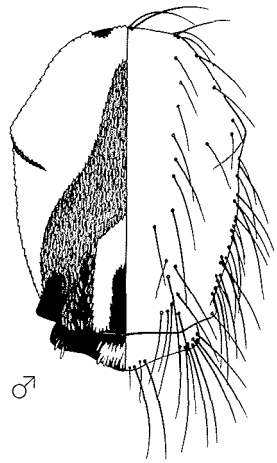
5000 FOOT CONTOUR
SINKS

PRO TOMACLEAYA

Fig.2





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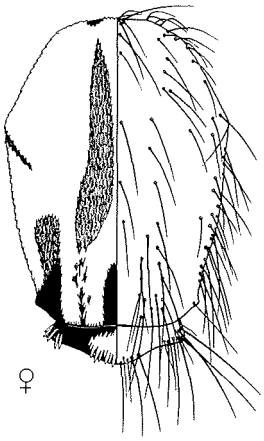

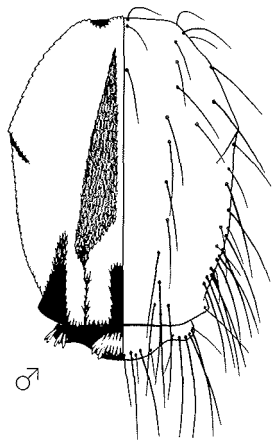

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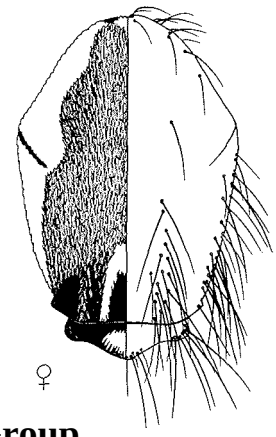
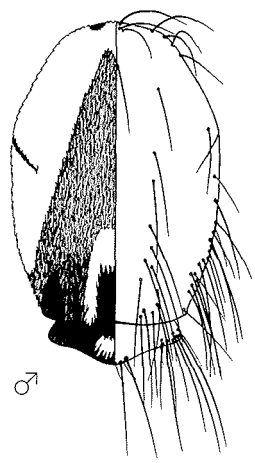




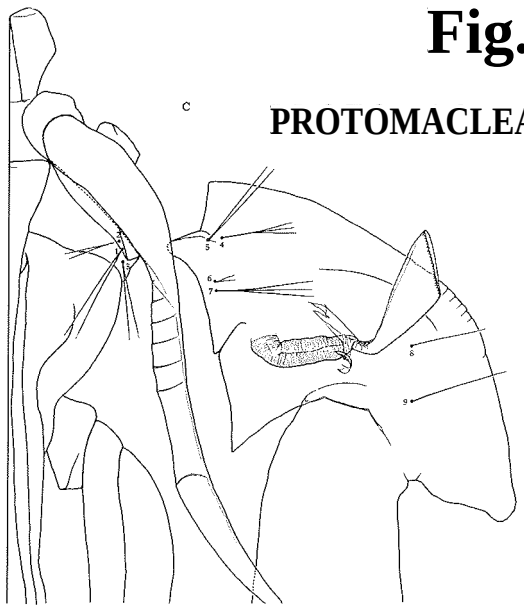
triseriatus

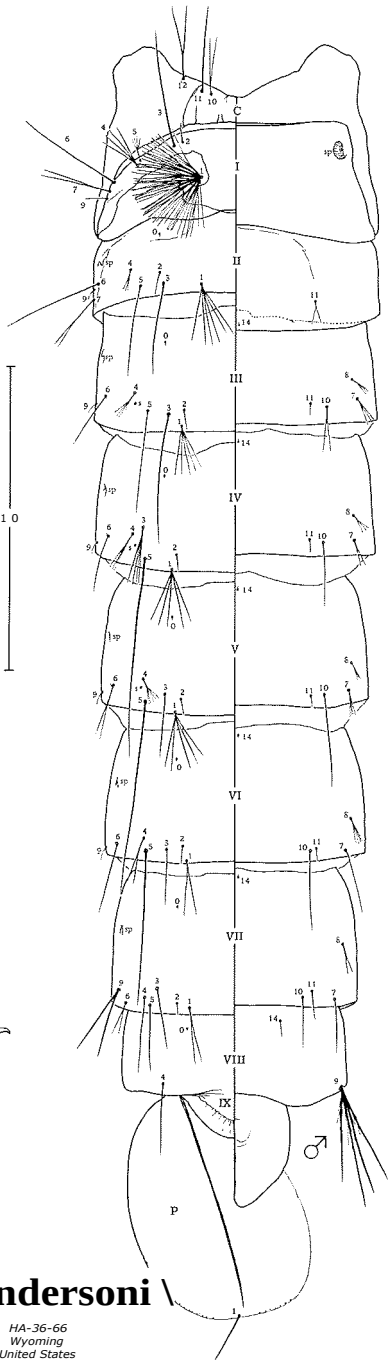
UCLA 571
Ohio
United States

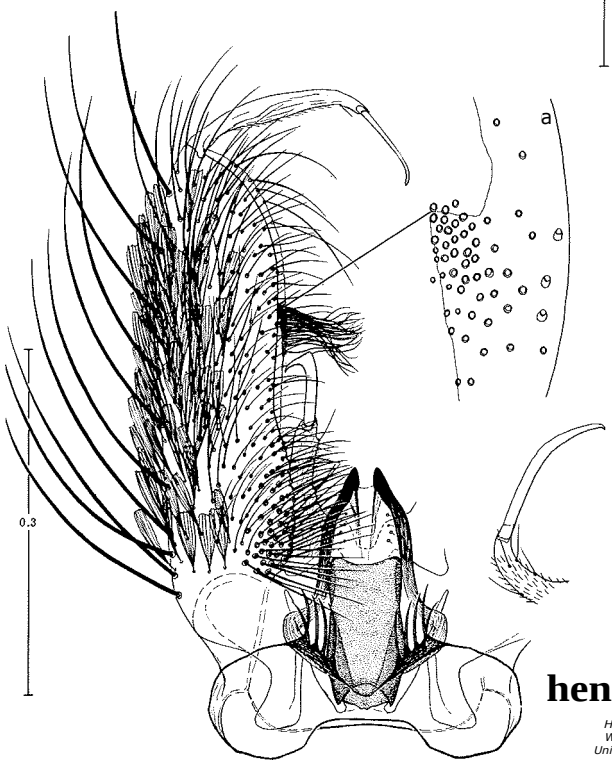
Triseriatus Group

Fig.3

PROTOMACLEAYA







**hendersoni **

HA-36-66
Wyoming
United States

Fig.4

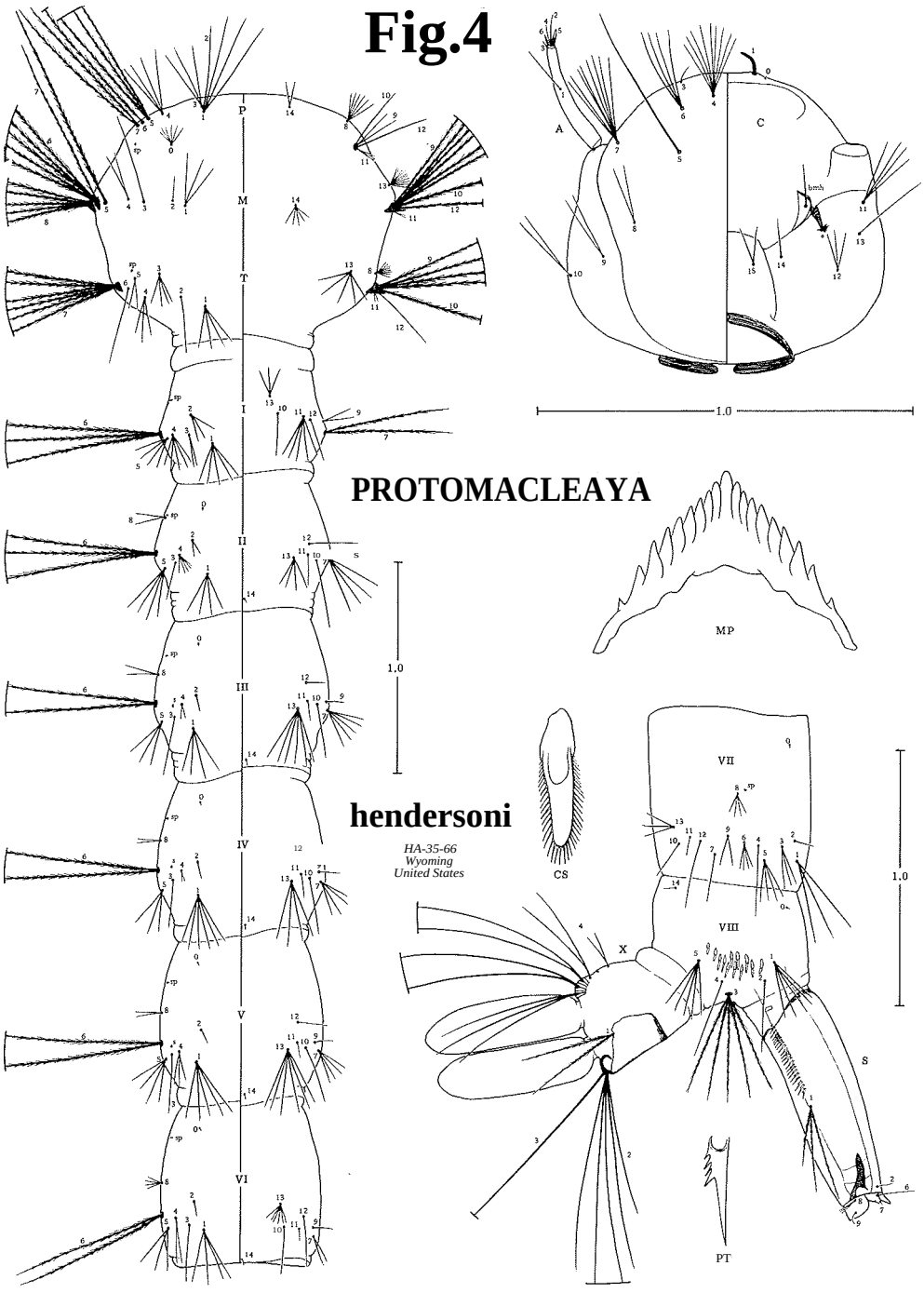

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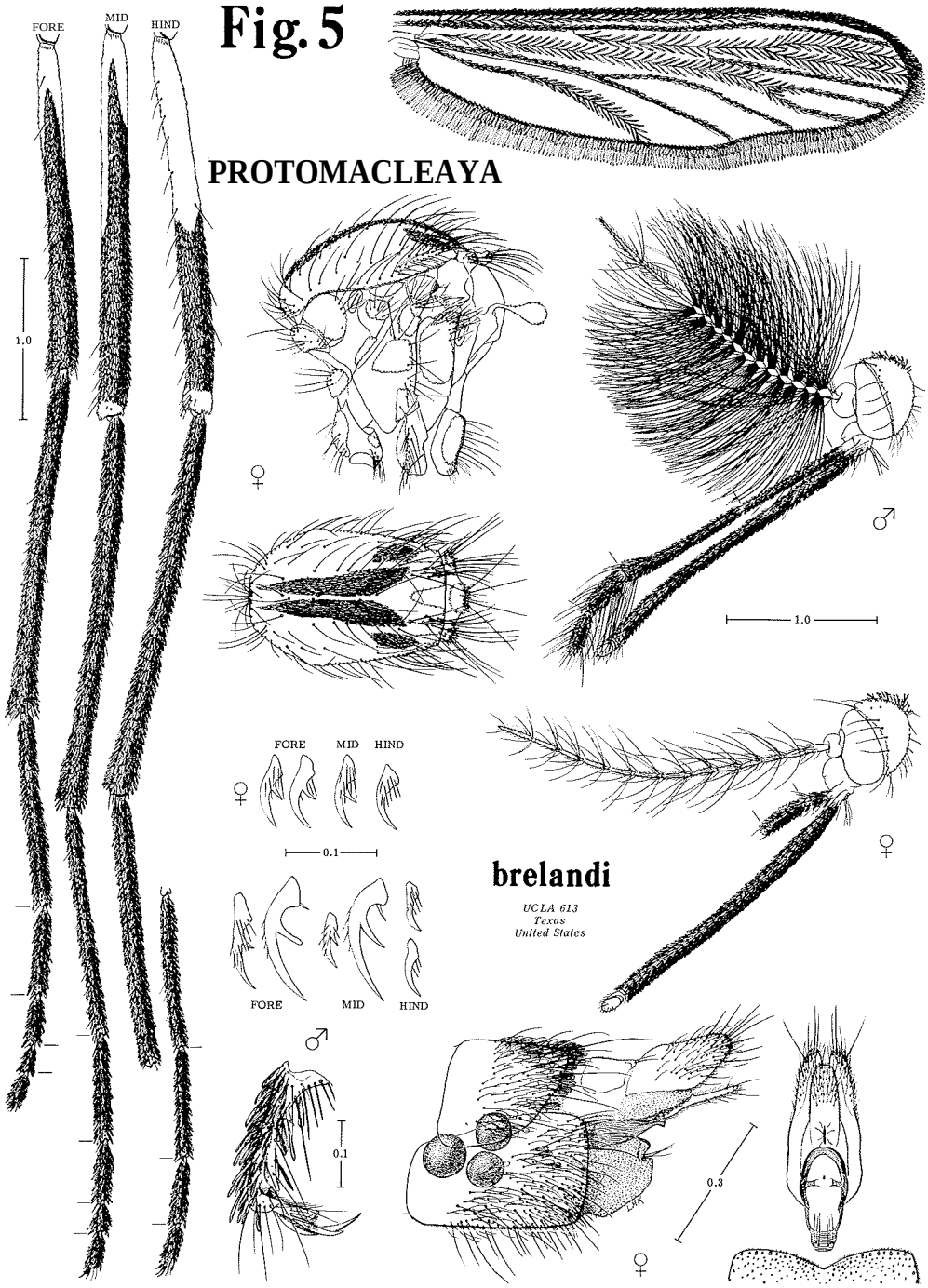
Fig. 5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brelandi
UCLA 613
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United States
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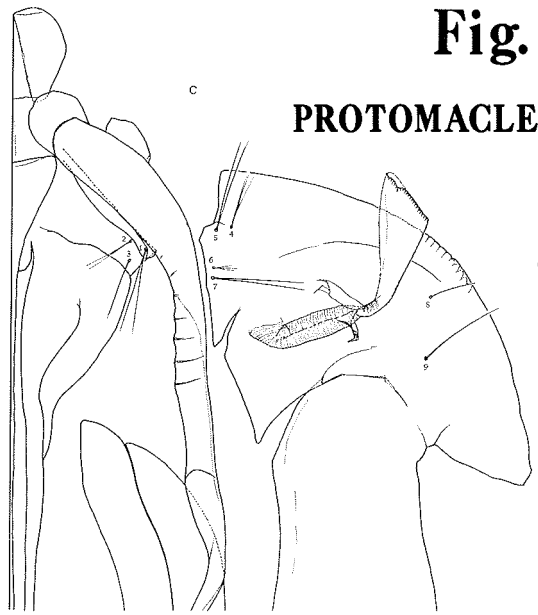
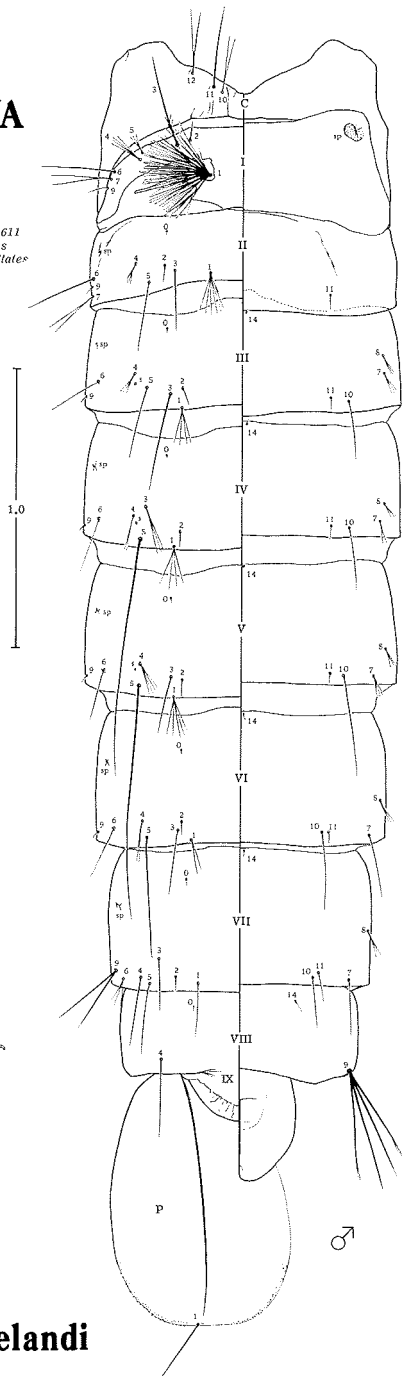
Fig. 6

PROTOMACLEAYA



UCLA 611
Texas
United States



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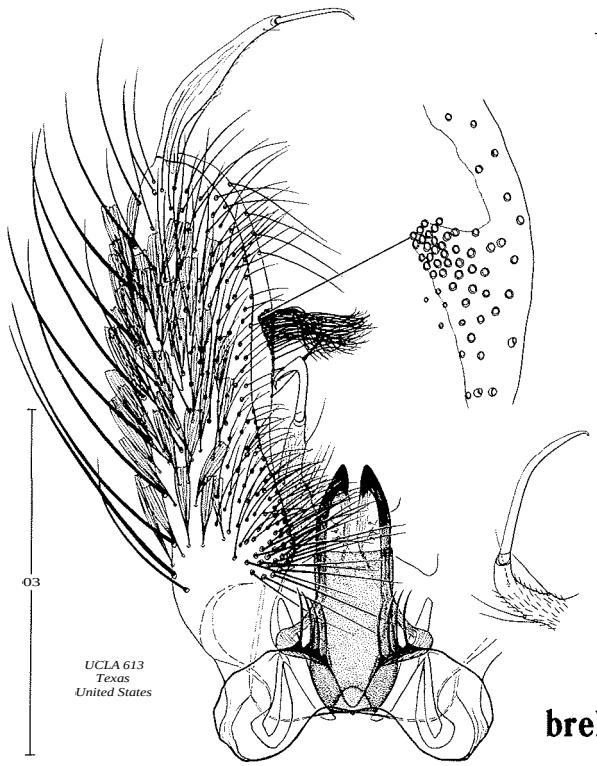

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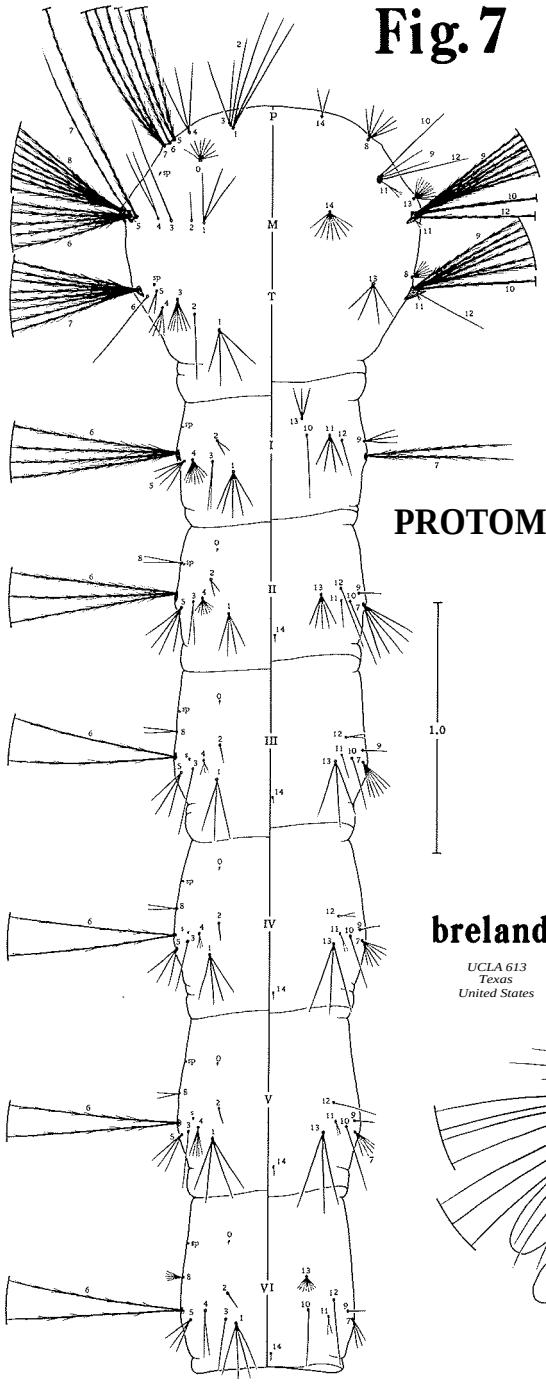
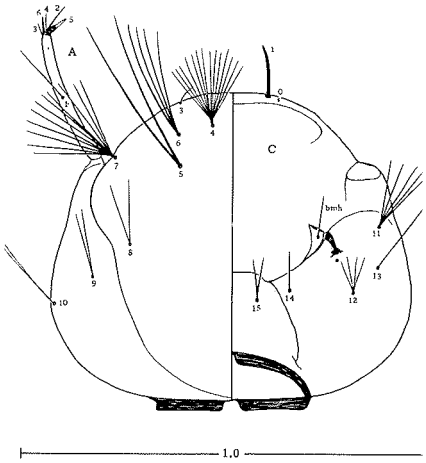
UCLA 613
Texas
United States

brelandi

Fig. 7





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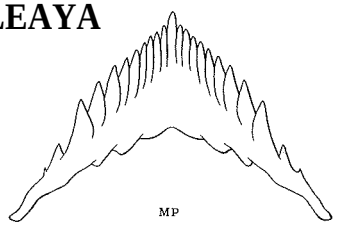

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UCLA 613
Texas
United States

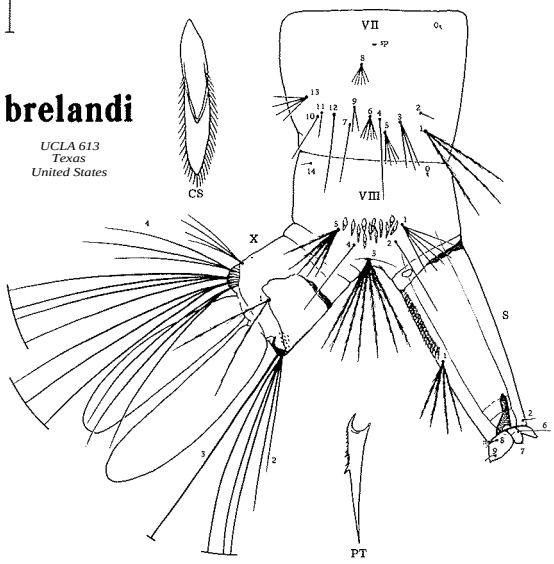


Fig.8

PROTOMACLEAYA

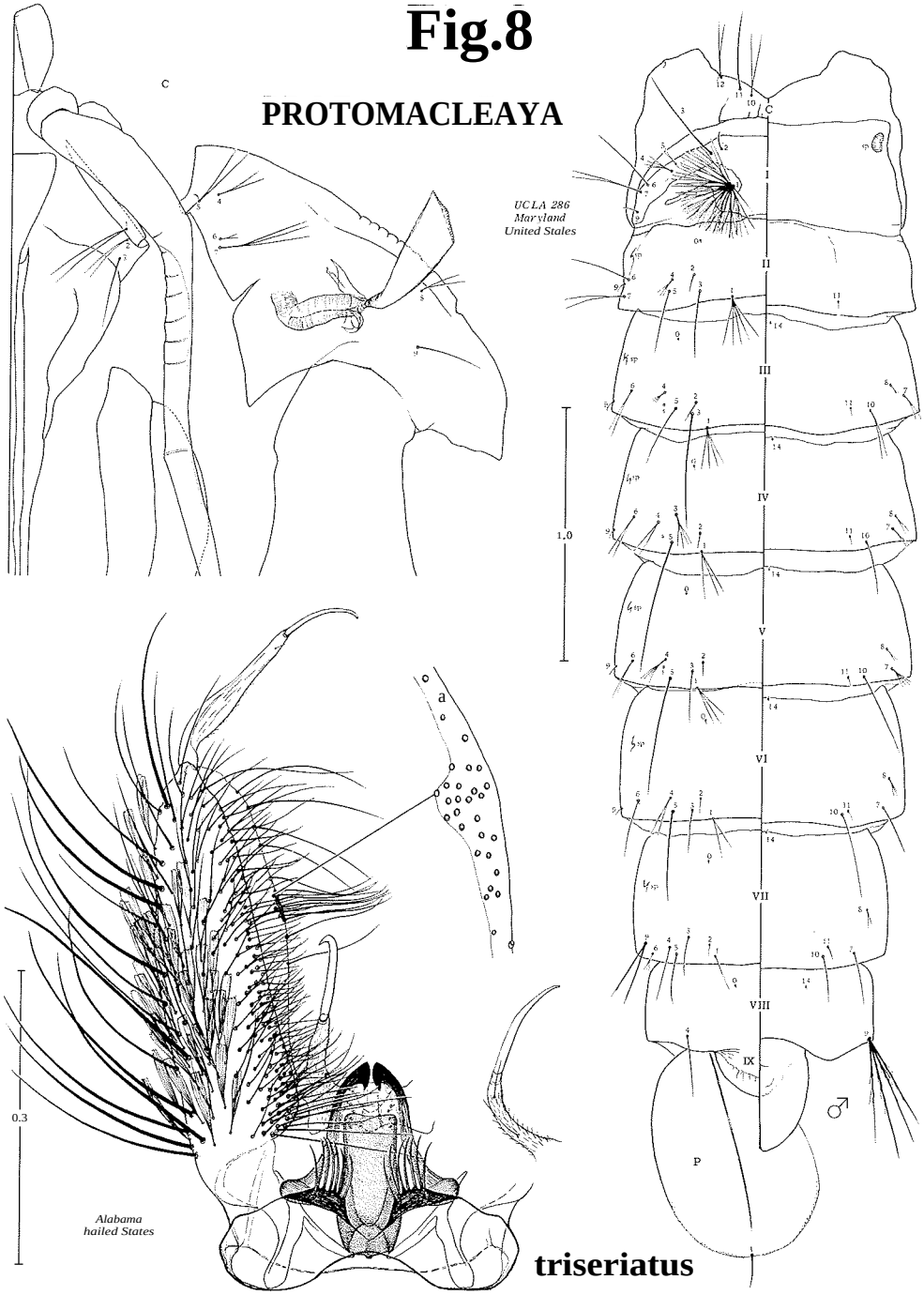
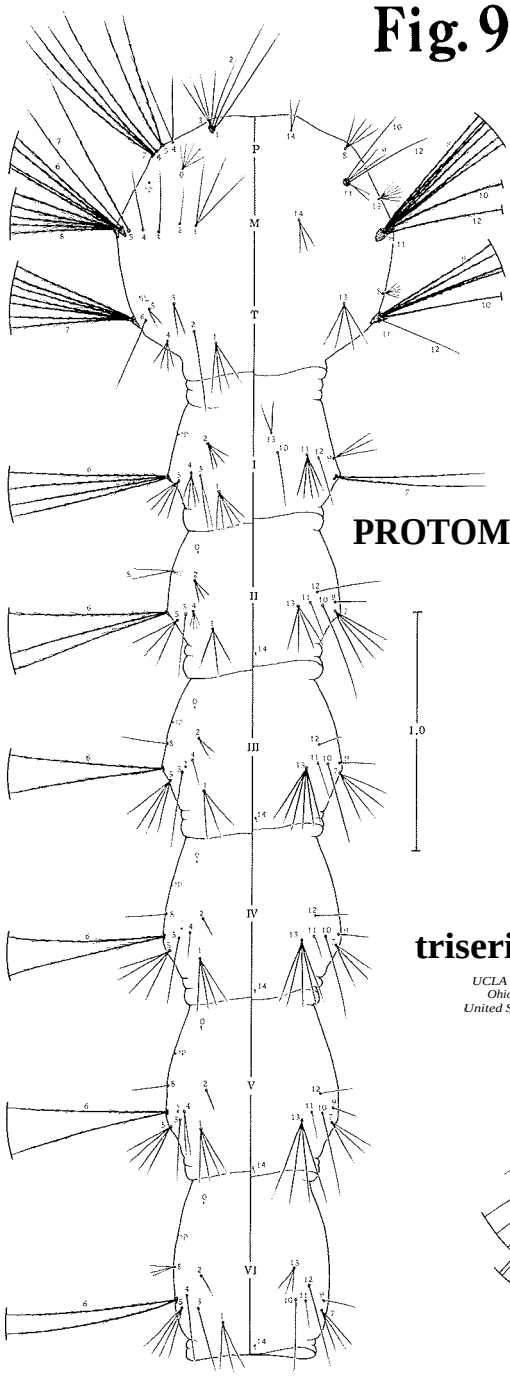
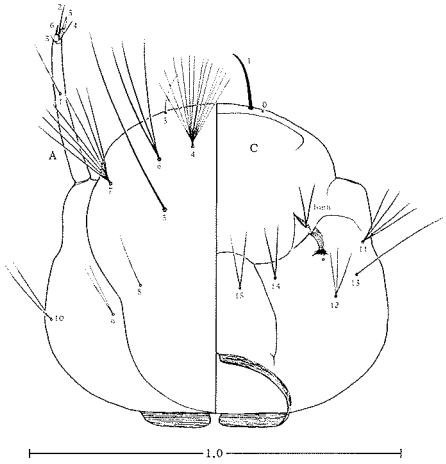


Fig. 9





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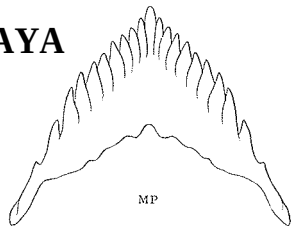
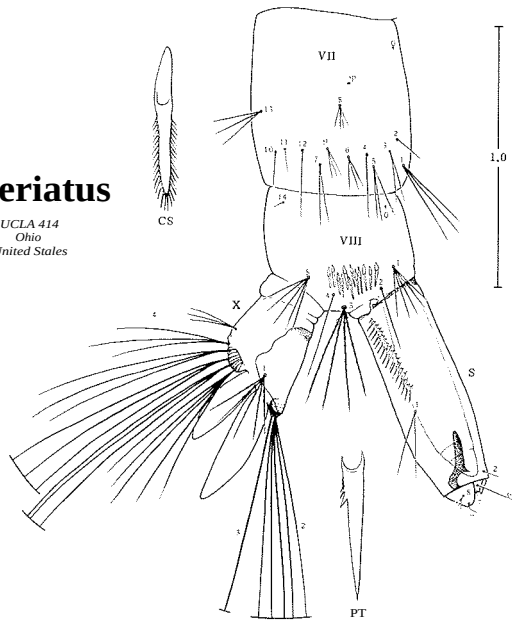


triseriatus

UCLA 414
Ohio
United Stales



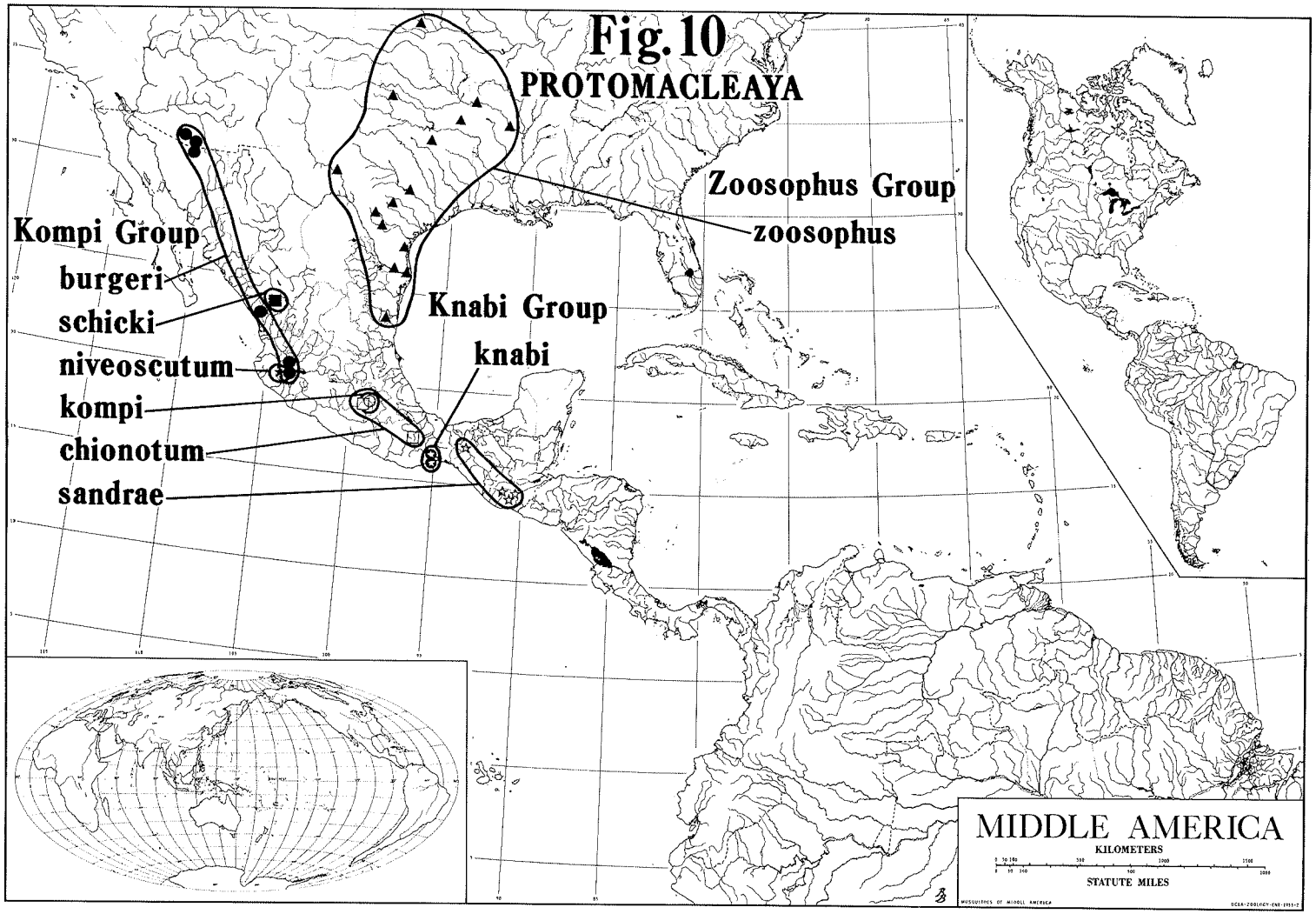


Fig. 10
PROTOMACLEAYA
Zoosophus Group
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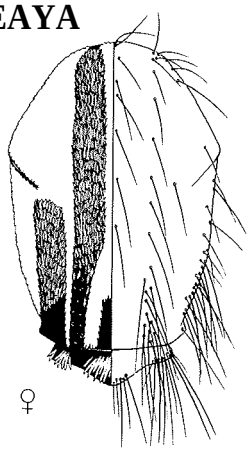
Kompi Group
burgeri
schicki
niveoscutum
kompi
chionotum
sandrae
Knabi Group
knabi
MIDDLE AMERICA
KILOMETERS
STATUTE MILES

PROTOMACLEAYA

Fig. 13

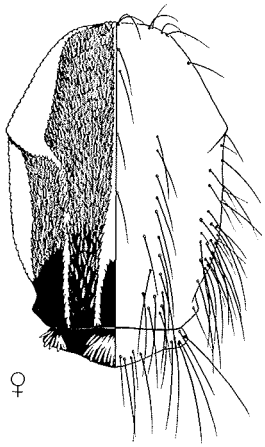
burgeri

UCLA 562
Arizona
Uniled States



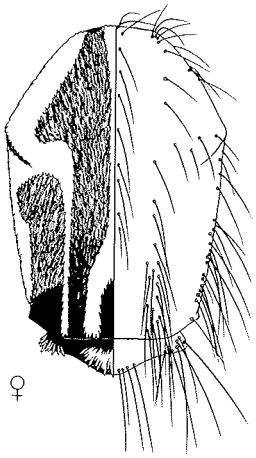
kompi

EX 619
Morelos
AL,101



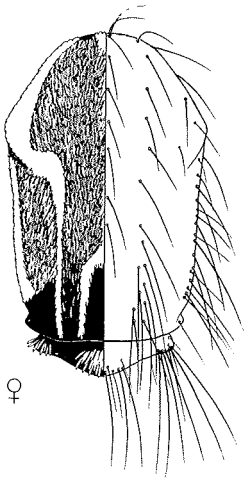
schicki

MEX 696
Dar.go
Mexico



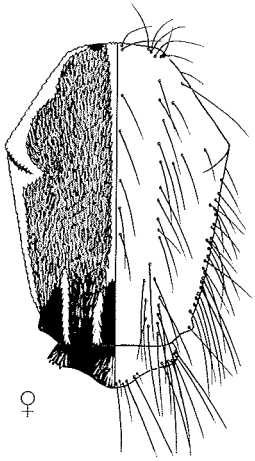
chionotum

MEX 304
Morelos
Mexico



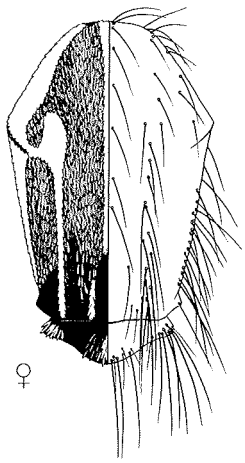
niveoscutum

MEX 671
Jalisco
Mexico



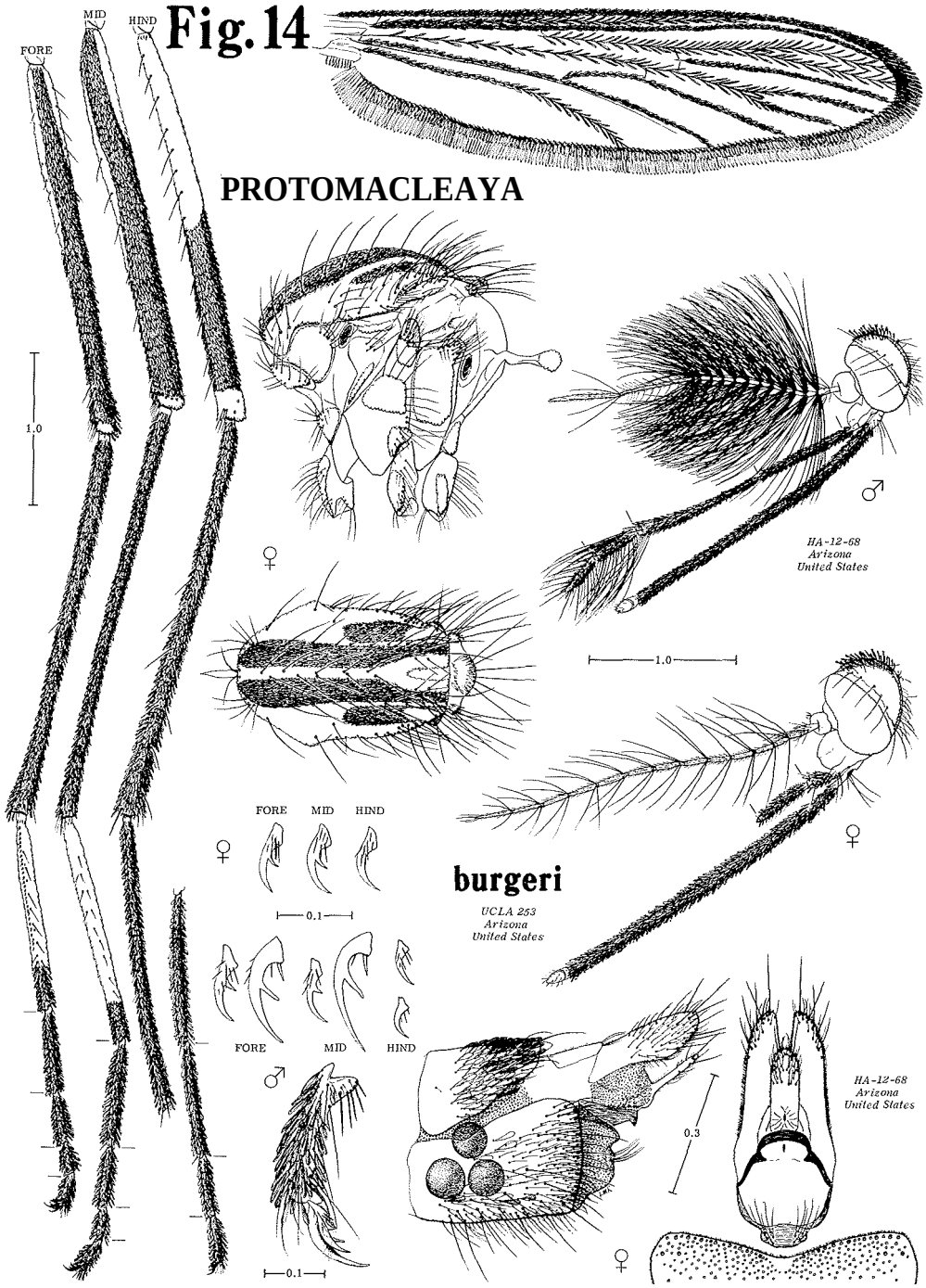
sandrae

GUA 125
Guatemala
Guatemala



Kompi Group

Fig. 14



PROTOMACLEAYA

Fig.15

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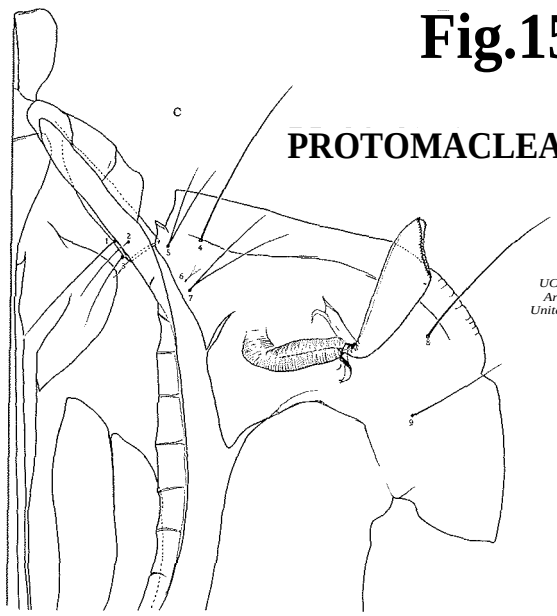
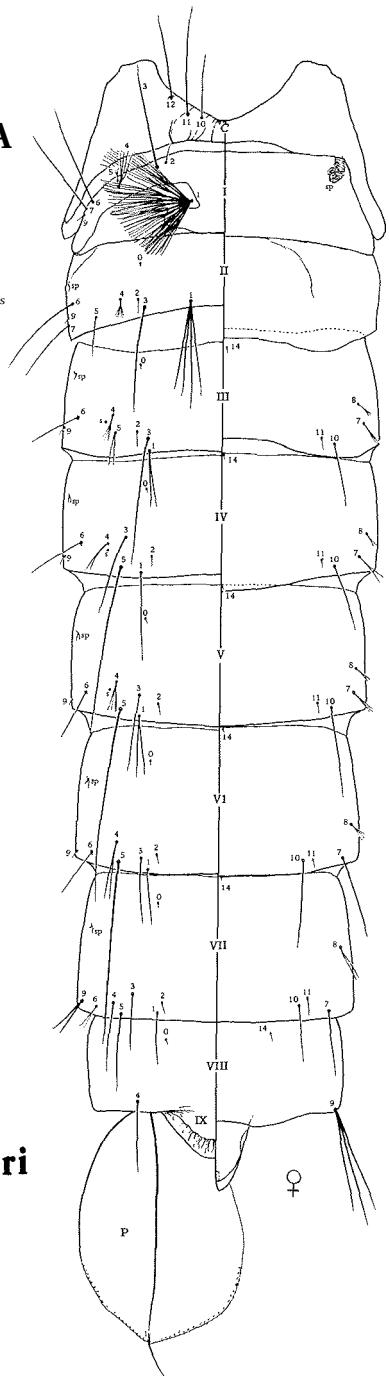


UCLA 253
Arizona
United States



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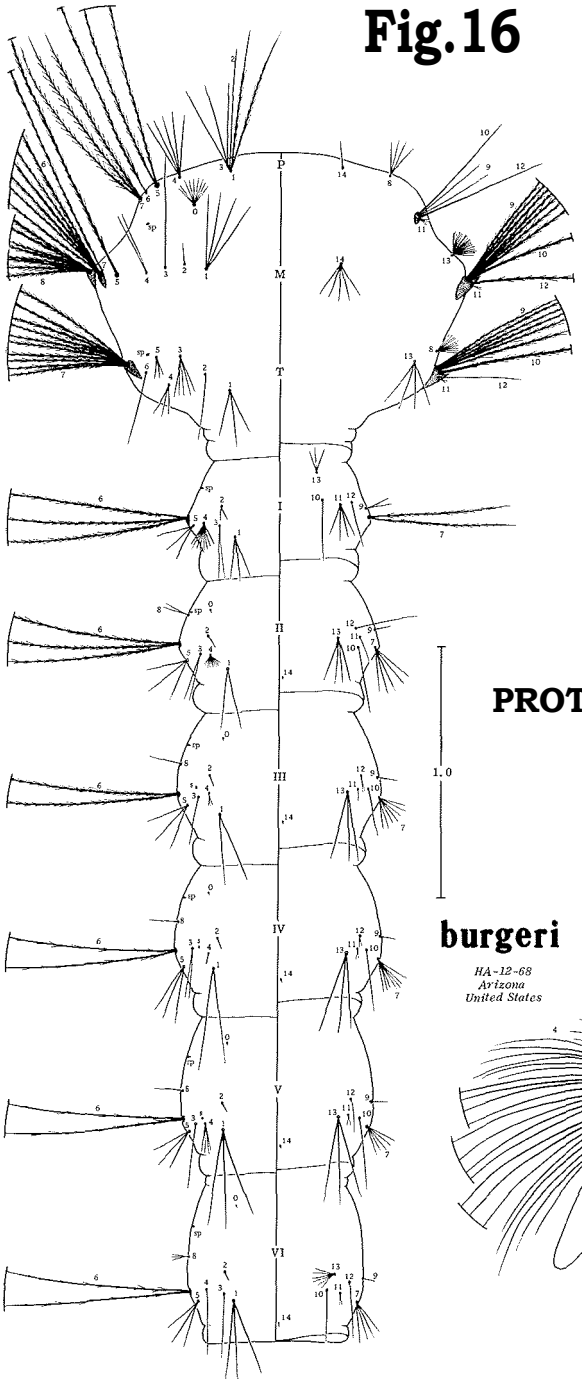
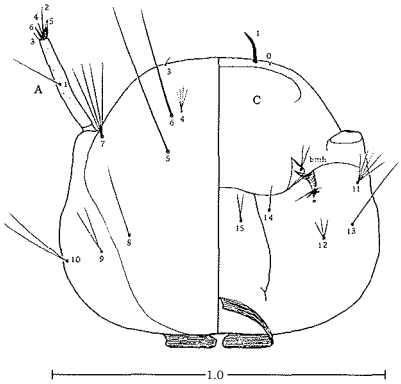
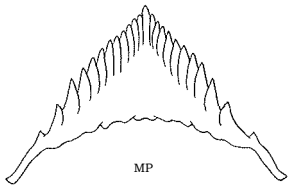
UCLA 454
Arizona
United States

burgeri

Fig.16







PROTOMACLEAYA

burgeri

HA-12-68
Arizona
United States

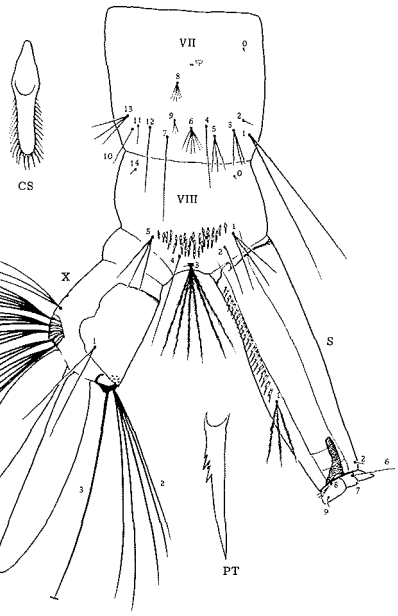
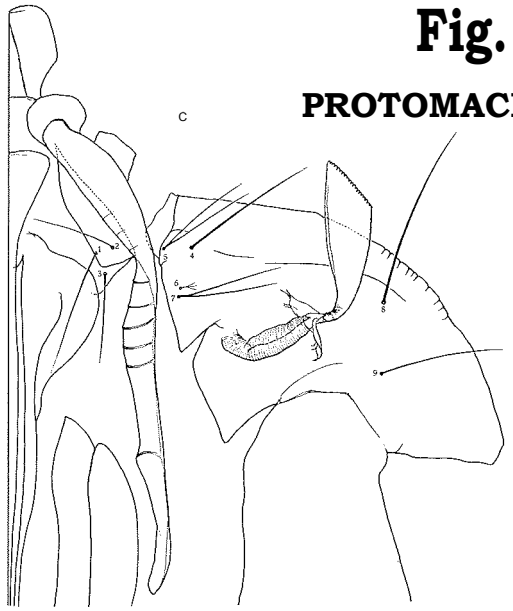


Fig.17

PROTOMACLEAYA



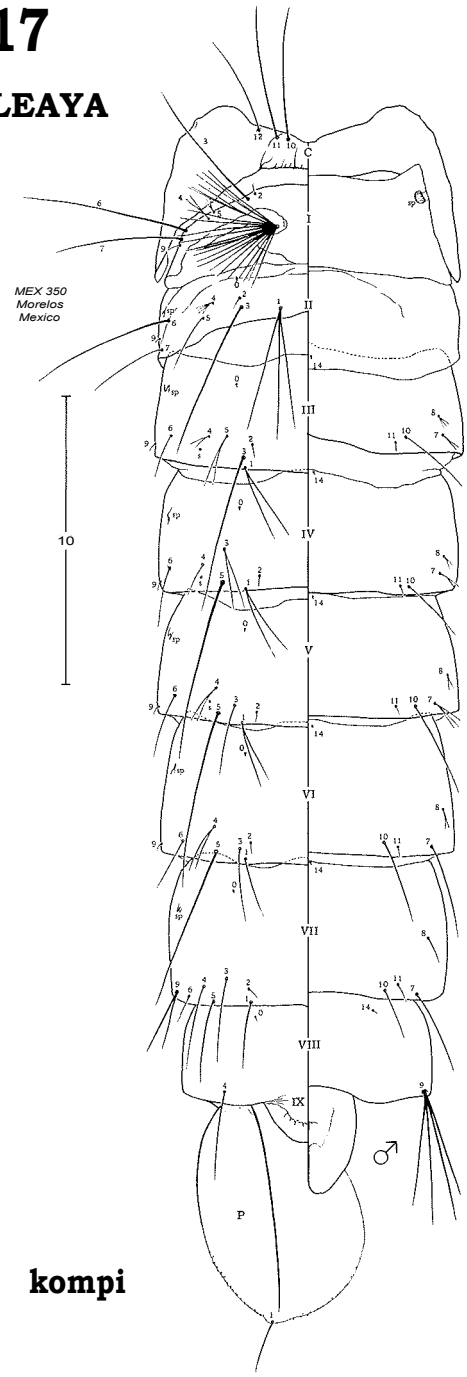


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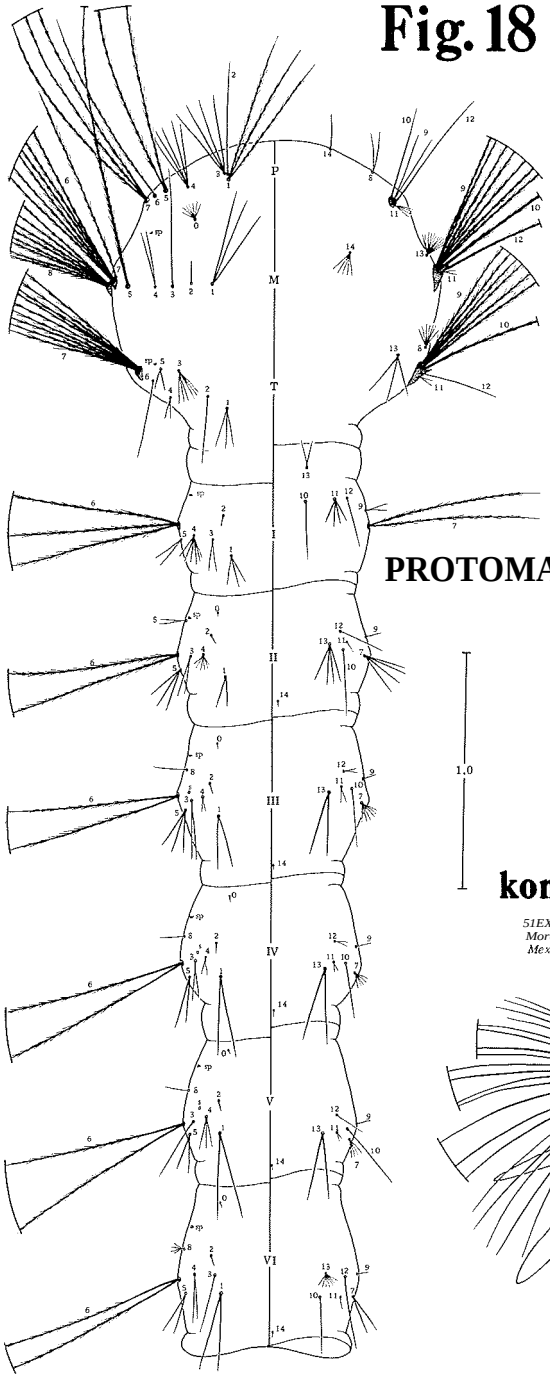
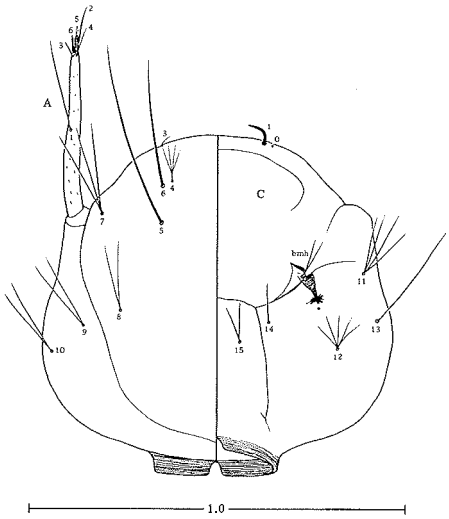
Fig. 18





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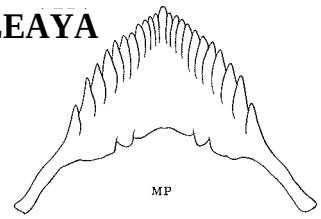

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51EX 350
Morelos
Mexico

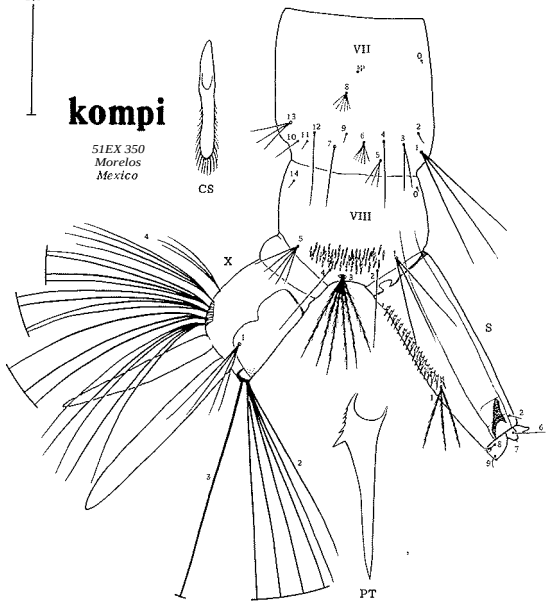
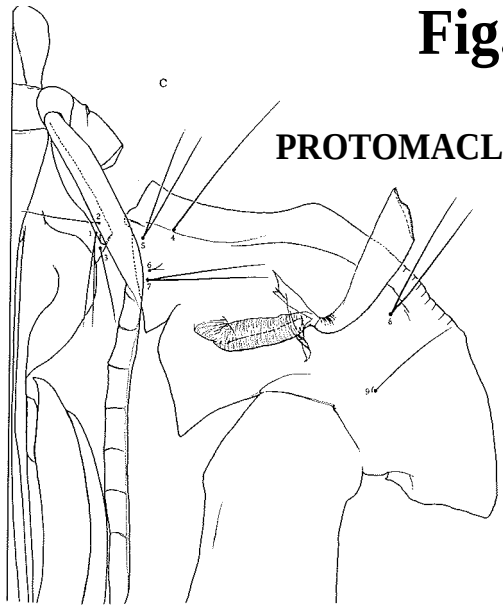
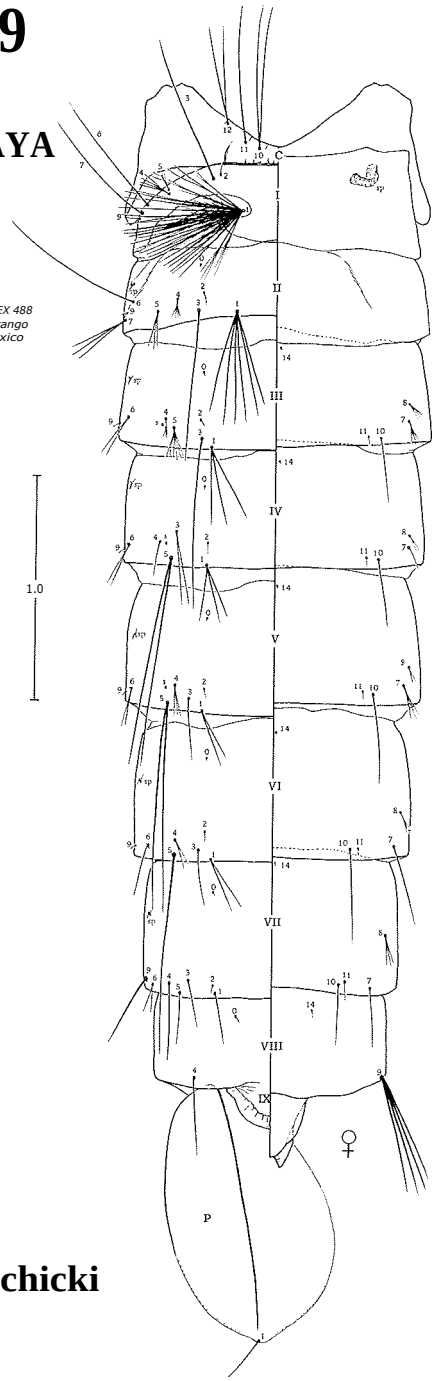
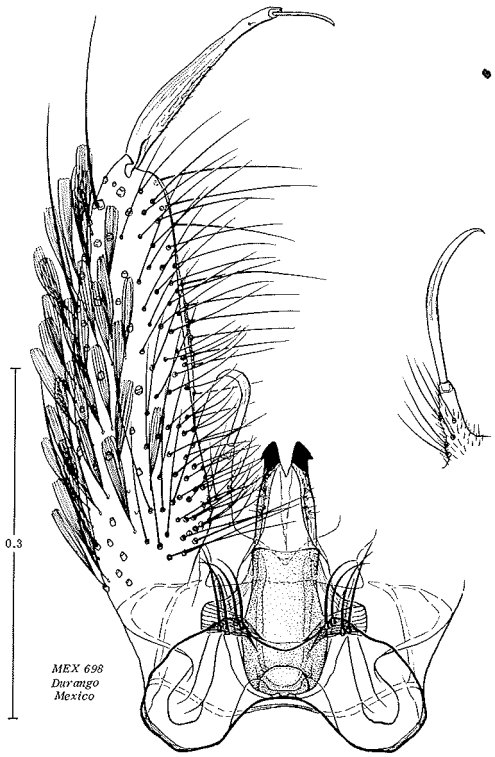


Fig.19

PROTOMACLEAYA

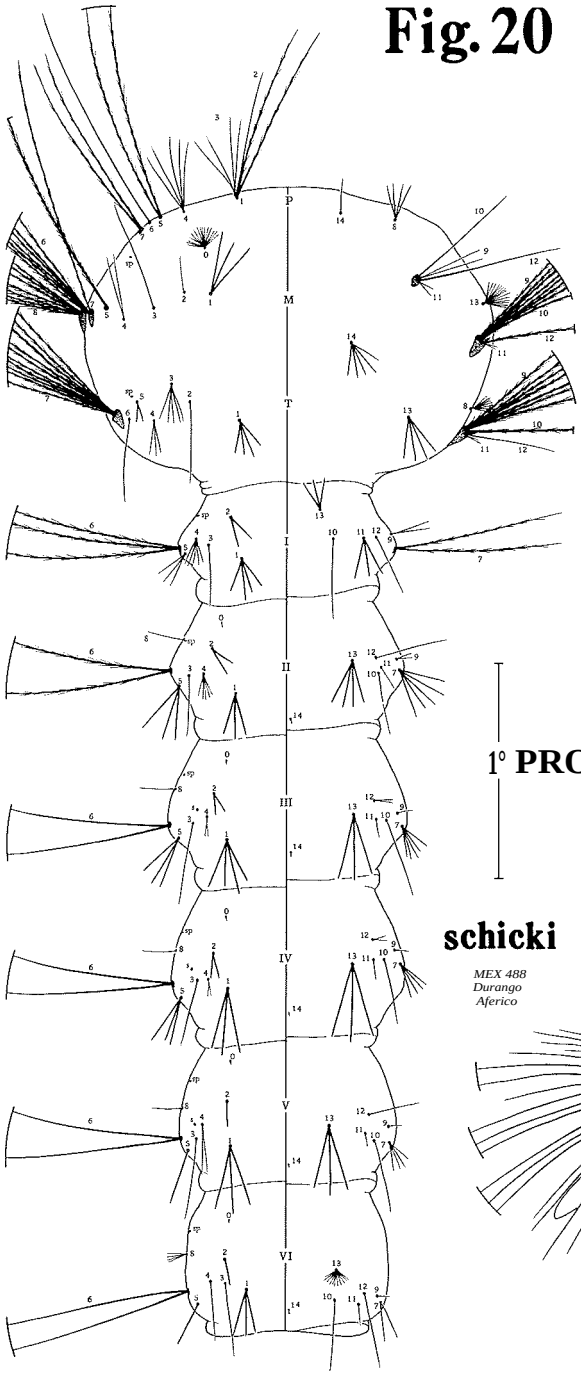


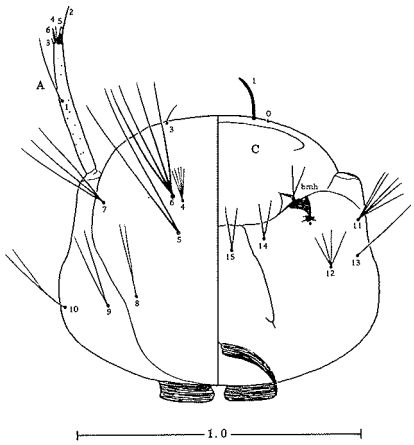


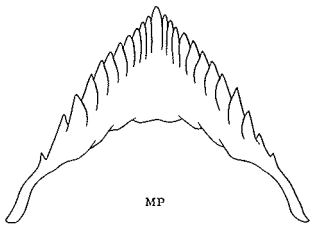


schicki

Fig. 20







1º **PROTOMACLEAYA**

schicki

MEX 488
Durango
Aferico

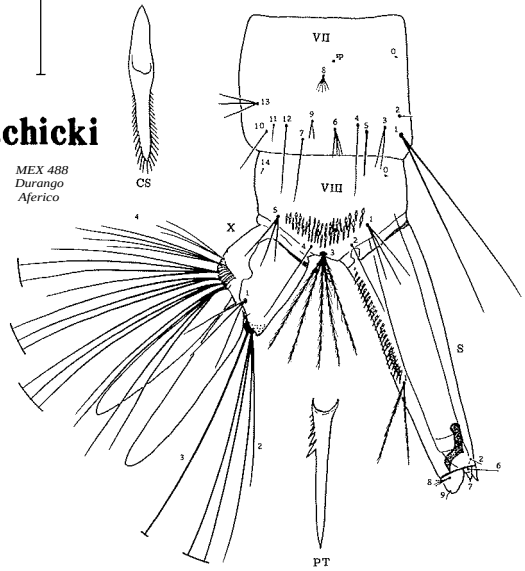


Fig. 21

PROTOMACLEAYA

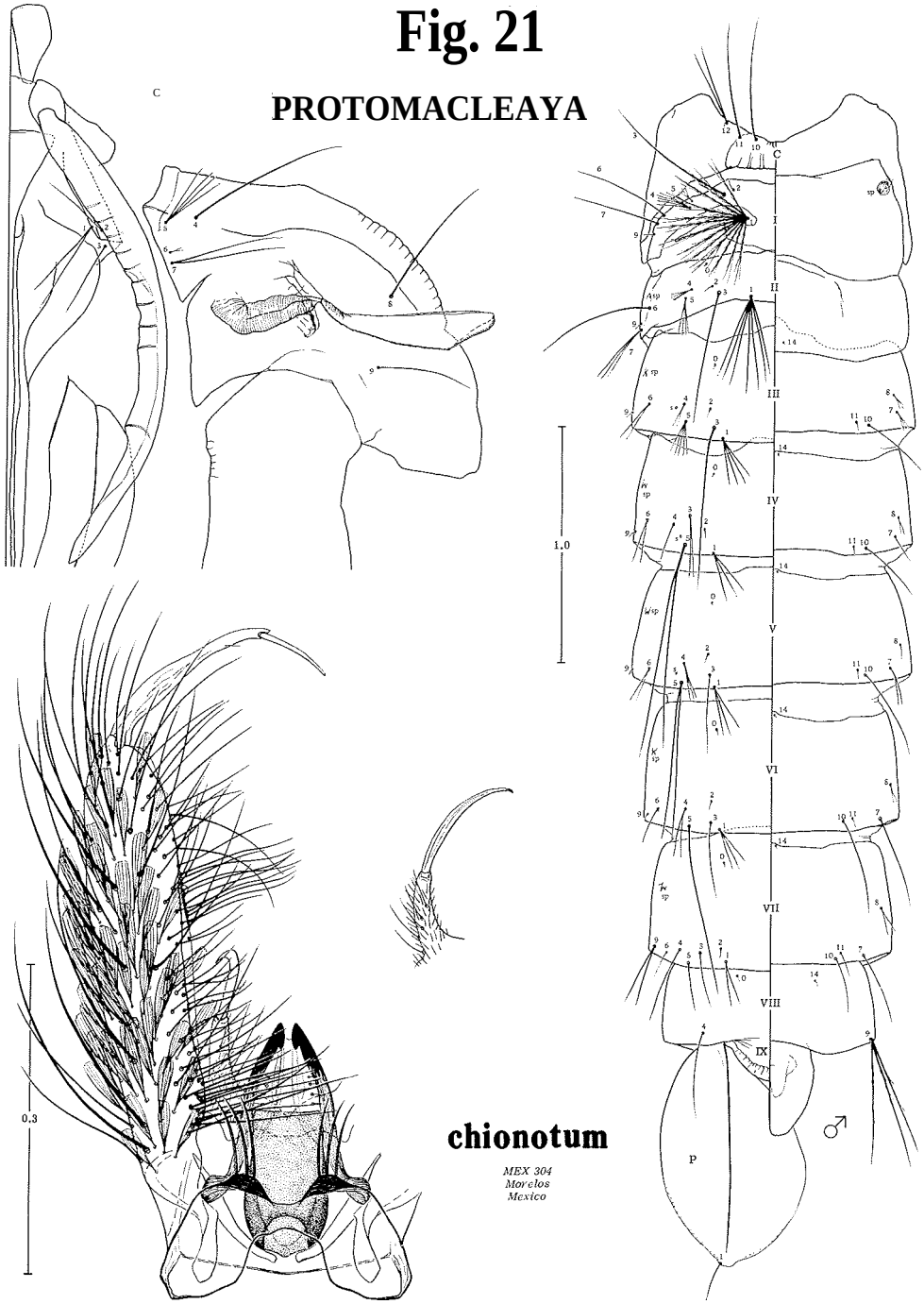


Fig. 22

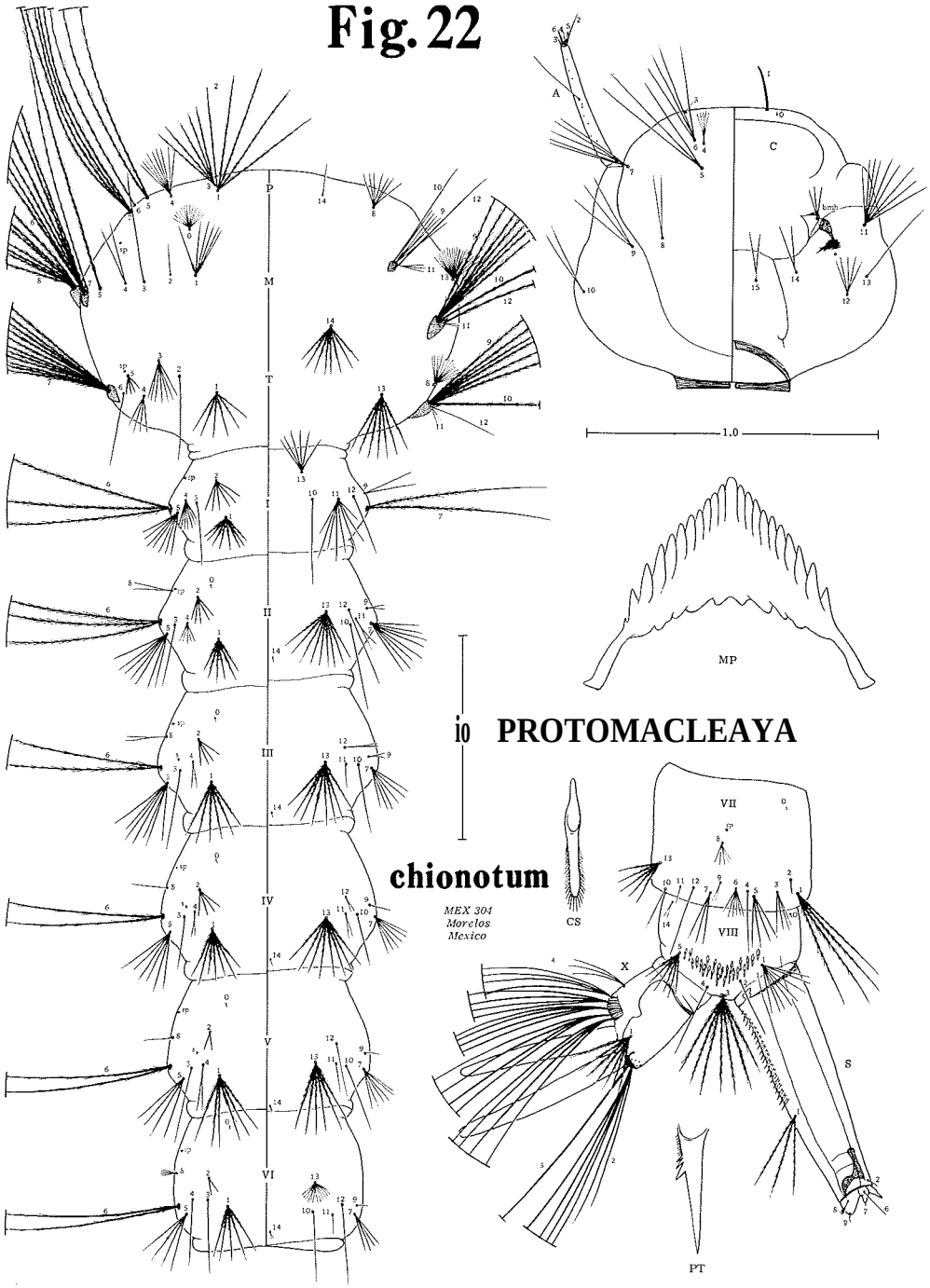

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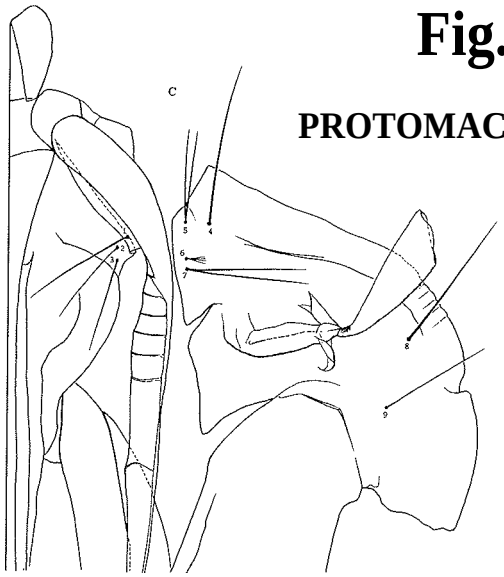
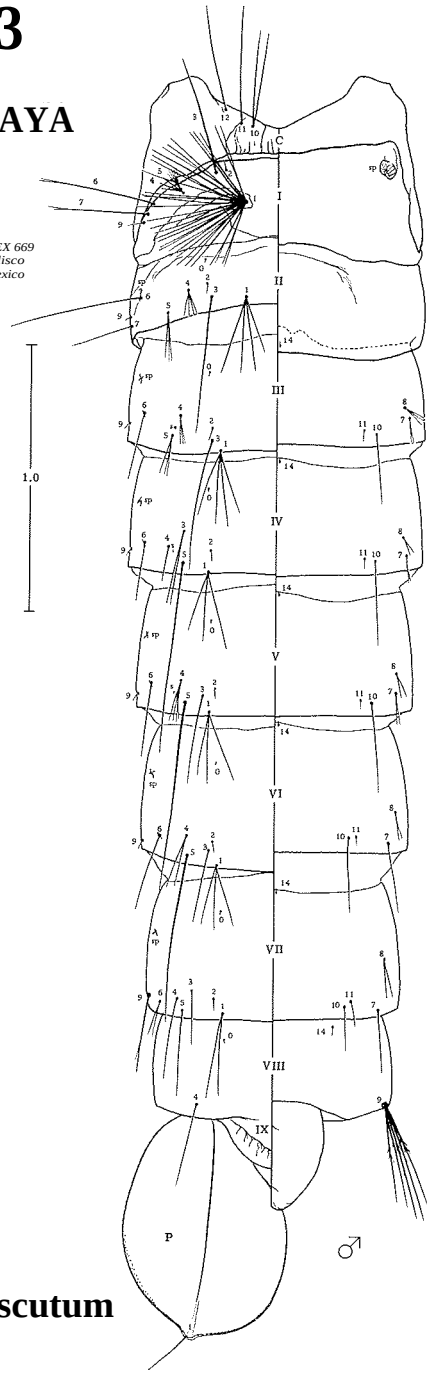
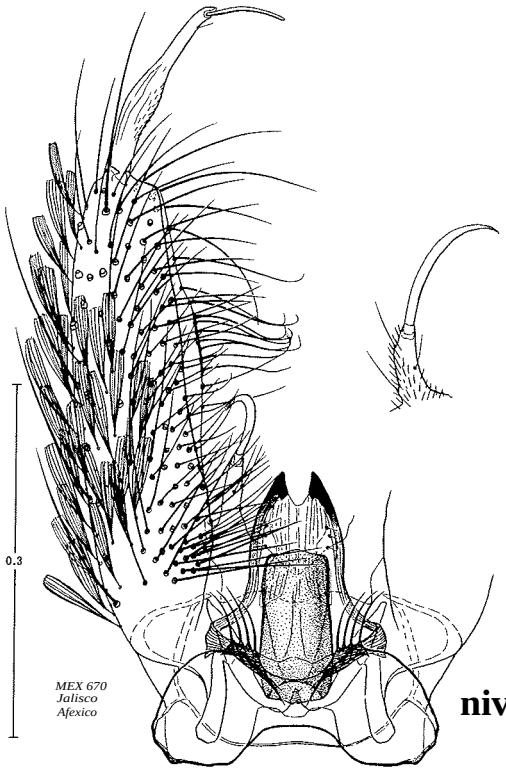
Fig. 23

PROTOMACLEAYA

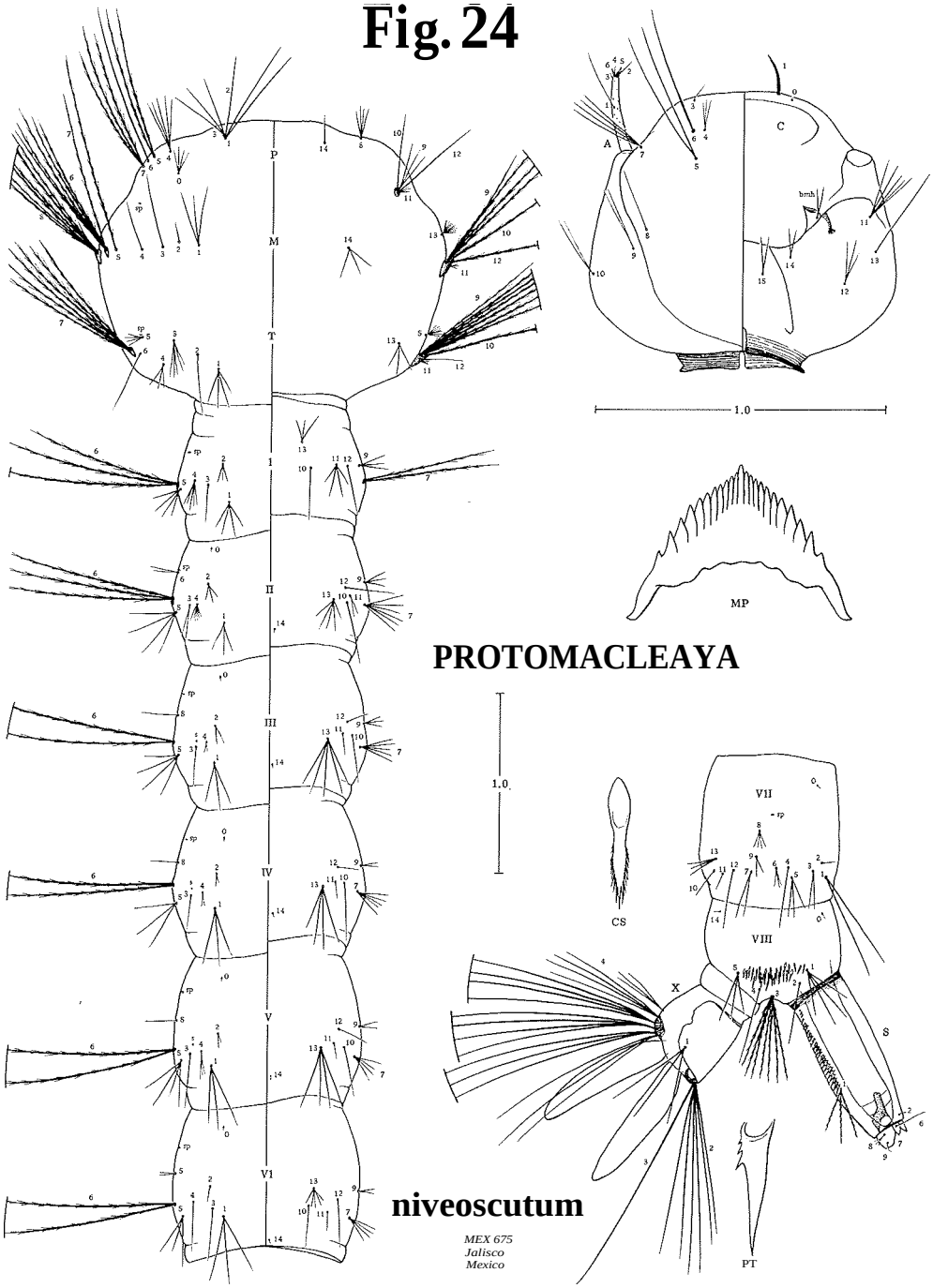






niveoscutum

Fig. 24



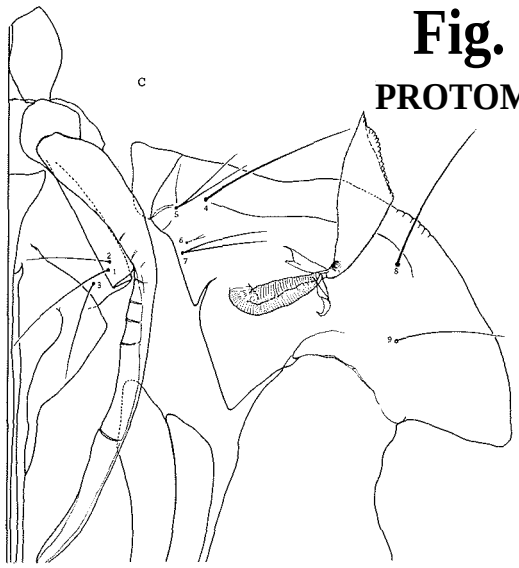
PROTOMACLEAYA

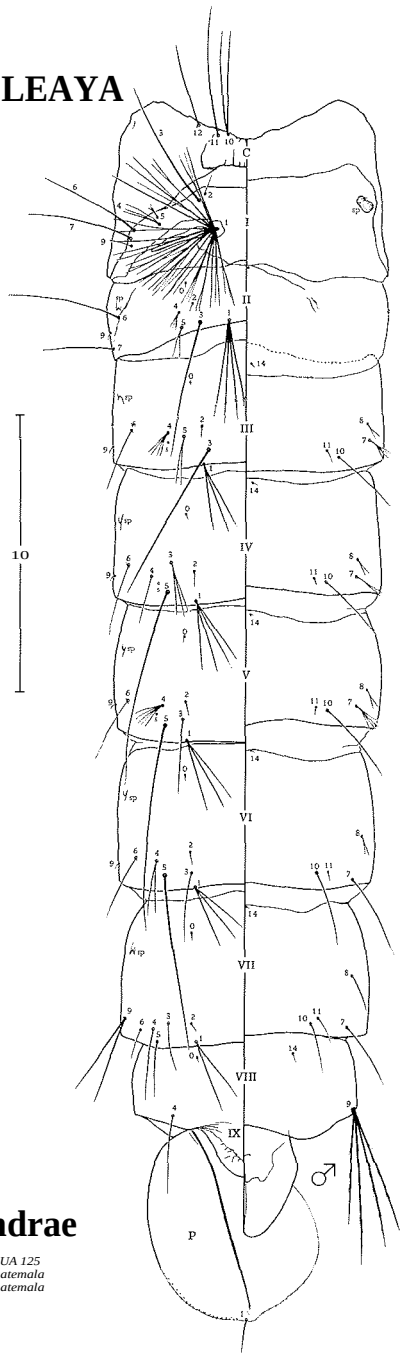
niveoscutum

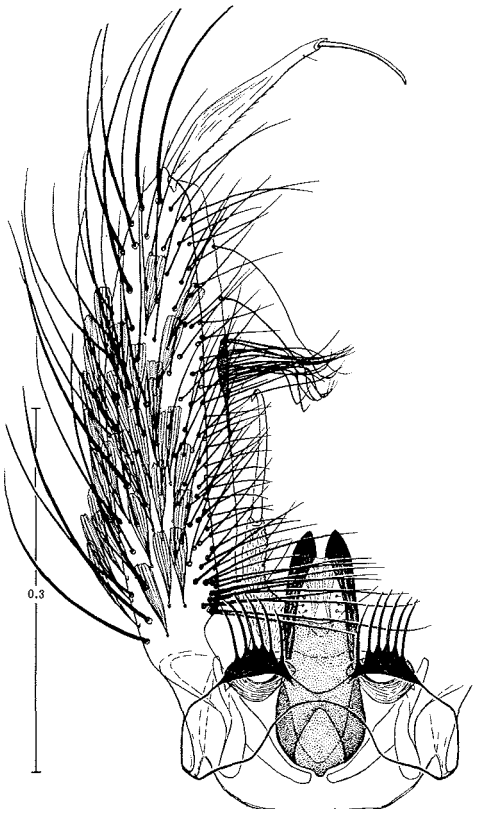
MEX 675
Jalisco
Mexico

Fig. 25

PROTOMACLEAYA



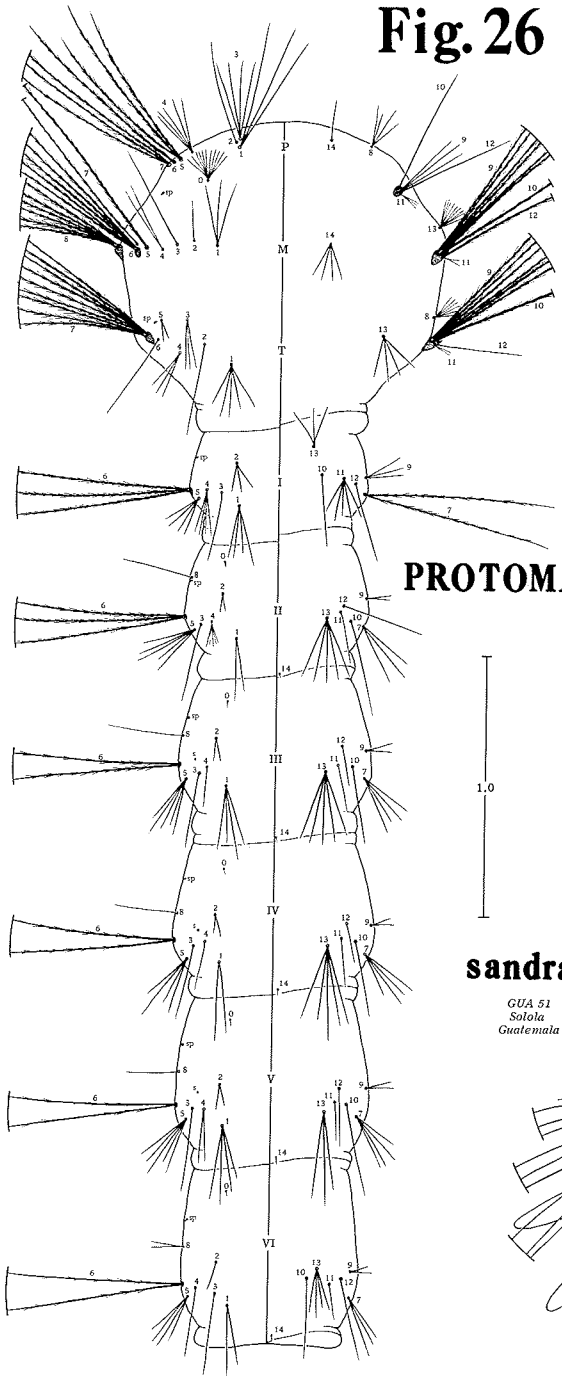


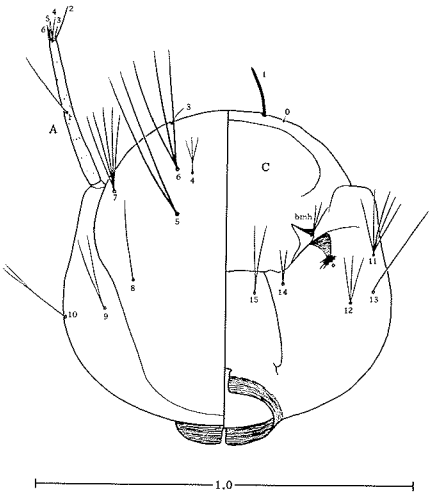


sandrae

GUA 125
Guatemala
Guatemala

Fig. 26





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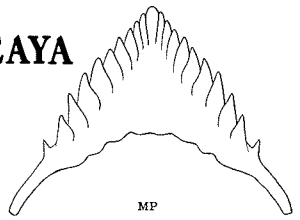

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sandrae

GUA 51
Solola
Guatemala

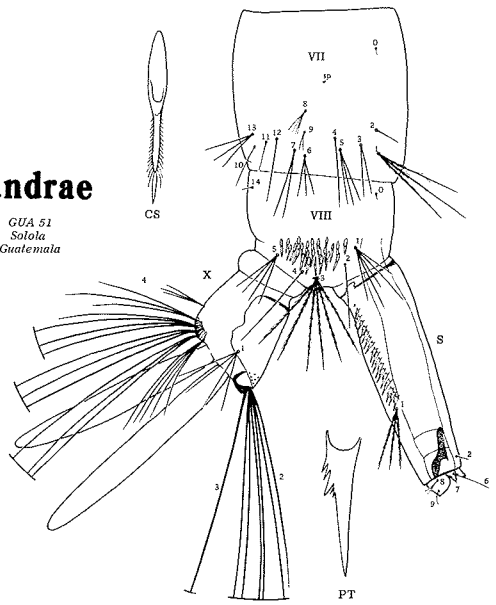
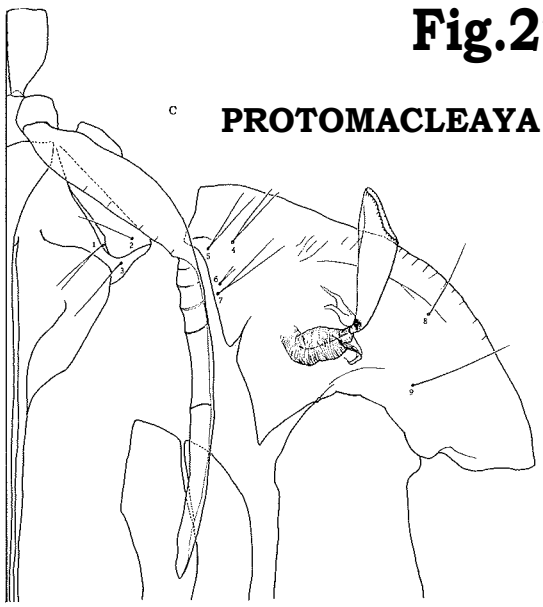
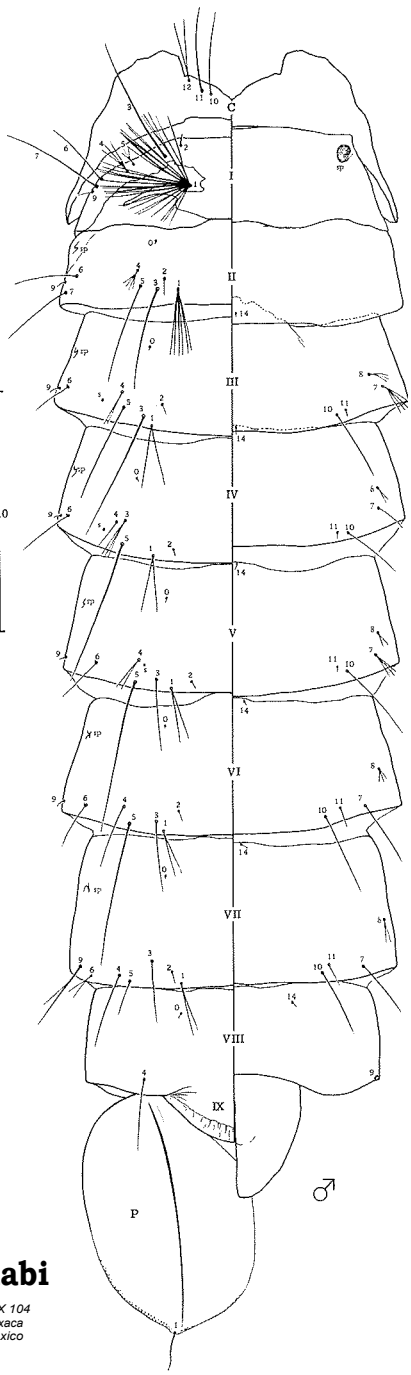
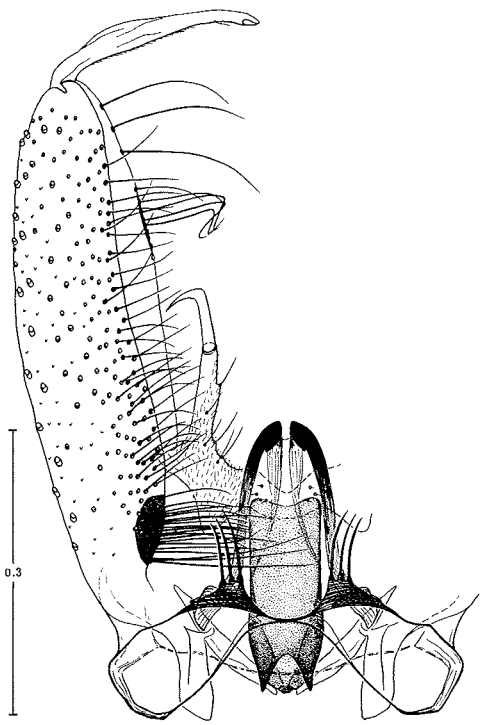


Fig.27

PROTOMACLEAYA



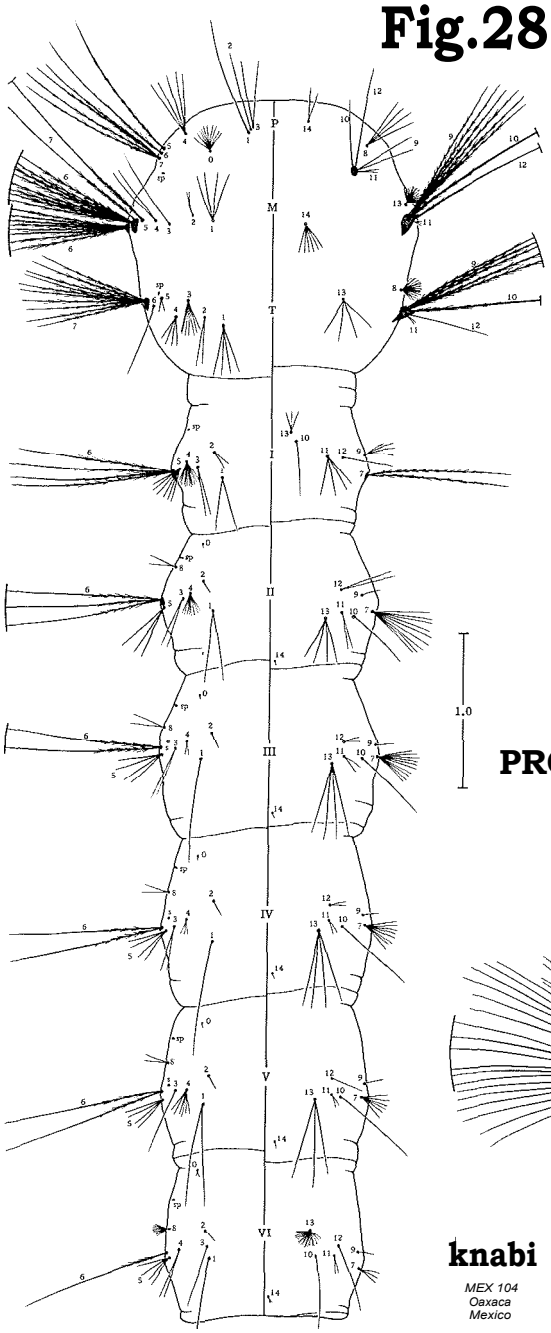


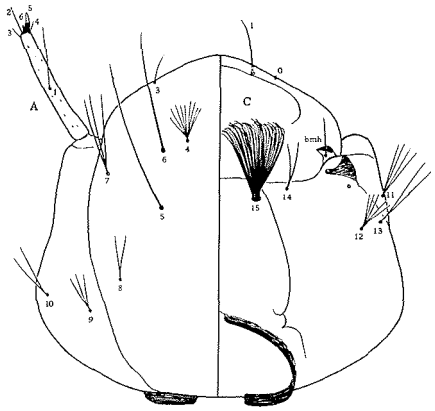


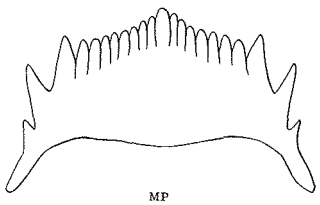
knabi

MEX 104
Oaxaca
Mexico

Fig.28

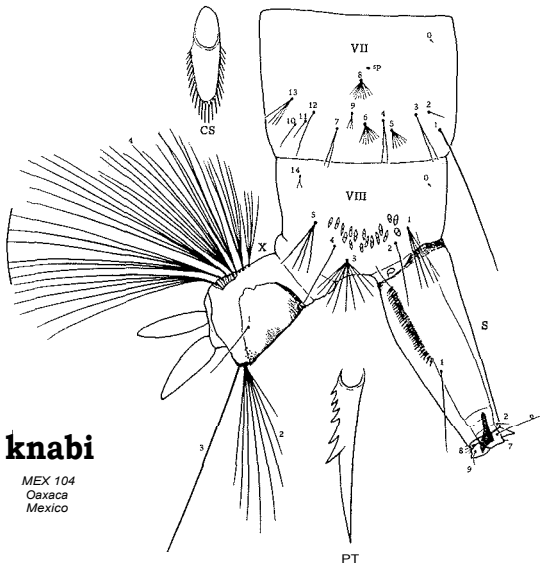






1.0

PROTOMACLEAYA



knabi

MEX 104
Oaxaca
Mexico

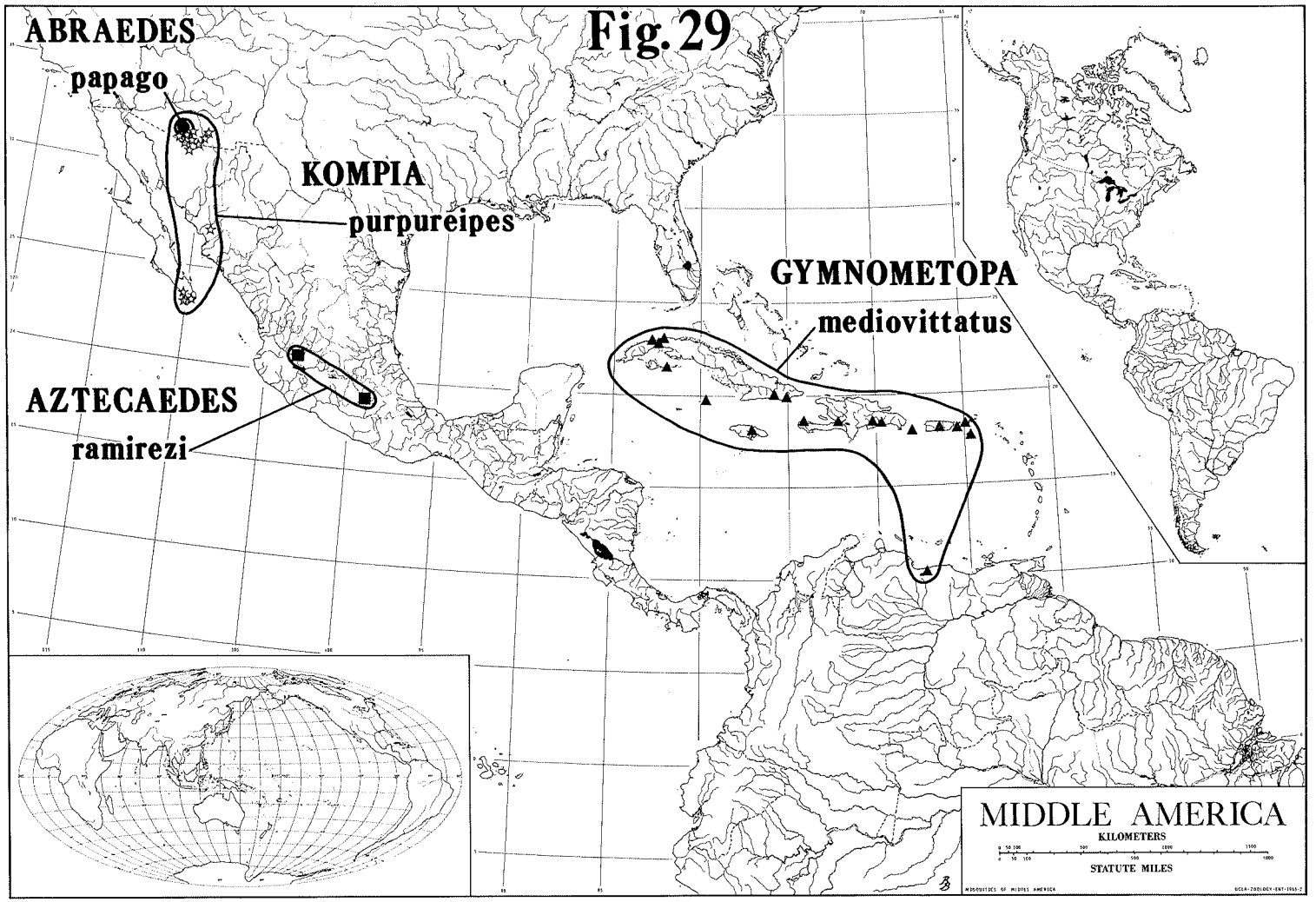
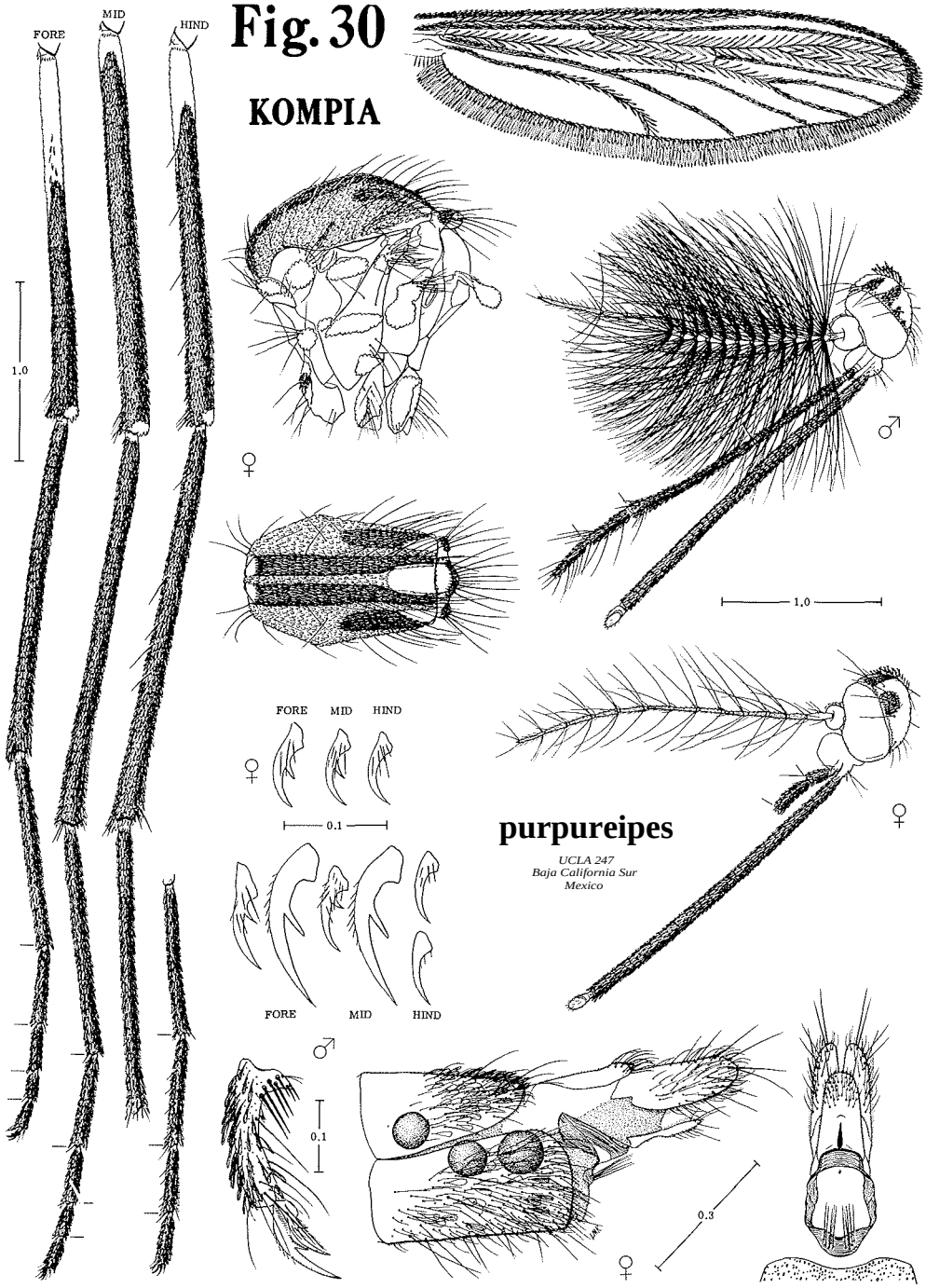


Fig. 29
ABRAEDES
papago
KOMPIA
purpureipes
GYMNOMETOPA
mediovittatus
AZTECAEDES
ramirezi
MIDDLE AMERICA
KILOMETERS
STATUTE MILES

Fig. 30

KOMPIA

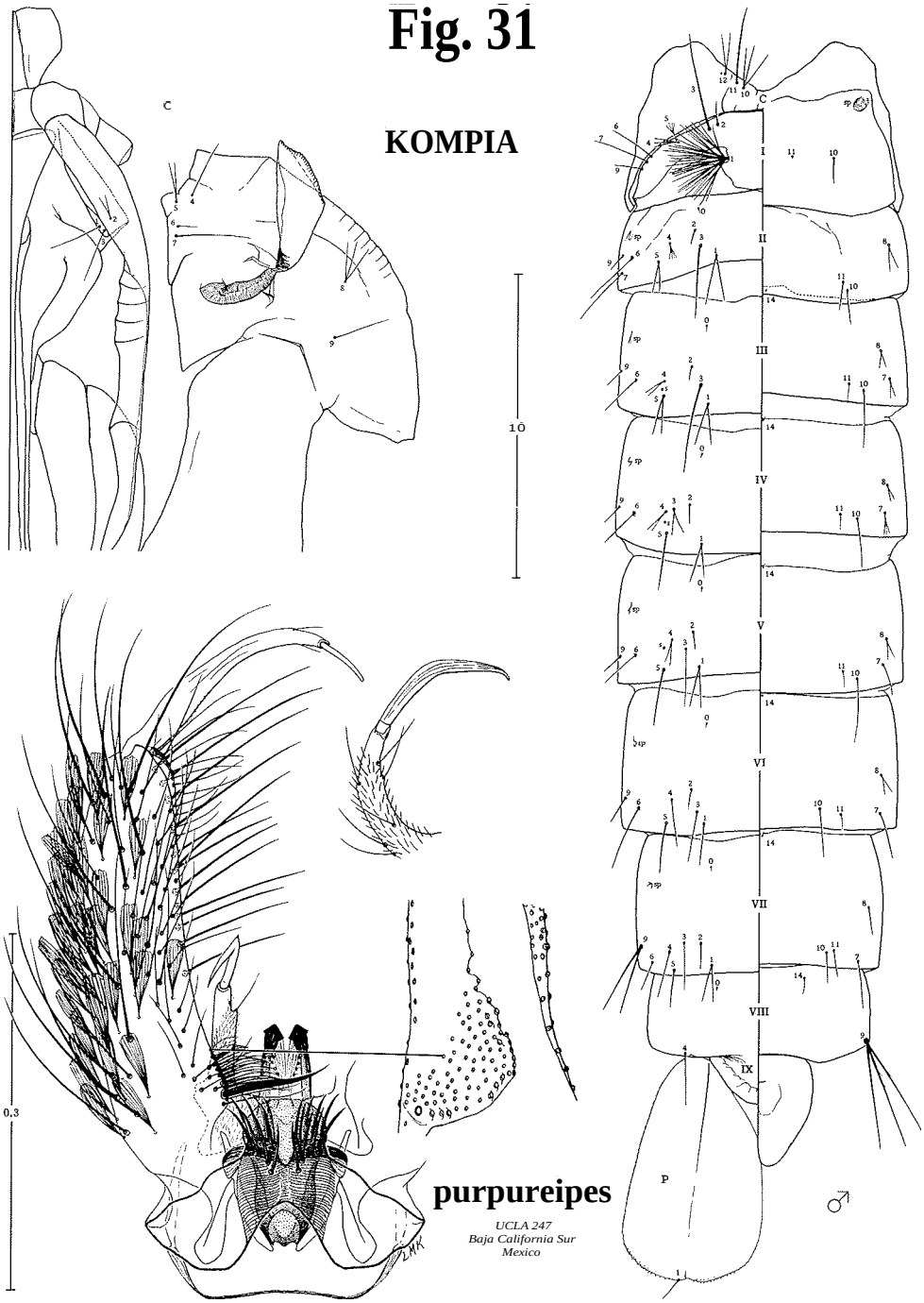


purpureipes

UCLA 247
Baja California Sur
Mexico

Fig. 31

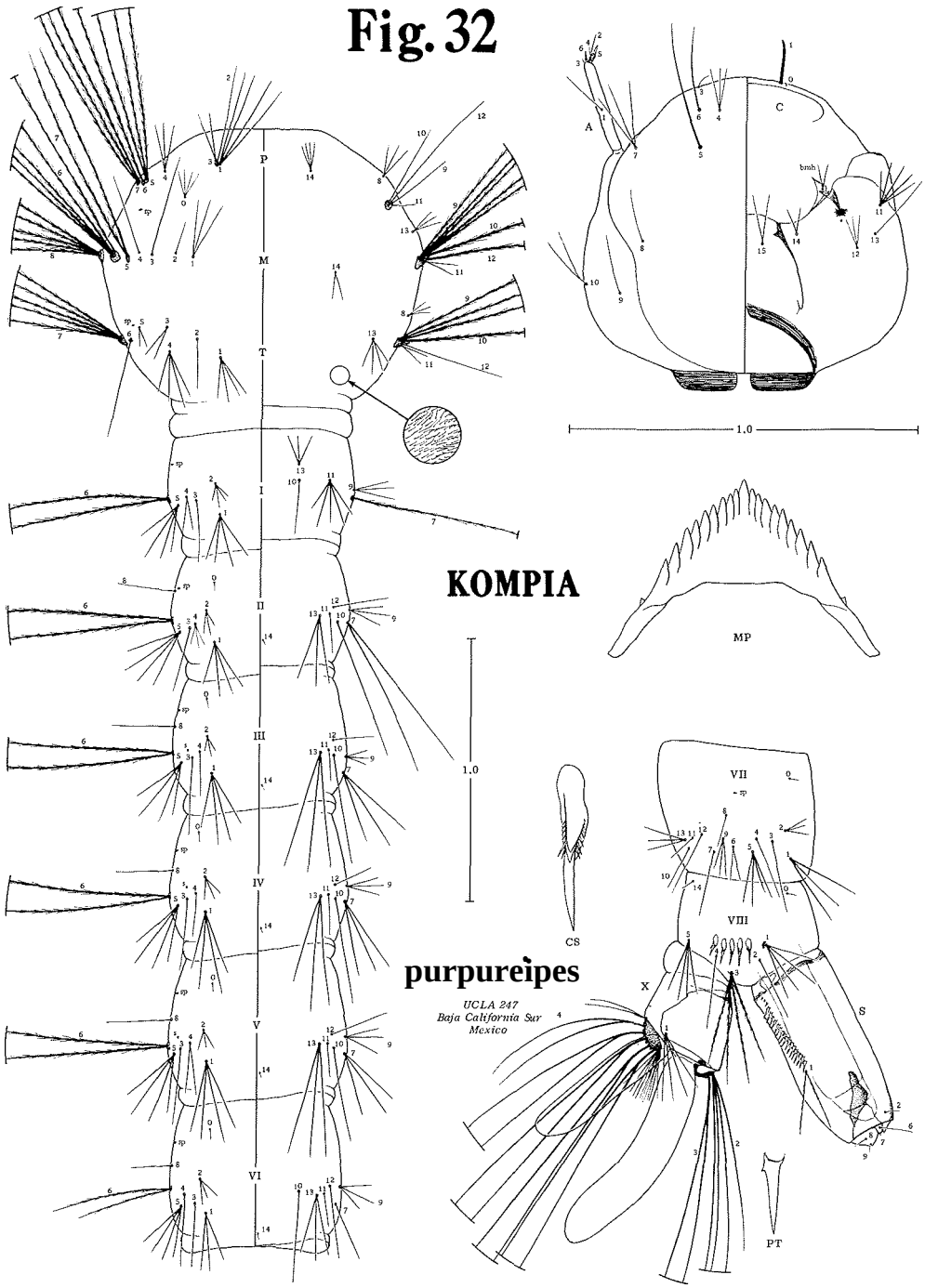
KOMPIA



purpureipes

UCLA 247
Baja California Sur
Mexico

Fig. 32



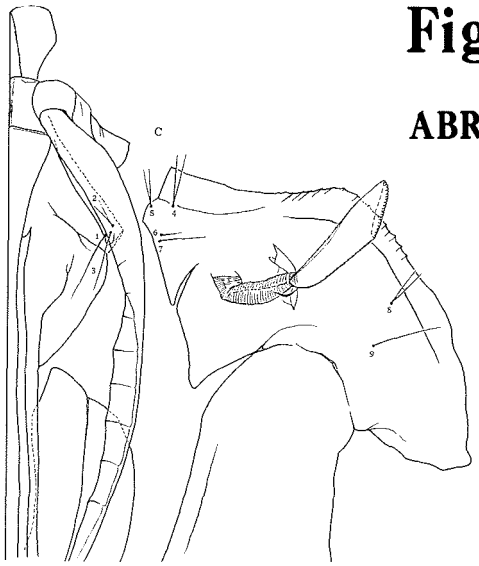
KOMPIA

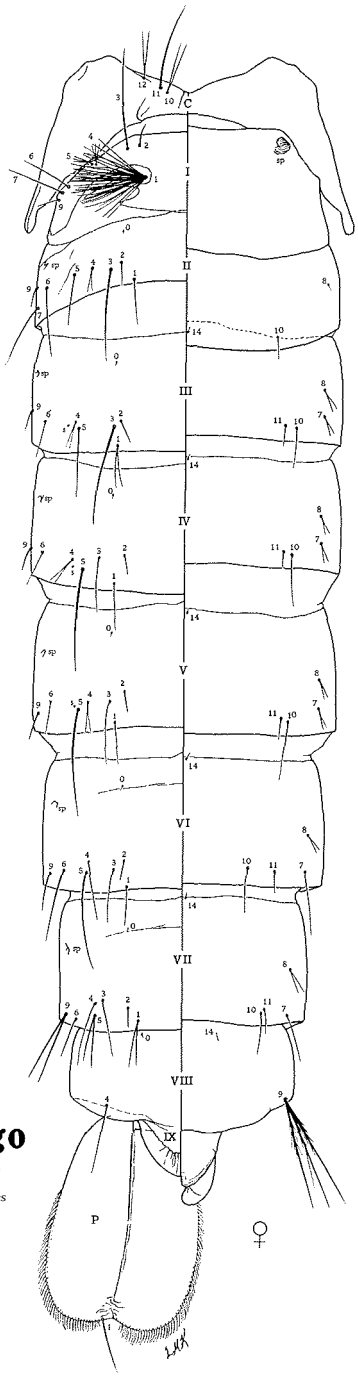
purpureipes

UCLA 247
Baja California Sur
Mexico

Fig. 33

ABRAEDES





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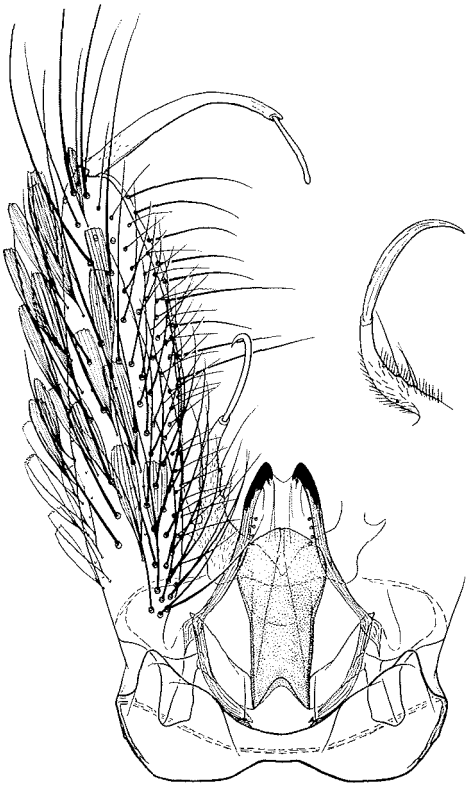
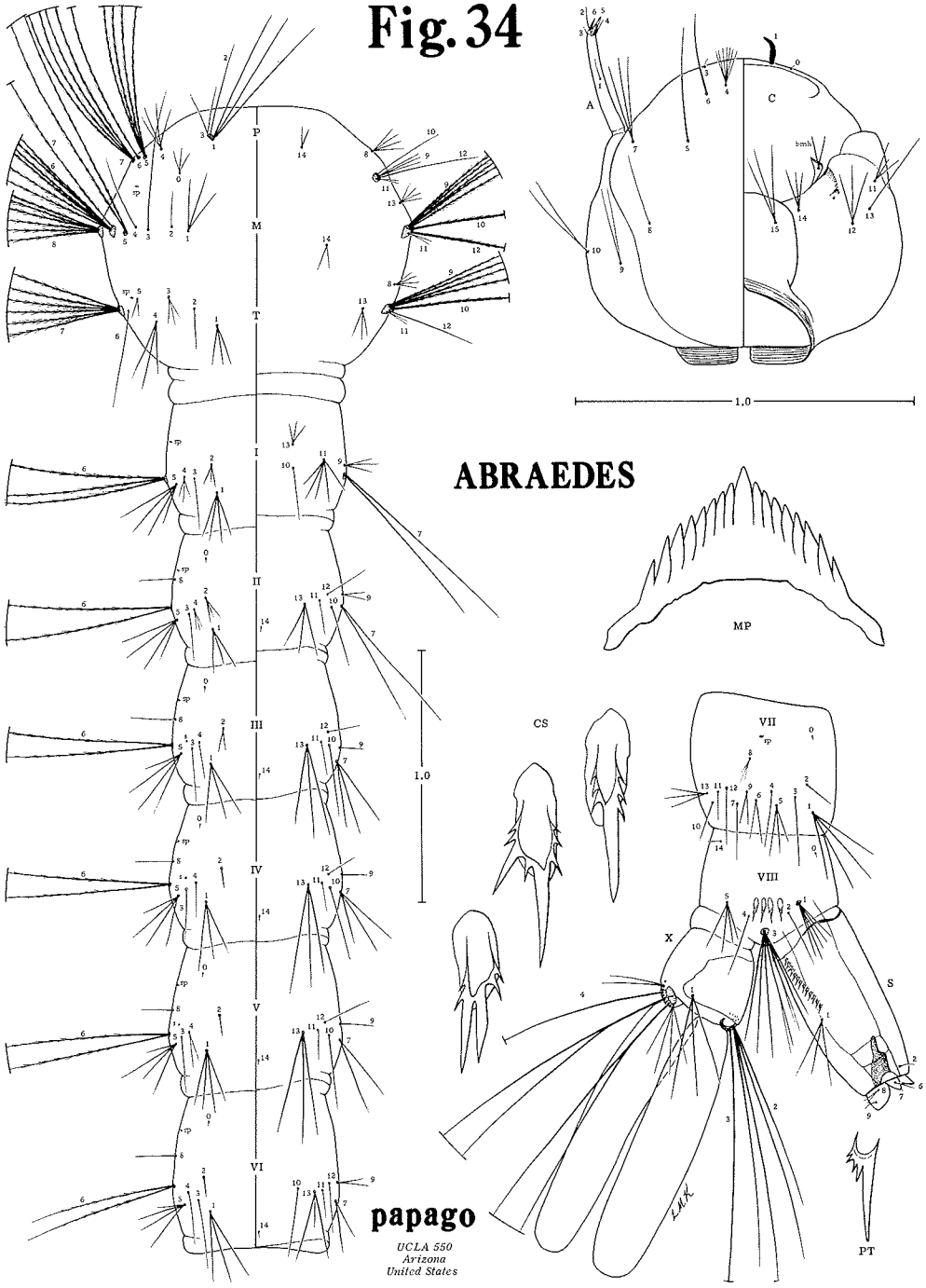


03

papago

UCLA 550
Arizona
United Slates

Fig. 34



papago

UCLA 550
Arizona
United States

Fig. 35

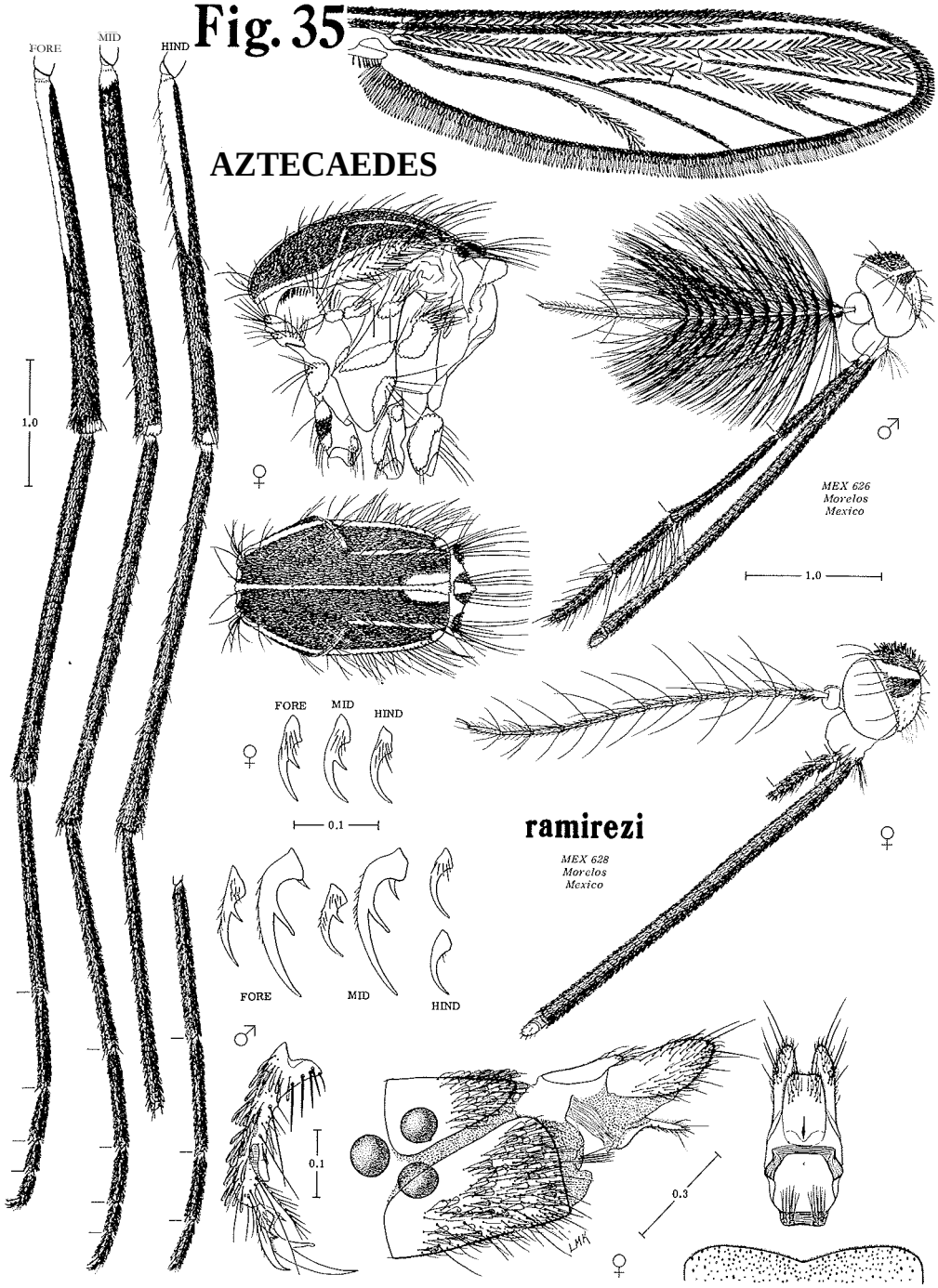
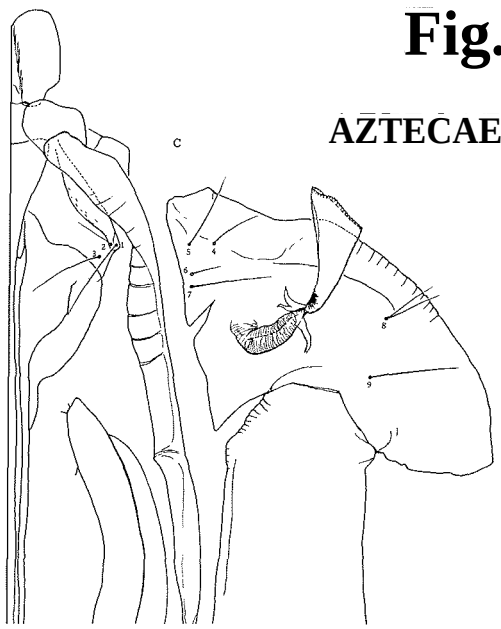
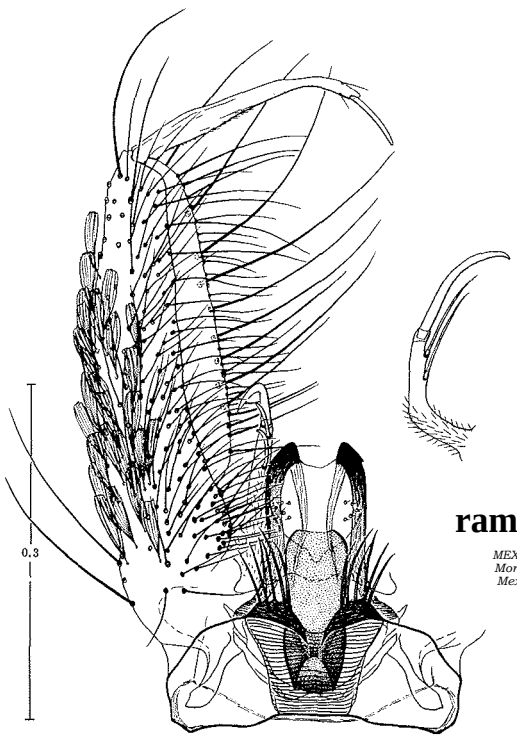
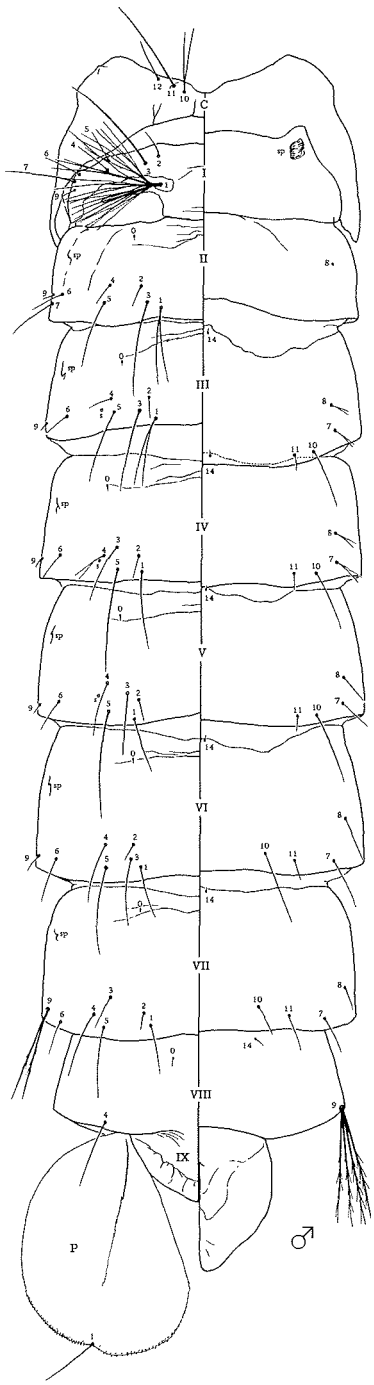

FORE
MID
HIND
1.0
AZTECAEDES
♀
♂
MEX 626
Morelos
Mexico
1.0
FORE
MID
HIND
0.1
ramirezi
MEX 628
Morelos
Mexico
FORE
MID
HIND
0.1
0.3

Fig.36

AZTECAEDES





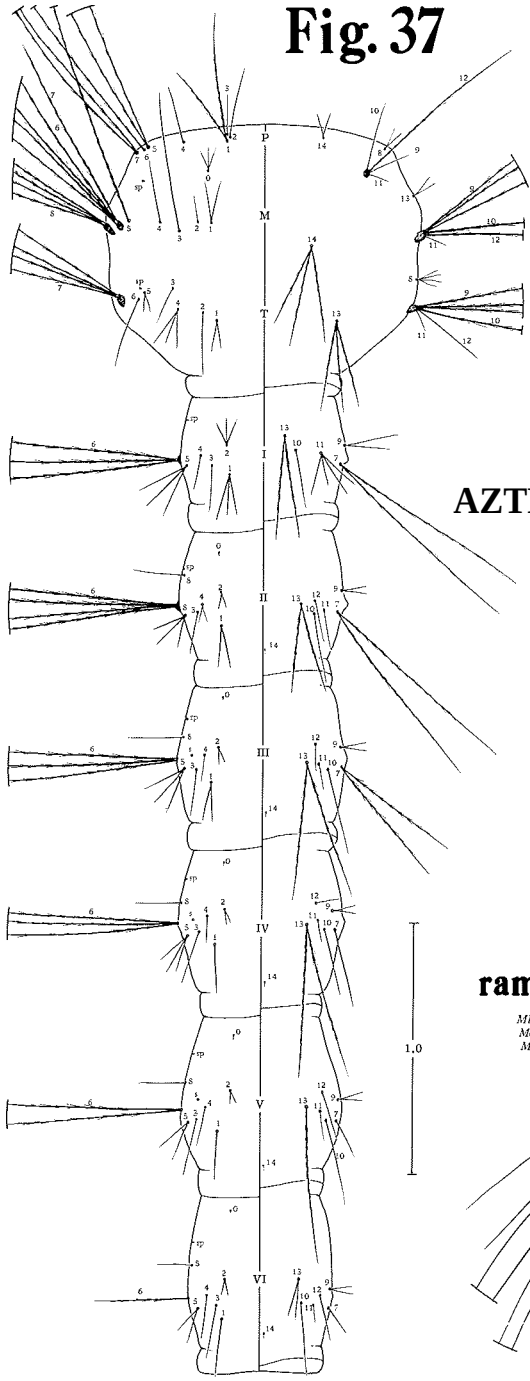


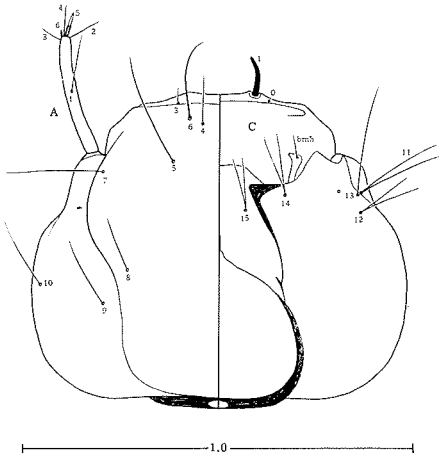
1 0

ramirezi

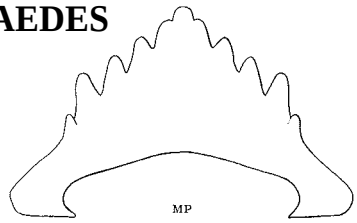
MEX 318
Morelos
Mexico

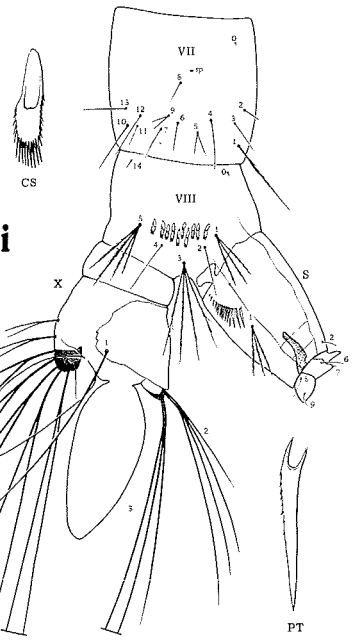
Fig. 37





AZTECAEDES





ramirezi

MEX 348
Morelos
Mexico

Fig. 38

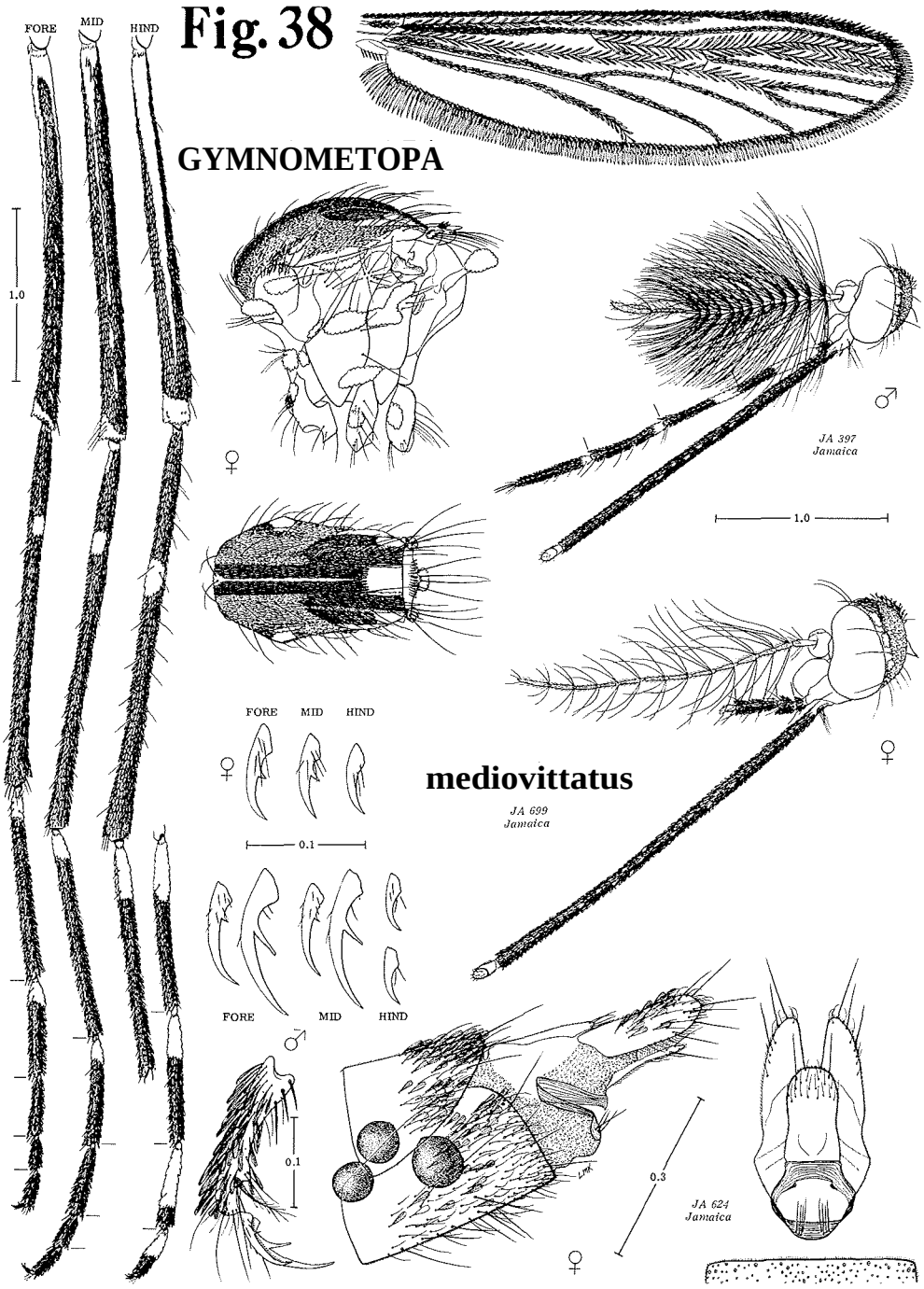
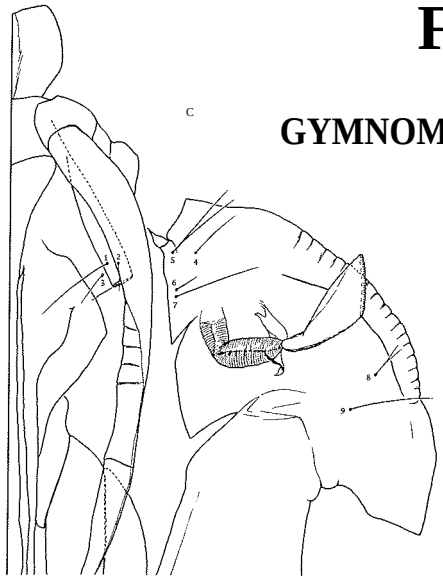
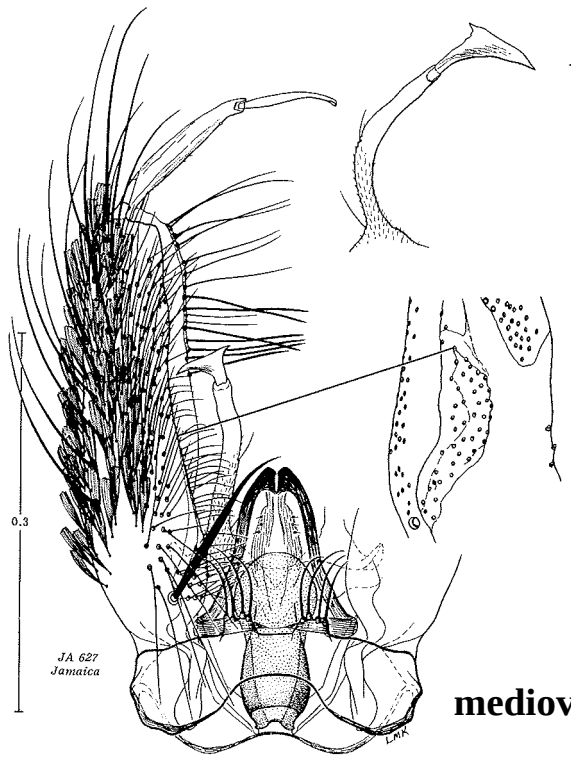

FORE
MID
HIND
1.0
GYMNOMETOPA
♀
♂
JA 397
Jamaica
1.0
FORE
MID
HIND
♀
mediovittatus
JA 699
Jamaica
0.1
FORE
MID
HIND
♂
0.1
0.3
JA 624
Jamaica
♀

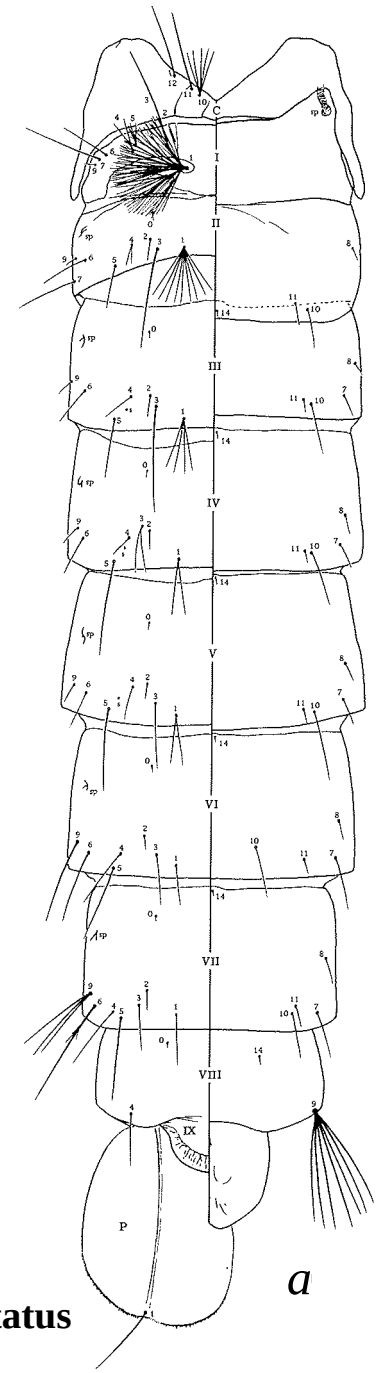
Fig.39

GYMNOMETOPA



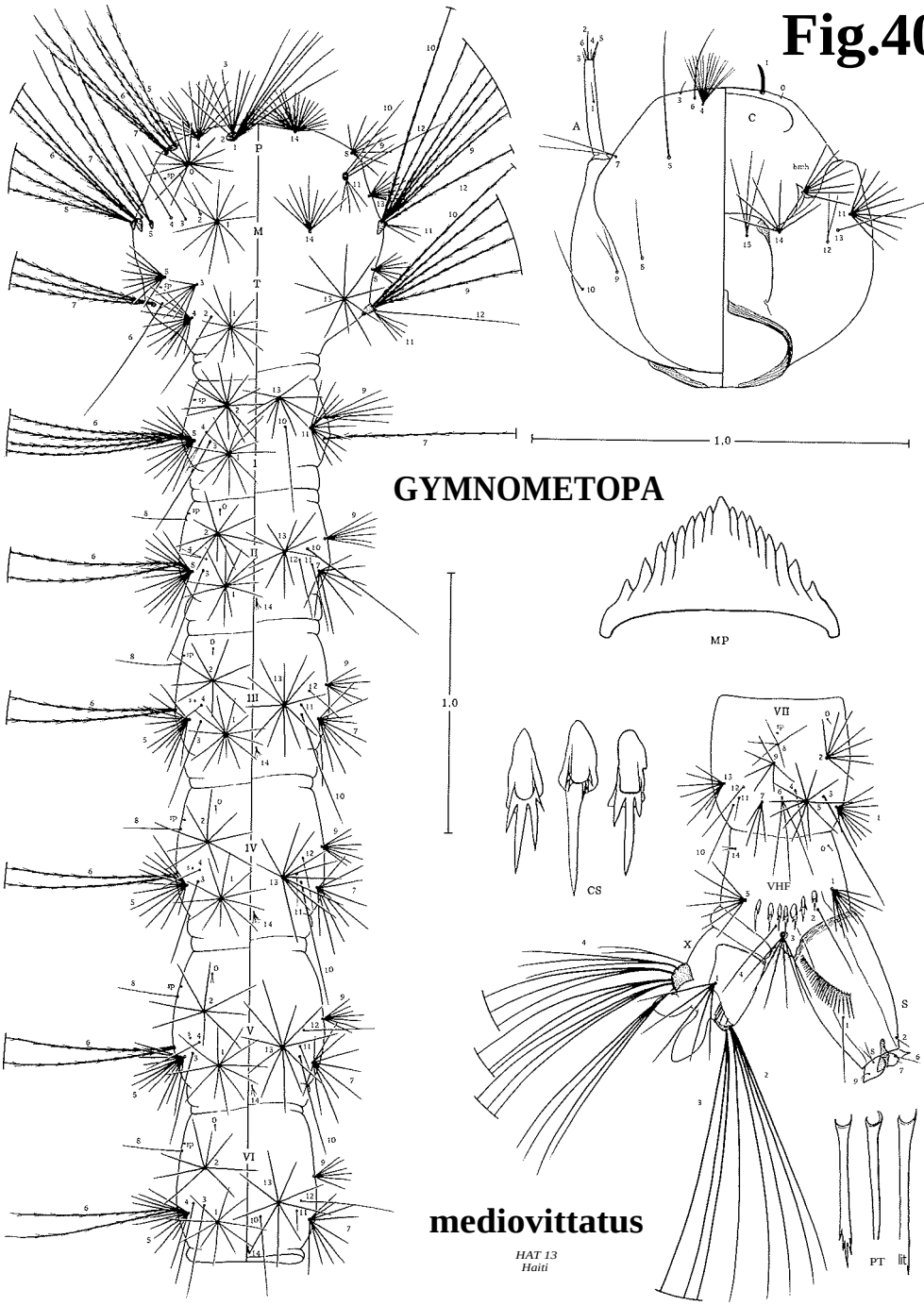


mediovittatus



a

Fig.40


A
C
1.0
GYMNOMETOPA
MP
1.0
CS
VHF
X
S
PT
lit
mediovittatus
HAT 13
Haiti

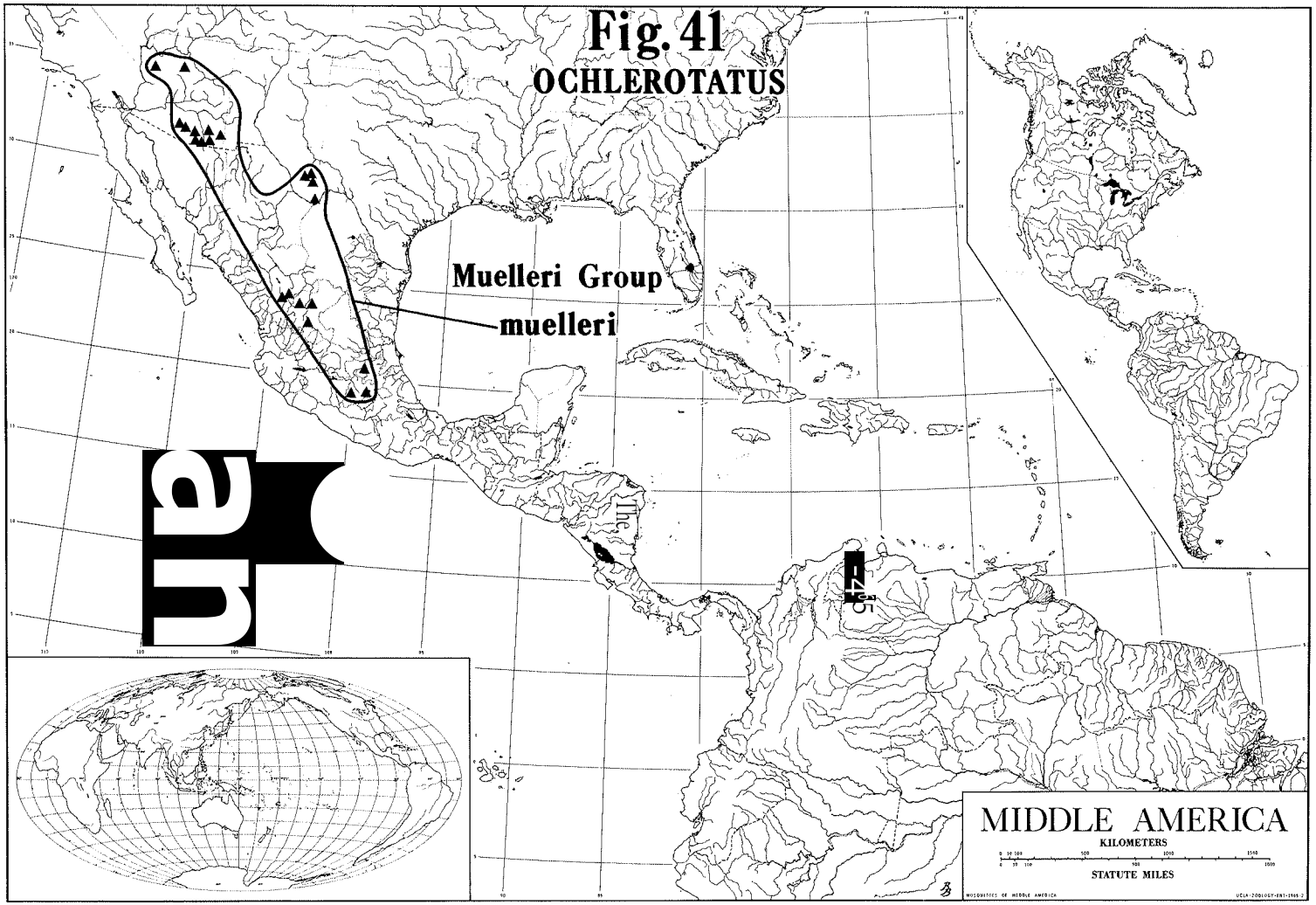


Fig. 41
OCHLEROTATUS
Muelleri Group
muelleri
MIDDLE AMERICA
KILOMETERS
STATUTE MILES

Fig. 42

OCHLEROTATUS

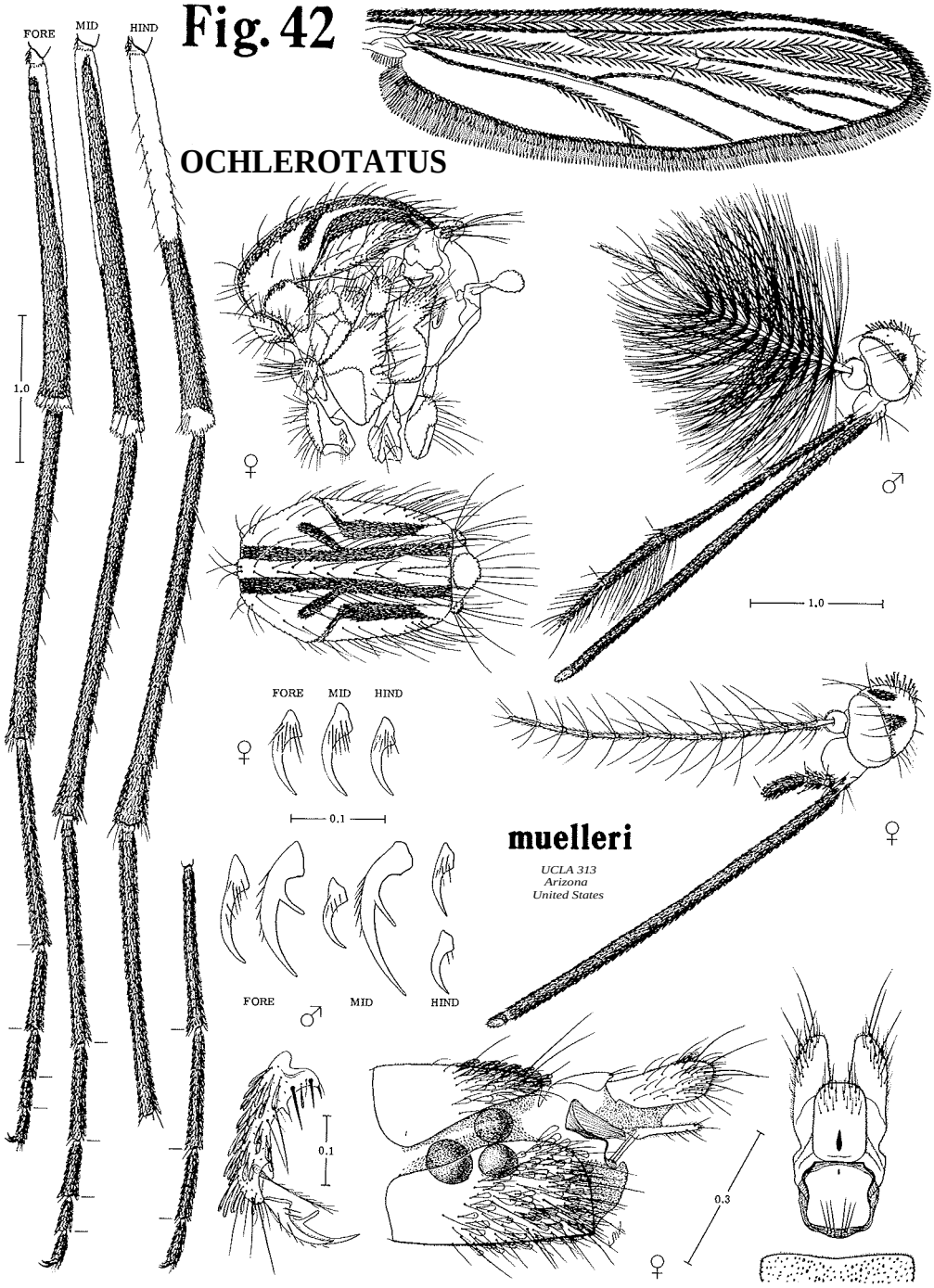
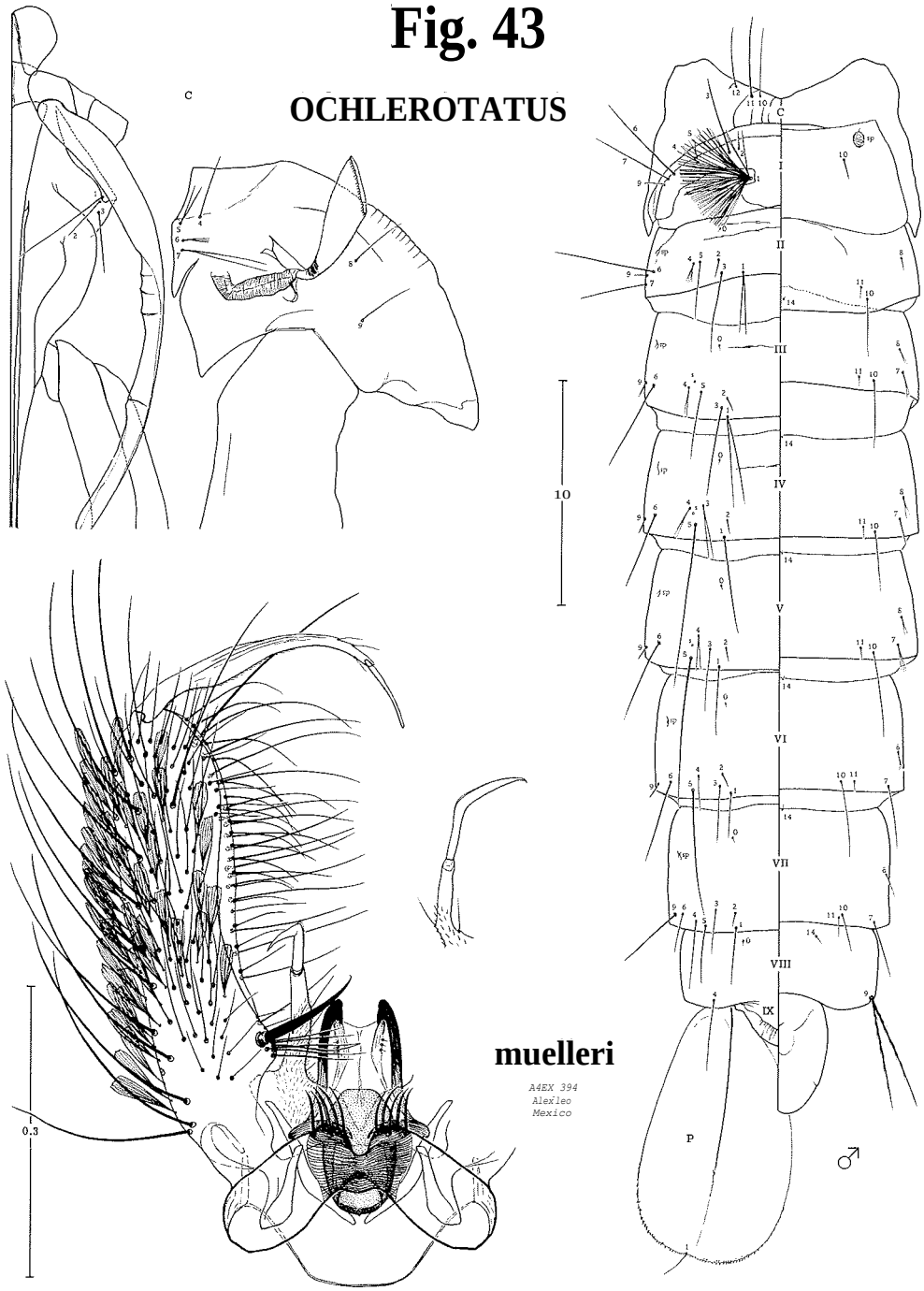


Fig. 43

OCHLEROTATUS



muelleri

A4EX 394
Alexleo
Mexico

Fig. 44

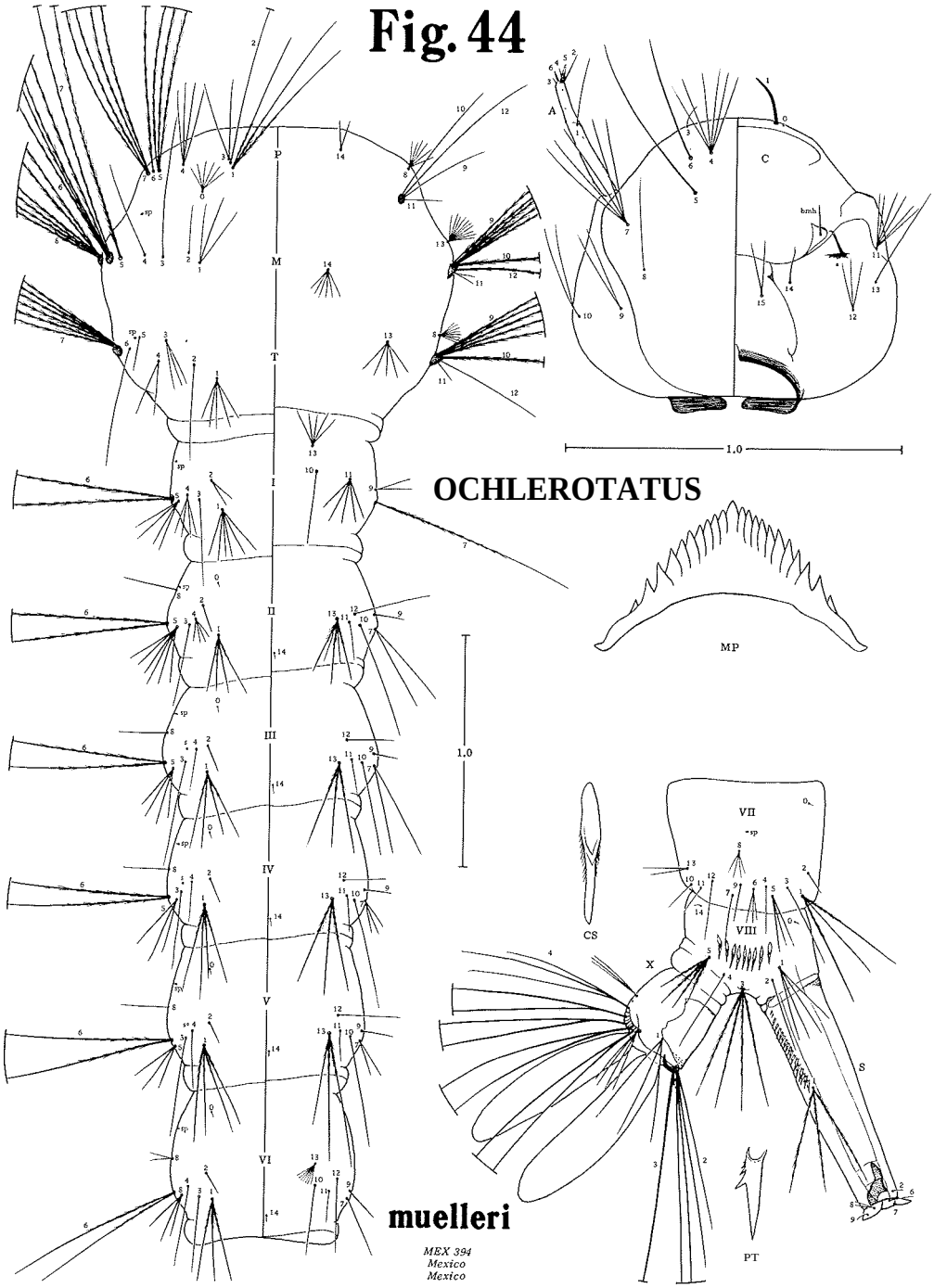

A
C
bmh
1.0
OCHLEROTATUS
MP
P
M
T
I
II
III
IV
V
VI
VII
VIII
X
CS
S
PT
1.0
muelleri
MEX 394
Mexico
Mexico

Fig. 45.

OCHLEROTATUS 11

Atropalpus Section

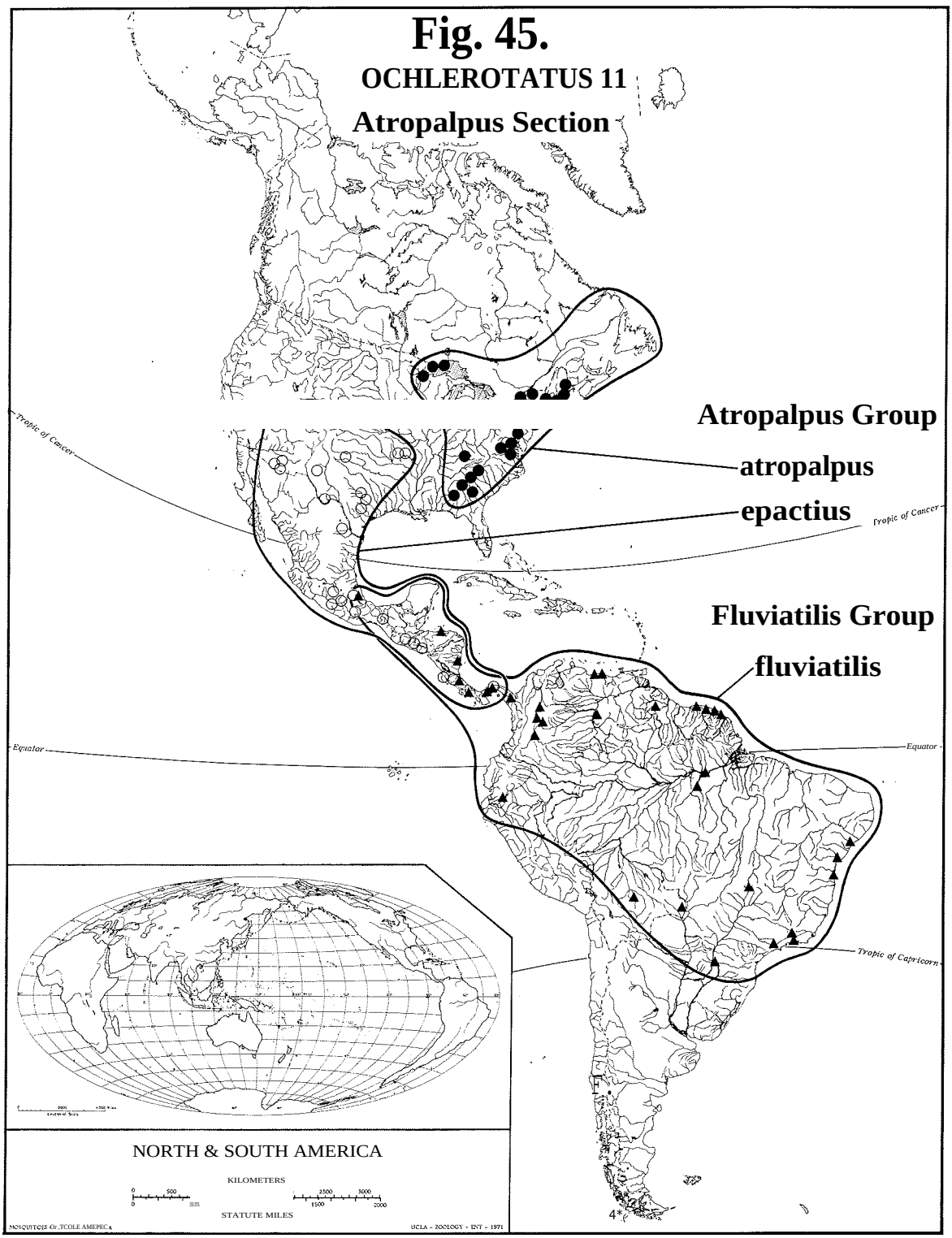
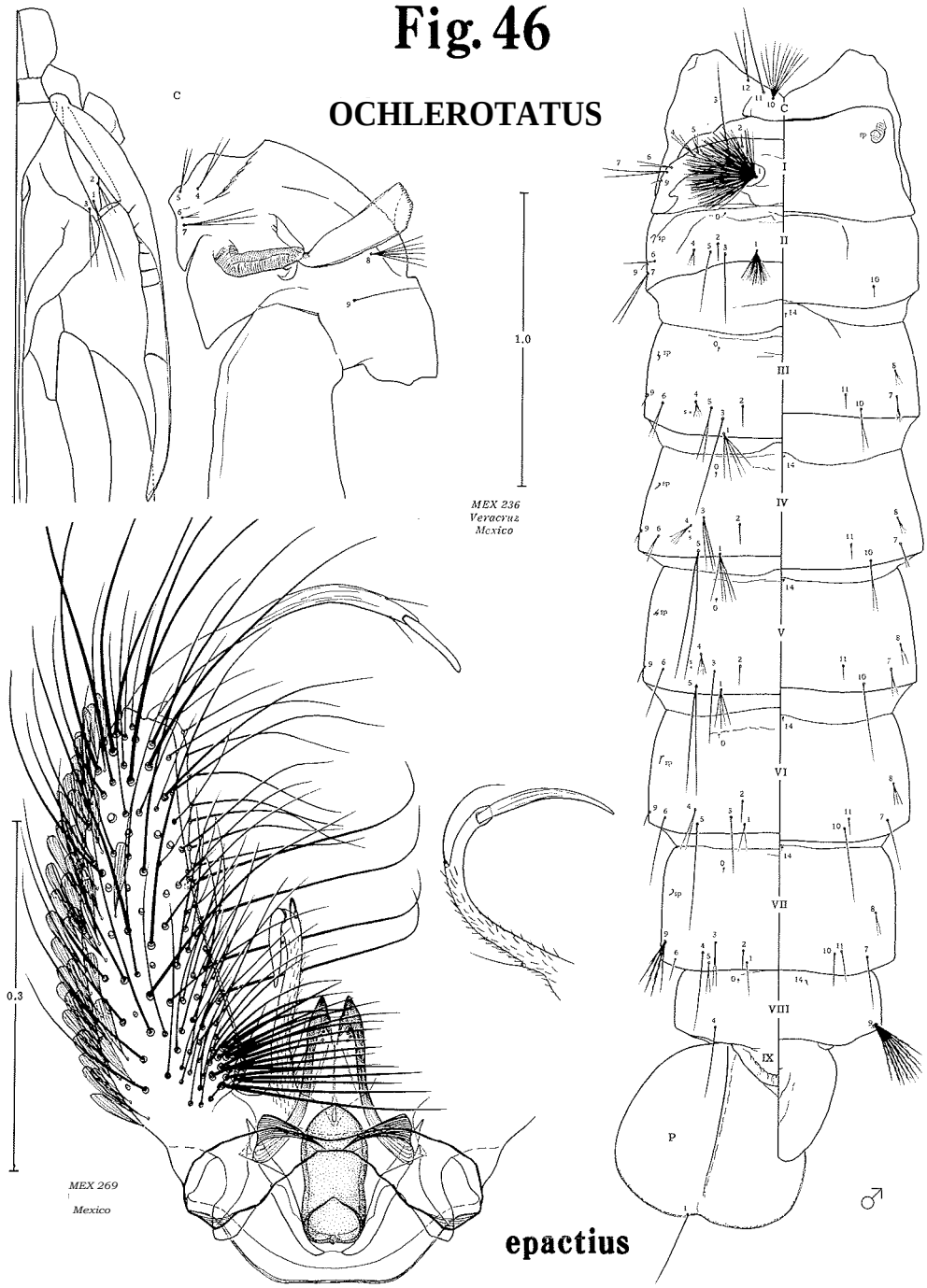


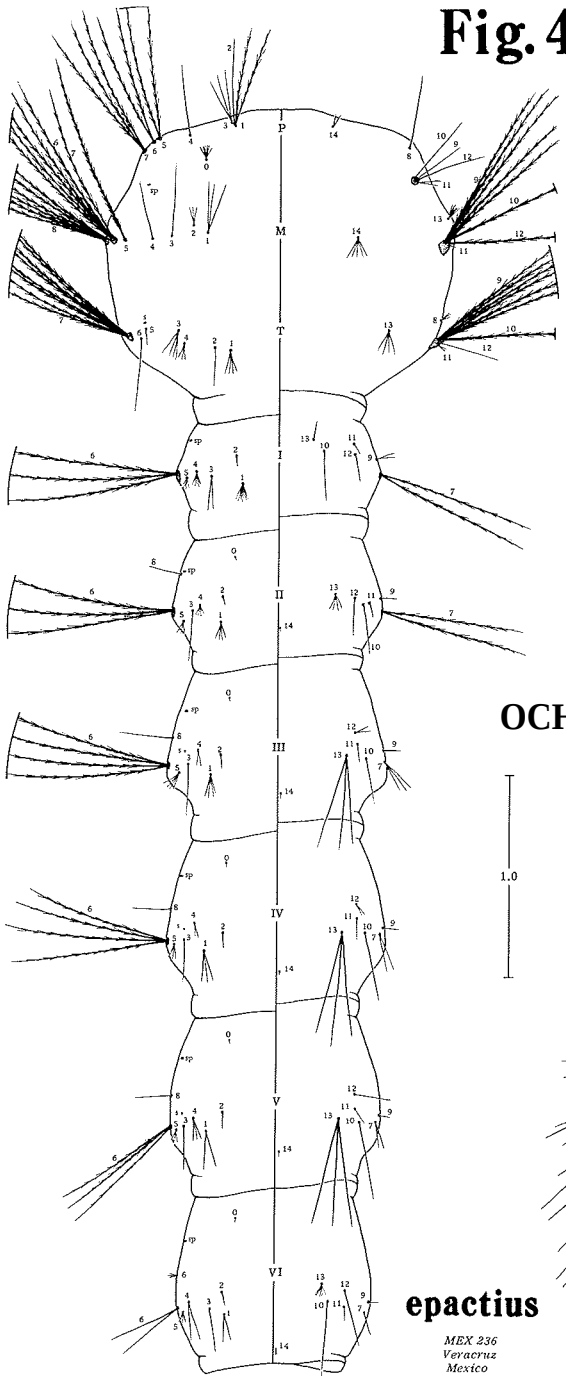
Fig. 46

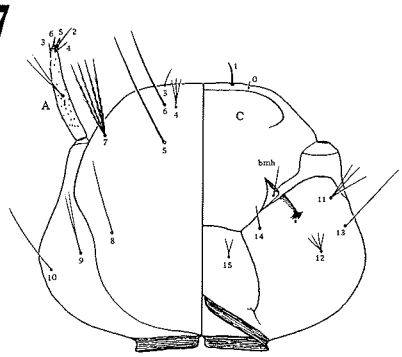
OCHLEROTATUS

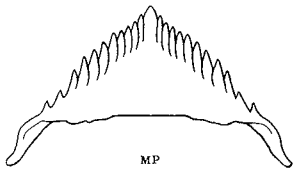


epactius

Fig. 47

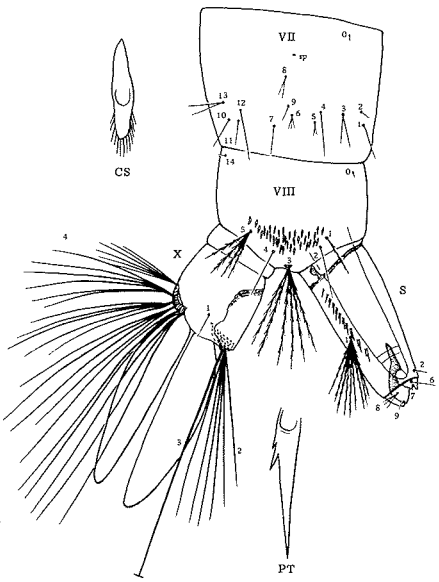






OCHLEROTATUS

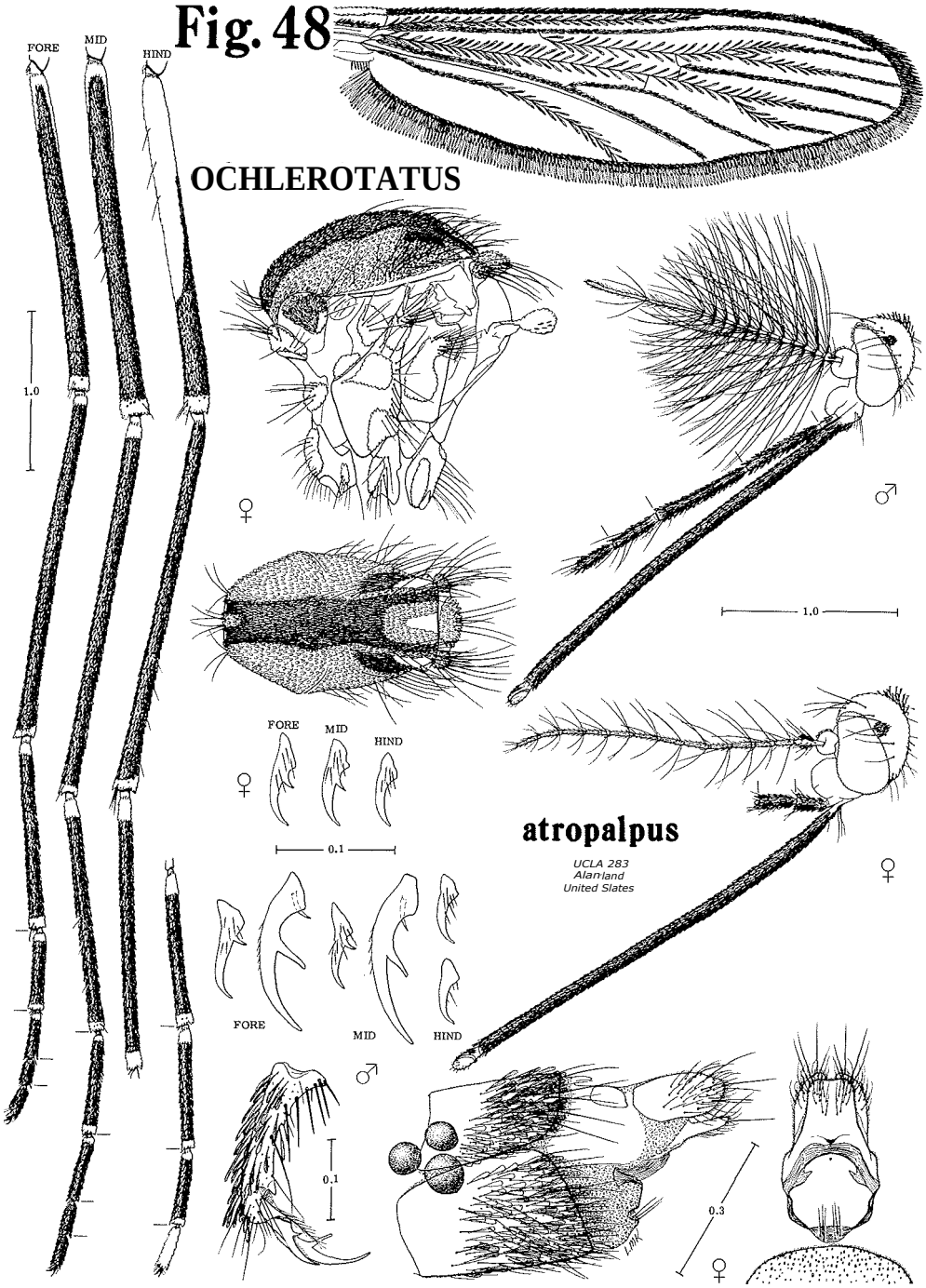
1.0



epactius

MEX 236
Veracruz
Mexico

Fig. 48



OCHLEROTATUS

atropalpus

UCLA 283
Alanland
United Slates

Fig.49

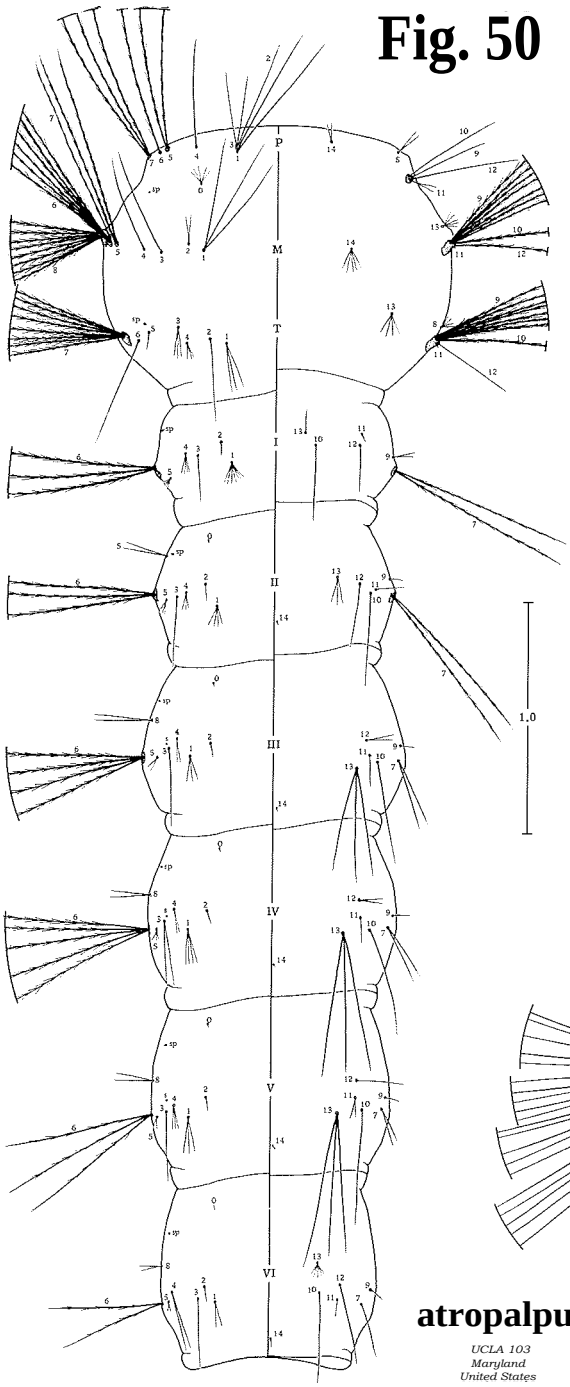
oCHLEROTATUS

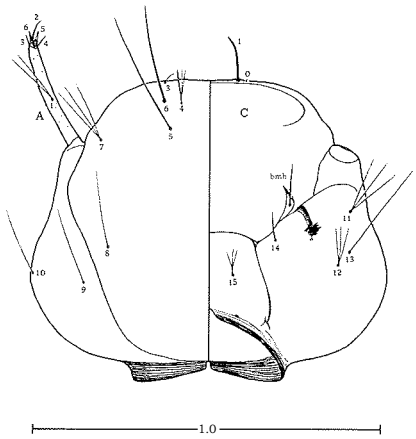
atropalpus

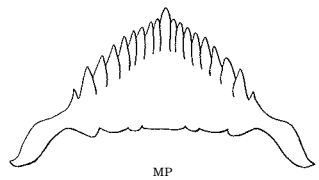
UCLA 283

11=e8rltes

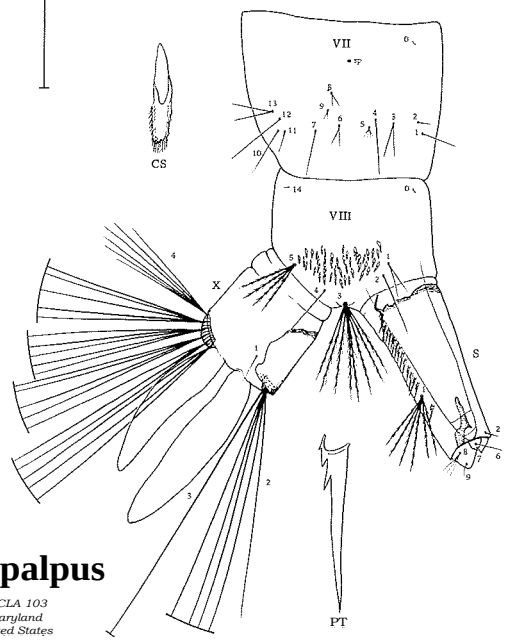
Fig. 50







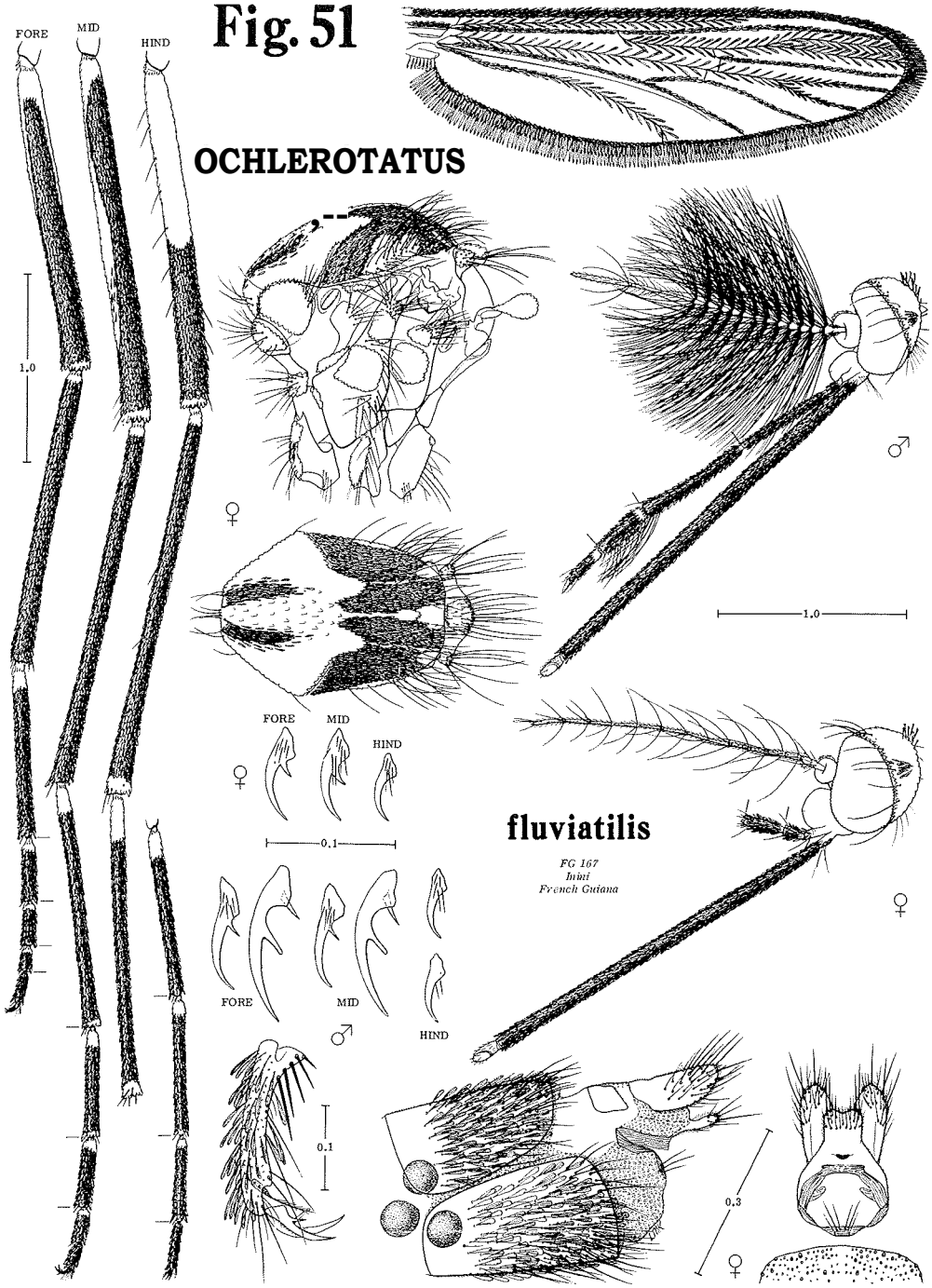
OCHLEROTATUS



atropalpus

UCLA 103
Maryland
United States

Fig. 51



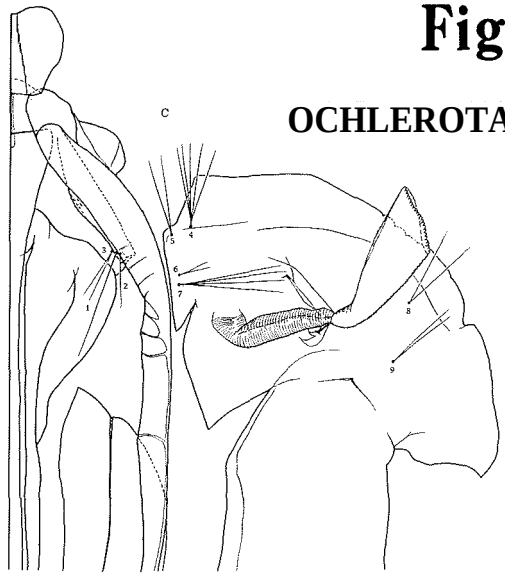
OCHLEROTATUS

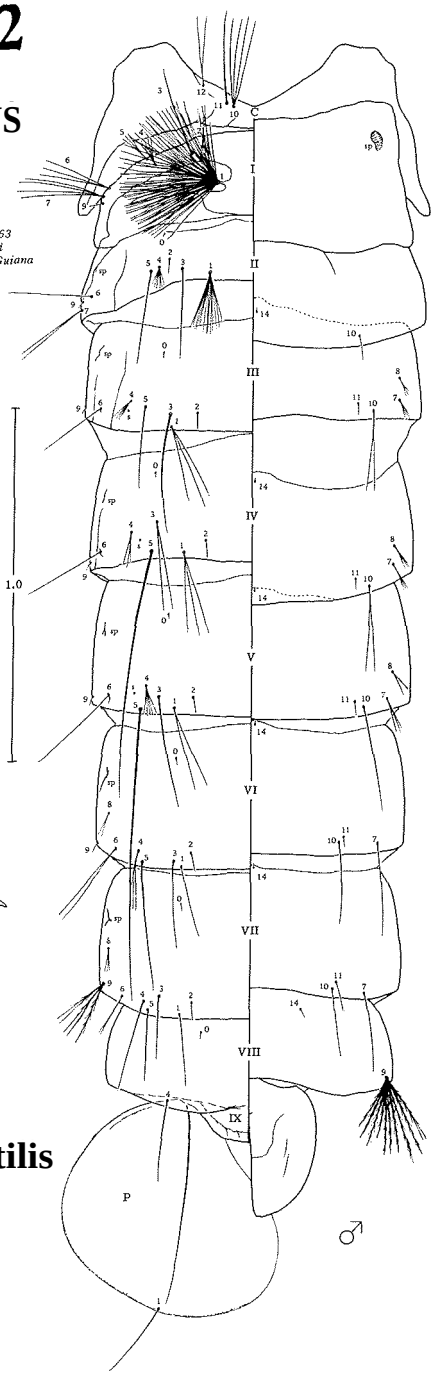
fluviatilis

FG 167
Inini
French Guiana

Fig. 52

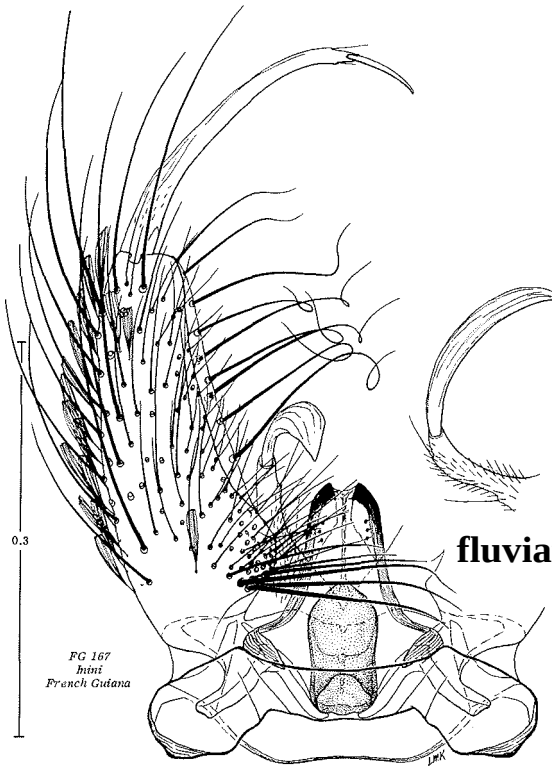
OCHLEROTATUS





FG 163
Ivini
French Guiana

1.0

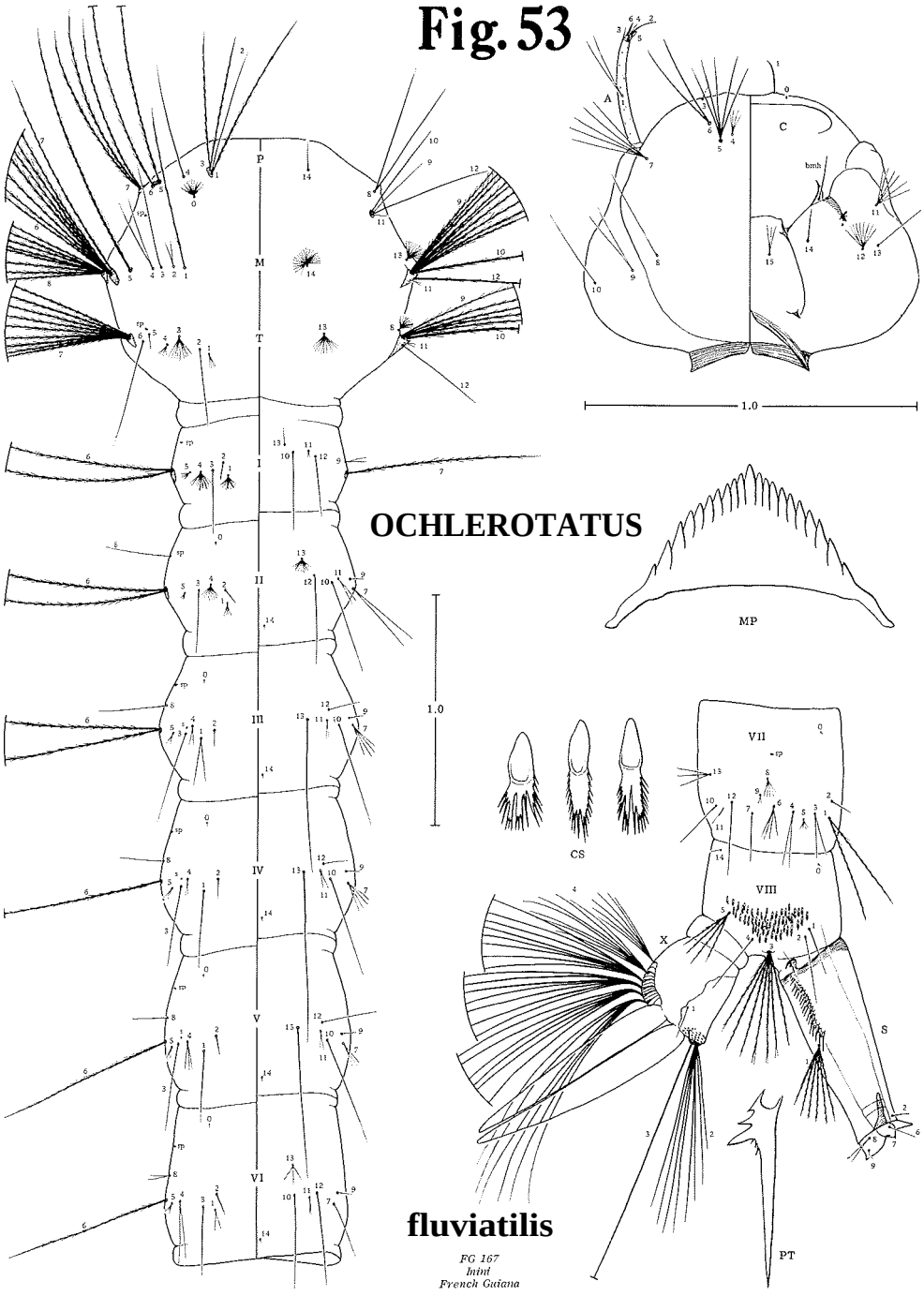


0.3

FG 167
Ivini
French Guiana

fluviatilis

Fig. 53



OCHLEROTATUS

fluviatilis

FG 167
Inini
French Guiana

Fig 54

CONOPOSTEGUS---,

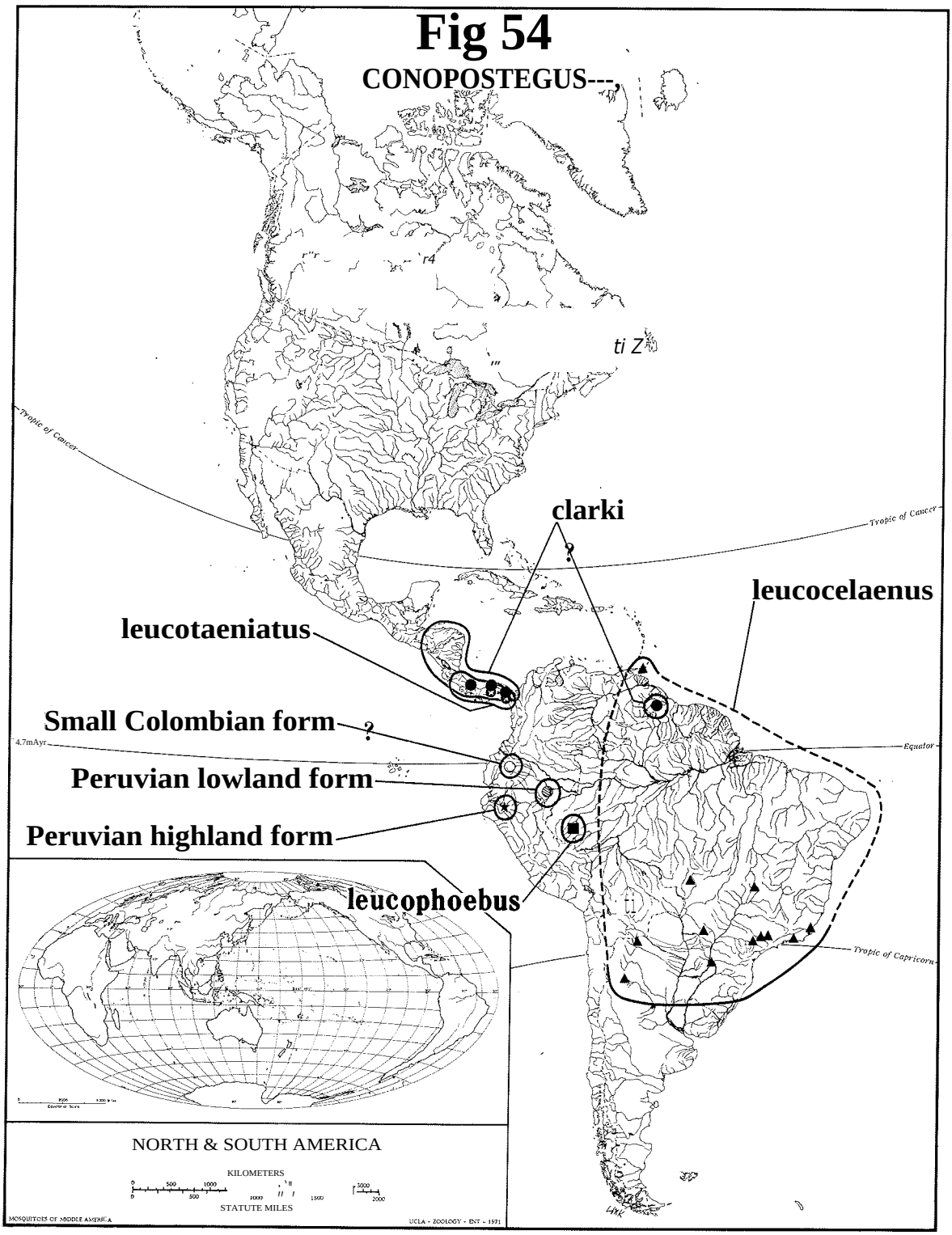


Fig.55

CONOPOSTEGUS

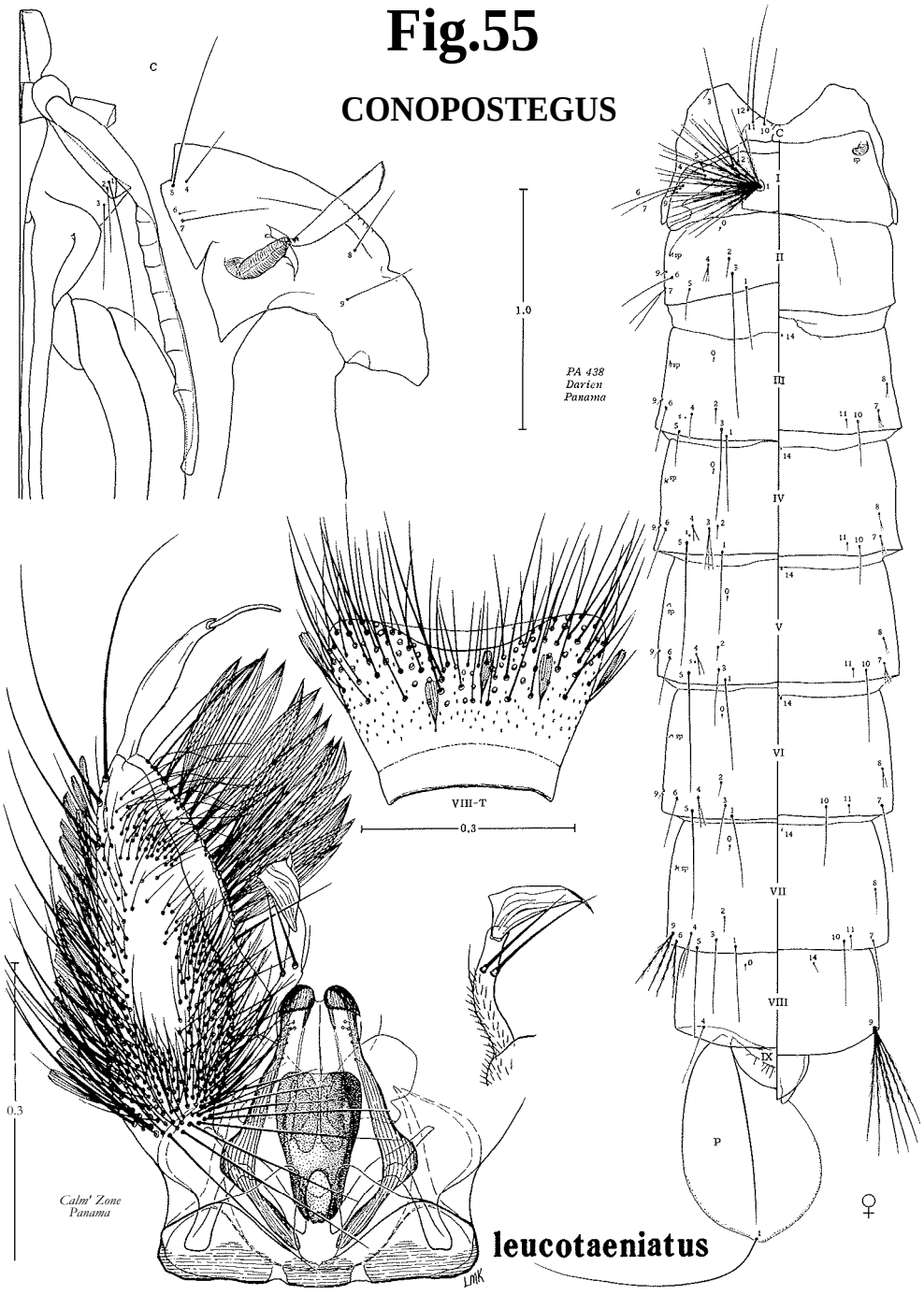
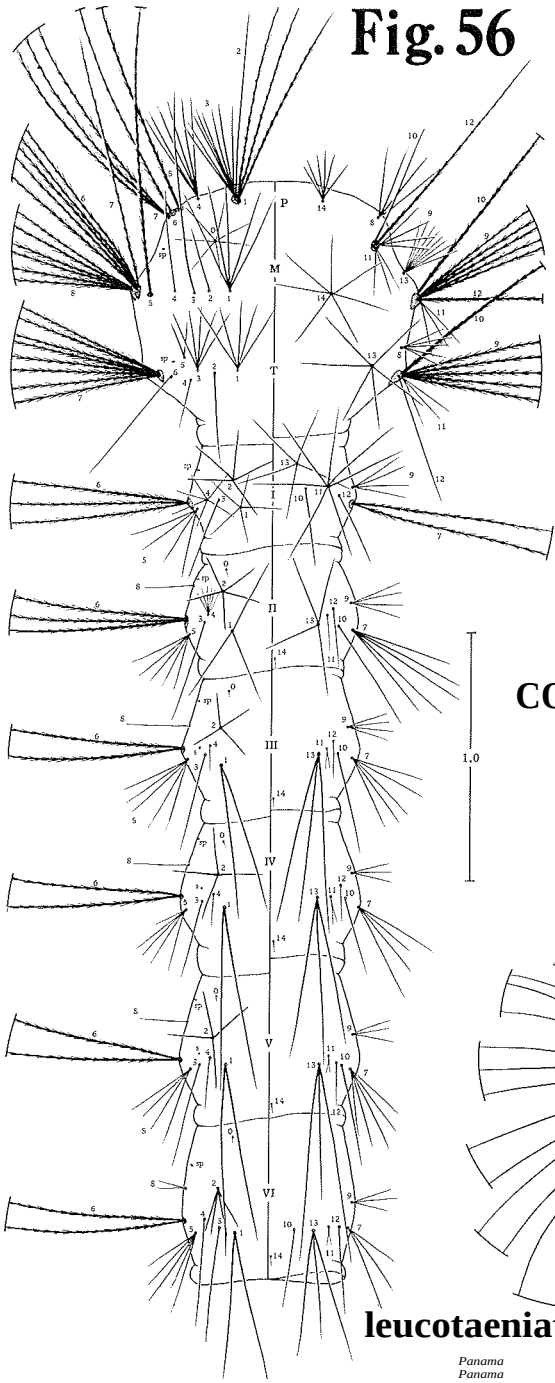
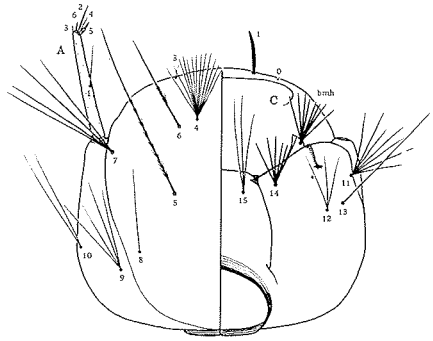
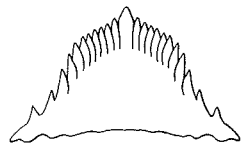


Fig. 56







CONOPOSTEGUS

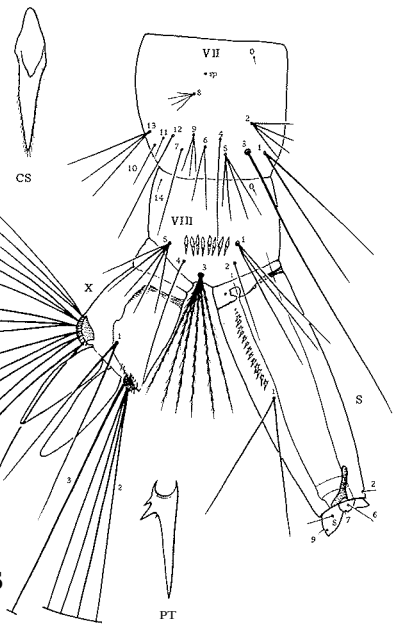


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Fig.57

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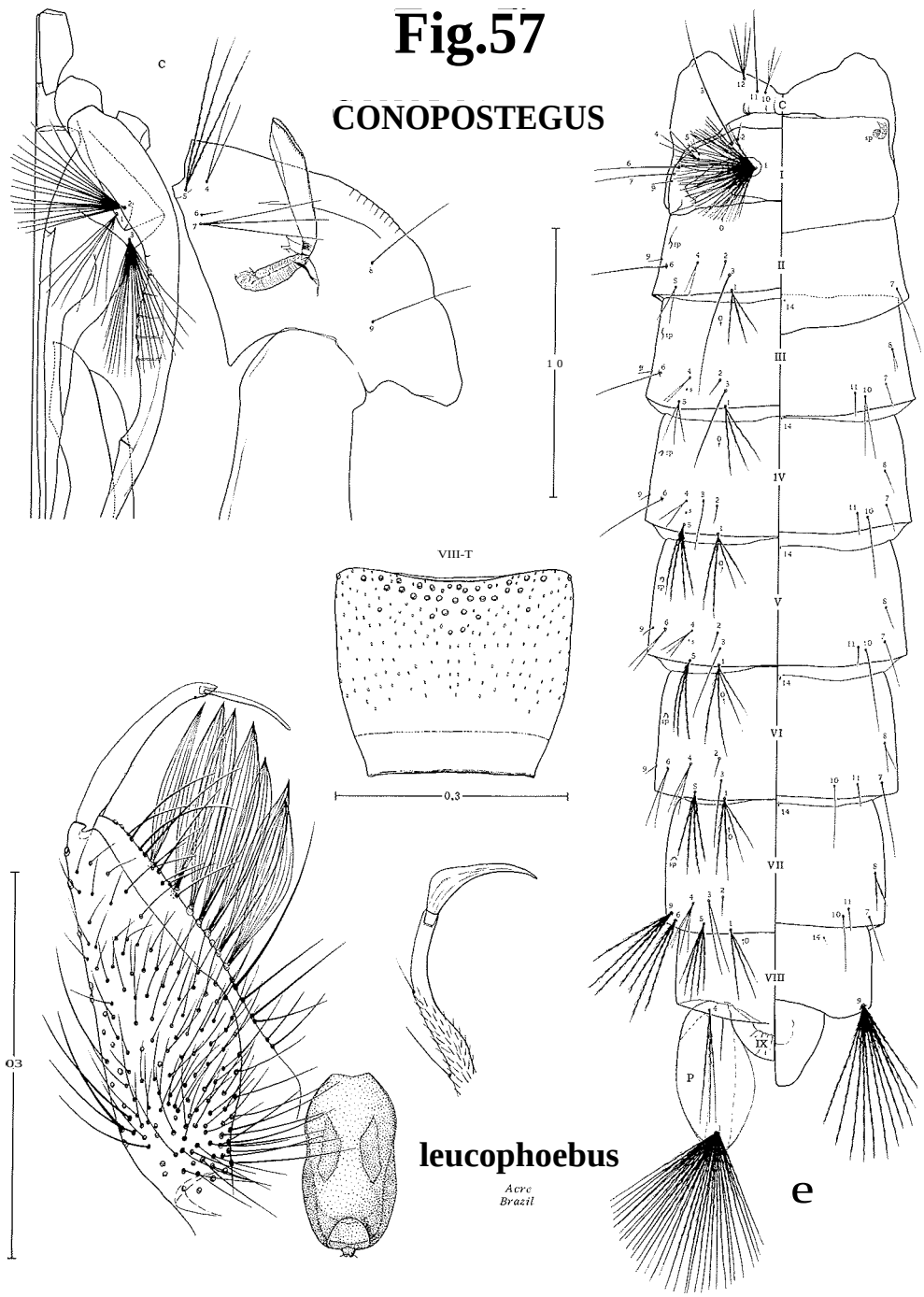

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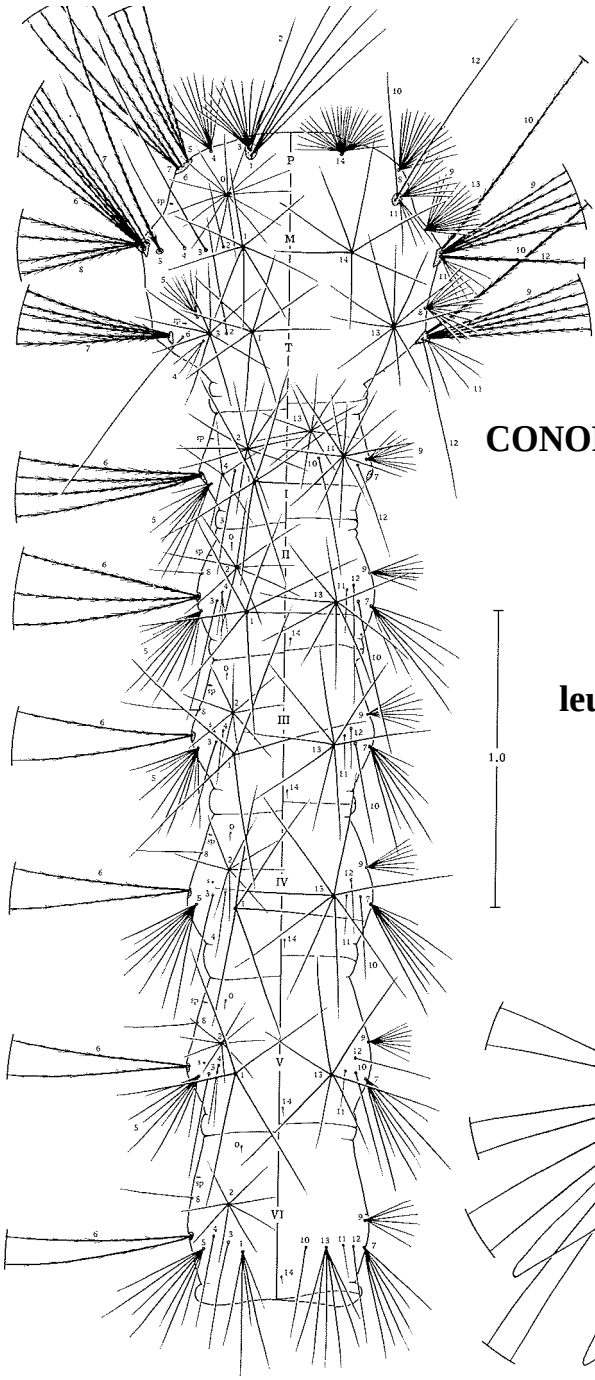
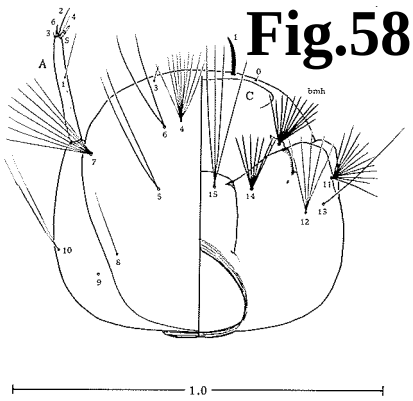
Fig.58





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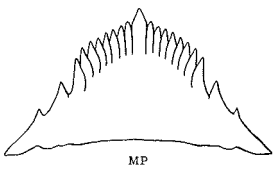

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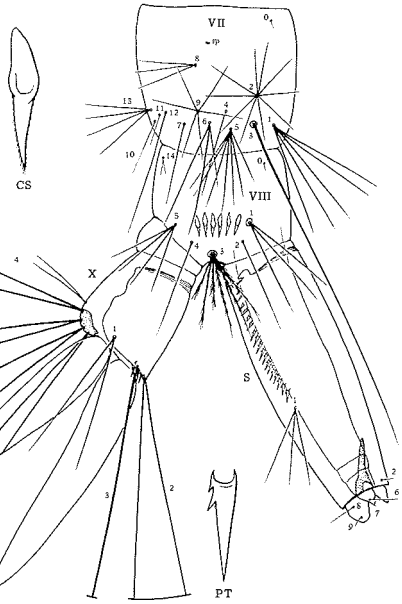
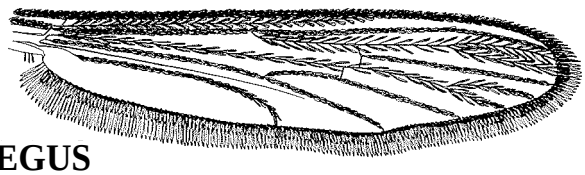


Fig. 59



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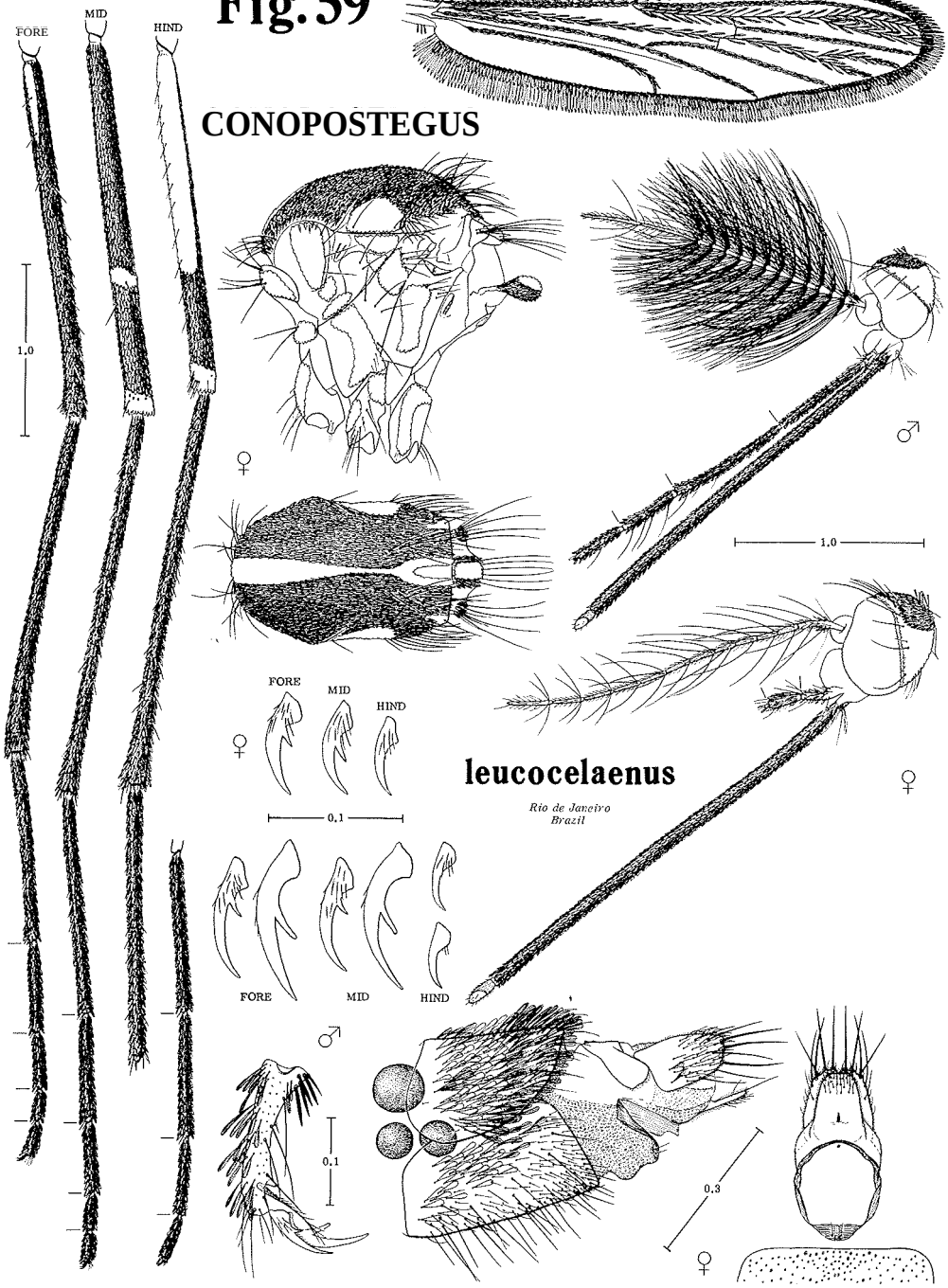

Fig. 60

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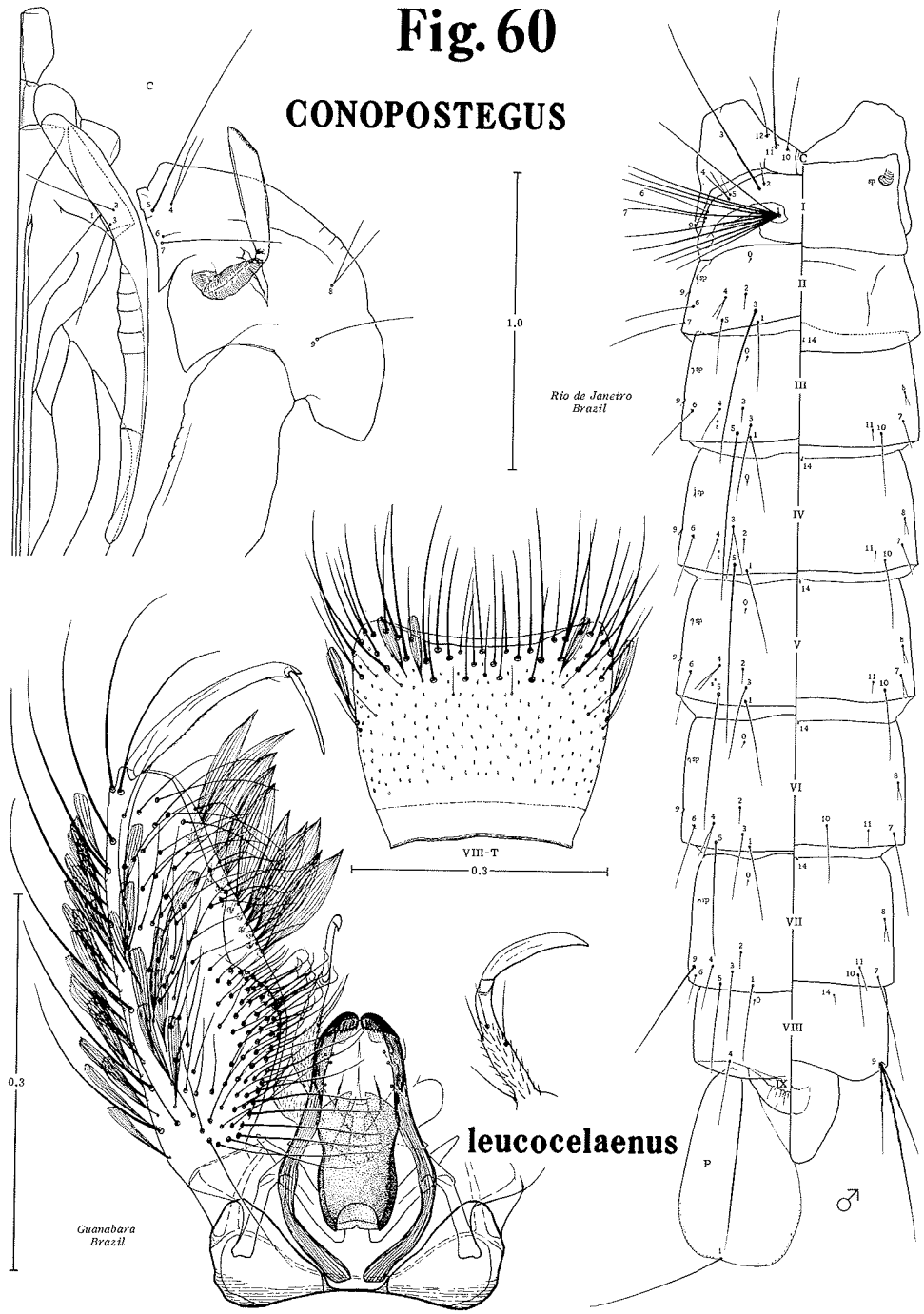

Fig 61

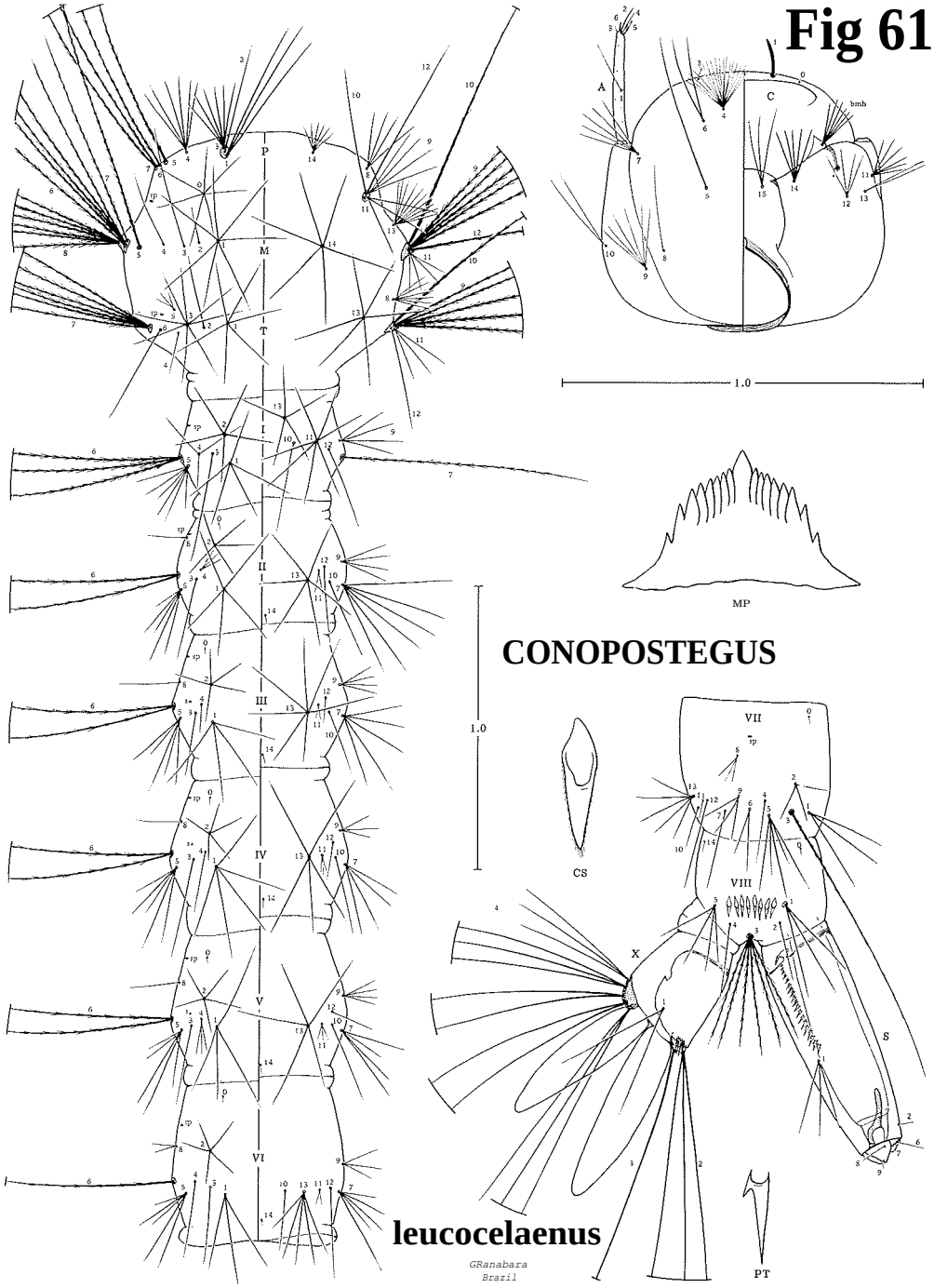
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Fig. 62

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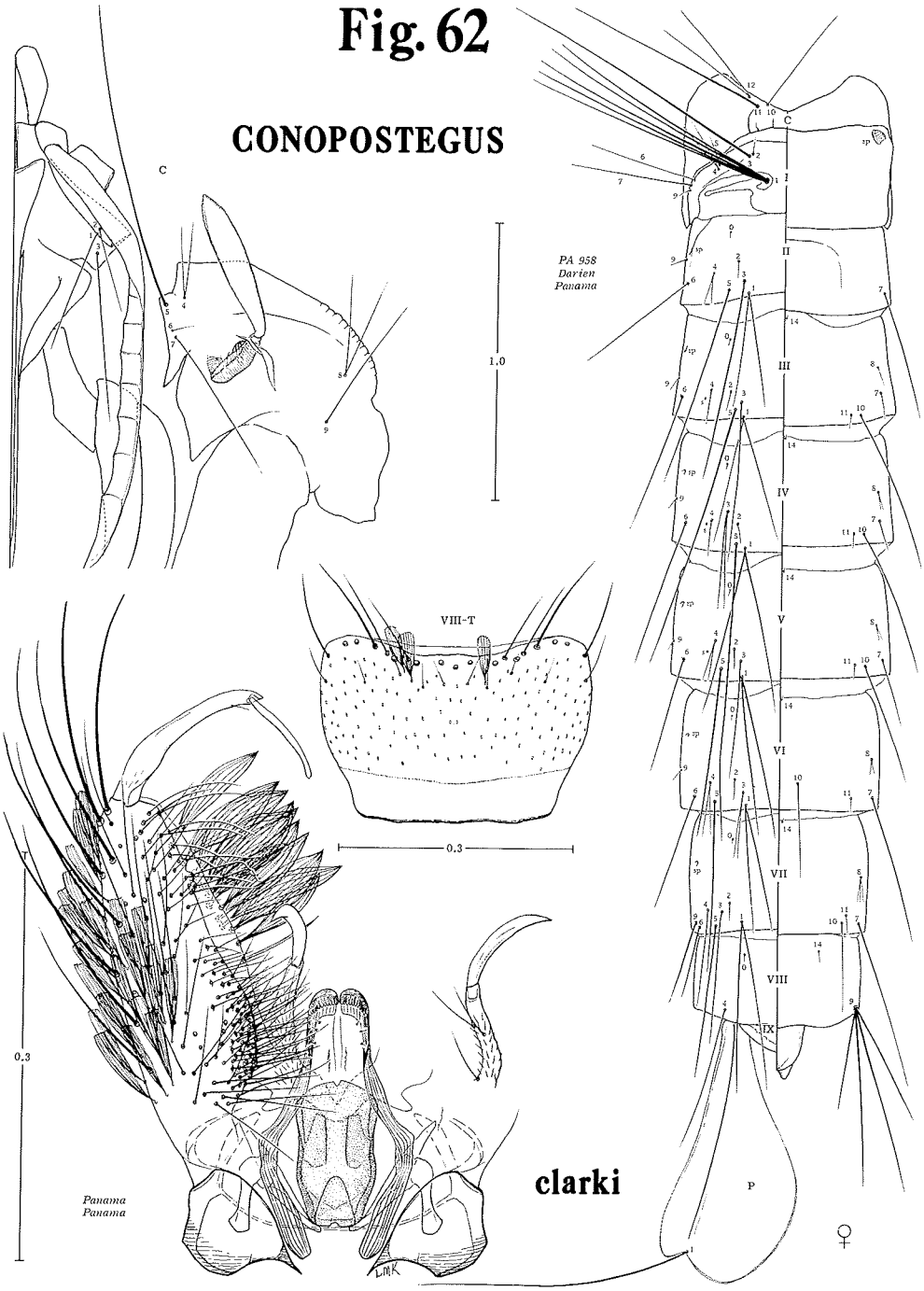
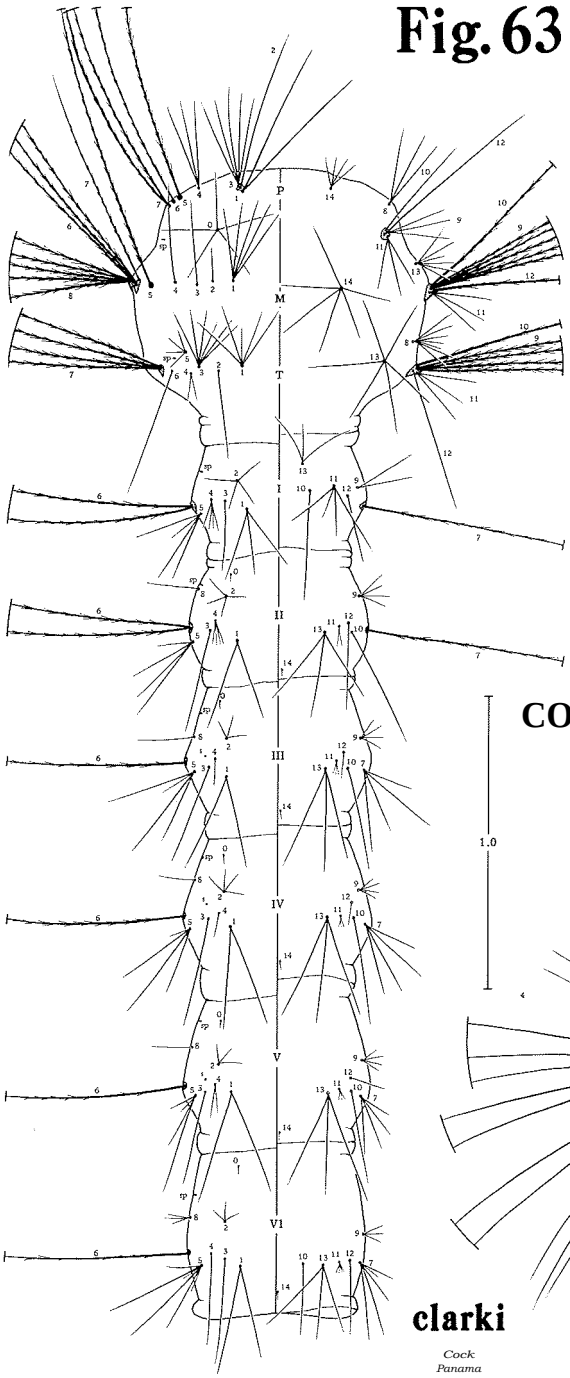
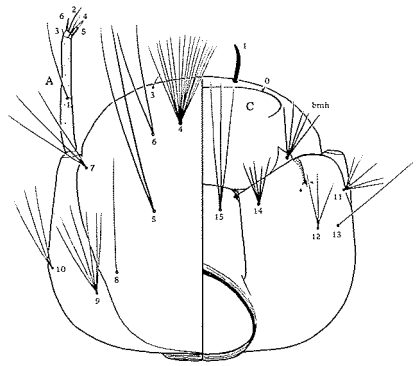
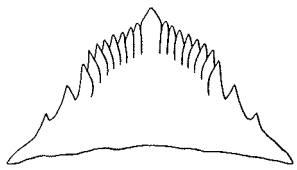


Fig. 63







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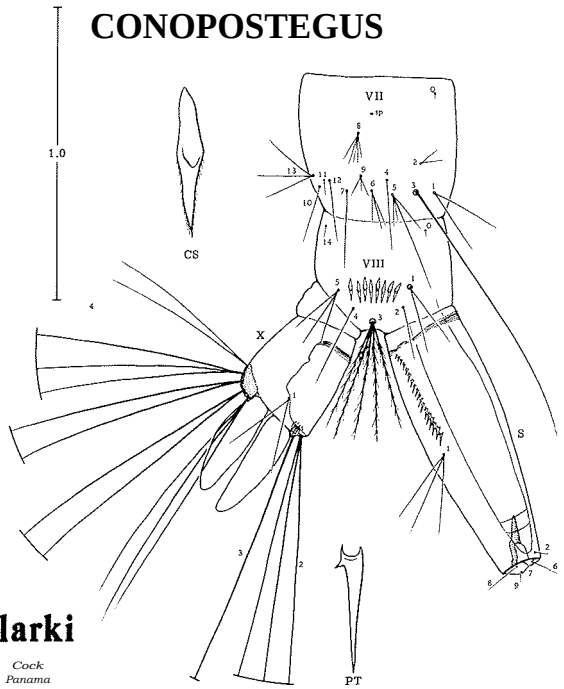

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