

Contributions
of the
American Entomological Institute

Volume 10, Number 3, 1973



CONTRIBUTIONS TO THE MOSQUITO FAUNA OF
SOUTHEAST ASIA. -XIX.

Bothaella, A New Subgenus of *Aedes* Meigen

by

John F. Reinert

Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE 1973		2. REPORT TYPE		3. DATES COVERED 00-00-1973 to 00-00-1973	
4. TITLE AND SUBTITLE Contributions to the Mosquito Fauna of Southeast Asia. XIX. Bothaella, A New Subgenus of Aedes Meigen				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Walter Reed Army Institute of Research, Department of Entomology, Washington, DC, 20012				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT see report					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 52	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

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CONTRIBUTIONS TO THE MOSQUITO FAUNA OF
SOUTHEAST ASIA. -XIX.

BOTHAELLA, A NEW SUBGENUS OF *Aedes* MEIGEN¹

By

John F. Reinert²

ABSTRACT

A new subgenus, *Bothaella*, of *Aedes* Meigen is defined, discussed and compared to related taxa. Descriptions, illustrations and keys are presented for the known stages of the 3 included species, *helenae*, *eldridgei* and *kleini*, all of which are new.

INTRODUCTION

During the course of revisionary work on the subgenera of *Aedes* Meigen, material of 3 new species was discovered which differed significantly from the other known subgenera. It therefore became necessary to define the present new subgenus, *Bothaella*, and describe the 3 new species, *helenae*, *eldridgei* and *kleini*. Keys are given for the known stages of these species and their geographical ranges are plotted on the map in figure 1.

Abbreviations used in literature cited conform to the World List of Scientific Periodicals, 4th edition, Butterworth, Washington, 1963. The abbreviations used in the distribution sections are as follows: ♂ = male; ♀ = female; L = larva; p = pupal skin; and l = larval skin. Pupal descriptions, tables and key utilize the following abbreviations: C = cephalothorax; I-VIII = abdominal segments 1 through 8; and P = paddle. In larval descriptions, tables and key the following abbreviations signify: A = antenna; C = head; I-VIII, X = abdominal segments 1 through 8 and 10; M = mesothorax; P = prothorax; S = siphon; and T = metathorax. When possible, 10 specimens were used in determining the range, mode and mean seta branching in pupal and larval descriptions and tables. In the pupal descriptions and tables, the number of branches on abdominal hair 1-I was measured on the basal 0.33 of the seta. Measurement scales on the illustrations are in millimeters. Distribution records are indicated as follows: countries are in capital letters; provinces are in italics; and place names have the first letter capitalized. The number of specimens examined from each province follows the last place name of the province in the distribution sections. The spelling of provinces and locality names in Thailand

¹This work was supported in part by Research Contract No. DA-49-193-MD-2672 from the U. S. Army Medical Research and Development Command, Office of the Surgeon General and carried out at the Southeast Asia Mosquito Project, Smithsonian Institution, Washington, D. C. 20560.

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is taken from the Official Standard Names Gazetteer No. 97, prepared by the Office of Geography, Department of the Interior, Washington, D. C., April 1966; and those from Cambodia from the Official Standard Names Gazetteer, 2nd Edition, prepared by the Geographic Names Division, U. S. Army Topographic Command, Washington, D. C., November 1971. Locality names which do not appear in the gazetteers are spelled according to the data sheets and labels on the specimens.

Nomenclature and chaetotaxy used for males, females and male genitalia follow Knight (1970) and Knight and Laffoon (1970a, 1970b, 1971) and those for the pupae and larvae follow Belkin (1962). The terminology of the female genitalia is taken from Laffoon and Knight (1971) except for additional terminology as given by Reinert (1973c) and Jones and Wheeler (1965).

GENUS *Aedes* MEIGEN

SUBGENUS *BOTHAELLA*, NEW SUBGENUS

Type species: *Aedes helenae* Reinert

The 3 species assigned to the subgenus share the following combination of characters.

MALE. Head. Antenna brown, plumose, pedicel with a patch of overlapping, broad, silvery scales on mesal and ventral surfaces, flagellomere 1 with a few brown scales, total length 0.73-0.85 length of proboscis; clypeus blackish-brown, bare; maxillary palpus short, dark brown scaled, 4 segmented, total length 0.18-0.19 length of proboscis; proboscis dark brown scaled (*kleini* with a few pale scales ventrally), total length 1.08-1.13 length of femur I; eyes contiguous; vertex and lateral areas covered with overlapping, broad, decumbent scales, a dorsomedian anterior triangular patch of silvery scales; occiput with numerous erect forked scales; several dark, long ocular setae; 2 dark, long interocular setae. **Thorax.** Scutal integument dark; scutum covered with narrow, curved, dark scales with prescutellar space bare; scutellum with broad dark scales on lateral lobe, median lobe with broad silvery scales basally and broad dark ones apically; following areas with setae which are dark and well developed; 2 median anterior promontory, numerous dorso-central (anterior and posterior), scutal fossal (2-4 anterior, 2-3 lateral and 1 posterior), numerous supra-alar, 5-8 posterior medial scutal (pale), 1 postalar callar and scutellar (3 long and 3-4 short lateral; 4-5 long and 2-4 short median); pleural integument dark; antepnotum with a large patch of overlapping broad, silvery scales, 7-9 dark setae; postpronotum without scales, 2-4 dark posterior setae; propleuron with a large patch of overlapping, broad silvery scales, 2-3 dark setae; prosternum, subspiracular area, paratergite, mesomeron and metepisternum bare; postspiracular area with a large patch of overlapping, broad, silvery scales, 1-2 dark setae; mesepisternum with an upper and a posterior patch of overlapping broad silvery scales, 1-2 upper and 1-2 lower setae; prealar knob with 3-8 dark setae; mesepimeron with a patch of overlapping, broad, silvery scales on upper area, 3-5 setae on upper area posterior to scale patch and 1 long seta on lower area. **Legs.** Coxae I-III each with several setae and a patch of broad scales which are silvery on II and III; femora I-III dark brown scaled, with white markings on posterior surfaces of I-III and anterior surfaces of II and III, I with or without anterior white scales, I length greater (1.09-1.11) than length of II; tibiae I-III dark brown scaled (a few apical white scales in *helenae*); tarsi dark brown scaled with or without

white bands; posttarsi I-III each with 2 ungues, I with ungues unequal, both with a tooth, II with ungues unequal, larger one simple and smaller one with a tooth, III with ungues equal and simple. *Wing*. Veins covered with dark scales dorsally and ventrally; alula with several narrow, dark scales along margin; upper calypter with numerous dark setae along margin; 1 remigial seta. *Halter*. Pedicel pale; capitellum silvery scaled with dark scales at base. *Abdomen*. Terga I-VII each blackish-brown scaled with a large latero-basal silvery scaled spot; sterna II-VII each blackish-brown scaled with a basal silvery scaled band; terga and sterna with numerous setae, mostly along posterior margins. *Genitalia*. Tergum IX band-like, moderately pigmented with 3-9 stout setae on each side of midline; gonocoxite short, broad, heavily pigmented, mesal surface membranous, dorsal surface with numerous moderately long or long thin setae, ventral surface with numerous short setae and a large circular apical mesal area which extends tergally and is covered with either short setae or moderately pigmented, short, broadly flattened, scale-like setae; gonostylus long, apical 0.42-0.46 expanded with several small fine setae and a heavily pigmented gonostylar claw which is short, bluntly rounded apically and attached apically or subapically to gonostylus; basal mesal lobe with apical 0.50 large, expanded and with 28-244 short setae, basal portion covered with small spicules and connected mesally with its mate; proctiger long, paraproct moderately pigmented with apex blunt and heavily pigmented, cercus membranous, cercal setae absent; tergum X narrow, heavily pigmented; phallosome with aedeagus divided into 2 lateral, moderately pigmented plates which are connected at base and apex, each lateral plate with outer lateral area curved tergally and with a mesal, longitudinal, heavily pigmented area terminating in 3-8 short teeth, paramere moderately long, 0.72-0.82 length of aedeagus, heavily pigmented, parameral apodeme long, 1.25-1.42 length of paramere, heavily pigmented; sternum IX large with basal, lateral and median areas moderately pigmented, 4-11 short to moderately long setae near center.

FEMALE. Similar to male in general habitus but with the following differences. *Head*. Antenna with basal 0.75-0.85 of flagellomere 1 pale, total length 0.77-0.95 length of proboscis; maxillary palpus total length 0.17-0.19 length of proboscis; proboscis total length 0.95-1.05 length of femur I. *Thorax*. 2-4 median anterior promontory setae; scutellum with 3-4 long and 2-6 short setae on lateral lobe and 4-6 long and 2-5 short setae on median lobe; antepronotum with 6-11 setae; postpronotum with 2-5 posterior setae; propleuron with 2-4 setae; prealar knob with 4-9 setae; mesepimeron with 3-8 setae on upper area and 1 lower one. *Legs*. Femur I length greater (1.07-1.15) than length of II; posttarsi I-III each with 2 ungues, I with ungues equal, both with a tooth, II with ungues equal, both with a tooth, III with ungues equal and simple. *Genitalia*. Tergum VIII with basal 0.60-0.90 retracted into segment VII, wide, base and apex slightly concave, several long stout setae along apical margin, moderately long thin setae and numerous broad dark scales on apical 0.35-0.55, index 0.47-0.60; sternum VIII large, wide, base very slightly concave, apex with a small median indentation and a small lobe on each side of midline, numerous setae and broad dark scales on apical 0.70-0.80, apical inter-segmental membrane very lightly pigmented mesally, index 0.63-0.73; tergum IX wide, moderately pigmented with a shallow median apical indentation, 1-6 setae apically on each side of midline, index 0.42-0.64; insula tongue-like, long, moderately pigmented, covered with minute spicules and with 2-5 tiny tuberculi on apical 0.20; lower vaginal lip, narrow, moderately pigmented, covered with small hair-like spicules; upper vaginal lip narrow, posterior margin somewhat

flattened, moderately to heavily pigmented, covered with small hair-like spicules, upper vaginal sclerite large, moderately to heavily pigmented; post-genital lobe moderately long, apex with a small to moderately deep median indentation, 7-14 setae on each side of midline, completely covered with minute hair-like spicules, dorsal PGL index 0.79-1.10, ventral PGL index 1.47-2.03; cercus short, apex bluntly rounded, mesal margin slightly concave, completely covered with minute spicules, scales absent, dorsal surface with 4-5 long stout setae apically and several moderately long and short setae on remainder of apical 0.40-0.50, ventral surface with 7-14 short setae on apical margin, index 2.05-2.69, cercus/ dorsal PGL index 2.58-3.64; 3 heavily pigmented, spherical seminal capsules, 1 large and 2 slightly smaller ones; base of accessory gland duct heavily pigmented.

PUPA. *Cephalothorax.* Setae 1, 7, 8-C single to triple; 2, 9-C single or double; 3, 6-C single; 4-C single to 6 branched; 5-C double to 6 branched; 1, 2-C short; 3, 6-C very long and stout; 4, 5, 7-9-C moderately long. *Metanotum.* Seta 10-C single to 5 branched; 11-C single or double; 12-C single to 4 branched. *Respiratory trumpet.* Moderately pigmented; a number of scattered, short setae on inner surface of meatus; pinna 0.29-0.38 length of meatus; index 4.46-5.77. *Abdomen.* Setae 0-II-VII single; 0-VIII single or double; 1-I with 11-34 branches on basal 0.33; 1-II single to 6 branched; 1-III, IV single to triple; I-V, VII single; 1-VI single or double; 2-I, III single to triple; 2-II, IV-VII single or double; 3-I, II single; 3-III, VI single or double; 3-IV double to 6 branched; 3-V single to triple; 3-VII single to 4 branched; 4-I triple to 8 branched; 4-II, V double to 7 branched; 4-III, IV single to 6 branched; 4-VI double to 5 branched; 4-VII single to triple; 4-VIII single or double; 5-I single to 5 branched; 5-II single or double; 5-III single to triple; 5-IV-VII single; 6-I, II, V single; 6-III, IV, VI single or double; 6-VII double to 5 branched; 7-I, VII single to triple; 7-II single to 4 branched; 7-III single to 7 branched; 7-IV, VI single to 5 branched; 7-V double to 8 branched; 8-III single to 4 branched; 8-IV single to 5 branched; 8-V, VII double to 5 branched; 8-VI double to 6 branched; 9-I single or double; 9-II-VI single; 9-VII double to 10 branched; 9-VIII with 5-12 branched; 10-I, II single to triple; 10-III, V-VII single or double; 10-IV single to 4 branched; 11-III-VI single; 11-VII single or double; 14-III-VII single; 14-VIII single or double; 3-I-III and 5-III-V very long and stout; 6-VII short, slightly cephalad and mesad to 9-VII; 9-VII, VIII long, stout and barbed. *Paddle.* Ovoid, with minute spicules on apical 0.80-0.89 of outer and apical 0.15-0.29 of inner margins; midrib moderately pigmented and reaches apex; 1-P moderately long, barbed, double to 14 branched; index 1.30-1.76.

LARVA. *Head.* Moderately pigmented; setae 0, 1, 3, 5, 6, 13-C single; 4-C with 4-14 branches; 7-C with 6-10 branches; 8, 10, 12-C single or double; 9-C single to triple; 11-C with 4-8 branches; 14-C double to 8 branched; 15-C double to 4 branched; basal maxillary hair double to 15 branched; 4-C moderately long, mesad and slightly cephalad to 6-C; 5-C long, well caudad of 6-C; 6-C long, well mesad to 7-C; 7-C moderately long, cephalad and well laterad to 5-C; mental plate heavily pigmented with 18-22 teeth; mouth brush with mesal hairs pectinate apically. *Antenna.* Short, moderately pigmented, a very few minute spicules on shaft; 1-A short, double or triple, attached 0.51-0.62 from base; 2-A long; 3-A short, 0.31-0.38 length of 2-A; 4-A moderately long, 0.60-0.83 length of 2-A; 5-A short, flattened; 6-A short, peg-like, 0.29-0.33 length of 2-A; 2, 3-A attached subapically. *Thorax.* Seta 0-P with 6-14 branches; 1-P triple to 5 branched; 2, 4-6, 10, 12-P single; 3-P with 4-15 branches; 7, 11-P double or triple; 8-P with 6-18 branches; 9-P double to 7 branched; 13-P with 4-21 branches; 14-P triple to 6 branched; 1-M with 5-9

branches; 2-M double to 4 branched; 3-5, 7, 10-12-M single; 6-M triple to 6 branched; 8-M with 4-6 branches; 9-M double to 6 branched; 13-M with 8-19 branches; 14-M with 6-16 branches; 1-T with 4-12 branches; 2, 6, 10-12-T single; 3-T double to 5 branched; 4-T single to triple; 5-T double to 9 branched; 7-T with 5-8 branches; 8-T with 5-14 branches; 9-T double to 4 branched; 13-T with 5-16 branches. *Abdomen*. 0-II-VIII single; 1-I with 5-10 branches; 1-II with 4-9 branches; 1-III with 4-10 branches; 1-IV triple to 9 branched; 1-V triple to 7 branched; 1-VI triple to 6 branched; 1-VII triple to 5 branched; 1-VIII double to 11 branched; 2-I triple to 10 branched; 2-II triple to 14 branched; 2-III triple to 11 branched; 2-IV, V single to 11 branched; 2-VI single to 9 branched; 2-VII with 5-10 branches; 2-VIII single; 3-I-VI single; 3-VII single to 5 branched; 3-VIII double to 8 branched; 4-I with 4-9 branches; 4-II double to 6 branched; 4-III double to 8 branched; 4-IV double to 9 branched; 4-V triple to 7 branched; 4-VI, VIII single; 4-VII single or double; 5-I triple to 8 branched; 5-II triple to 6 branched; 5-III triple to 7 branched; 5-IV, VII double to 5 branched; 5-V, VI triple to 5 branched; 5-VIII double to 7 branched; 6-I triple to 6 branched; 6-II triple or 4 branched; 6-III double or triple; 6-IV-VI double; 6-VII with 4-7 branches; 7-I single to triple; 7-II double; 7-III triple to 9 branched; 7-IV with 4-10 branches; 7-V triple to 8 branched; 7-VI double to 4 branched; 7-VII single or double; 8-II single to 4 branched; 8-III, V single or double; 8-IV single; 8-VI triple to 8 branched; 8-VII with 5-14 branches; 9-I single to triple; 9-II double to 7 branched; 9-III, VI single to 6 branched; 9-IV, V single to 5 branched; 9-VII double to 4 branched; 10-I, IV-VI single; 10-II, III single or double; 10-VII single to 4 branched; 11-I with 5-16 branches; 11-II-IV, VI double to 5 branched; 11-V double to 4 branched; 11-VII single to triple; 12-II single or double; 12-III single to triple; 12-IV double or triple; 12-V, VI single; 12-VII single to 4 branched; 13-I with 4-15 branches; 13-II triple to 16 branched; 13-III triple to 11 branched; 13-IV triple to 9 branched; 13-V double to 8 branched; 13-VI with 4-13 branches; 13-VII with 4-9 branches; 14-II, V, VIII single; 14-III, IV, VI, VII single or double; VIII with comb composed of 15-26 scales arranged in 2 irregular rows; 1-X long, stout, barbed, double to 4 branched, attached near posterior margin of saddle; 2-X long, stout, with 4-6 branches; 3-X very long, stout, single; ventral brush composed of 8-9 setae on grid, each single to triple, no precratal setae, basal 1-2 setae moderately long, remainder long; saddle moderately pigmented, with large spicules on posterior margin, acus absent; 4 anal papillae, long and slender. *Siphon*. Heavily pigmented, acus well developed, index 2.90-4.89; pecten on basal 0.36 of siphon, composed of 12-17 evenly spaced teeth, each tooth with a slender attenuated filament with small denticles on ventral margin; 1-S long, barbed, double to 5 branched, base attached on basal 0.43 of siphon and distad to last pecten tooth; 2-S short, single and on apical margin of siphon; 6, 8, 9, 13-S short and single.

EGG. Not known.

DISTRIBUTION. This subgenus is currently known from Thailand from the following 4 provinces: Chiang Mai, Kanchanaburi, Lampang and Nan and from Cambodia from 2 provinces: Kompong Som and Kompong Speu.

The known distributions of the 3 included species of *Bothaella* are plotted on the map in Figure 1.

TAXONOMIC DISCUSSION. The subgenus *Bothaella* is characterized and separated from the other subgenera of *Aedes* by the following: in the adults by the combination of (1) head with only decumbent broad scales on vertex and erect forked scales restricted to occiput, (2) antennal pedicel with a large patch of overlapping, broad, silvery scales on mesal and ventral areas, short

fine hairs absent, (3) dorsocentral (anterior and posterior) setae well developed, (4) acrostichal setae absent, (5) prosternum bare, (6) propleuron with 2-4 setae, (7) mesepisternum with 1-2 upper and 1-2 posterior setae, (8) mesepimeron with 3-8 upper and 1 lower setae, (9) male maxillary palpus short (0.18-0.19 length of proboscis) and (10) male posttarsi I-III each with 2 ungues, I with ungues unequal, each with a tooth, II with ungues unequal, smaller one with a tooth and III with ungues equal and simple; in the male genitalia by the combination of (1) development of the aedeagus which is composed of 2 lateral plates each with lateral surfaces curved tergally and presence of poorly to well developed short distal teeth, (2) proctiger without cercal setae, (3) development of basal mesal lobe into a large expanded distal lobe bearing 28-244 short setae, (4) development of gonocoxite and (5) development of gonostylus; in the female genitalia by the combination of (1) tergum VIII shape and number of scales, (2) sternum VIII shape and number of scales, (3) tergum IX shape and number of setae, (4) insula tongue-like with distal tuberculi, (5) development of postgenital lobe, (5) cercus short, mesal margin slightly concave and absence of scales and (6) 1 large and 2 slightly smaller spherical, seminal capsules; in the pupae by the combination of (1) setae 1, 2-C short and usually single, 3-C very long, stout and single, (2) setae 4, 5-C approximately equally developed in length and branching, (3) seta 6-C very long, stout and single and 7-C short to moderately long and single to triple, (4) setae 3-II-III and 5-IV-V very long, stout and single, (5) 6-VII short, double to 5 branched and slightly cephalad and mesad to 9-VII, (6) 9-VII-VIII long, stout, barbed, double to 10 branched on VII and 5-12 branched on VIII and (7) paddle with small spicules on outer and inner margins but without hair-like fringe and seta 1-P multiple branched and barbed; and in the fourth stage larvae by the combination of (1) setae 5, 6-C stout, long and single, 4-C moderately long, multiple branched (4-14 branched), mesad and slightly cephalad to 6-C, 5-C well caudad to 6-C, (2) antenna short with seta 1-A short and double or triple, (3) seta 13-P well developed with 4-21 branches, (4) setae 6-I-VI long, barbed and double on IV-VI, (5) seta 1-VII long, stout and triple to 5 branched and 3-VII short, (6) seta 13-VII cephalad and well separated from 10-VII, (7) seta 1-X long, stout, barbed, double to 4 branched and attached near caudal margin of saddle, (8) saddle incompletely rings segment X and ventral brush composed of 8-9 setae each of which is single to triple and (9) siphon with pecten of 12-17 evenly spaced teeth and no detached ones, 1-S long, barbed, double to 5 branched and attached on basal 0.45 of siphon distad to last pecten tooth.

The adult habitus and chaetotaxy of the subgenus *Bothaella* is most similar to those of the subgenera *Stegomyia* Theobald and *Christophersiomyia* Barraud of *Aedes* and the genus *Heizmannia* Ludlow. This subgenus can be separated from *Stegomyia* which is outlined by Reinert (1973b) by the following characters: prosternum bare; propleuron with 2-4 setae; mesepimeron with 1 lower seta; remigial setae present and maxillary palpus of male short, total length 0.18-0.19 length of proboscis while *Stegomyia* possesses: prosternum with broad scales, at least on dorsolateral areas; propleuron with 5-7 setae; mesepimeron without lower setae; remigial setae absent and maxillary palpus of male usually approximately equal in length to proboscis (some members of the *albolineatus* group have palpi 0.48 length of proboscis). The subgenus *Christophersiomyia* possesses the following which differ from *Bothaella*: prosternum with white scales; propleuron with 6-14 (usually 8-10) setae; paratergite and postpronotum with numerous scales; scutum with a large patch of narrow, curved, white scales on anterior 0.50 and proboscis with a broad band of white scales near middle. *Bothaella* resembles the genus *Heizmannia* but lacks the

following features of this genus (see Reinert 1973a): prosternum covered with broad silvery scales; mesepisternum without setae on upper area; anterior dorsocentral setae absent (setae anterior to prescutellar space); prescutellar space completely covered with scales; mesopostnotum with setae (subgenus *Heizmannia* only) and antepronota large, nearly contiguous or only moderately separated.

The short maxillary palpus of the male is also similar to those of the following subgenera of *Aedes*: *Aedes* Meigen, *Cancraedes* Edwards, *Chrophersiomyia*, *Geoskusea* Edwards, *Huaedes* Huang, *Leptosomatomyia* Theobald, *Neomacleaya* Theobald, *Nothoskusea* Dumbleton, *Paraedes* Edwards, *Rhinoskusea* Edwards and *Verrallina* Theobald. Members of the subgenus *Bothaella* do not resemble any of these subgenera in the adult habitus and are easily separated from them by one or more of the following characters: absence of acrostichal setae; number of setae on propleuron; number of setae on mesepisternum; absence of short fine hairs on antennal pedicel and development of the female and male ungues of the posttarsi.

Male genitalia of *Bothaella* have a resemblance to those of the subgenus *Leptosomatomyia* and to a lesser extent to the subgenus *Huaedes* in the development of tergum IX, gonostylus and basal mesal lobe but differ in the development of the gonocoxite, proctiger and aedeagus. The female genitalia also show similarities to *Leptosomatomyia* and *Huaedes* but differ in the development of tergum IX, absence of scales on the cercus and in the latter subgenus by the number of tuberculi on the insula. Female genitalia of *Leptosomatomyia* also differ from both *Bothaella* and *Huaedes* by having the apical intersegmental membrane of sternum VIII moderately to heavily pigmented.

Pupae of *Bothaella* are most similar to members of the subgenus *Stegomyia* but are easily differentiated by a combination of characters 1, 3, 6 and 7 as listed above.

The fourth stage larvae of *Bothaella* resemble species of *Stegomyia*, *Finlaya*, *Howardina* Theobald and *Heizmannia*. From the *Stegomyia* they are easily separated by: the number of setae in the ventral brush; presence of seta 13-P, however, this seta is present and well developed in *hoguei* Belkin, *upolensis* Marks, *robinsoni* Belkin and *tulagiensis* Edwards; and setae 10-VII and 13-VII are well separated (these 2 setae are also well separated in *robinsoni* and *tulagiensis*). The larvae of these 4 species of *Stegomyia* are similar in many respects to the subgenus *Bothaella* but are unlike it in the development of the ventral brush and seta 3-X which is not single in these species. From the *Finlaya* they are separated by the following combination of characters: seta 6-C single; seta 10-P single; seta 13-P present; and setae 6, 8-S short. Larvae of the *sexlineatus* section and 2 species of the *walkeri* section (i. e., *cozumelensis* Diaz Najera and *ioliota* Dyar and Knab) of *Howardina* (subgenus as defined by Berlin, 1969) have a number of similarities to those of *Bothaella* especially in the presence of seta 13-P; however, *Howardina* differ by possessing the following features: setae 5, 6-C not both single (except 2 species of *walkeri* section); 3-VII very long and single; 13-VII close to and not well cephalad of 10-VII; and shape of the comb scales. *Bothaella* larvae are very similar in many respects to those of the genus *Heizmannia* but are differentiated by the following combination of features of the latter genus: seta 5-C barbed and multiple branched (3-16 branched, usually with 5 or more branches except in *complex* Theobald in which 5-C is single to triple, of 14 larvae and larval skins in the SEAMP collection 5-C was single in 2, double in 11 and triple in 1); absence of seta 13-P; seta 13-VII attached close to seta 10-VII; and seta 2-X usually double or triple (occasionally 4 branched in *achaetae* (Leicester), *catesi* (Lien), *communis* (Leicester), *demeilloni* Mattingly,

macdonaldi Mattingly and triple to 7 branched in *reidi* Mattingly).

This subgenus is dedicated to Dr. Botha de Meillon, Principal Investigator, Southeast Asia Mosquito Project, Smithsonian Institution, in acknowledgement of his many contributions to the study of the world Culicidae and his guidance and inspiration.

MEDICAL IMPORTANCE. Nothing is known about the medical significance of the species included in this subgenus.

BIOLOGY. The most common habitat of immature stages is water in small rock pools, however, occasionally they have been found in bamboos. Larvae and pupae have been collected from clear or colored, fresh, temporary water in small rock pools (a number of times from volcanic rock) and several times from split bamboo, bamboo stumps and cups, located in partial or heavy shade, situated in primary and secondary rainforests, secondary deciduous forests and bamboo groves, and always in mountainous terrain between altitudes of 75 and 1520 meters.

Adults of *kleini* were collected in a small dry forest and 1 female was taken biting man between 1800 and 1900 hours in a littoral rainforest.

KEYS TO SPECIES OF *Aedes* (*BOTHAELLA*)

ADULTS

1. Tarsus III dark brown scaled. *kleini*
Tarsus III with white scaled bands. 2
2. Mesepisternum with 2 setae; postpronotum with 2-3 posterior setae. *eldridgei*
Mesepisternum with 3 setae; postpronotum with 3-5 posterior setae. *helenae*

MALE GENITALIA

1. Basal mesal lobe with 28-37 short setae; gonostylus with 5-8 tiny setae on expanded portion. *helenae*
Basal mesal lobe with 70-244 short setae; gonostylus with 10-14 tiny setae on expanded portion. 2
2. Basal mesal lobe with 70-78 setae and with a ventromesal finger-like projection terminating with a broad apically flattened seta. . . . *eldridgei*
Basal mesal lobe with 201-244 setae and without a finger-like projection. *kleini*

PUPAE*

- Paddle hair 1 double to 5 branched; abdominal hair 9-VII double to 4 branched. *eldridgei*
Paddle hair 1 with 6-14 branches; abdominal hair 9-VII with 5-10 branches. *helenae*

*Pupae of *kleini* are not known.

FOURTH STAGE LARVAE*

Head hair 4-C with 4-8 branches; abdominal hair 2-II with 7-14 branches.

helenae

Head hair 4-C with 9-14 branches; abdominal hair 2-II with 3-5 branches.

eldridgei

DESCRIPTION OF THE SPECIES OCCURRING IN SOUTHEAST ASIA

Aedes (Bothaella) helenae, new species

(Figs. 2, 4, 5, 8, 11, 13)

MALE (Fig. 2). *Head*. Antenna brown, plumose, pedicel with a patch of overlapping broad, silvery scales on mesal and ventral surfaces, flagellomere 1 with a few brown scales, total length approximately 0.81 length of proboscis; clypeus blackish-brown, bare; maxillary palpus short, dark brown scaled, 4 segmented, segments 1 and 2 short, segment 3 approximately 0.48 length of segment 4 which is long and slightly longer than combined length of basal 3 segments, total length approximately 0.19 length of proboscis; proboscis dark brown scaled, total length approximately 1.08 length of femur I; eyes contiguous; vertex and lateral areas covered with overlapping, broad, decumbent scales, a dorsomedian triangular patch of silvery scales anteriorly with apex extending onto dorsal portion of interocular space, a small patch of silvery scales on postgena next to eye, remainder of scales blackish-brown; occiput with numerous blackish-brown, erect, forked scales; several dark, long ocular setae; 2 dark, long interocular setae. *Thorax*. Scutal integument blackish-brown; scutum covered with narrow, curved, blackish-brown scales with prescutellar space bare; scutellum with a patch of broad blackish-brown scales on lateral lobe, median lobe with a basal patch of broad silvery scales and broad blackish-brown ones apically; following areas with setae which are dark and well developed: 2 median anterior promontory, numerous dorsocentral (anterior and posterior), scutal fossal (2-3 anterior, 2-3 lateral and 1 posterior), numerous supra-alar, 6-8 posterior medial scutal (pale), 1 postalar callar and scutellar (3 long and 2-4 short lateral; 4-5 long and 2-4 short median); pleural integument blackish-brown; anteprenotum with a large patch of overlapping, broad, silvery scales, 7-8 long dark setae; postpronotum with 3-4 long, dark, posterior setae; propleuron with a large patch of overlapping, broad, silvery scales, 2-3 long, dark setae; prosternum, subspiracular area, paratergite, mesomeron and metepisternum bare; postspiracular area with a large patch of overlapping, broad, silvery scales, 1-2 long, dark setae; mesepisternum with an upper and a posterior patch of overlapping, broad, silvery scales, 2 long, dark, upper setae and 1 long, dark lower one; prealar knob with 5-8 moderately long, dark setae; mesepimeron with a patch of overlapping, broad, silvery scales on upper area, a patch of 3-5 moderately long, dark setae posterior to scale patch on upper area and 1 long, dark seta on lower area. *Legs* (Fig. 4). Coxae I-III each with several moderately long and long setae, I with anterior and lateral areas covered with broad blackish-brown scales and a dorsal and an antero-ventral patch of broad silvery ones, II and III each with an anterior patch of broad silvery scales; trochanters I-III each with broad silvery scales; femora

*Larvae of *kleini* are not known.

I and II each covered with broad blackish-brown scales, I with an anteroapical silvery scaled spot, a few similar scales at base and forming a narrow postero-dorsal stripe on basal 0.40-0.50, II with a dorsoapical silvery scaled spot, a few similar scales at base and forming an indistinct patch on basal 0.60-0.70 of posterior surface, III with anterior and posterior surfaces with basal 0.75-0.80 and apex silvery scaled, remainder blackish-brown scaled, a few brown scales on dorsal margin of basal silvery area, total length of I approximately 1.11 length of II; tibiae I-III each blackish-brown scaled, II with a few dorsoapical silvery scales, III with a small ventroapical patch of silvery scales; tarsus I-III each blackish-brown scaled, III with tarsomeres 1 and 2 each with a narrow basal and apical white scaled band, tarsomeres 3 and 4 each with a small dorsobasal and dorsoapical white scaled spot, tarsomere 5 pale scaled; post-tarsi I-III each with 2 ungues, I with ungues unequal, both with a tooth, II with ungues unequal, larger one simple and smaller one with a tooth, III with ungues equal and simple. *Wing*. Veins covered with blackish-brown scales dorsally and ventrally; alula with several narrow blackish-brown scales along margin; upper calypter with numerous dark setae; 1 remigial seta. *Halter*. Pedicel pale; capitellum silvery scaled with dark brown scales at base. *Abdomen*. Terga I-VII each blackish-brown scaled with a large laterobasal silvery scaled spot; sterna II-VII each blackish-brown scaled with a basal silvery scaled band; terga and sterna with numerous golden setae, mostly along posterior margins. *Genitalia* (Fig. 8). Tergum IX band-like with lateral caudal areas broad and gradually tapering mesally, moderately pigmented, 3-8 stout setae more or less in a longitudinal line on each side of midline, a number of small spicules scattered mostly on basal area; gonocoxite short, broad, heavily pigmented, mesal surface membranous, entire surface covered with minute spicules, dorsal surface with numerous moderately long thin setae, lateral margin with a few long stout setae, ventral surface with numerous short thin setae over entire area except for a large circular apical mesal area which is covered with a tightly packed patch of moderately pigmented, short, broadly flattened, erect, scale-like setae, lateral and ventral surfaces with scattered broad dark scales; gonostylus long, total length, minus claw, approximately 0.80 length of gonocoxite, apical 0.45 expanded but sloping to a blunt apex and with 4-7 short fine setae along outer margin and 1-2 similar ones on inner margin, gonostylar claw short, apex broad and rounded, heavily pigmented and attached apically; basal mesal lobe with apical portion large, expanded with 28-37 short, stout, evenly spaced setae, those along apical margin stouter, basal portion covered with small spicules and connected mesally with its mate; proctiger long, paraproct moderately pigmented with apex blunt and heavily pigmented, cercus membranous, cercal setae absent; tergum X narrow, heavily pigmented; phallosome with aedeagus divided into 2 lateral, moderately pigmented plates which are connected basally and narrowly at apex, each lateral plate with lateral area curved tergally and with a mesal, longitudinal, heavily pigmented sclerotized area terminating in 3-4 poorly developed, short teeth (teeth visible in lateral view), paramere moderately long, approximately 0.82 length of aedeagus, heavily pigmented, parameral apodeme long, approximately 1.25 length of paramere, heavily pigmented; sternum IX large, basal, lateral and median areas moderately pigmented, entire surface covered with minute spicules, 4-7 short to moderately long setae near center.

FEMALE (Fig. 2). Similar to male in general habitus but with the following differences. *Head*. Antenna with basal 0.85 of flagellomere 1 pale, total length approximately 0.83 length of proboscis; maxillary palpus approximately 0.19 length of proboscis; proboscis approximately 1.05 length of femur I.

Thorax. 2-4 median anterior promontory setae; 3-4 anterior scutal fossal setae; scutellar setae (3 long and 3-6 short lateral; 4-5 long and 3-5 short median); anteprenotum with 6-9 setae; postpronotum with 3-5 setae; prealar knob with 5-9 setae; propleuron with 2-4 setae; mesepimeron with 4-8 upper setae and 1 lower one (1 specimen with 1 long and 1 short lower setae).

Legs (Fig. 4). Femur I total length approximately 1.07 length of II; tarsus I with tarsomere 1 with a narrow, basal, white scaled band, tarsomeres 2 and 3 each with a small dorsobasal white scaled spot, II with tarsomeres 1-4 each with a narrow, basal white scaled band and a small, dorsoapical, white scaled spot, III with tarsomeres 1-4 each with a moderately broad basal and apical silvery scaled band, tarsomere 5 completely silvery scaled; tarsi I and II of some specimens with pale scaled areas reduced; posttarsi I-III each with 2 ungues, I with ungues equal, both with a tooth, II with ungues equal, both with a tooth, III with ungues equal and simple. *Genitalia* (Fig. 5). Tergum VIII with basal 0.60-0.80 retracted into segment VII, wide, base and apex slightly concave, several long stout setae along apical margin, moderately long thin setae and numerous broad dark scales on apical 0.35, scales extending 0.50 basally along lateral margins, index 0.51-0.60; sternum VIII large, wide, base slightly concave, apex with a small lobe on each side of midline, numerous setae and broad dark scales on apical 0.80, index 0.63-0.73; tergum IX wide, moderately pigmented with a median apical indentation, 3-6 setae apically on each side of midline, index 0.42-0.59; insula tongue-like, long, moderately pigmented, covered with minute spicules and with 3-5 tiny tuberculi on apical 0.20; lower vaginal lip moderately pigmented, covered with hair-like spicules; narrow and with base broader; upper vaginal lip narrow, moderately to heavily pigmented, covered with hair-like spicules; upper vaginal sclerite large, moderately to heavily pigmented; postgenital lobe moderately long, apex with a moderately deep median indentation, 7-10 setae on each side of midline, completely covered with minute hair-like spicules, dorsal PGL index 0.92-1.10, ventral PGL index 1.83-2.03; cercus short, apex bluntly rounded, mesal margin slightly concave, completely covered with minute spicules, scales absent, dorsal surface with 4-5 long stout setae apically and several moderately long and short setae on remainder of apical 0.45, ventral surface with 8-12 short setae on apical margin, index 2.34-2.58, cercus/dorsal PGL index 2.66-3.24; 3 heavily pigmented, spherical seminal capsules, 1 large and 2 slightly smaller ones; base of accessory gland duct heavily pigmented.

PUPA (Fig. 11). Chaetotaxy as figured and recorded in table 1.

Respiratory trumpet. Moderately pigmented; a number of scattered, short setae on inner surface of meatus; index 4.46-5.24, average 4.95. *Abdomen*. Seta 4-III triple to 6 branched; 4-V triple to 7 branched; 4-VI double to 5 branched; 7-VII single to triple; 9-VII with 5-10 branches; 9-VIII with 6-12 branches. *Paddle*. Ovoid, with minute spicules on apical 0.85-0.89 of outer and apical 0.15-0.24 of inner margins; midrib moderately pigmented and reaches apex; 1-P moderately long, barbed, 6-14 branched; index 1.46-1.76, average 1.62.

LARVA (Fig. 13). Chaetotaxy as figured and recorded in table 3.

Head. Seta 4-C moderately long, 4-8 branched; 5, 6-C long, single; 7-C moderately long, 7-10 branched; 14-C moderately long to long, 5-8 branched; basal maxillary hair 9-15 branched; mental plate with 18-20 (usually 19) teeth; mouth brush with mesal hairs pectinate apically. *Antenna*. Short, moderately pigmented; seta 1-A short, double, attached 0.51-0.62 from base. *Thorax*. Seta 3-P with 11-15 branches; 8-P with 12-18 branches; 9-P with 4-7 branches; 13-P with 13-21 branches; 14-P with 4-6 branches; 13-M with 13-19 branches;

14-M with 10-16 branches; 5-T with 6-9 branches; 8-T with 10-14 branches; 13-T with 10-16 branches. *Abdomen*. Seta 1, 2-I with 7-10 branches; 4-I with 5-7 branches; 11-I with 10-16 branches; 13-I with 8-15 branches; 2-II with 7-14 branches; 4-II with 4-6 branches; 13-II with 8-16 branches; 2-III with 5-10 branches; 4-III with 5-8 branches; 9-III triple to 6 branched; 13-III with 7-11 branches; 2-IV with 8-11 branches; 4-IV with 4-9 branches; 9-IV triple to 5 branched; 2-V with 8-11 branches; 5-V with 4-5 branches; 9-V triple to 5 branched; 13-V with 4-8 branches; 2-VI with 6-9 branches; 5-VI with 4-5 branches; 8-VI with 4-8 branches; 9-VI triple to 6 branched; 2-VII with 7-10 branches; 1-VIII with 8-11 branches; 3-VIII with 5-8 branches; 1-X long, barbed, double to 4 branched; 2-X long, 4-6 branched; 3-X long, single; comb with 18-25 (usually 22) scales arranged in 2 irregular rows; saddle incompletely rings segment X, acus absent, moderately to heavily pigmented with long spine-like spicules on posterior margin; ventral brush of 8 setae on grid, each single to triple; 4 anal papillae, long and slender. *Siphon*. Heavily pigmented, acus well developed, index 4.08-4.89; pecten on basal 0.31 of siphon, composed of 13-16 (usually 15) evenly spaced teeth, each with a few denticles on ventral margin; seta 1-S long, barbed, double or triple, base attached on basal 0.40 of siphon and distal to last pecten tooth.

EGG. Not known.

TYPE-DATA. Type series includes holotype male, allotype and 33 paratypes (15 males, 18 females). Holotype male with associated pupal and larval skins, THAILAND, *Chiang Mai*, Amphoe Chiang Dao, Ban Tham Kraeb, 7 September 1970, Kol Mongkolpanya collector, collection number 04770-9, SEAMP accession number 271, genitalia preparation number T73.138, collected as a larva from fresh colored water in a partially shaded, small, rock pool located in a deciduous forest in mountainous terrain at an altitude of 1000 meters; allotype with associated pupal and larval skins, collection number 04770-14, other data as in holotype; paratypes 12 males with associated pupal and larval skins (collection numbers: 04770-1, 04770-2, 04770-4, 04770-5, 04770-7, 04770-11, 04770-19, 04765-3, 04765-4, 04766-1, 04766-3, 04766-9), 2 males with associated pupal skins (collection numbers: 04770-100, 04765-100), 15 females with associated pupal and larval skins (collection numbers: 04770-8, 04770-12, 04770-13, 04770-15, 04770-16, 04770-20, 04770-21, 04765-1, 04765-2, 04765-6, 04765-7, 04765-8, 04765-9, 04766-2, 04766-11), 2 females with associated pupal skins (collection numbers: 04770-101, 04766-100), 1 male (collection number 04765-10) and 1 female (collection number 04770-6), all with same data as holotype. All type material is deposited in the U. S. National Museum (Natural History), Washington, D. C., except 1 male and 1 female paratypes (both with associated skins) which will be deposited in the British Museum (Natural History), London, England, and 2 male and 2 female paratypes (all with associated skins) which will be sent to the Department of Entomology, SEATO Medical Research Laboratory, Bangkok, Thailand.

DISTRIBUTION. Material examined: 70♂, 111♀, 85 L, 177 with associated skins (46 p, 131 l).

THAILAND. *Chiang Mai*, Ban Huai Kaeo, Ban Huai Tat, Ban Tham Kraeb, Chiang Dao, Doi Pha Daeng; 51♂, 77♀, 127 p, 46 L, 113 l. *Lampang*, San Chao Pho Phatu Pha; 1♂, 7♀, 8 p, 17 L. *Nan*, Doi Chik Chong; 18♂, 27♀, 42 p, 22 L, 18 l.

TAXONOMIC DISCUSSION. The adult habitus of *helenae*, *eldridgei* and *kleini* are very similar but can be separated in both sexes by the following list of features, *helenae* possesses: mesepisternum with 2 upper and 1 posterior setae, tarsus III with basal white scaled bands on tarsomeres 1-4 and post-

pronotum with 3-4 (male) or 3-5 (female) posterior setae, *eldridgei* possesses: mesepisternum with 1 upper and 1 posterior setae, tarsus III with basal white scaled bands on tarsomeres 1-4 and postpronotum with 2 (male) or 2-3 (female) posterior setae, and *kleini* possesses: mesepisternum with 1-2 upper and 1-2 posterior setae, tarsus III completely brown scaled and postpronotum with 2 (male and female) posterior setae. Adults of *helenae* and *eldridgei* each have an upper and a lower patch of scales on the mesepisternum while those of *kleini* possess a single large patch of scales extending over upper, posterior and lower portions of this structure.

Male genitalia of *helenae* show close similarities in morphological development to both *eldridgei* and *kleini* but each species has diagnostic differences as follows--*helenae* possesses: basal mesal lobe with 28-37 setae, sternum IX with 4-6 setae, tergum IX with 3-8 setae on each side of midline, gonostylus with 4-7 short setae on outer and 1-2 similar ones on inner surfaces, and gonocoxite with a closely packed patch of short, broad, scale-like setae distally on sternomesal area; *eldridgei* possesses: basal mesal lobe with 70-78 setae and a ventromesal finger-like projection at apex terminating in a flattened seta, sternum IX with 8-9 setae, tergum IX with 3-4 setae on each side of midline, gonostylus with 7-8 short setae on outer and 3-6 similar ones on inner surfaces, and gonocoxite with a group of short setae distally on sternomesal area; and *kleini* possesses: basal mesal lobe with 201-244 setae, sternum IX with 9-11 setae, tergum IX with 7-9 setae on each side of midline, gonostylus with 9-11 short setae on outer and 1 similar one on inner surfaces, and gonocoxite with a closely packed patch of short, broad, scale-like setae distally on sternomesal area.

The female genitalia of *helenae* are very similar to both *eldridgei* and *kleini* but are separated by the following, *helenae* with: tergum IX with 3-6 setae on each side of midline, postgenital lobe with 7-10 setae on each side of midline, and cercus index 2.34-2.58; *eldridgei* with: tergum IX with 3-5 setae on each side of midline, postgenital lobe with 11-14 setae on each side of midline, and cercus index 2.05-2.20; and *kleini* with: tergum IX with 1-2 setae on each side of midline, postgenital lobe with 7-8 setae on each side of midline, and cercus index 2.46-2.69.

Pupae of *helenae* and *eldridgei* are very similar but can be distinguished from each other by seta 9-VII which is 5-10 branched in *helenae* and double to 4 branched in *eldridgei* and seta 1-P is 6-14 branched in the former species and double to 5 branched in the latter species.

The larvae of *helenae* and *eldridgei* are similar in many features but are easy to separate by using the setae mentioned in the key and species descriptions. Some of the most distinctive setae are as follows, in *helenae*: 4-C with 4-8 branches; 3-P with 11-15 branches; 5-T with 6-9 branches; 13-T with 10-16 branches; 11-I with 10-16 branches; 2-II with 7-14 branches; 9-III triple to 6 branched; 2-IV, V, 1-VIII with 8-11 branches; 9-IV triple to 5 branched and 2-VI with 6-9 branches, while *eldridgei* has: 4-C with 9-14 branches; 3-P with 4-8 branches; 5-T double to 4 branched; 13-T, 11-I with 5-7 branches; 2-II triple to 5 branched; 9-III-V single; 2-IV single to 4 branched; 2-V, VI single to triple and 1-VIII double to 5 branched. The siphonal index of *helenae* is 4.08-4.89 as compared to 2.90-3.63 for *eldridgei*.

The larval skin of the allotype female (04770-14) has 2 setae 4-C on the left side, their bases are side by side and they are both 5 branched, seta 4-C on the right side is 4 branched.

This species is dedicated to my wife, Mary Helen (Mollie), for her continued encouragement and assistance in typing my manuscripts.

BIOLOGY. The immature habitat is water in small rock pools. Im-

matrices were collected from clear or colored, fresh, temporary water (usually containing dead leaves) in small rock pools, small rock pools in volcanic rock, twice each from small split bamboo and small bamboo stumps, and once from a bamboo cup, all located in mountainous terrain. Collection sites of the immatures were in partial or heavy shade and most often in secondary deciduous forests (15 collections) but also in primary and secondary rainforests (10 collections) and at altitudes between 380 and 1520 meters (most often at or near 1000 meters). Larvae were collected once from water in a small rock pool in association with *Aedes eldridgei*.

One larva (04766-D) was heavily infected with *Coelomomyces stegomyiae* Keilin. Identification of this parasite was made by Dr. J. N. Couch.

AEDES (BOTHAEELLA) ELDRIDGEI, NEW SPECIES
(Figs. 3, 4, 6, 9, 12, 14)

MALE (Fig. 3). *Head*. Antenna brown, plumose, pedicel with a patch of overlapping, broad, silvery scales on mesal and ventral surfaces, flagellomere 1 with a few brown scales, total length approximately 0.73 length of proboscis; clypeus blackish-brown, bare; maxillary palpus short, dark brown scaled, 4 segmented, segments 1 and 2 short, segment 3 approximately 0.50 length of segment 4 which is long and slightly longer than basal 3 segments, a few short dark brown setae at apex of segments 2, 3 and 4, total length approximately 0.18 length of proboscis; proboscis dark brown scaled, total length approximately 1.13 length of femur I; eyes contiguous; vertex and lateral areas covered with overlapping, broad, decumbent scales, a dorsomedian triangular patch of silvery scales anteriorly with apex extending onto dorsal portion of interocular space, a few pale scales on postgena next to eye, remainder of scales blackish-brown; occiput with numerous black, erect, forked scales; several dark, long ocular setae; 2 long, dark interocular setae. *Thorax*. Scutal integument blackish-brown; scutum covered with narrow, curved reddish-brown scales with prescutellar space bare; scutellum with a patch of broad blackish-brown scales on lateral lobe, median lobe with a patch of broad silvery scales and broad blackish-brown ones apically; following areas with setae which are dark and well developed: 2 median anterior promontory, numerous dorsocentral (anterior and posterior), scutal fossal (2-3 anterior, 2-3 lateral and 1 posterior), numerous supra-alar, 6-7 posterior medial scutal (pale), 1 postalar callar and scutellar (3 long and 2-3 short lateral; 4 long and 2-3 short median); pleural integument blackish-brown; antepnotum with a large patch of overlapping, broad, silvery scales, 7 long dark setae; postpronotum with 2 dark posterior setae, upper one short and lower one long; propleuron with a large patch of overlapping, broad, silvery scales, 3 long dark setae; prosternum, subspiracular area, paratergite, mesomeron and metepisternum bare; postspiracular area with a large patch of overlapping, broad, silvery scales, 1-2 dark setae; mesepisternum with an upper and a posterior patch of overlapping, broad, silvery scales, 1 long, dark upper seta and 1 long, dark lower one; prealar knob with 5-6 moderately long, dark setae; mesepimeron with a patch of overlapping, broad, silvery scales on upper area, a patch of 3-4 moderately long, dark setae posterior to scale patch on upper area and 1 long dark seta on lower area. *Legs* (Fig. 4). Coxae I-III each with several moderately long and long setae, I with anterior and lateral areas covered with broad, blackish-brown scales and a dorsal and an anteroventral patch of broad silvery scales, II and III each with an anterior patch of broad silvery scales; trochanters I-III each

covered with broad blackish-brown scales and a few white ones dorsally at base, I with white scales on posterior surface at base and forming a narrow posterodorsal stripe on basal 0.40, one specimen with a small dorsoapical silvery scaled spot, II with white scales on posterior surface at base and forming a narrow posteroventral stripe on basal 0.55, II also with an anteroapical small patch of silvery scales, III covered with broad silvery scales on basal 0.62 and with a narrow dorsal stripe of broad blackish-brown scales on basal 0.47, stripe overlaps slightly onto anterior and posterior surfaces, remainder covered with broad blackish-brown scales except apex of anterior and dorsal surfaces which are covered with broad silvery scales, total length of I approximately 1.10 length of II; tibiae I-III each blackish-brown scaled; tarsi I-III each blackish-brown scaled, III with tarsomeres 1 and 2 each with a narrow basal and apical white band, tarsomeres 3 and 4 each with a small dorsobasal and dorsoapical white scaled spot, tarsomere 5 pale scaled with a few pale brown scales at middle; posttarsi I-III each with 2 ungues, I with ungues unequal, both with a tooth, II with ungues unequal, larger one simple and smaller one with a tooth, III with ungues equal and simple. *Wing*. Veins covered with dark brown scales dorsally and ventrally; alula with several narrow, dark brown scales along margin; upper calypter with numerous dark setae; 1 remigial seta. *Halter*. Pedicel pale; capitellum silvery scaled with dark brown scales at base. *Abdomen*. Terga I-VII each covered with blackish-brown scales with a laterobasal silvery scaled spot; sterna II-VII each blackish-brown scaled with a basal silvery scaled band; terga and sterna with numerous dark setae, mostly along posterior margins. *Genitalia* (Fig. 9). Tergum IX band-like with lateral caudal areas broad and gradually tapering mesally, moderately pigmented, 3-4 stout setae in a small patch on each side of midline, a number of minute spicules scattered mostly on basal area; gonocoxite short, broad, heavily pigmented, mesal surface membranous, entire surface covered with minute spicules, dorsal surface with numerous moderately long and long thin setae forming 4 rows on mesal area from base to apex, lateral margin with several moderately long to long stout setae, ventral surface with numerous short thin setae over entire area including a large apical mesal area, lateral and ventral surfaces with scattered broad dark scales; gonostylus long, total length, minus claw, approximately 0.70 length of gonocoxite, apical 0.46 expanded but sloping to a blunt apex and with 7-8 short fine setae along outer margin and 3-6 similar ones on inner margin, a patch of spicules on tergal surface near middle of outer margin of expanded portion, gonostylar claw short, apex broad and rounded, heavily pigmented and attached subapically; basal mesal lobe with apical portion large, expanded, with 70-78 short, thin, evenly spaced setae and a ventromesal finger-like projection at apex which terminates in a heavily pigmented, long, apically expanded claspette filament, basal portion of lobe connected mesally with its mate, small spicules covering basal portion and finger-like projection; proctiger long, paraproct moderately pigmented with apex blunt and heavily pigmented, cercus membranous, cercal setae absent; tergum X narrow, heavily pigmented; phallosome with aedeagus divided into 2 lateral, moderately pigmented plates which are connected basally and apically, each plate with lateral area curved tergally and with a mesal, longitudinal, heavily pigmented area terminating in 6-8 well developed, heavily pigmented, short, tergally curved teeth, paramere moderately long, approximately 0.75 length of aedeagus, heavily pigmented, parameral apodeme long, approximately 1.35 length of paramere, heavily pigmented; sternum IX large, basal, lateral and median areas moderately pigmented, entire surface covered with minute spicules, 8-9 short to moderately long setae near center.

FEMALE (Fig. 3). Similar to male in general habitus but with the following differences. *Head*. Antenna with basal 0.85 of flagellomere 1 pale, total length approximately 0.95 length of proboscis; maxillary palpus approximately 0.19 length of proboscis; proboscis approximately 0.95 length of femur I; lateral surface of head with a small patch of silvery scales located next to eye at level of the ventral margin of the antepronotum. *Thorax*. 3 median anterior promontory setae; 2-4 anterior scutal fossal setae; scutellum (3-4 long and 3-4 short setae on lateral lobe; 4-6 long and 3-4 short setae on median lobe); antepronotum with 9-11 setae; postpronotum with 2-3 setae; propleuron with 2-3 setae; postspiracular area with 1 seta; prealar knob with 6-9 setae. *Legs* (Fig. 4). Femora I and II without basal white scales on anterior surfaces but with white scales at base on posterior surfaces, I-III each with an apical silvery scaled spot extending over anterior, dorsal and posterior surfaces, total length of I approximately 1.08 length of II; tibia III with a few dorsoapical pale scales; tarsus I with tarsomere 1 with a narrow, basal, white scaled band, tarsomeres 2 and 3 each with a small dorsobasal white scaled spot, II with tarsomeres 1-4 each with a narrow, basal white scaled band and a small, dorsoapical, white scaled spot; III with tarsomeres 1-4 each with a moderately broad basal and apical silvery scaled band, tarsomere 5 completely silvery scaled; tarsi I and II of some specimens with pale scaled areas reduced; posttarsi I-III each with 2 ungues, I with ungues equal, both with a tooth, II with ungues equal, both with a tooth, III with ungues equal and simple. *Genitalia* (Fig. 6). Tergum VIII with basal 0.80-0.90 retracted into segment VII, wide, base and apex slightly concave, several long stout setae along apical margin, moderately long thin setae and numerous broad dark scales on apical 0.50, index 0.47-0.49; sternum VIII large, wide, base very slightly concave, apex with a small lobe on each side of midline, numerous setae and broad dark scales on apical 0.80, usually a few broad pale scales medially, index 0.65-0.70; tergum IX wide, moderately pigmented with a median apical indentation, 3-5 setae apically on each side of midline, index 0.47-0.64; insula tongue-like, long, moderately pigmented, covered with minute spicules and with 2-4 tiny tuberculi on apical 0.20; lower vaginal lip moderately pigmented, covered with hair-like spicules, narrow and with base broader; upper vaginal lip narrow, moderately to heavily pigmented, covered with hair-like spicules; upper vaginal sclerite large, moderately to heavily pigmented; post-genital lobe moderately long, apex with a moderately deep median indentation, 11-14 setae on each side of midline, completely covered with minute hair-like spicules, dorsal PGL index 0.79-0.87, ventral PGL index 1.47-1.51; cercus short, apex bluntly rounded, mesal margin slightly concave, completely covered with minute spicules, scales absent, dorsal surface with 4-5 long stout setae apically and several moderately long and short setae on remainder of apical 0.50, ventral surface with 8-14 short setae on apical margin, index 2.05-2.20, cercus/dorsal PGL index 2.58-2.81; 3 heavily pigmented, spherical seminal capsules, 1 large and 2 slightly smaller ones; base of accessory gland duct heavily pigmented.

PUPA (Fig. 12). Chaetotaxy as figured and recorded in table 2. *Respiratory trumpet*. Moderately pigmented; a number of scattered, short setae on inner surface of meatus; index 4.63-5.77, average 5.22. *Abdomen*. Seta 4-III single to triple; 4-V double to 5 branched; 4-VI double or triple; 7-VII single; 9-VII double to 4 branched; 9-VIII with 5-9 branches. *Paddle*. Ovoid, with minute spicules on apical 0.80-0.85 of outer and apical 0.25-0.29 of inner margins; midrib moderately pigmented and reaches apex; 1-P moderately long, barbed, double to 5 branched; index 1.30-1.66, average 1.45.

LARVA (Fig. 14). Chaetotaxy as figured and recorded in table 4. *Head*. Seta 4-C moderately long, 9-14 branched; 5, 6-C long, single; 7-C moderately

long, 6-10 branched; 14-C moderately long, double to 4 branched; basal maxillary hair double to 8 branched; mental plate with 19-22 (usually 20) teeth; mouth brush with mesal hairs pectinate apically. *Antenna*. Short, moderately pigmented; seta 1-A short, double or triple, attached 0.55-0.58 from base.

Thorax. Seta 3-P with 4-8 branches; 8-P with 6-12 branches; 9-P double or triple; 13-P with 4-12 branches; 14-P triple to 5 branched; 13-M with 8-14 branches; 14-M with 6-11 branches; 5-T double to 4 branched; 8-T with 5-8 branches; 13-T with 5-7 branches. *Abdomen*. Seta 1-I with 5-7 branches; 2-I triple to 5 branched; 4-I with 4-5 branches; 11-I with 5-7 branches; 13-I with 4-9 branches; 2-II triple to 5 branched; 4-II double to 4 branched; 13-II triple to 7 branched; 2-III triple or 4 branched; 4-III double or triple; 9-III single; 13-III triple to 8 branched; 2-IV single to 4 branched; 4-IV double or triple; 9-IV single; 2-V single to triple; 5-V triple; 9-V single; 13-V double to 5 branched; 2-VI single to triple; 5-VI triple; 8-VI triple or 4 branched; 9-VI single or double; 2-VII with 5-6 branches; 1-VIII double to 5 branched; 3-VIII double to 6 branched; 1-X long, barbed, double; 2-X long, 4-6 branched; 3-X long, single; comb with 15-26 (usually 24) scales arranged in 2 irregular rows; saddle incompletely rings segment X, acus absent, moderately to heavily pigmented with long spine-like spicules on posterior margin; ventral brush of 8-9 setae on grid, each single to triple; 4 anal papillae, long and slender. *Siphon*. Heavily pigmented, acus well developed, index 2.90-3.63; pecten on basal 0.36 of siphon, composed of 12-17 (usually 14) evenly spaced teeth, each with a few ventral and dorsal denticles; seta 1-S long, barbed, triple to 5 branched, base attached on basal 0.43 of siphon and distal to last pecten tooth.

EGG. Not known.

TYPE-DATA. Type series includes holotype male, allotype and 7 paratypes (2 males, 5 females). Holotype male with associated pupal and larval skins, THAILAND, *Chiang Mai*, Amphoe Chiang Dao, Ban Tham Kraeb, 7 September 1970, Kol Mongkolpanya collector, collection number 04761-5, SEAMP accession number 259, genitalia preparation number T72.564, collected as a larva from fresh colored water in a partially shaded, small, rock pool located in a secondary deciduous forest in mountainous terrain at an altitude of 1000 meters; allotype with associated pupal and larval skins, with same data as holotype except for the following: 26 September 1970, collection number 04845-4, SEAMP accession number 271, small rock pool on side of a cliff at an altitude of 1520 meters; paratype 1 male, THAILAND *Kanchanaburi*, Huai Bong Ti, 2 June 1965, Kol Mongkolpanya collector, collection number 00189-101, collected as a pupa from fresh colored water in a heavily shaded, small rock pool on the side of a mountain in a primary bamboo grove in mountainous terrain at an altitude of 200 meters; paratypes 3 females with associated pupal skins (collection numbers: 00225-100, 00225-104, 00225-105), THAILAND, *Kanchanaburi*, Khao Na Chang, 6 June 1965, E. L. Peyton collector, collected as pupae from fresh clear water in a partially shaded, small rock pool on the side of a mountain located in a secondary rain forest in a valley at an altitude of 75 meters; paratypes 2 females, collection number 00225, with same data as specimen 00225-100; paratype 1 male with associated pupal and larval skins, same data as allotype except for the following: collection number 04832-5, SEAMP accession number 241, genitalia preparation number 71-397, collected from a small rock pool located inside mouth of a cave. All type material is deposited in the U. S. National Museum (Natural History), Washington, D. C., except 1 paratype female with associated pupal skin which will be deposited in the British Museum (Natural History), London, England, and 1 paratype female with associated pupal skin which will be sent to the Department of Entomology, SEATO Medical Research Laboratory,

Bangkok, Thailand.

DISTRIBUTION. Material examined: 3♂, 5♀, 20 L, 8 with associated skins (5 p, 3 l).

THAILAND. *Chiang Mai*, Ban Tham Kraeb, Chiang Dao; 2♂, 2♀, 4p, 3 l. *Kanchanaburi*, Ban Sai Yok, Huai Bong Ti, Huai Mae Nam Noi, Khao Na Chang; 1♂, 3♀, 4 p, 15 L. *Nan*, Doi Chik Chong; 5 L.

TAXONOMIC DISCUSSION. Adults of *eldridgei* are very similar to those of *helenae* and *kleini* and are discussed under the taxonomic discussion section of *helenae*.

Male genitalia of *eldridgei* are similar to the other 2 species of the subgenus and are discussed in the taxonomic discussion section of *helenae*. The most diagnostic features of the genitalia of *eldridgei* are the development of the basal mesal lobe and the aedeagal teeth.

The female genitalia are compared to the other 2 species of the subgenus under the taxonomic discussion section of *helenae*.

Pupae of *eldridgei* and *helenae* can be separated by the number of branches on setae 9-VII and 1-P as mentioned in the key.

Larvae of *eldridgei* are similar to those of *helenae* and are discussed under the taxonomic discussion section of that species. Setae of the latter species tend to have more branches than those of *eldridgei*.

This species is dedicated to Lieutenant Colonel Bruce F. Eldridge, Chief of the Department of Entomology, Walter Reed Army Institute of Research, in appreciation of the counsel and support he has always given me.

BIOLOGY. The immature habitat is water in small rock pools. Immatures were collected from clear or occasionally colored, fresh, temporary water (usually containing dead leaves and other dead vegetation) in small rock pools situated on mountain sides, located in partial or heavy shade, in primary bamboo groves, primary rainforests, and secondary deciduous and bamboo forests. One larval collection was made from a fresh clear water rock pool inside the mouth of a cave. All immature collections were in mountainous terrain at altitudes between 75 and 1520 meters (usually near 200 meters). Larvae were collected once in association with *Aedes helenae*.

AEDES (BOTHAELLA) KLEINI, NEW SPECIES
(Figs. 4, 7, 10)

MALE. *Head.* Antenna brown, plumose, pedicel with a patch of overlapping, broad, silvery scales on mesal and ventral surfaces, flagellomere 1 with several small dark brown scales, total length approximately 0.85 length of proboscis; clypeus dark brown, bare; maxillary palpus short and dark brown scaled, 4 segmented, segments 1 and 2 short, segment 3 approximately 0.44 length of segment 4 which is long and slightly longer than basal 3 segments, a few short dark brown setae at apex of segments 2, 3 and 4, total length approximately 0.18 length of proboscis; proboscis dark brown scaled with a few pale scales forming an indistinct stripe on basal 0.50 of ventral surface (paratype without pale scales), total length approximately 1.09 length of femur I; eyes contiguous; vertex and lateral areas covered with overlapping, broad, decumbent scales, a dorsomedian triangular patch of silvery scales anteriorly with apex extending onto dorsal portion of interocular space and a small patch of similar scales on postgena, remainder of scales dark brown; occiput with numerous pale to dark, long, erect, forked scales; several dark, long ocular setae; 2 long, dark interocular setae. *Thorax.* Scutal integument dark brown; scutum covered with narrow, curved reddish-black scales with prescutellar space bare; scutellum

with a patch of broad dark brown scales on lateral lobe, median lobe with a patch of broad silvery scales and broad dark brown ones apically; following areas with setae which are dark and well developed: 2 median anterior promontory, numerous dorsocentral (anterior and posterior), scutal fossal (3-4 anterior, 2-3 lateral and 1 posterior), numerous supra-alar, 5-7 posterior medial scutal (pale), 1 postalar callar and scutellar (3 long and 2-3 short lateral; 4 long and 2-3 short median); pleural integument dark brown; antepnotum with a large patch of overlapping, broad, silvery scales, 7-9 long and short dark setae; postpronotum with 1 long and 1 short to moderately long, dark, posterior setae; propleuron with a large patch of overlapping, broad, silvery scales, 1-2 long and 1 moderately long dark setae; prosternum, subspiracular area, paratergite, mesomeron and metepisternum bare; postspiracular area with a large patch of overlapping, broad, silvery scales covering most of area, 1 long dark seta; mesepisternum with a large patch of overlapping, broad, silvery scales on upper and posterior areas, 1-2 long, golden upper setae and 1-2 long, golden lower ones; prealar knob with 3-5 moderately long, dark setae, mesepimeron with a patch of overlapping, broad, silvery scales on upper area, a patch of 3-5 moderately long, golden setae posterior to scale patch on upper area and 1 long golden seta on lower median area. *Legs* (Fig. 4). Coxae I-III each with several moderately long and long brown or golden setae, I with anterior and lateral areas covered with broad silvery scales, II and III each with an anterior patch of broad silvery scales; trochanters I-III each with broad silvery scales; femora I and II covered with broad dark brown scales, I and II each with a posteromedian patch of pale scales which is on basal 0.30 of I and basal 0.50 of II, III with a broad, longitudinal, silvery scaled stripe on basal 0.75 of anterior surface and basal 0.65 of posterior surface, stripe broad basally and tapered to a point apically, also a lateroapical silvery scaled spot on anterior surface and a small spot on posterior surface, total length of I approximately 1.09 length of II; tibiae I-III each dark brown scaled; posttarsi I-III each with 2 ungues, I with ungues unequal, both with a tooth, II with ungues unequal, larger one simple and smaller one with a tooth, III with ungues equal and simple. *Wing*. Veins covered with dark brown scales dorsally and ventrally; alula with a row of narrow, dark brown scales along margin; upper calypter with numerous setae; 1 remigial seta. *Halter*. Pedicel pale; capitellum silvery scaled with dark brown scales at base. *Abdomen*. Terga I-VII each covered with dark brown scales with a large laterobasal silvery scaled spot; sterna II-VII each dark brown scaled with a basal silvery scaled band; terga and sterna with numerous golden setae, mostly along posterior margins. *Genitalia* (Fig. 10). Tergum IX band-like with lateral caudal areas broad and gradually tapering mesally, moderately pigmented, 7-9 stout setae in a more or less double longitudinal line on each side of midline, a number of minute spicules scattered mostly on basal area; gonocoxite short, broad, heavily pigmented, mesal surface membranous, entire surface covered with minute spicules, dorsal surface with numerous moderately long and long thin setae forming 3 rows on basal 0.60 of mesal area, a few short setae at apex, lateral surface with several long stout setae from base to apex, ventral surface with numerous short thin setae over entire area except for a large circular apical mesal area which is covered with a tightly packed patch of moderately pigmented, short, broadly flattened, erect, scale-like setae, lateral and ventral surfaces with scattered broad dark scales; gonocoxite long, total length, minus claw, approximately 0.73 length of gonocoxite, apical 0.42 expanded with 9-11 short fine setae along outer margin and 1 similar seta on inner margin, gonostylar claw short, apex broad and rounded,

heavily pigmented and attached subapically on inner margin; basal mesal lobe with apical portion large, expanded, with 201-244 short, thin, evenly spaced setae, basal portion covered with small spicules and connected mesally with its mate; proctiger long, paraproct moderately pigmented with apex blunt and heavily pigmented, cercus membranous, cercal setae absent; tergum X narrow, heavily pigmented; phallosome with aedeagus divided into 2 lateral, moderately pigmented plates which are connected basally and narrowly at apex, each plate with lateral area curved tergally and with a mesal, longitudinal, heavily pigmented area terminating in 4-5 short teeth (teeth visible in lateral view), paramere moderately long, approximately 0.72 length of aedeagus, heavily pigmented, parameral apodeme long, approximately 1.42 length of paramere, heavily pigmented; sternum IX large, basal, lateral and median areas moderately pigmented, entire surface covered with minute spicules, 5-6 short to moderately long setae near center.

FEMALE (Fig. 4). Similar to male in general habitus but with the following differences. *Head*. Antenna with basal 0.75 of flagellomere 1 pale, 0.77 length of proboscis; maxillary palpus 0.17 length of proboscis; proboscis 0.98 length of femur I. *Thorax*. Postspiracular area with 1-2 setae; prealar knob with 4-5 setae. *Legs* (Fig. 4). Femora II and III each with a dorsoapical silvery scaled spot, large on III (spot on II represented by 1-3 white scales in paratype), total length of I approximately 1.15 length of II; posttarsi I-III each with 2 unguis, I with unguis equal, both with a tooth, II with unguis equal, both with a tooth, III with unguis equal and simple. *Genitalia* (Fig. 7). Tergum VIII with basal 0.70-0.80 retracted into segment VII, wide, base and apex slightly concave, several long stout setae along apical margin, moderately long thin setae and numerous broad dark scales on apical 0.55, index 0.51-0.56; sternum VIII large, wide, base slightly concave, apex with a small lobe on each side of midline, numerous setae and broad dark scales on apical 0.70, index 0.66-0.67; tergum IX wide, moderately pigmented with a median apical indentation, 1-2 setae apically on each side of midline, index 0.51-0.52; insula tongue-like, long, moderately pigmented, covered with minute spicules and with 3 tiny tuberculi on apical 0.20; lower vaginal lip moderately pigmented, covered with hair-like spicules, narrow and with base broader; upper vaginal lip narrow, moderately to heavily pigmented, covered with hair-like spicules; upper vaginal sclerite large, moderately to heavily pigmented; postgenital lobe moderately long, apex with a moderately deep median indentation, 7-8 setae on each side of midline, completely covered with minute spicules, dorsal PGL index 0.90-0.96, ventral PGL index 1.74-2.04; cercus short, apex bluntly rounded, mesal margin slightly concave, completely covered with minute spicules, scales absent, dorsal surface with 4-5 long stout setae apically and several moderately long and short setae on remainder of apical 0.40, ventral surface with 7-9 short setae on apical margin, index 2.46-2.69, cercus/dorsal PGL index 3.56-3.64; 3 heavily pigmented, spherical seminal capsules, 1 large and 2 slightly smaller ones; base of accessory gland duct heavily pigmented.

PUPA, LARVA and EGG. Not known.

TYPE-DATA. Type series includes holotype male, allotype, 1 paratype male and 1 paratype female. Holotype male, CAMBODIA, *Kompong Speu*, Oudong, 25 September 1970, J-M. Klein collector, collection number 808, SEAMP accession number 336, genitalia preparation number T73.109, adult collected at rest in a small dry forest around the well known temples containing the king tombs of Oudong; allotype with same data as holotype except the following: date 18 September 1970 and genitalia preparation number T73.69; paratype male with same data as allotype except the following: collection number 809,

SEAMP accession number 301, genitalia preparation number T72.642; and paratype female, CAMBODIA, *Kompong Som*, Sihanoukville, 31 March 1970, J-M. Klein collector, SEAMP accession number 270, genitalia preparation number T72.635, taken biting man between 1800-1900 hours in a littoral rainforest. The holotype and allotype are deposited in the U. S. National Museum (Natural History), Washington, D. C., and the 2 paratypes are deposited in the J-M. Klein Collection.

DISTRIBUTION. Material examined: holotype ♂, allotype ♀ and 1♂ and 1♀ paratypes.

CAMBODIA. *Kompong Som*, Sihanoukville; 1♀. *Kompong Speu*, Oudong; 2♂, 1♀.

TAXONOMIC DISCUSSION. Adults of *kleini* are very similar to both *helenae* and *eldridgei* but are easily distinguished from the latter 2 species by the dark scaled tarsi, coxa I white scaled and mesepisternum with a single large white scaled patch.

The male genitalia of *kleini* are similar to both *eldridgei* and *helenae* but with the closest morphological resemblance to the latter species. *Aedes kleini* genitalia are easily separated from the other 2 species of the subgenus by the number of setae on the basal mesal lobe and by the other features mentioned in the taxonomic discussion section of *helenae*.

Female genitalia are similar to *helenae* and *eldridgei* and are compared to these 2 species in the taxonomic discussion section of *helenae*.

This species is dedicated to Dr. J-M. Klein, Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), Bondy, France, in recognition of his contributions to the study of Cambodian mosquitoes.

BIOLOGY. Adults were taken at rest in a small dry forest. One female was collected biting man in a littoral rainforest between 1800-1900 hours. Nothing is known about the immature habitats.

ACKNOWLEDGEMENTS

Grateful appreciation is expressed to: Dr. Botha de Meillon, Principal Investigator, Southeast Asia Mosquito Project (SEAMP), and Lieutenant Colonel Bruce F. Eldridge, Chief of the Department of Entomology, Walter Reed Army Institute of Research, for critically reading the manuscript; to Dr. Douglas J. Gould, Chief of the Department of Medical Entomology, Southeast Asia Treaty Organization Medical Research Laboratory, Bangkok, Thailand, and his personnel and Dr. J-M. Klein, Office de la Recherche Scientifique et Technique Outre-Mer, Bondy, France, for the collection of the specimens; to Mr. Young T. Sohn and Mrs. Shuling Tung, SEAMP, and K. Miyasaka, U. S. Army 406th Medical Laboratory, Tokyo, Japan, for preparing the illustrations; to Mr. Thomas V. Gaffigan, SEAMP, for technical assistance; to Dr. J. N. Couch, Department of Biology, University of North Carolina, Chapel Hill, North Carolina, for identifying the *Coelomomyces* specimens; to my wife, Mollie, for typing the drafts; and to Mrs. Janet Rupp for typing the manuscript for offset reproduction.

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APPENDIX: TABLE 1. Record of the branching of the setae on the pupae of *Aedes (Bothaella) helenae*

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Cephalothorax(C)				Abdomen II			
1	1-2	1	1.1	0	1	1	1
2	1	1	1	1	1-3	2	2.1
3	1	1	1	2	1-2	1	1.3
4	2-6	4	4.2	3	1	1	1
5	2-4	3	3.6	4	2-7	4	4.8
6	1	1	1	5	1-2	1	1.2
7	1-3	2	1.9	6	1	1	1
8	1-2	1	1.1	7	2-4	2	2.6
9	1-2	1	1.1	9	1	1	1
Metanotum(C)				10	1-3	2	2.2
10	1-5	2	2.5	Abdomen III			
11	1-2	1	1.1	0	1	1	1
12	1-4	3	2.4	1	1-2	1	1.4
Abdomen I				2	1-3	1	1.7
1	11-34	21	17.3	3	1	1	1
2	1-3	1	1.6	4	3-6	3	3.8
3	1	1	1	5	1-2	1	1.2
4	3-8	6	5.1	6	1-2	1	1.2
5	2-5	3	3.2	7	2-6	5	4.5
6	1	1	1	8	2-4	3	2.9
7	1-3	2	2	9	1	1	1
9	1	1	1	10	1-2	2	1.6
10	1-2	2	1.8	11	1	1	1
				14	1	1	1

TABLE 1. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Abdomen IV				Abdomen V (Cont.)			
0	1	1	1	10	1-2	1	1.1
1	1-3	1	1.4	11	1	1	1
2	1-2	1	1.2	14	1	1	1
3	3-5	3	3.9	Abdomen VI			
4	2-6	3	3.4	0	1	1	1
5	1	1	1	1	1-2	1	1.1
6	1	1	1	2	1-2	1	1.2
7	2-5	4	3.5	3	1-2	1	1.1
8	2-4	3	2.6	4	2-5	2	3
9	1	1	1	5	1	1	1
10	1-4	2	2.1	6	1-2	1	1.1
11	1	1	1	7	2-5	3	2.9
14	1	1	1	8	2-5	2	3.2
Abdomen V				9	1	1	1
0	1	1	1	10	1	1	1
1	1	1	1	11	1	1	1
2	1-2	1	1.1	14	1	1	1
3	1-3	1	1.4	Abdomen VII			
4	3-7	4	4.8	0	1	1	1
5	1	1	1	1	1	1	1
6	1	1	1	2	1-2	1	1.1
7	4-8	6	6.1	3	2-4	2	2.3
8	2-5	2	2.6	4	1-3	1	1.4
9	1	1	1	5	1	1	1

TABLE 1. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
6	2-5	4	3.6	Abdomen VIII			
7	1-3	1	1.2	0	1-2	1	1.2
8	2-5	4	3.4	4	1	1	1
9	5-10	6	6.9	9	6-12	9	9.1
10	1-2	1	1.4	14	1-2	1	1.4
11	1-2	1	1.3	Paddle(P)			
14	1	1	1	1	6-14	13	11.1

APPENDIX: TABLE 2. Record of the Branching of the setae on the pupae of *Aedes (Bothaella) eldridgei*

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Cephalothorax(C)				Abdomen I (Cont.)			
1	1-3	1	1.5	2	1	1	1
2	1-2	1	1.1	3	1	1	1
3	1	1	1	4	3-6	4	4
4	1-5	3	2.9	5	1-4	2	1.9
5	2-3	2	2.1	6	1	1	1
6	1	1	1	7	1-2	1	1.3
7	1-3	1	1.4	9	1-2	1	1.1
8	1-3	1	1.3	10	1-3	3	2.1
9	1-2	1	1.1	Abdomen II			
Metanotum(C)				0	1	1	1
10	1-3	2	1.9	1	1-6	2	2.7
11	1	1	1	2	1	1	1
12	1-3	2	1.8	3	1	1	1
Abdomen I				4	3-6	4	4.1
1	14-27	15	18.4	5	1-2	1	1.1

TABLE 2. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Abdomen II (Cont.)				Abdomen IV (Cont.)			
6	1	1	1	4	1-4	2	2.2
7	1-3	2	1.8	5	1	1	1
9	1	1	1	6	1-2	1	1.1
10	1-2	1	1.1	7	1-5	2	2.8
Abdomen III				8	1-5	2	2.4
0	1	1	1	9	1	1	1
1	1-3	1	1.5	10	1-2	1	1.2
2	1	1	1	11	1	1	1
3	1-2	1	1.1	14	1	1	1
4	1-3	2	2.1	Abdomen V			
5	1-3	2	1.9	0	1	1	1
6	1-2	1	1.1	1	1	1	1
7	1-7	2	3.4	2	1-2	1	1.1
8	1-3	2	1.9	3	1-2	1	1.3
9	1	1	1	4	2-5	4	3.6
10	1-2	1	1.3	5	1	1	1
11	1	1	1	6	1	1	1
14	1	1	1	7	2-7	4	3.6
Abdomen IV				8	2-5	4	3.7
0	1	1	1	9	1	1	1
1	1-2	1	1.1	10	1-2	1	1.1
2	1-2	1	1.1	11	1	1	1
3	2-6	3	3.2	14	1	1	1

TABLE 2. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Abdomen VI				Abdomen VII (Cont.)			
0	1	1	1	3	1-3	1	1.5
1	1	1	1	4	1	1	1
2	1	1	1	5	1	1	1
3	1	1	1	6	2-5	2	2.9
4	2-3	2	2.2	7	1	1	1
5	1	1	1	8	2-5	3	3.1
6	1	1	1	9	2-4	3	2.9
7	1-3	2	2.2	10	1	1	1
8	3-6	4	3.9	11	1-2	1	1.3
9	1	1	1	14	1	1	1
10	1-2	1	1.1	Abdomen VIII			
11	1	1	1	0	1-2	1	1.1
14	1	1	1	4	1-2	1	1.2
Abdomen VII				9	5-9	7	6.7
0	1	1	1	14	1	1	1
1	1	1	1	Paddle(P)			
2	1	1	1	1	2-5	3	3.8

APPENDIX: TABLE 3. Record of the branching of the setae on the larvae of *Aedes (Bothaella) helenae*

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Antenna(A)				Prothorax(P)(Cont.)			
1	2	2	2	4	1	1	1
	Head(C)			5	1	1	1
0	1	1	1	6	1	1	1
1	1	1	1	7	2-3	2	2.2
3	1	1	1	8	12-18	14	14.3
4	4-8	4	4.9	9	4-7	6	5.6
5	1	1	1	10	1	1	1
6	1	1	1	11	2-3	2	2.1
7	7-10	9	8.6	12	1	1	1
8	1	1	1	13	13-21	14	16.8
9	2-3	2	2.3	14	4-6	5	4.8
10	1	1	1	Mesothorax(M)			
11	5-8	7	6.8	1	5-7	6	5.8
12	1-2	2	1.6	2	2-4	3	2.8
13	1	1	1	3	1	1	1
14	5-8	6	6.3	4	1	1	1
15	2-4	3	3	5	1	1	1
bmh	9-15	12	12.3	6	3-5	3	3.9
	Prothorax(P)			7	1	1	1
0	8-14	9	11.1	8	4-6	4	4.9
1	4-5	5	4.7	9	4-6	5	4.8
2	1	1	1	10	1	1	1
3	11-15	12	13.1	11	1	1	1

TABLE 3. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Mesothorax(M) (Cont.)				Abdomen I (Cont.)			
12	1	1	1	7	2	2	2
13	13-19	14	15	9	2-3	3	2.7
14	10-16	10	12.3	10	1	1	1
Metathorax(T)				11	10-16	11	12.4
1	5-12	6	7.9	13	8-15	13	11.6
2	1	1	1	Abdomen II			
3	4-5	4	4.1	0	1	1	1
4	2-3	2	2.1	1	6-9	9	7.6
5	6-9	7	7.2	2	7-14	11	10.6
6	1	1	1	3	1	1	1
7	5-6	5	5.1	4	4-6	5	5.2
8	10-14	11	11.5	5	3-6	6	5.3
9	3-4	3	3.4	6	3	3	3
10	1	1	1	7	2	2	2
11	1	1	1	8	1-4	2	1.8
12	1	1	1	9	3-7	4	4.6
13	10-16	12	13.1	10	1-2	1	1.1
Abdomen I				11	3-5	4	3.8
1	7-10	8	8.2	12	1-2	1	1.2
2	7-10	9	9.1	13	8-16	9	11.7
3	1	1	1	14	1	1	1
4	5-9	5	6	Abdomen III			
5	4-8	6	5.8	0	1	1	1
6	3-4	3	3.4	1	5-10	7	7.5

TABLE 3. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Abdomen III (Cont.)				Abdomen IV (Cont.)			
2	9-11	10	10.1	10	1	1	1
3	1	1	1	11	3-5	4	3.9
4	5-8	5	6.1	12	2	2	2
5	4-7	5	5	13	5-9	7	6.9
6	2-3	2	2.1	14	1-2	1	1.2
7	4-8	5	5.4	Abdomen V			
8	1-2	2	1.6	0	1	1	1
9	3-6	4	4.2	1	4-6	4	4.7
10	1	1	1	2	8-11	9	9.3
11	2-5	3	3.2	3	1	1	1
12	1-3	2	2	4	3-7	5	4.9
13	7-11	10	9	5	4-5	4	4.2
14	1-2	1	1.2	6	2	2	2
Abdomen IV				7	4-8	7	6
0	1	1	1	8	1-2	1	1.2
1	5-9	5	6.4	9	3-5	3	3.9
2	8-11	9	9	10	1	1	1
3	1	1	1	11	3-4	4	3.6
4	4-9	6	6	12	1	1	1
5	4-5	4	4.4	13	4-8	4	5.9
6	2	2	2	14	1	1	1
7	5-10	5	6.5	Abdomen VI			
8	1	1	1	0	1	1	1
9	3-5	3	3.9	1	3-6	4	4.3

TABLE 3. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Abdomen VI (Cont.)				Abdomen VII (Cont.)			
2	6-9	8	7.7	8	5-14	9	8.6
3	1	1	1	9	3-4	4	3.8
4	1	1	1	10	1-4	1	1.7
5	4-5	4	4.3	11	1-3	2	2
6	2	2	2	12	1	1	1
7	2-4	2	2.7	13	4-8	6	6.4
8	4-8	5	5.4	14	1-2	1	1.2
9	3-6	3	3.8	Abdomen VIII			
10	1	1	1	0	1	1	1
11	2-5	4	3.7	1	8-11	8	9
12	1	1	1	2	1	1	1
13	4-13	11	9.1	3	5-8	6	6.2
14	1-2	1	1.2	4	1	1	1
Abdomen VII				5	3-7	5	5
0	1	1	1	14	1	1	1
1	3-5	3	3.8	Abdomen X			
2	7-10	8	8.3	1	2-4	2	2.4
3	4-5	4	4.3	2	4-6	5	5.3
4	1	1	1	3	1	1	1
5	4-5	4	4.6	Siphon(S)			
6	4-7	5	5.1	1	2-3	3	2.6
7	1	1	1	2	1	1	1

TABLE 4. Record of the branching of the setae on the larvae of *Aedes (Bothaella) eldridgei*

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Antenna(A)				Prothorax(P)(Cont.)			
1	2-3	2	2.1	3	4-8	8	6.8
Head(C)				4	1	1	1
0	1	1	1	5	1	1	1
1	1	1	1	6	1	1	1
3	1	1	1	7	2-3	2	2.3
4	9-14	13	11.3	8	6-12	8	8.5
5	1	1	1	9	2-3	2	2.2
6	1	1	1	10	1	1	1
7	6-10	7	8	11	2-3	2	2.1
8	1-2	1	1.3	12	1	1	1
9	1-3	2	2.1	13	4-12	7	7.1
10	1-2	2	1.6	14	3-5	5	4.4
11	4-8	5	5.6	Mesothorax(M)			
12	2	2	2	1	6-9	9	7.1
13	1	1	1	2	2-3	2	2.1
14	2-4	3	2.6	3	1	1	1
15	2-3	3	2.6	4	1	1	1
bmh	2-8	4	4.5	5	1	1	1
Prothorax(P)				6	3-6	4	3.9
0	6-12	9	8.8	7	1	1	1
1	3-9	5	5.3	8	4-6	5	5
2	1	1	1	9	2-5	3	3.2
				10	1	1	1

TABLE 4. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Mesothorax(M)(Cont.)				Abdomen I (Cont.)			
11	1	1	1	6	3-6	5	4.8
12	1	1	1	7	1-3	2	1.9
13	8-14	9	10.3	9	1-3	2	1.9
14	6-11	6	8.5	10	1	1	1
Metathorax(T)				11	5-7	5	5.1
1	4-8	6	6.6	13	4-9	4	5.3
2	1	1	1	Abdomen II			
3	2-4	4	3.6	0	1	1	1
4	1-2	1	1.2	1	4-8	5	5.4
5	2-4	3	3.1	2	3-5	4	3.9
6	1	1	1	3	1	1	1
7	6-8	7	7.1	4	2-4	4	3.4
8	5-8	5	6.1	5	3-4	3	3.3
9	2-4	3	3	6	3-4	3	3.1
10	1	1	1	7	2	2	2
11	1	1	1	8	1-2	2	1.6
12	1	1	1	9	2-5	2	2.9
13	5-7	6	5.8	10	1	1	1
Abdomen I				11	2-3	2	2.4
1	5-7	7	5.8	12	1	1	1
2	3-5	4	3.7	13	3-7	6	5.6
3	1	1	1	14	1	1	1
4	4-5	4	4.3	Abdomen III			
5	3-7	4	4.5	0	1	1	1

TABLE 4. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Abdomen III (Cont.)				Abdomen IV (Cont.)			
1	4-7	4	5.2	9	1	1	1
2	3-4	4	3.6	10	1	1	1
3	1	1	1	11	2-3	2	2.1
4	2-3	3	2.6	12	2-3	2	2.3
5	3-7	3	4	13	3-7	5	4.4
6	2	2	2	14	1	1	1
7	3-9	7	6	Abdomen V			
8	1-2	1	1.3	0	1	1	1
9	1	1	1	1	3-7	5	4.3
10	1-2	1	1.2	2	1-3	2	2.2
11	2-3	3	2.6	3	1	1	1
12	1	1	1	4	3-4	3	3.4
13	3-8	5	4.5	5	3	3	3
14	1	1	1	6	2	2	2
Abdomen IV				7	3-7	5	5.4
0	1	1	1	8	1-2	1	1.1
1	3-6	5	4.7	9	1	1	1
2	1-4	2	2.1	10	1	1	1
3	1	1	1	11	2-3	2	2.4
4	2-3	2	2.4	12	1	1	1
5	2-5	3	3.6	13	2-5	4	3.8
6	2	2	2	14	1	1	1
7	4-8	5	5.7	Abdomen VI			
8	1	1	1	0	1	1	1

TABLE 4. (Continued)

Hair	Range	Mode	Mean	Hair	Range	Mode	Mean
Abdomen VI (Cont.)				Abdomen VII (Cont.)			
1	3-5	3	3.8	7	1-2	1	1.3
2	1-3	2	1.8	8	5-6	5	5.3
3	1	1	1	9	2-3	2	2.2
4	1	1	1	10	1	1	1
5	3	3	3	11	1-3	2	2.2
6	2	2	2	12	1-4	4	2.8
7	2-3	3	2.7	13	4-9	5	5.3
8	3-4	4	3.6	14	1	1	1
9	1-2	1	1.1	Abdomen VIII			
10	1	1	1	0	1	1	1
11	3-4	3	3.2	1	2-5	3	3.2
12	1	1	1	2	1	1	1
13	4-9	4	6	3	2-6	4	3.9
14	1	1	1	4	1	1	1
Abdomen VII				5	2-5	2	3.1
0	1	1	1	14	1	1	1
1	3-5	3	3.6	Abdomen X			
2	5-6	6	5.6	1	2	2	2
3	1-2	1	1.2	2	4-6	4	4.6
4	1-2	1	1.1	3	1	1	1
5	2-4	4	3.1	Siphon(S)			
6	4-6	6	5	1	3-5	3	3.3
				2	1	1	1

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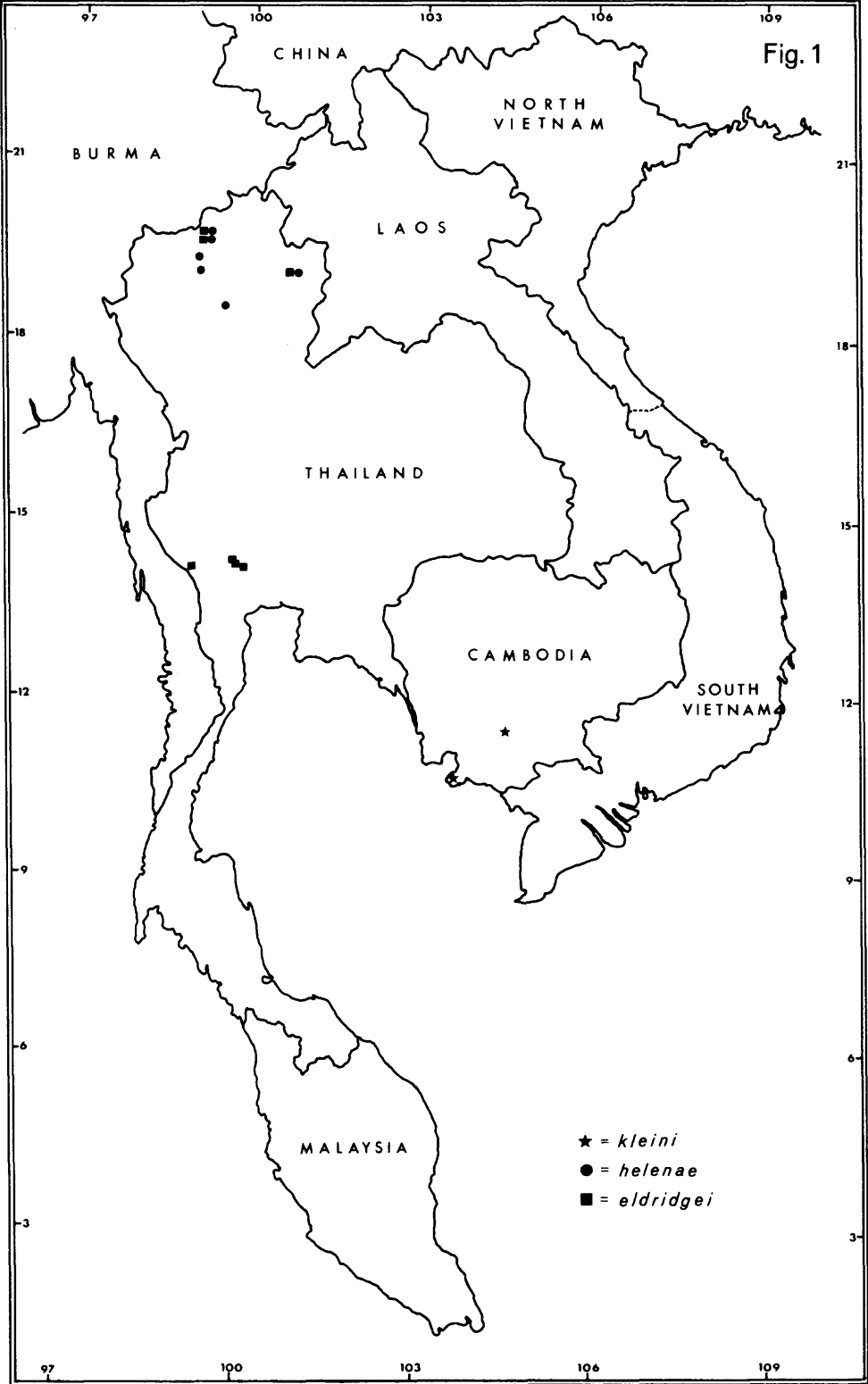


Fig. 4

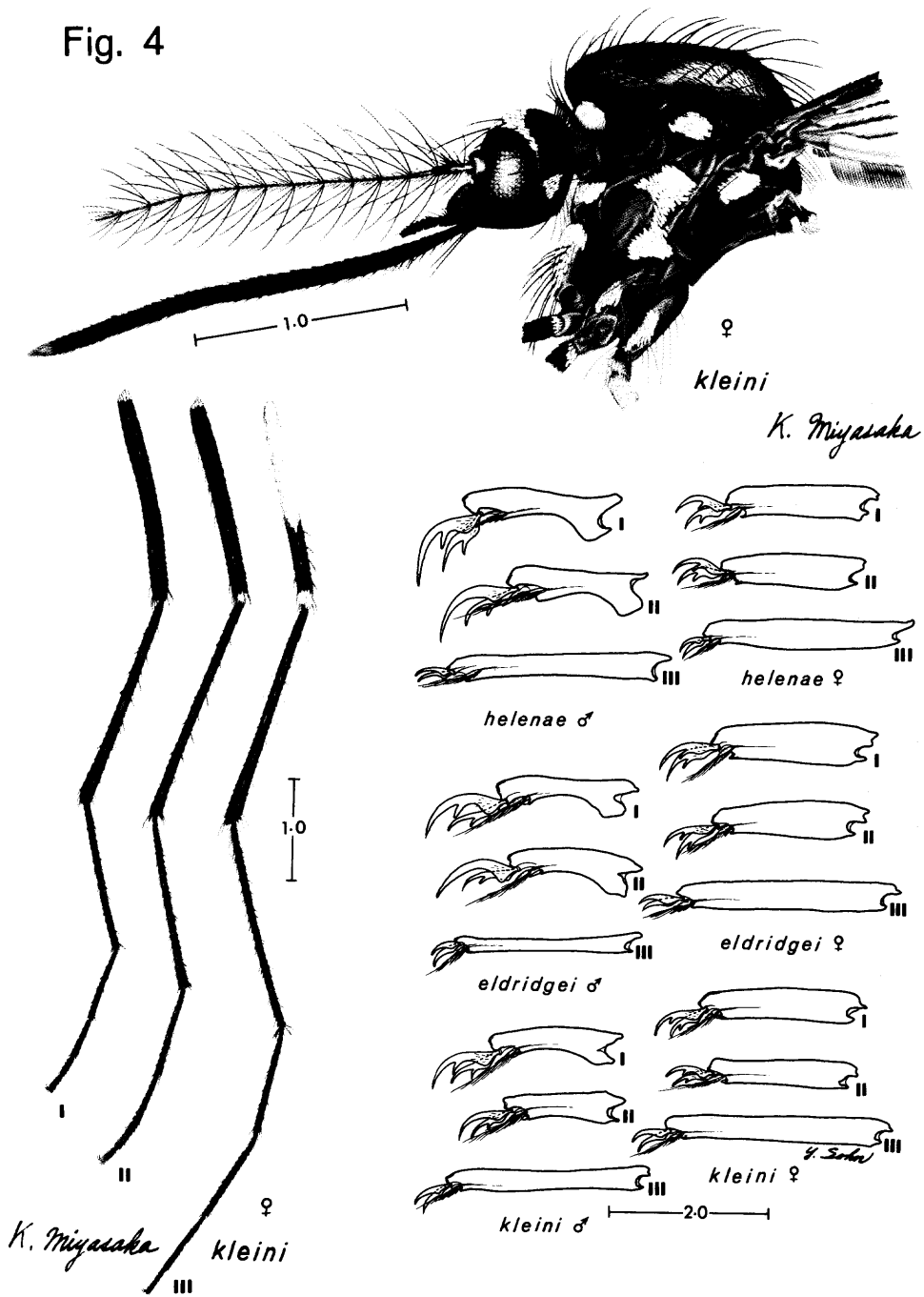
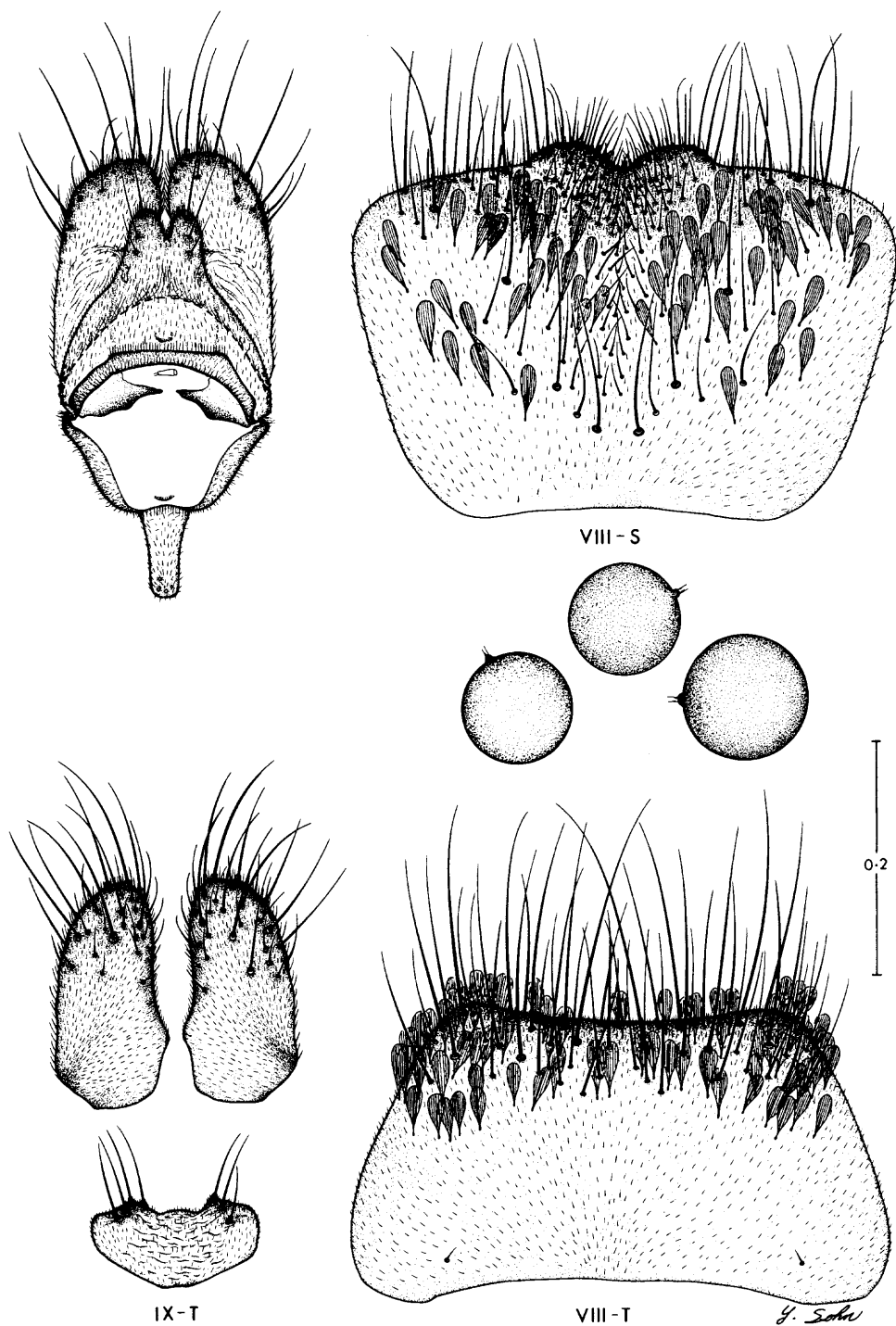
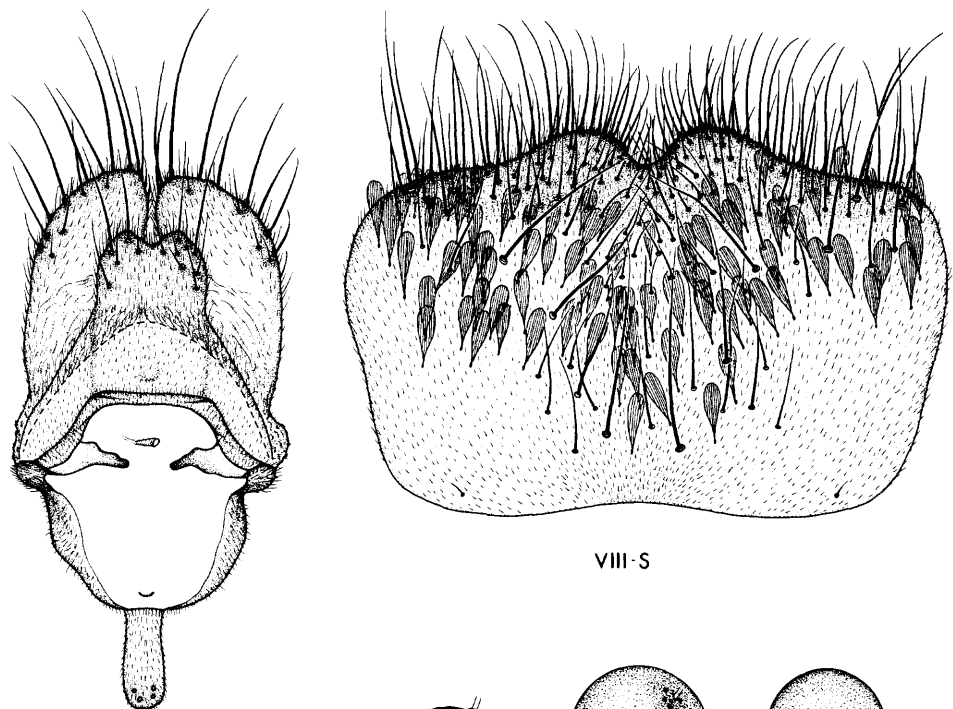


Fig. 5

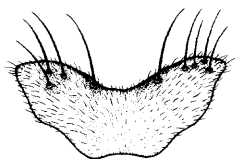
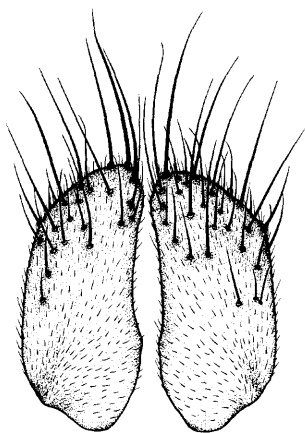
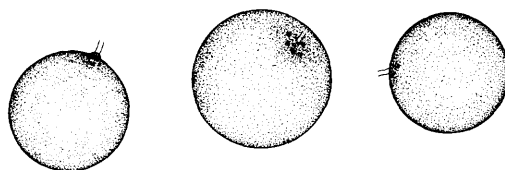


helenae

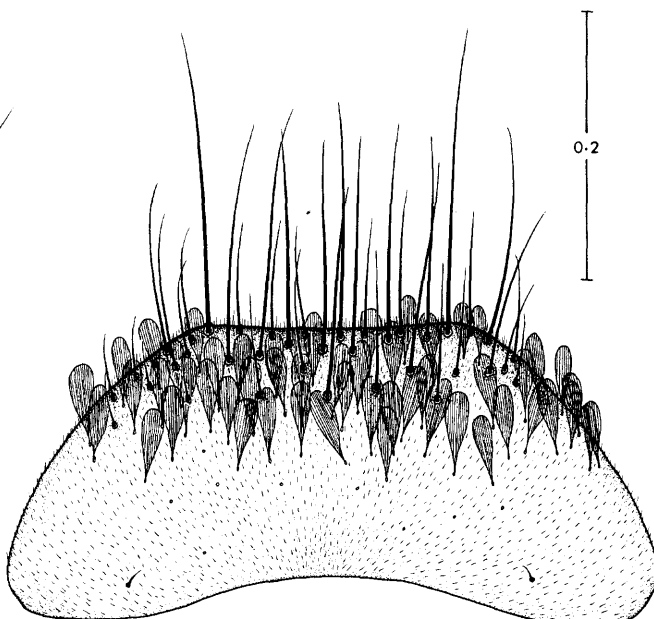
Fig. 6



VIII-S



IX-T



VIII-T

Y. Sohn

eldridgei

Fig. 7

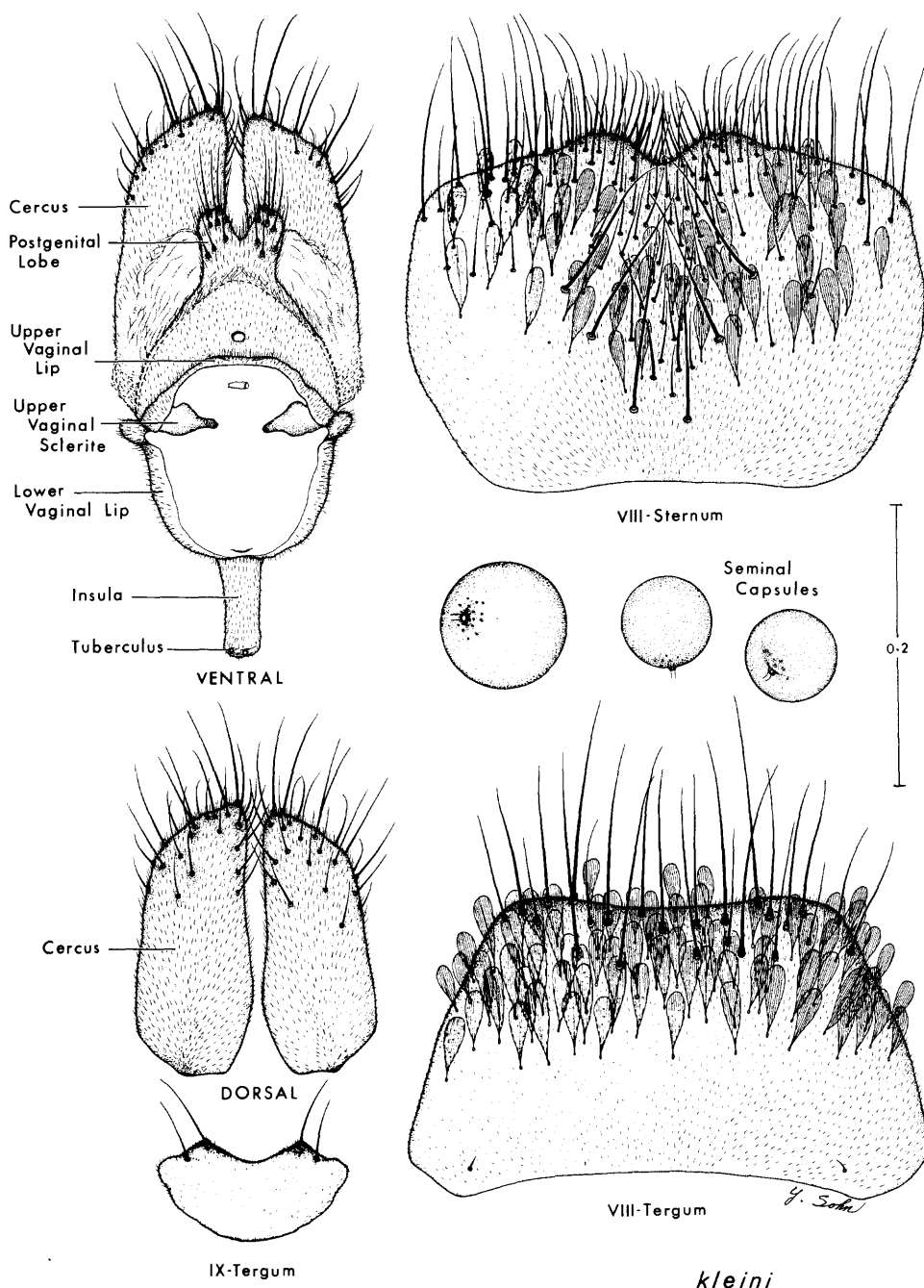


Fig. 8

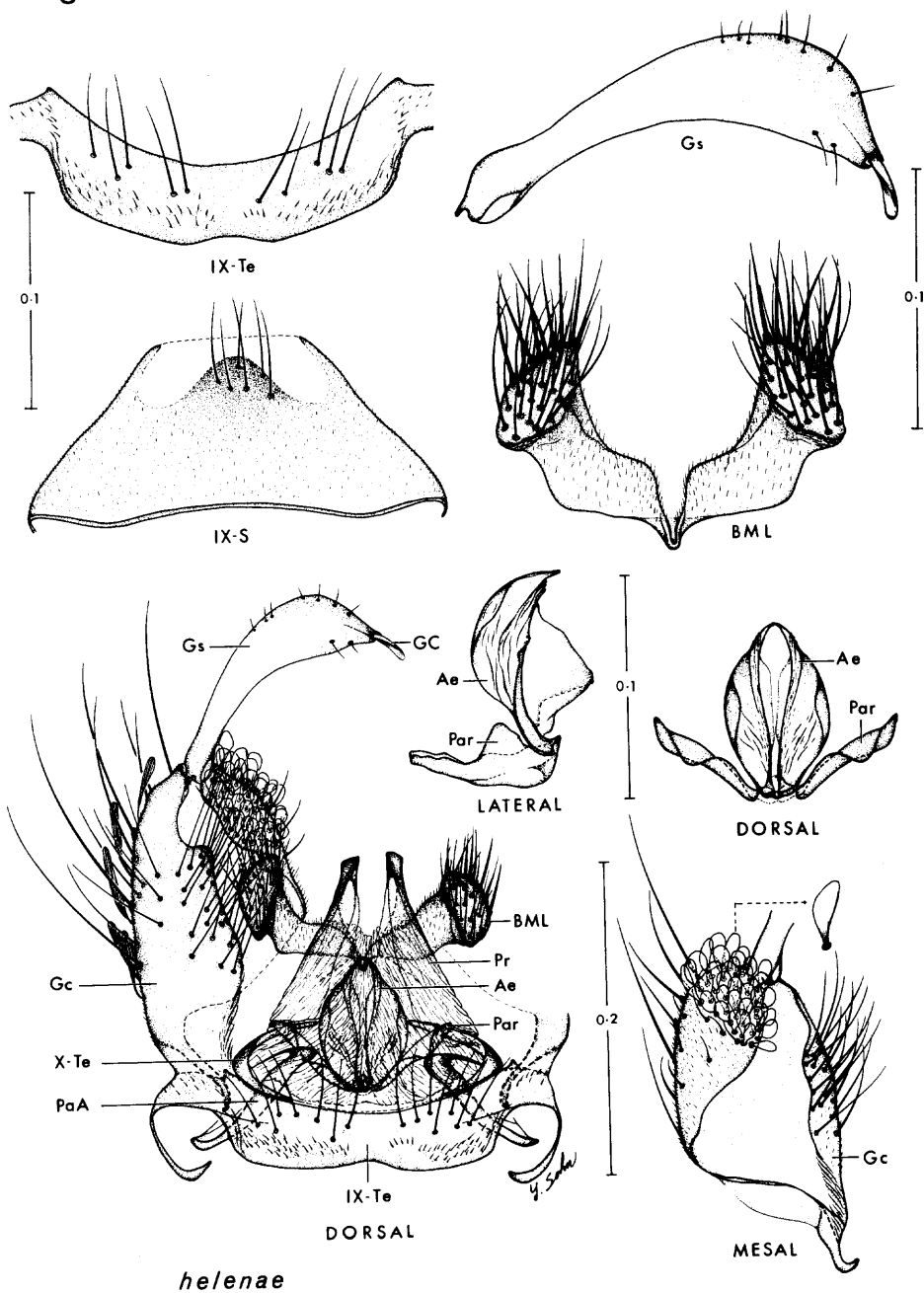


Fig. 9

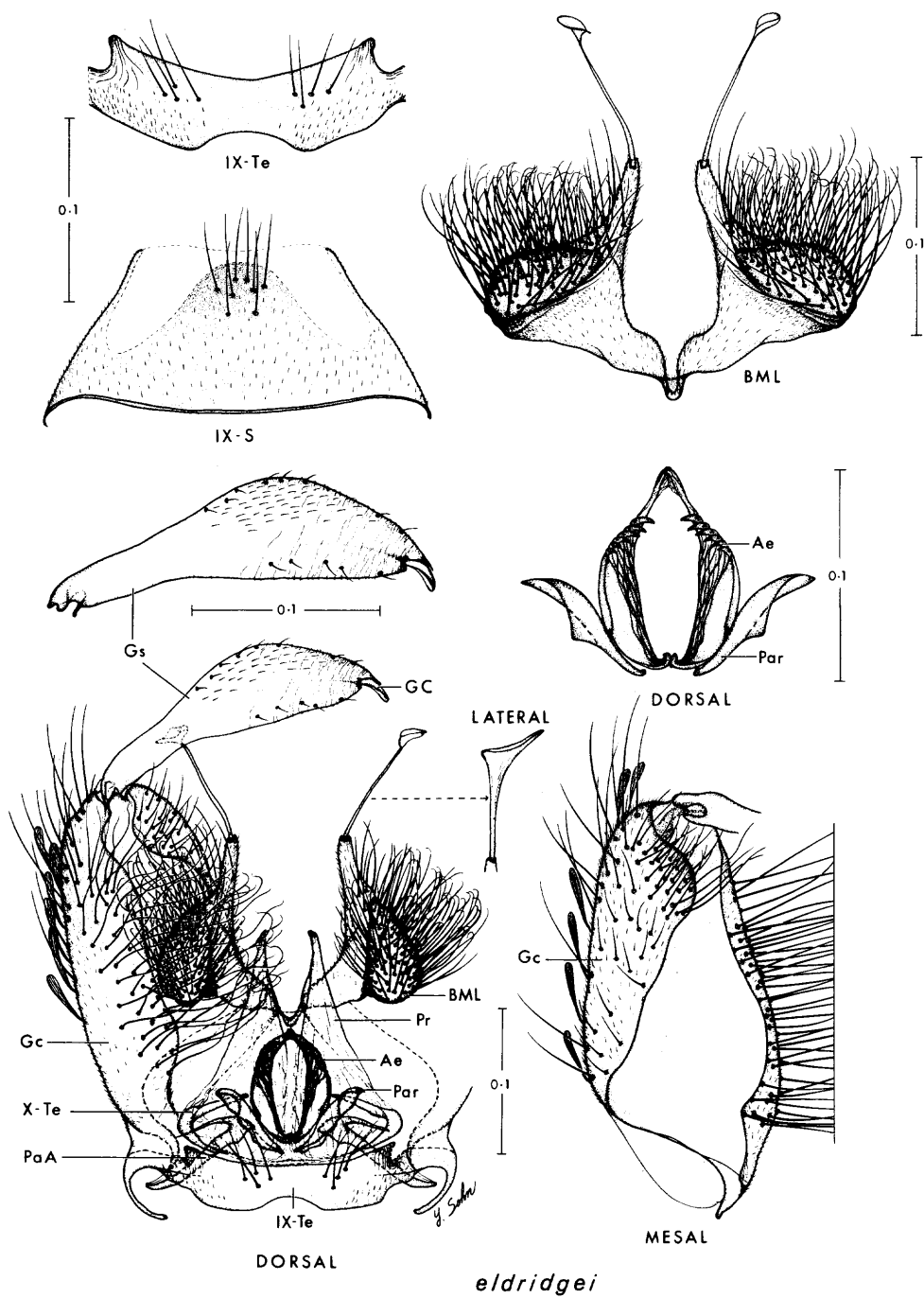


Fig.10

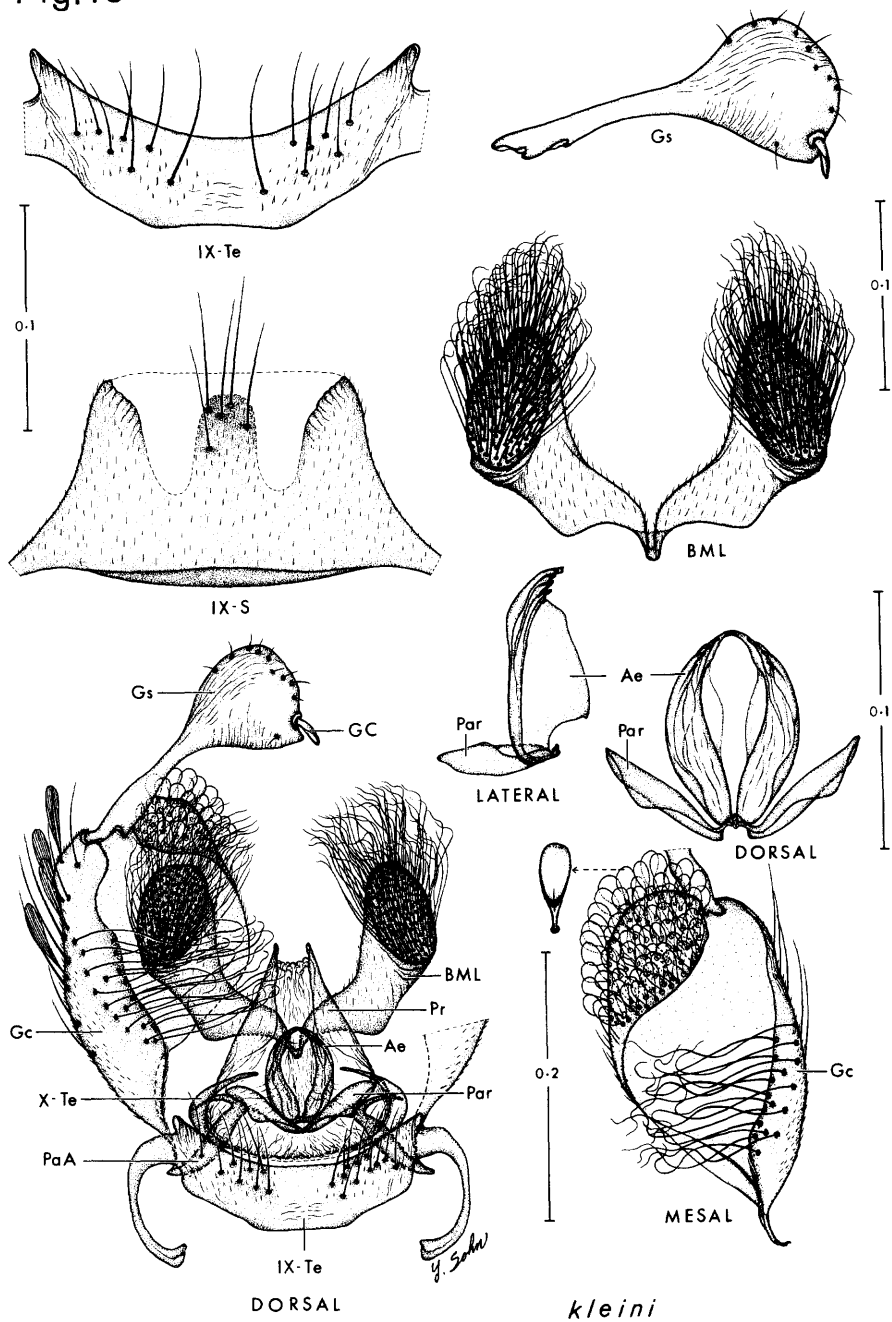


Fig. 11

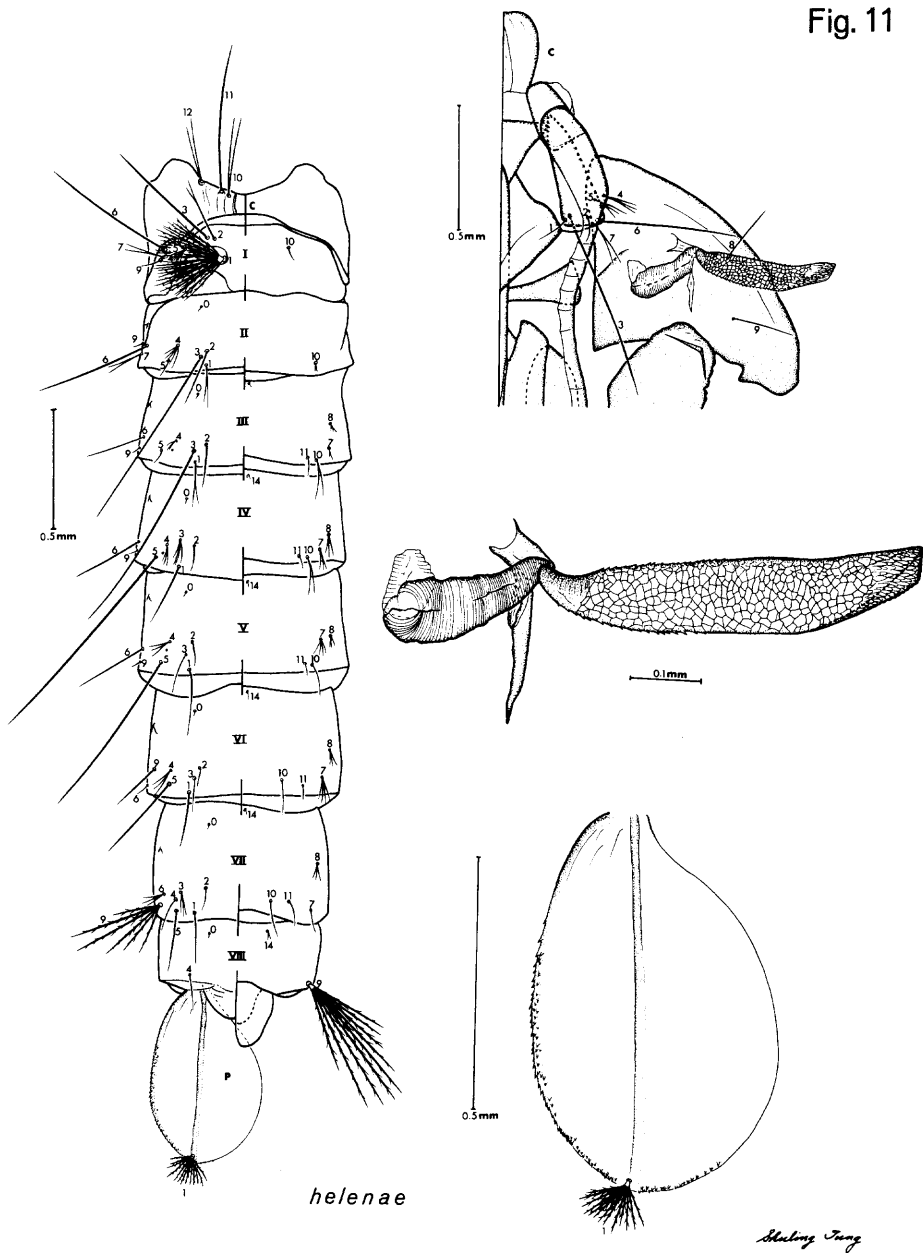
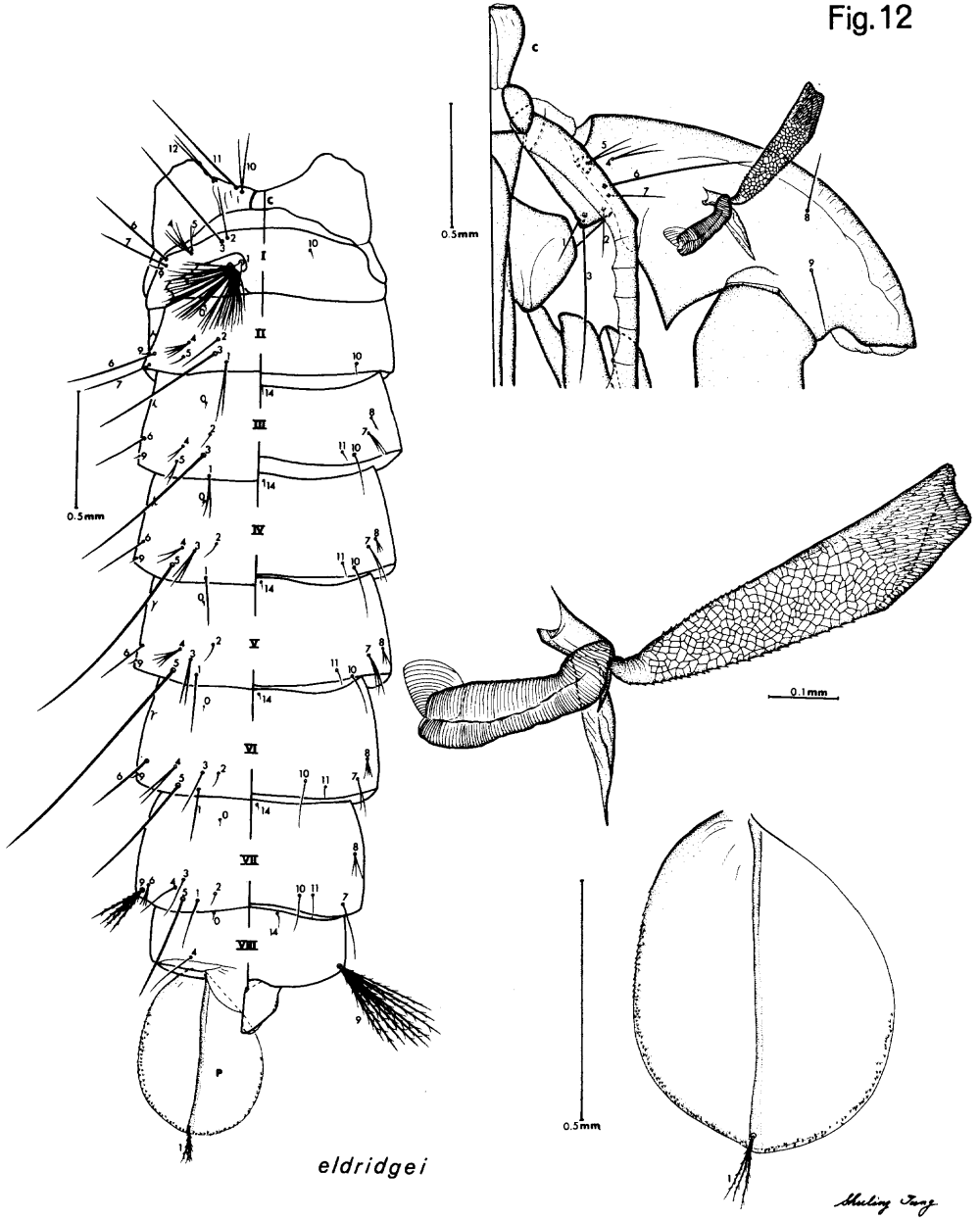
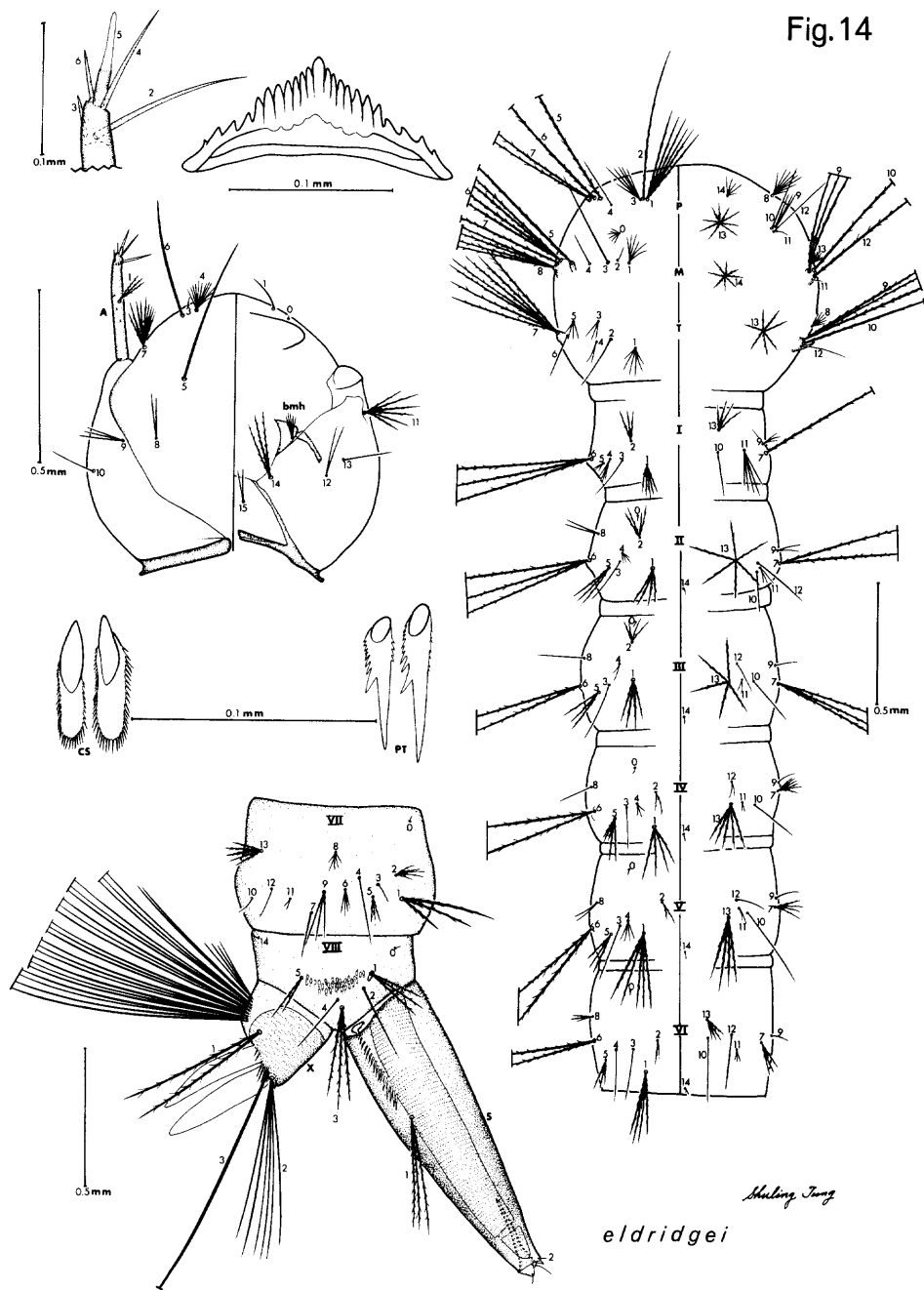


Fig.12



Shaling Jung

Fig.14



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