

A New *Aedes (Finlaya)* Mosquito  
from Thailand

Kenneth L. Knight  
Department of Entomology  
North Carolina State University  
Raleigh, North Carolina 27650

**ABSTRACT.** Both sexes, the pupa and the larva of *Aedes (Finlaya) harinasutai* n. sp. from Thailand are described. The relationship of the new species to other members of the *niveus* subgroup is described.

During the past decade a new endemic area of bancroftian filariasis has been described in Thailand (Harinasuta *et al* 1970). Dr. Chamlong Harinasuta and coworkers from the Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand pinpointed *Aedes (Finlaya) niveus* group species as vectors of *Wuchereria bancrofti* in the province of Kanchanaburi. Later, Dr. Douglas J. Gould<sup>1/</sup> led a team of workers from the SEATO Medical Research Laboratory (SMRL) in a study of this vector-borne disease relationship and determined that the species described here was involved. The results of their work are being reported elsewhere.

The terminology used for the larval and pupal chaetotaxy is that of Belkin (1962). The following system is used for setal branching: if only one numeral is given in parenthesis following the setal number, it represents the only number of branches encountered in the sample; if 2 sets of figures are given, the first, represents the modal number of branches and the second the range encountered in the sample. The number of setae branches was determined from a sample of 10 individuals.

*Aedes (Finlaya) harinasutai* new species  
(Figs. 1,2,3,4)

**FEMALE.** (Fig. 1). *Integument:* brownish-black. *Antenna:* pedicel bare, sometimes a few very small dark hairlike scales anteriorly; flagellar whorls with 5-6 setae. *Palpus:* black-scaled; about 0.2 of proboscis. *Proboscis:* black-scaled. *Head:* clypeus bare; eyes contiguous; vertex with 2 interocular setae, clothed with broad flat scaling, dorsally dark medially and pale laterally, usually a small area of darker scales at approximate level of antepronotum, silvery scales ventrally, a line of silvery scales along ocular margin, this line widened dorsomedially, a transverse line or narrow band of dark erect scales posteriorly on occiput. *Thorax:* antepronotum bare above, with broadened silvery scales laterally; postpronotum bare except for a few narrowed dark scales dorsoposteriorly; approximately anterior half of scutum with silvery-white scaling, remainder black-scaled, this black scaling carried forward medially into the silvery-white scaling for 0.25 to slightly more than half the extent of the latter area, pale scaling withdrawn from lateral scutal margin posteriorly from level of scutal angle, no acrostichal or dorsocentral setae, about 10 supra-

<sup>1/</sup> Now Chief, Department of Entomology, Walter Reed Army Institute of Research, Walter Reed Army Medical Center, Washington, D. C. 20012

paratergal bristles with only 1 row over anterior half of paratergite; scutellum with overlapping broad dark scales on each lobe; pleuron with a patch of broad overlapping silvery-white scales on the propleural, lower prealar, dorsal mesepisternal, ventroposterior mesepisternal, and mesepimeral areas; 2-6 propleural setae. *Legs*: coxae anteriorly with broadened overlapping silvery-white scaling, replaced ventrally on midcoxa with dark scaling, a few dark scales sometimes similarly placed on forecoxa; forefemur black-scaled, anteroventrally a narrow band of pale scales along basal 0.33, posteriorly with broad variably shaped pale-scaled area medially along basal half, not connecting with anterior pale scaling, midfemur black-scaled, a variable line of pale scaling beginning sub-basally and extending along basal third to half or more of posteroventral margin; hindfemur with apical 0.28-0.38 black-scaled, this dark area complete ventrally, remainder silvery-white scaled; tibiae and tarsi black-scaled; unguis equal, unidentate on fore- and midlegs, simple on hind. *Wing*: dark-scaled. *Hal-ter*: integument pale, knob dark-scaled. *Abdomen*: tergum I black-scaled dorsally, a broad band of silvery-white scales laterally, terga II-VII black-scaled with prominent basolateral silvery-white scaled areas, mediobasal white scales present on VII, both VI and VII may have complete basal bands; sterna II-VII each with prominent basal white band, sternum VIII bare of scales and strongly compressed laterally.

**MALE.** In general, similar to female, differing as follows. *Antenna*: pedicel bare; flagellomeres 0.73-0.79 of proboscis and strongly plumose, elongate setae of the 12 flagellar whorls directed principally dorso-ventrally, apical 2 flagellomeres equal to about 0.5 of combined length of flagellomeres. *Palpus*: black scaled, approximately 0.86-0.98 length of proboscis, segments IV and V combined equal to 0.21-0.24 of total palpal length. *Proboscis*: black-scaled, 1.10-1.47 of forefemur. *Head*: vertex with decumbent broad scaling whitish or cream-colored, may be slightly darker medially, erect scales dark. *Thorax*: scutum anterior to wing bases solidly silvery-white scaled, posterior margin of pale scaling often slightly concave, area around prescutellar bare space usually with a few silvery-white scales, remainder black-scaled, all scutal scales narrow; scutellar lobes covered with overlapping broad black scales; pleura as in female, lower prealar scales few or occasionally absent. *Legs*: as in female except fore- and midunguis unequal, smaller unguis with a subbasal tooth, larger unguis bidentate, hind unguis equal and simple. *Abdomen*: terga VI, VII and sometimes V with silvery-white basal bands. *Genitalia* (Fig. 2): segment VIII with 14-20 setae of assorted sizes along distal margin of tergum and 33-47 along distal margin (concave) of sternum; segment IX with tergal lobes distinct, distally tuberculate, each bearing 2-6(3) strong setae, sternum with 2 setae; gonocoxite elongate, distinctly tapered, surface finely spiculate, viewed mesally (Fig. 2j) sternal surface distinctly concave, tergal and lateral surfaces clothed with dark scales, mesal membrane of gonocoxite broadly triangular basally, sharply narrowed for more than distal half, remainder of gonocoxite sclerotized, mesal surface with irregular band of 7-13 setae arranged 1-3 deep tergally along length of mesal membrane, distal 1-2(2) of these setae distinctly longer than the others, mesotergal area basally with a clump of 8-12 long slender setae, remainder of mesotergal area largely bare of setae, tergal surface with many long slender setae, basal ridge with distinct apodeme, bearing 3-6(4) separated back-curved setae, mesosternal sclerotized margin bearing a prominent patch of 15-26(21) variably developed dusky scales along the distal 0.67 of its length (these scales differing markedly in shape and contour from scales on tergal and lateral surfaces), a fringe of 13-22(7) setae 1-2 deep

sternally along length of mesal membrane (distal 2-4 distinctly longer than remainder); gonostylus simple, lightly spiculate, bearing 1 small seta near apex, gonostylar claw 0.58-0.95 its length; claspette stem densely spiculate from base to curvature, with 2-4 short setae, filament greatly expanded basally, sharply tapered distally but not hooked, expanded portion slightly clearer in texture (shape appearing markedly different when seen tergally in undissected specimen, Fig. 2a); aedeagus with conspicuous medial concavity distally, distal margin on either side of concavity with fimbriate fringe (about 7-11 acute fimbriations), sternally with an elongate U-shaped refractile band longitudinally, ventral aedeagal bridge distinct; paramere and parameral apodeme shaped as figured; paraproct with a single apical tooth, cercal membrane with 2-3(2) cercal setae.

**PUPA (Fig. 3).** Relative position, length, degree of development and branching of setae as figured. *Cephalothorax*: pigmentation in slide-mounted specimens light, with shaded areas laterally on postscutal plate (vicinity of and posterior to 9-CT), basally on wing sheath and on medial portions of halter sheath; trumpet strongly pigmented except distally, surface structured with uneven rows of irregular quadrangular plates, trumpet index 3.8-5.6, trumpet width at beginning of pinna 0.14-0.23 length of trumpet, length of pinna about 0.09-0.16 length of trumpet; seta 1-CT quite distinctly longer than 2-CT, 5-CT 0.62-0.93 of 1-CT, 8.9-CT of about same magnitude of development as 2,3-CT; 1-CT (2,2-3), 2-CT (10,1-2), 3-CT(1,1-2), 4-CT (2,1-5), 5-CT (3,2-4), 6-CT (1), 7-CT (3.2-5), 8-CT (2,1-5), 9-CT (1,1-2), 10-CT (5,6;3-9), 11-CT (1), 12-CT (2,2-5). *Abdomen*: pigmentation in slide-mounted specimens light except for small triangular area mediobasally on sternal surface of segment II; setae 0 and 14 single on all segments where occurring, smaller setae often dendritically branched near or beyond middle, 3-I (1), 6-I (1,1-2), 1-II (3,1-5), 3-II (1), 5-II (1,1-2), 6-II (1,1-2), 1-III (2,3;1-5), 3-III (1), 5-III (2,1-4), 6-III (1,1-3), 1-IV (1,2;1-5), 3-IV (4,2-7), 5-IV (1,1-3), 6-IV (2,1-4), 1-V (1,2;1-4), 3-V (1,1-2), 5-V (1,1-2), 10-V (1), 1-VI (1,1-2), 3-VI (1), 5-VI (1), 6-VI (2,1-3), 1-VII (1,1-2), 3-VII (1,1-2), 4-VII (1,1-2), 5-VII (1,1-2), 6-VII (4,1-5), 9-VII (3,2-5), 4-VIII (1), 9-VIII (9,5-9), 1-Pa (3,2-5), 9-VII-VIII and 1-Pa distinctly spiculate, width of segment V only 0.67-0.80 length of 5-V, 5-VI only 0.41-0.64 length of 5-V. *Paddle*: refractile portion of paddle margin 0.46-0.57 length of paddle, paddle index 1.47-1.69, 1-Pa only 0.25-0.33 length of paddle.

**LARVA (Fig. 4).** Relative position, length, degree of development and branching of setae as figured. Body not spiculate; without prominent stellate setae. *Head*: width 1.30 (1.20-1.39) of length; seta 1-C (1) elongate, slender, tapering mostly occurring beyond middle, 3-C (1), 4-C (10,13;8-15; only slightly less well-developed than 5-6-C), 5-C (10,8-14), 6-C (10,6-13), 7-C (10,13;14-18), 8-C (2,3;2-3), 9-C (5,6;4-9), 10-C (4,2-4), 11-C (12,8-13), 12-C (3,2-7), 13-C (1,1-2), 14-C (4,5;3-5), 15-C (3,2-5), 20-C (4,2-5), setae 4,5,6,7 and 11-C prominent, finely spiculate, flexible, setae 14,15 and 20-C with stiffly-tapered branches (somewhat stellate in type); dorsosentum with 8-10 (9) lateral teeth, first 1-3 more widely spaced. *Antenna*: slightly swollen at insertion of seta 1-A, tapered distally from there, sparse slender spiculation, distal 0.67 pigmented more darkly than head; seta 1-A inserted at 0.42-0.53 from base of antenna, with 6-10 (9) weakly spiculate branches, 2-A 0.84-1.03 of 3-A and 0.57-0.81 of 4-A. *Thorax*: all setae (except 0-P) and tubercles moderately pigmented;

larger setae lightly feathered, 0-P (9,9-13), 1-P (5,3-6), 2-P (1), 3-P (7,5-10), 4-P (2,2-3), 5-P (2,2-5), 6-P (1,1-2), 7-P (6,7;4-8), 8-P (8,6-10), 9-P (3,4;2-6), 10-P (1), 11-P (4,2-5), 12-P (1), 14-P (5,3-5), 1-M (4,5;3-6), 2-M (1,1-2), 3-M (1), 4-M (2), 5-M (1,1-2), 6-M (3,3-7), 7-M (1), 8-M (7,5-10), 9-M (7,5-9), 10-M (1), 11-M (2,1-3), 12-M (1), 13-M (10,13;8-13), 14-M (6,5-11), 1-T (4,3-5), 2-T (1,12), 3-T (7,6-12), 4-T (2,1-3), 5-T (2,2-4), 6-T (1), 7-T (9,5-11), 8-T (6,5-9), 9-T (5,4-8), 10-T (1), 11-T (2,13), 12-T (1), 13-T (8,4-9). *Abdomen*: all setae and tubercles moderately pigmented, a few setae thinly stellate in form, seta 6 lightly feathered on I-VI, setae 0 and 14 single (not seen on I), 1-I (7,3-8), 2-I (3,2-4), 3-I (2,1-2), 4-I (10,7-14), 5-I (4,3-6), 6-I (4,3-6), 7-I (1,2,1-2), 9-I (3,2-4), 10-I (1), 11-I (7,5-12), 13-I (6,3-6), I-II (2,1-4), 2-II (2,1-3), 3-II (2,1-2), 4-II (7,4-9), 5-II (3,2-5), 6-II (4,3-5), 7-II (5,4-8), 8-II (2,2-3), 9-II (1,2;1-3), 10-II (1), 11-II (1), 12-II (1,1-2), 13-II (5,3-8), 1-III (2,1-5), 2-III (1,1-2), 3-III (1,1-2), 4-III (2,1-4), 5-III (3,2-5), 6-III (2), 7-III (6, 6-10), 8-III (1), 9-III (1,1-2), 10-III (1), 11-III (1,1-2), 12-III (1,1-2), 13-III (4,2-4), 1-IV (2,1-4), 2-IV (1,1-2), 3-IV (2,1-2), 4-IV (2,2-4), 5-IV (4,3-5), 6-IV (2,1-2), 7-IV (6,5-8), 8-IV (1), 9-IV (1), 10-IV (1), 11-IV (1,1-2), 12-IV (1,1-3), 13-IV (4,2-4), 1-V (2,1-4), 2-V (1,1-2), 3-V (1), 4-V (5,4-8), 5-V (4,2-5), 6-V (2,1-2), 7-V (5,5-8), 8-V (1,1-2), 9-V (1), 10-V (1), 11-V (2,1-2), 12-V (1,1-2), 13-V (3,3-5), 1-VI (1,1-3), 2-VI (1), 3-VI (1), 4-VI (2,1-2), 5-VI (3,2-3), 6-VI (2,1-2), 7-VI (3,5;2-5), 8-VI (4,2-5), 9-VI (1), 10-VI (1,1-2), 11-VI (1), 12-VI (1), 13-VI (8,7-11), 1-VII (1,1-2), 2-VII (1), 3-VII (3,2-5), 4-VII (1), 5-VII (2,2-4), 6-VII (8,6-10), 7-VII (2,1-2), 8-VII (6,3-8), 9-VII (2,2-4), 10-VII (1), 11-VII (1), 12-VII (1), 13-VII (4,2-5), 1-VIII (3,2-4), 2-VIII (1), 3-VIII (6,4-9), 4-VIII (1,1-3), 5-VIII (5,3-6); comb a row of 8 (5-10 strong pigmented spines, laterally finely fringed on slightly more than basal half; siphon pigmented, apical 0.75 strongly so, distinctly tapered from beyond middle, index about 4.5 (4.21-4.77), acus detached, pecten with 8 (8-16) teeth, dark, with 1-2 weak ventral denticles before middle, basal teeth slightly longer than apical teeth, pecten teeth usually begin well removed from siphon base, 1-S with 3 (2-5) finely feathered branches, 2-S only 0.20-0.33 width of siphon apex in length; segment X with saddle moderately pigmented, incomplete, finely spiculate distally, siphon-saddle index 2.92-3.21, 1-X (2,1-2) finely feathered, 2-X (2,2-3), 3-X (1), 4-X with 8 (6-8) tufts, each tuft with 2 (1-3) branches, basal 2-4 tufts precritical, grid without lateral bar, gills as figured, dorsal pair distinctly longer than saddle and 1.29-1.85 length of ventral pair.

TYPE-DATA. Holotype, male #07199(23)4, with a slide of the associated pupal and larval skins and another of the dissected genitalia, reared from a female taken biting man in a bamboo grove at Ban Nithae, Kanchanaburi, THAILAND, September 21, 1974, elevation 160 m., by Kol Mongkolpanya, SEATO Medical Research Laboratory, U. S. Army. Allotype, female #07199(23)2, with a slide of the associated pupal and larval skins, same data as holotype. Paratypes: 10 males, 8 females, associated with 18 pupal skins and 15 larval skins, all reared from same biting female as holotype and allotype.

The holotype, allotype and paratypes are deposited in the U. S. National Museum. Paratypes of 1 male, 1 female, with associated pupal and larval skins, will be deposited in the British Museum (Natural History). The holotype and allotype are in excellent condition.

DISTRIBUTION. Material at hand (including type-series): 376 ♂, 431 ♀, 56 dissected slide-mounted ♂ genitalia, associated with 829 pupal skins and 725 larval skins, 174 slides of whole larvae. All of this material was reared from females taken biting in orchard or bamboo groves in the vicinity of villages. Fifteen mothers of sibling series are included in the collection. THAILAND, Kanchanaburi Province, Sanklaburi District: Ban Nithae, Ban La Wa, Ban Ku Phadu, and Ban Nong Padong.

TAXONOMIC DISCUSSION. Currently, there are 24 *Aedes* (*Finlaya*) species and subspecies assigned to the *niveus* subgroup, as follows: *albolateralis* (Theobald), *alboniveus* Barraud, *dorseyi* Knight, *ganapathi* Colless, *idjenensis* Brug, *inermis* Colless, *lacteus* Knight, *laoagensis* Knight, *litoreus* Colless, *mohani* Knight, *nipponicus* LaCasse and Yamaguti, *nippononiveus* Sasa and Nakahashi, *niveoides* Barraud, *niveus niveus* (Ludlow) and *n. leonis* Colless, *novoniveus* Barraud, *omorii* Lien, *peccus* Colless, *pseudoniveus* (Theobald), *saperoi* Knight, *sinensis* Chow, *subniveus* Edwards, *vanus* Colless, and *watteni* Lien.

*Aedes harinasutai* differs from all of these species in the shape of the male claspette filament (Fig. 2c) viewed from a lateral aspect. Only in *harinasutai* does the filament have a smoothly rounded expansion at the base and then is almost immediately rather sharply tapered to a needle-like apex. A combination of the shape and setation of the basal ridge, the shape and ornamentation of the aedeagal apex and the presence of 2 (occasionally 1) elongate setae distally near the tergal margin of the mesal membrane on the gonocoxite also serves to distinguish the male from all of the other *niveus* subgroup species (male of *idjenensis* is unknown).

As the number of species in the *niveus* subgroup has increased, accurate separation of each of the known species from all of the others based upon female characters has become increasingly difficult. This is further intensified by the continental, peninsular and island mix of the Indo-Malaysian area which offers many opportunities for reproductive isolation and the subsequent blurring of adult distinctions based on scale marking patterns. *Aedes harinasutai* cannot be distinguished in either the larval or pupal stages from a number of other species in the *niveus* subgroup.

The collection provided by Dr. Gould for this study included 115 separate sibling sets reared from a total of 24 different collections, all resulting from biting females collected in orchards and bamboo groves in a limited area of Kanchanaburi. Five separate species of the *niveus* subgroup appear in the collection, not all solidly nameable because of the absence of males. The female of *A. harinasutai* can be distinguished from the other 4 by a combination of possessing a prealar scale tuft and having the anterior scutal pale scaling withdrawn from the lateral scutal margin posteriorly from the level of the scutal angle. This information will be of use should any addition disease-vector studies be made in this area.

I am pleased to name this species in honor of Dr. Chamlong Harinasuta, Dean of the Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

BIONOMICS. As already pointed out, this species is known in nature only from man-biting females collected within a limited area in Kanchanaburi. This province lies near to midway in the length of Thailand. No other specimens have yet been seen by me in the large collections made in Thailand by the SEATO Medical Research Laboratory. One can only speculate as to where the immature stages develop but possibly when the breeding sites are known, this species may be more widely dispersed than now seems to be the case.

#### ACKNOWLEDGMENTS

I would like to thank Dr. Ronald A. Ward for critically reviewing the manuscript, and Mrs. Chien C. Chang for preparing the illustrations. Sincere appreciation is expressed to Dr. Douglas J. Gould and the expert team of technicians at SMRL who collected, prepared and shipped the fine collection on which this description is based.

#### LITERATURE CITED

- Belkin, J. N. 1962. The mosquitoes of the South Pacific (Diptera, Culicidae). Berkeley, Univ. Calif. Press. 2 vol. (608 p., 412 fig.).
- Harinasuta, Chamlong, Supat Sucharit, Thongchai Deesin, Kamhang Surathin and Samran Vutikes. 1970. Bancroftian filariasis in Thailand, a new endemic area. Southeast Asian J. Trop. Med. Public Health 1:233-45.

## EXPLANATION OF FIGURES

Fig. 1. Adult, ♀. a. Head and thorax, lateral aspect. b. Head and thorax, dorsal aspect. c. Femora, anterior and posterior aspects.

Fig. 2. Genitalia, ♂, a. Entire, tergal aspect. b. Aedeagus, parameres, and parameral apodemes; sternal aspect. c. Claspette, lateral aspect, d. Paraprocts with cercal membrane, tergal aspect. e. Paraproct with cercal membrane, lateral aspect. f. Ninth tergite, tergal aspect. g. Eighth sternite. h. Gonocoxite, mesal aspect. i. Eighth tergite. j. Ninth sternite.

Fig. 3. Pupa. a. Cephalothorax. b. Abdomen, dorsal aspect on left. c. Trumpet. d. Paddle, dorsal aspect.

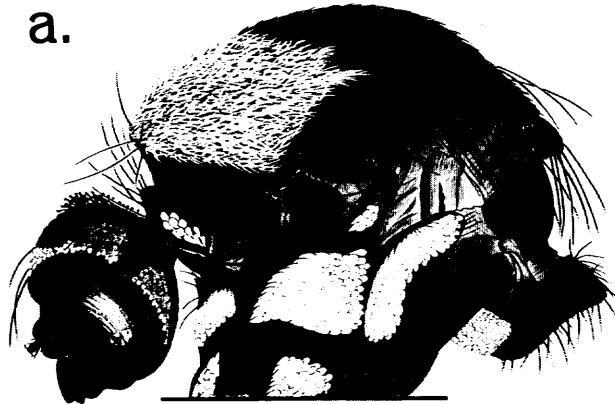
Fig. 4. Larva. a. Thorax and abdomen, dorsal aspect on left. b. Head, dorsal aspect on left. c. Dorsomentum, ventral aspect. d. Comb scales. e. Pecten teeth. f. Terminal abdominal segments, lateral aspect.

## ABBREVIATIONS

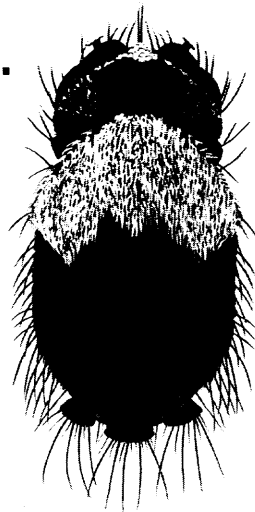
A-----antenna	Gs-----gonostylus
Ae-----aedeagus	M-----mesothorax
br-----basal ridge	MM-----mesal membrane
bra-----basal ridge apodeme	MP-----dorsomentum
C-----head	P-----prothorax
CF-----claspette filament	Pa-----paddle
Cm-----cercal membrane	PaA-----parameral apodeme
CS-----comb scale	Par-----paramere
CSe-----cercal setae	Ppr-----paraproct
CSt-----claspette stem	PT-----pecten teeth
CT-----cephalothorax	S-----siphon
G-----gonocoxite	T-----metathorax
GC-----gonostylar claw	Tr-----trumpet
	VAB-----ventral aedeagal bridge

Fig. 1

a.

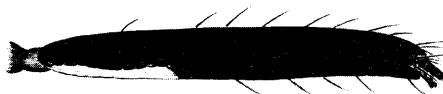


b.



c.

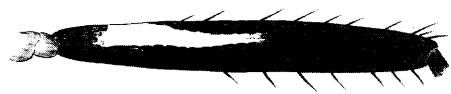
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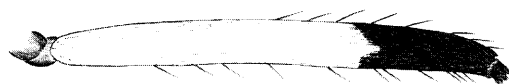
fore leg

d.

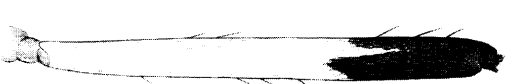
POSTERIOR



mid leg



hind leg



*C. Chang*



Fig. 2

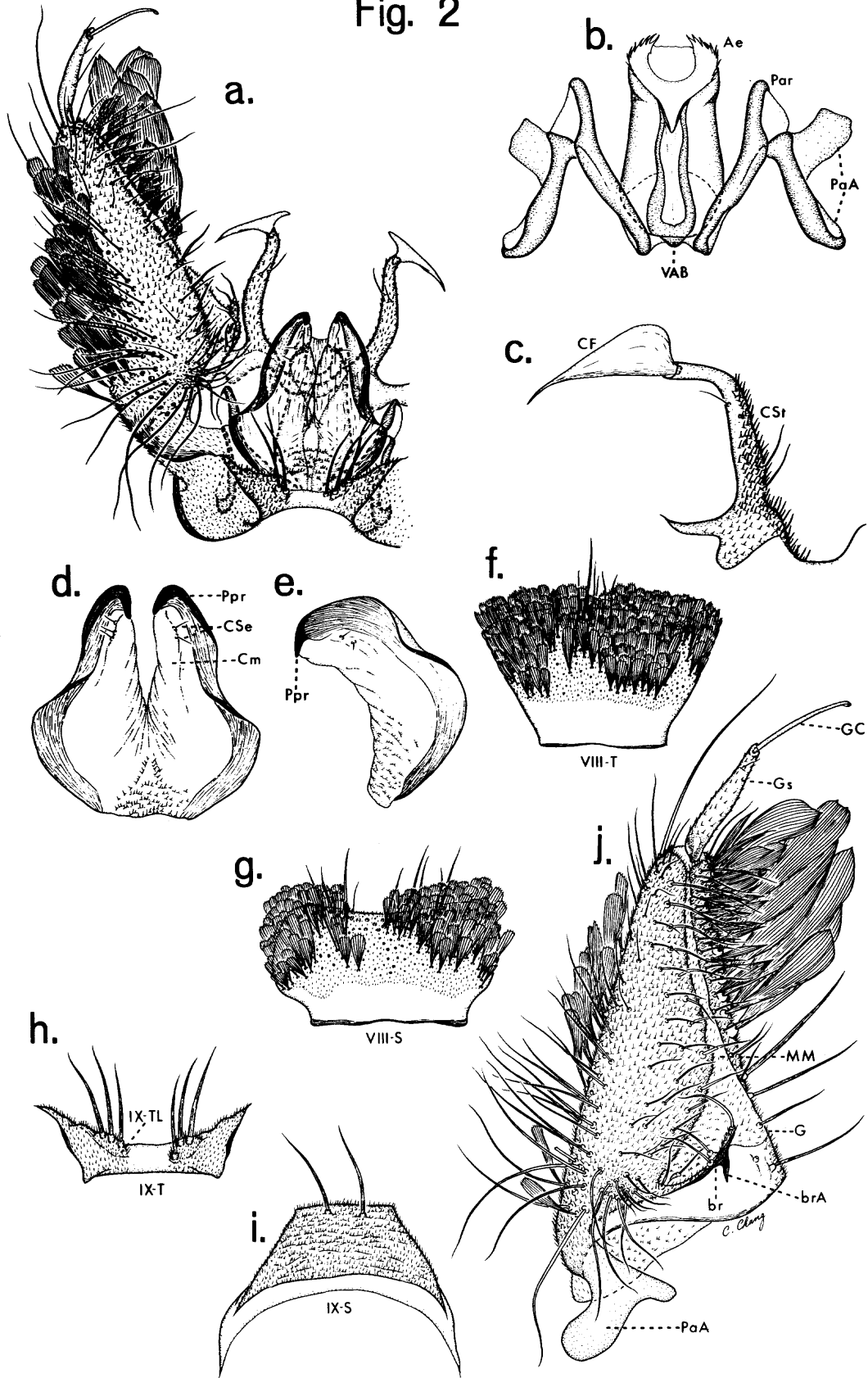


Fig. 3

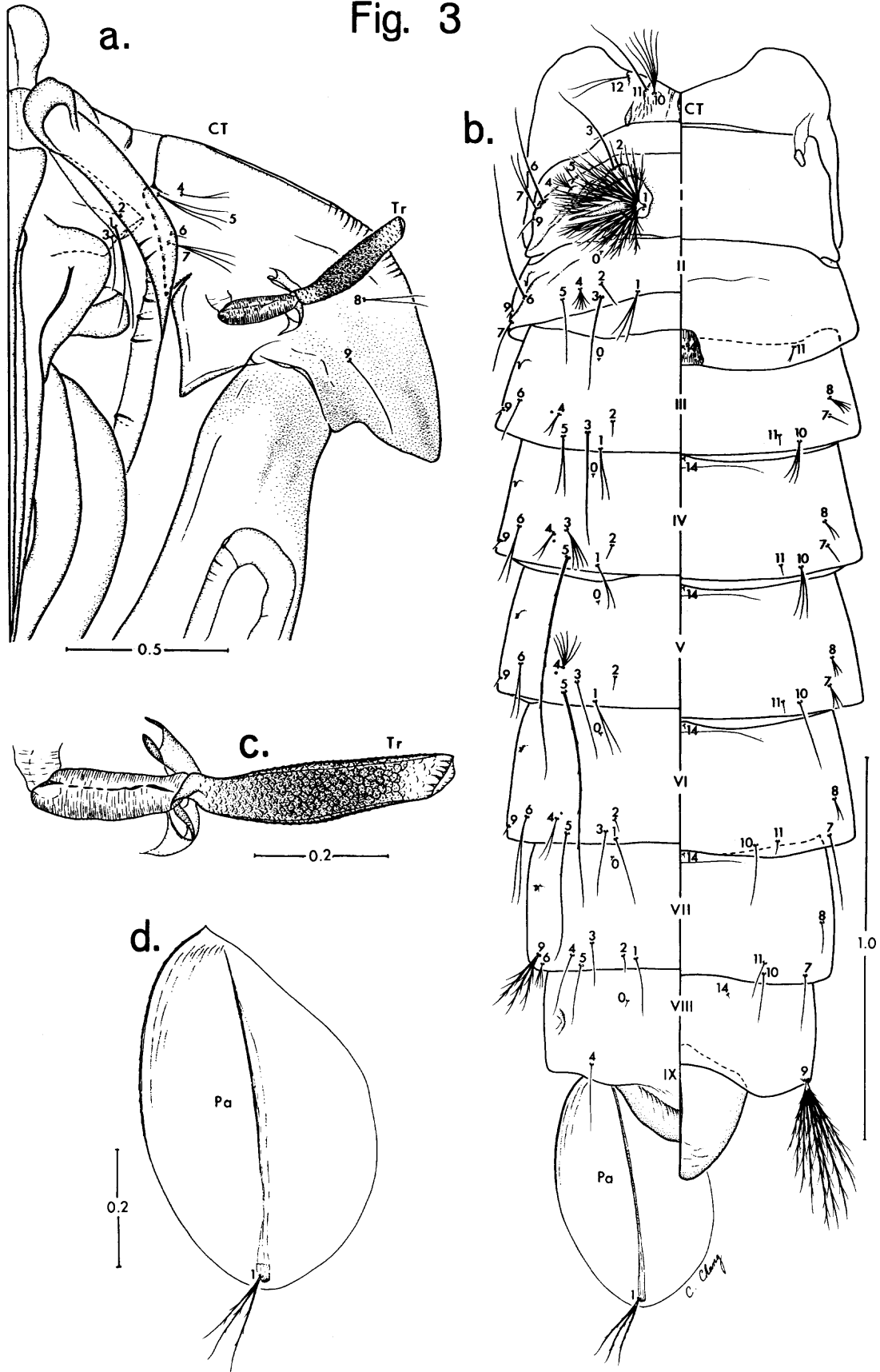


Fig. 4

