

**A new species of the subgenus *Eumelanomyia* of *Culex*  
(Diptera: Culicidae) from Thailand<sup>1</sup>**

Ralph E. Harbach and Rampa Rattanarithikul

Department of Medical Entomology  
U.S. Army Medical Component  
Armed Forces Research Institute of Medical Sciences<sup>2</sup>  
APO San Francisco 96346-5000

**ABSTRACT.** *Culex (Eumelanomyia) oresbius*, n. sp., from Chiang Mai Province, Thailand, is described and illustrated. It is compared with *Culex macrostylus*, an isomorphic sister species from Malaysia.

The new species described here was first collected in June and July, 1978 and tentatively identified by the junior author as a member of the *Culex (Eumelanomyia) bokorensis* subgroup of Sirivanakarn (1972). No further attempt was made to determine the identity of this species until additional specimens were collected in October, 1985. At that time the species was found to closely resemble the published description of *Cx. (Eum.) macrostylus* Sirivanakarn and Ramalingam, 1976, a member of the *tenuipalpis* subgroup (Sirivanakarn, 1972) from Malaysia. However, the species could not be identified as *macrostylus* with certainty. Some differences were noted in the male genitalia and the immatures of *macrostylus* were not described in sufficient detail to permit a complete analysis of the larval and pupal stages. For these reasons a detailed study and comparison was made with the type series of *macrostylus*. This study revealed that the two forms are differentiated only in the male genitalia. The species is being described as new despite the overall remarkable morphological congruence with *macrostylus* because speciation in the *Eumelanomyia* and certain other subgenera of *Culex* appears to have been determined largely by unique specializations in the male genitalia which have produced isolating barriers, probably involving specific mate recognition systems, between species.

***Culex (Eumelanomyia) oresbius*, New Species**

*Culex (Eumelanomyia) macrostylus* Sirivanakarn and Ramalingam of Miyagi et al. 1986: 184, 187 (coll. rec.).

**Adult.** A small brown mosquito without distinctive markings and special ornamentation. Isomorphic with *macrostylus* from Malaysia, differing only in features of the male genitalia.

**FEMALE.** Scaling predominantly brown, darker on proboscis, legs, wings and abdominal terga. **Head:** Antenna brown, length 1.5-1.9 mm, mean 1.8 mm. Proboscis uniformly dark-scaled; length same as proboscis. Maxillary palpus short, length 0.18-0.25 mm, mean 0.23 mm, about 0.13 length of proboscis; dark-scaled. Forked scales of vertex light brown, slender; falcate scales yellowish brown to light buff-colored; lateral spatulate scales whitish. **Thorax:** Integument brown, pleura paler than scutum. Scutum with uniform covering of fine golden brown scales, scales larger and noticeably paler on anterior promontory; with complete row of acrostichal setae, these about 0.5 length of dorsocentral setae, all setae dark brown. Scutellar scales same as scutal scales; lateral lobes each with 3,4 large setae, median lobe with 5-7 large setae. Anteprenotum mostly with pale setae of different lengths; scales absent. Postpronotum sometimes with few fine pale scales on anterodorsal margin; with row of 5,6 setae on posterodorsal margin. Pleural setae light brown to yellow: 4,5 proepisternal, 3-5 prealar, 4,5 upper mesokatepisternal, 8-15 lower mesokatepisternal, 4, 5 upper mesepimeral and 1 lower mesepimeral; pleura usually

<sup>1</sup>The views of the authors do not purport to reflect the positions of the Department of the Army or the Department of Defense.

<sup>2</sup>International mail: Department of Medical Entomology, U.S. Army Medical Component, Armed Forces Research Institute of Medical Sciences, Rajvithi Road, Bangkok 10400, Thailand.

without scales, sometimes with some inconspicuous pale scales along bases of lower mesokatepisternal setae. *Wing*: Length 3.0-3.7 mm, mean 3.5 mm; cell R2 3.5 length of vein R2+3; cell M1 0.75 length of cell R2; entirely dark-scaled. *Halter*: Scabellum and pedicel pale; capitellum dark. *Legs*: Anterior surface of forecoxa pale-scaled; anterolateral surfaces of mid- and hindcoxae with longitudinal patch of pale scales; coxal setae all pale. Trochanters pale except for small distal dark spot on mesal surface. Forefemur mainly dark-scaled, with posteroventral stripe of pale scaling; midfemur also mainly dark-scaled, with broad dorsal stripe of dark scales beginning at base, progressively expanding over lateral surfaces in distal direction and encircling femur before tip; hindfemur mainly pale-scaled, with narrow dorsal stripe of dark scales beginning beyond base, gradually widening distally and abruptly encircling femur before apex. Tibiae and tarsi entirely dark-scaled. Ungues small, simple, dark. Pulvilli distinct, whitish. *Abdomen*: Tergum I with median posterior patch of dark scales; terga II-VIII entirely dark-scaled. Sterna pale-scaled, scales whitish but often appearing darker against dark integument.

**MALE.** Coloration and scaling as in female. *Head*: Antenna plumose, minor whorls present; length 1.35-1.45 mm, mean 1.40 mm. Proboscis without false joint; longer than antenna, length 1.8 mm. Maxillary palpus short, length 0.30-0.35 mm, mean 0.33 mm, 0.23-0.26 length of proboscis. *Wing*: Length 2.9-3.1 mm, mean 3.0 mm; cell R2 3.0 length of vein R2+3; cell M1 0.7 length of cell R2. *Legs*: Ungues dark; foreungues subequal, anterior foreunguis larger and bearing ventral tooth near midlength; midungues also subequal, anterior midunguis larger and bearing small tooth beyond base; hindungues small, equal, simple. *Abdomen*: Tergum VIII (ventral in position) dark-scaled. Color of sternal scaling not determined satisfactorily in specimens available but appears to be darker than in female. *Genitalia* (Fig. 1): Differing significantly from *macrostylus* as noted below and shown in Figure 1. Ninth tergal lobe small, with irregular row of 3-6 short setae (mode 4). Gonocoxite globose, nearly as broad as long, ventrolateral surface with relatively dense covering of moderately long setae, dorsolateral surface with patch of short setae near subapical lobe, mesal surface without setae; subapical lobe distinctly divided, proximal and distal divisions arise separately from gonocoxite [distal division arises from base of proximal division in *macrostylus*]; proximal division elongate, with 4 prominent apical setae (designated as setae *a-d* for ease of reference, no homologies with subgenus *Culex* intended) and row of small simple setae (*s*) on proximolateral margin [without foliform seta (*f*) and row of lanceolate setae (*l*) found in *macrostylus*], setae *a* and *b* stout, tapered and hooked at tip; *d* on lateral sides of *a* and *b*, flattened and bent at tip; *d* arises from a distinct narrow cufflike pedicel lateral to *c*, sinuous in lateral view, distal part flattened and laterally curled [seta *d* rodlike, bent distally and not arising from distinct cufflike pedicel in *macrostylus*]; distal division short, slender, bearing a stout, distally pectinate (comblike) seta and 3 compressed, sinuous setae at tip. Gonostylus large, nearly as long as gonocoxite, with ventrally spiculate swelling and lateral flange at midlength; gonostylar claw small, simple, subapical. Phallosome as broad as long, lateral plate (*lp*) broadly fused (laterally) with aedeagal sclerite (*aes*); lateral plate roughly obliquely oval in dorsal view, with some 15-20 sharp denticles on dorsomesal surface and apical margin, joined basally (anteriorly) to plate of opposite side by relatively broad and short dorsal aedeagal bridge; aedeagal sclerite slightly larger than lateral plate, joined to sclerite of other side by rather weakly developed ventral aedeagal bridge (not evident in figure). Proctiger normal; paraproct simple, crown dark with numerous blunt spicules. Cercal sclerite and tergum X elongate, simple; 2-4 cercal setae (mode 3).

**Pupa** (Fig. 1). Character and placement of setae as figured; range and modal number of branches in Table 1; indistinguishable from *macrostylus*. *Cephalothorax*: Lightly tanned, scutum, metanotum and metathoracic wings slightly darker. Setae 1,8-CT usually triple (see table); 5-CT with 3 or 4 branches in nearly equal frequencies; 3,4,6,10,11-CT usually double, sometimes single, 10-CT sometimes triple; 7-CT always double; alveolus of 13-CT often present. *Trumpet*: Moderately tanned, tracheoid area darker; gently flared distally, index 6.82-9.08, mean 8.07 (width measured at midlength); tracheoid area long, about 0.5 trumpet length; pinna with short slit extending 0.05-0.10 mm into meatus. *Abdomen*: Uniformly lightly tanned; length 2.31-2.76 mm, mean 2.56 mm. Seta 7-I,II single or double, 7-II infrequently double; 9-II occasionally anterior to 7-II; 9-III-VI very small, ventral; 6-III-VI usually with 3 or 4 branches, more often 3; 5-IV commonly triple (2-4), slightly longer than length of tergum following; 5-V,VI double (5-VI found triple on one side of one specimen examined), strongly developed, more than 1.5 length of tergum following; 4-VIII single or double in nearly equal frequencies. *Genital lobe*: Lightly tanned; length about 0.17 mm in female, 0.34-0.36 mm in male. *Paddle*: Lightly tanned, buttress and midrib slightly darker; buttress weak, distinct only at base of paddle; midrib complete to near apex; length 0.68-0.84 mm, mean 0.70 mm, width 0.41-0.52 mm, mean 0.48 mm, index 1.46-1.72, mean 1.55. Seta 1-P present, stronger than 2-P, single.

**Larva** (Fig 2). Character and positions of setae as figured; range and modal number of branches in Table 2; not differing noticeably from *macrostylus*. **Head:** Wider than long; length 0.65-0.76 mm, mean 0.72 mm; width 1.05-1.14 mm, mean 1.10 mm; lightly and evenly tanned. Anterior margin of median labral plate straight or only very slightly emarginate between insertions of seta 1-C. Hypostomal suture well developed, extending posterolaterally from posterior tentorial pit to collar. Dorsomentum lightly to moderately tanned; usually with 7 teeth (6,7) on either side of median tooth, median tooth sharp or blunt, lateral teeth pointed, 3 or 4 lateral teeth adjacent to median tooth with point directed anteromesad. Seta 1-C pigmented, stout, slightly bent mesad, length 0.10- 0.13 mm; 2-C absent; 5-C single, weak, not much longer than 4-C; 6-C normally double (1,2), length normal; 11,12-C single or double, 11-C more often double, 12-C usually single; 14-C normally triple (2-4), with branches diverging at nearly equal angles in a single plane; 16,17-C absent [the presence of these setae could not be confirmed in *macrostylus*]. **Antenna:** Length 0.59-0.67 mm, mean 0.63 mm, nearly as long as head; lightly tanned, distal part darker; dorsal and lateral surfaces of proximal part with long slender spicules. Seta 1-A with 20-25 branches; 2,3-A subapical. **Thorax:** Integument hyaline, smooth. Seta 4-P with 3 or 4 branches, more often with 4; 7-P normally double, occasionally single or triple; 8-P noticeably aciculate in basal 0.3 (not so in *macrostylus*); 11-P frequently with 4 branches (2-4); 14-P double. Seta 6-T nearly as long as 7-T; 13-T weakly developed, resembling seta 14-M, with 2-5 branches. **Abdomen:** Integument hyaline, smooth. Setae 6,7-I and 6-II borne on relatively large, posteriorly extended sclerites; 6-III-VI almost always triple (6-IV and 6-VI each found double one time on one side in different specimens); 1-III-V usually with 5 branches (see table), 1-VI usually double or triple, more often double, occasionally single, inserted posteromesad of 3-VI; 13-III-V not well developed, short, not much longer than seta 12 on corresponding segment, progressively longer on succeeding posterior segments, usually single (see table). **Segment VIII:** Comb with 55-72 scales, mean 64; scales short, fringed on sides and apex, shaft pigmented. **Siphon:** Index 5.62-6.37 (width measured at base), mean 5.95; broadest at base, tapering, gently curved anteriorly beyond midlength; proximal 0.5 lightly tanned, distal 0.5 darker, basal ring and acus also darker. Pecten with 13-15 spines, mode 14; spines long and slender, increasing in length distally, with complete ventral row of tiny spicules, spicules denser distally. Seta 1-S in 7 or 8 pairs (1a-S sometimes absent or unpaired, 14-16 setae); 7 proximal pairs (1a-g) irregularly paired along posterior midline, triple (1a found double on 2 occasions), with one branch much longer than others (about 7 times longer than width of siphon at point of insertion) and usually bent at tip; one pair (1h) borne posterolaterally, short (about 2 times width of siphon at point of insertion), usually double (1,2). **Segment X:** Saddle complete; lightly to moderately tanned; length 0.35-0.38 mm, mean 0.36 mm, siphon/saddle index 3.11-3.33, mean 3.23. Seta 1-X frequently triple (2,3), longer than saddle; 4-X usually in 7 pairs (14 setae), occasionally in 6.5 pairs (13 setae), 1-3 setae borne proximal to grid. Anal papillae long and tapered, about twice length of saddle.

**Type data.** The type series includes 10 males, 15 females, 1 larval exuviae, 17 pupal exuviae and 18 fourth-instar larvae with the following collection data: THAILAND, Chiang Mai Province, Amphur Chom Thong, Doi Inthanon, pond, 1,400 m, 5 October 1985, Harbach and Kol. Holotype male (TH26-104) with associated pupal exuviae and genitalia on slides. Allotype female (TH26-8) with associated larval and pupal exuviae on slide. Paratypes: 8 males (TH26a-h) with genitalia on slides; 1 male (TH26-107) with pupal exuviae on slide; 4 females (TH26-100, -102, -103, -105) with pupal exuviae on slides; 10 females, 10 unassociated pupal exuviae (7 males; 3 females) and 18 fourth-instar larvae from the same collection (TH26). The series is deposited in the National Museum of Natural History, Smithsonian Institution, Washington, DC. The name of this species is taken from the Greek word *oresbios* which mean "living in or on mountains."

**Other material examined.** The type series of *macrostylus* (holotype male with dissected genitalia, 2 females, 2 larval exuviae, 3 pupal exuviae and 3 fourth-instar larvae) and another 45 specimens of *oresbios* (4 males, 2 male genitalia, 2 females, 3 larval exuviae, 6 pupal exuviae, 2 pupae and 26 fourth-instar larvae) were examined during this study. The additional specimens of *oresbios* came from the following collections made in the immediate vicinity of the type locality: 07830 (1 larval exuviae), 22 June 1978, Areas 3 Ban Nam Phare Noi 1; 07851 (1 male with larval and pupal exuviae and dissected genitalia), 29 June 1978, Ban Yang, Nam Tok Siriphum; 07905 (12 fourth-instar larvae), 07906 (8 fourth-instar larvae) and 07908 (1 male with pupal exuviae and dissected genitalia, 1 female with pupal exuviae, 1 larval exuviae, 2 pupae and 6 fourth-instar larvae), 7 July 1978, 34 km from Chom Thong to Doi Inthanon; TH161 (2 males and 1 female with pupal exuviae), 8 February 1986, Doi Inthanon. These collections are located partly in the National Museum of Natural History, Smithsonian Institution, and partly in the Department of Medical Entomology, Armed Forces Research Institute of Medical Sciences (AFRIMS).

**Bionomics.** Collections containing larvae of *oresbius* have been made in permanent and temporary bodies of clear, fresh, stationary water under some degree of shade. Habitats include a pond, a swampy depression, a pool in a dry streambed and floodwater pools containing algae and some grassy and herbaceous plants. Other species collected with *oresbius* include *Aedes (Finlaya) pulchriventer* (Giles) and *Culex (Eumelanomyia)* sp. (in pond at 1,400 m [type locality]); *Anopheles (Anopheles) gigas* Giles and *Culex (Culex) mimulus* Edwards (in swampy depression at 1,400 m); *An. (Cellia) maculatus* Theobald, *An. (Cel.) vagus* Dönitz, *An. (Cel.) minimus* Theobald and *An. (Cel.) annularis* van der Wulp (in pool in streambed at 400 m); and *Ae. (Fin.) harveyi* (Barraud) and *Ae. (Fin.) pulchriventer* (in flood pools at 1,700 m). A single male of *oresbius* was reared from a collection of larvae taken from a bamboo stump at 1,500 m. This collection also contained *Armigeres (Armigeres) moultoni* Edwards and *Ar. (Arm.) subalbatius* (Coquillett). Nothing is known about the bionomics of the adults.

**Systematics.** *Culex oresbius* and *macrostylus* are considered to be separate but closely related sister species. The differences in the subapical lobe of the male gonocoxite noted in the description are quite distinct. Nevertheless our present knowledge of these species is very limited and it is possible that the two forms are actually geographic variants of a single species. Whether or not this is the case can be determined only when specimens become available from areas between the widely disjunct type localities. *Culex macrostylus* is known only from Genting Heights, Pahang, Malaysia (Sirivanakarn and Ramalingam 1976) and *oresbius* from a small area around Doi Inthanon, Thailand's highest mountain located in the northern province of Chiang Mai. These localities lie approximately 1,800 km from one another.

#### Acknowledgments

The authors gratefully acknowledge Ronald A. Ward, Walter Reed Biosystematics Unit (WRBU), Smithsonian Institution, Washington, DC for commenting on the manuscript, Taina Litwak of the same organization for preparing the illustrations, and Kol Mongkolpanya, AFRIMS, for his assistance in collecting and identifying specimens.

#### References Cited

- Miyagi, I., T. Toma, M. Tsukamoto, M. Horio, M. Mogi, T. Okazawa, Y. Tokuyama, S. Sucharit, W. Tumrasvin, C. Khamboonruang and W. Choochote. 1986. New distribution records of mosquitoes from Thailand with a collection list of 1983-1984 surveys. *Trop. Biomed.* 3: 181-192.
- Sirivanakarn, S. 1972. Contributions to the mosquito fauna of Southeast Asia. XIII. The genus *Culex*, subgenus *Eumelanomyia* Theobald in Southeast Asia and adjacent areas. *Contrib. Am. Entomol. nst. (An Arbor)* 8(6): i + 86 pp.
- Sirivanakarn, S. and S. Ramalingam. 1976. A new species of *Culex (Eumelanomyia)* Theobald with notes on three other species from Malaysia (Diptera: Culicidae). *Mosq. Syst.* 8: 209-216.

Table 1. Number of branches for pupal setae of *Culex (Eumelanomyia) oresbius*.<sup>a</sup>

Seta No.	Cephalothorax		Abdominal Segments								Paddle	
	CT	I	II	III	IV	V	VI	VII	VIII	IX	P	
0	-	-	1	1	1	1	1	1	1	-	-	
1	2-4(3) <sup>b</sup>	100-135+	11-17(12)	5-9(8)	4-9(7)	3-7(6)	2-5(3)	2,3(2)	-	1	1	
2	2-4(3)	1	1	1	1	1	1	1	-	-	1	
3	1,2(2)	1,2(2)	1,2(1)	1,2(2)	3-6(5)	1	1	2-4(2)	-	-	-	
4	1,2(2)	1-3(2)	1-4(3)	2-4(3)	1,2(2)	2-5(3)	2-4(3)	1	1,2(2)	-	-	
5	3,4(3)	1-3(1)	3-6(4)	4-6(5)	2-4(3)	2	2,3(2)	1,2(1)	-	-	-	
6	1-3(2)	1,2(1)	1,2(1)	1-4(3)	2-4(3)	2-4(3)	2-4(3)	2-6(4)	-	-	-	
7	2	1,2(1)	1,2(1)	2-5(4)	2,3(2)	2-4(3)	1	1-3(1)	-	-	-	
8	2-4(3)	-	-	2-5(3)	1-3(2)	1,2(2)	2,3(2)	1-4(2)	-	-	-	
9	1,2(2)	1	1,2(1)	1	1	1	1	2,3(2)	4,5(5)	-	-	
10	1-3(2)	- <sup>c</sup>	-	1,2(2)	1,2(2)	1	1	1	-	-	-	
11	1,2(2)	1,3(2)	-	1	1	1,2(1)	1,2(1)	1,2(2)	-	-	-	
12	2-4(4)	-	-	-	-	-	-	-	-	-	-	
13	- <sup>c</sup>	-	-	-	-	-	-	-	-	-	-	
14	-	-	-	1	1	1	1	1	1	-	-	

<sup>a</sup>Based on counts made on the holotype, allotype and 8 paratypes.<sup>b</sup>Range (mode).<sup>c</sup>Alveolus only.

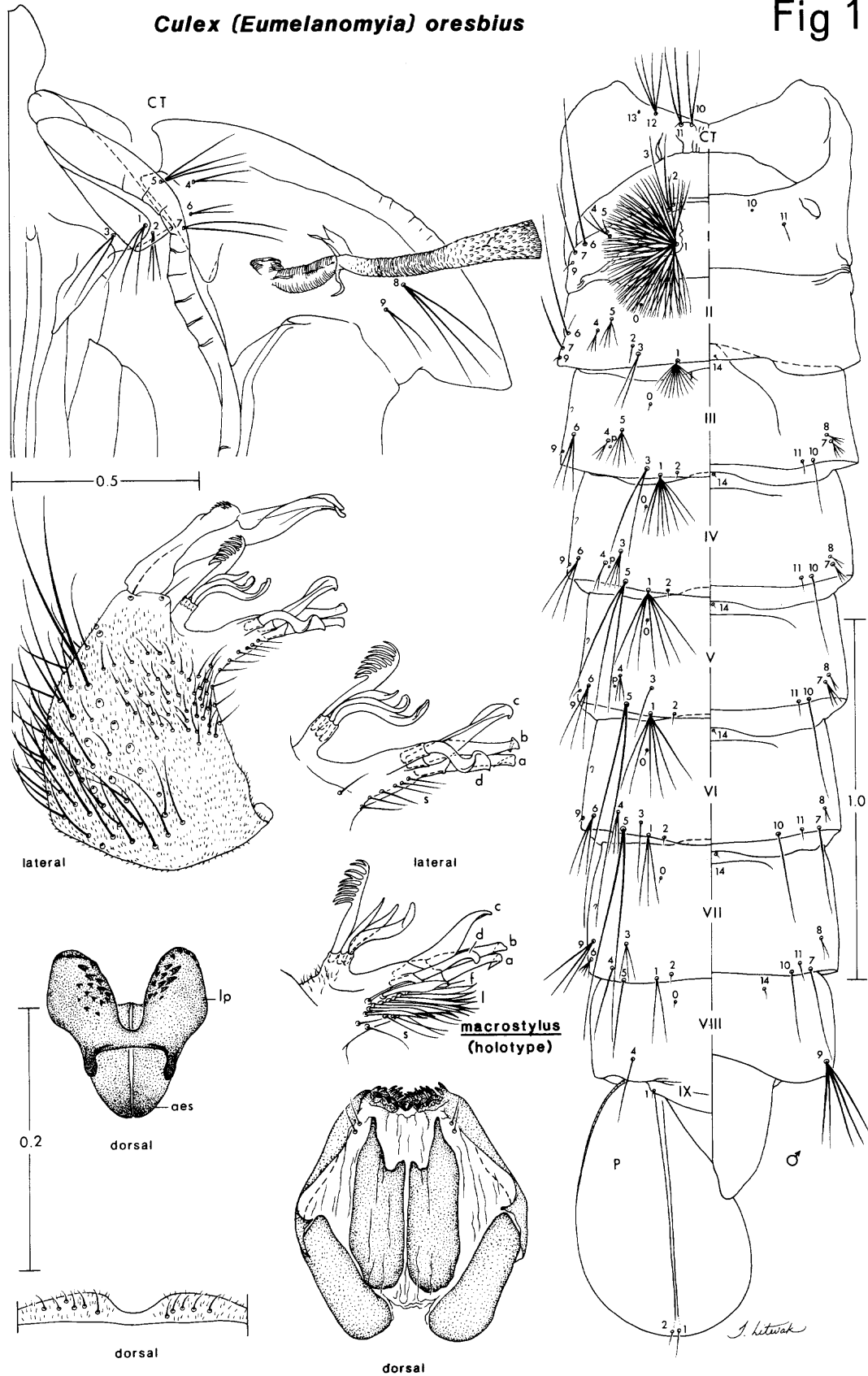
**Table 2.** Number of branches for fourth-instar larval setae of *Culex (Eumelanomyia) oresbius*.<sup>a</sup>

Seta No.	Head		Thorax					Abdominal Segments							
	C	P	M	T	I	II	III	IV	V	VI	VII	VIII	X		
0	-	9-14(12) <sup>b</sup>	-	-	-	1	1	1	1	1	1	1	-		
1	1	1	1	1	3-7(4)	2-5(3)	4-6(5)	4,5(5)	5,6(5)	1-3(2)	2-5(4)	4,5(5)	2,3(3)		
2	-	1	2-5(4)	2-7(4)	1,2(1)	1	1,2(1)	1	1	1	1	1	1		
3	1	1	1,2(1)	4-6(5)	3-5(4)	1-3(2)	1-3(2)	1-3(2)	1	1	2-5(3)	7-9(8)	1		
4	1	3,4(4)	3-5(4)	3,4(3)	7-11(8)	4-7(4)	2-4(3)	2,3(2)	3-7(5)	3,4(4)	1	1	1-8(6)		
5	1	1	1	1,2(1)	2-5(3)	2-4(3)	2,3(3)	1-3(3)	2,3(2)	1-3(2)	2-4(3)	1,2(2)	-		
6	1,2(2)	1	1	1	1,2(2)	2	3	2,3(3)	3	2,3(3)	6-12(7)	-	-		
7	4-7(6)	1-3(2)	1	6-8(7)	1	3-5(4)	5-8(5)	6,7(6)	4-6(5)	2,3(2)	1,2(1)	1a-S,	2,3(3)		
8	3,4(4)	1	4	5-8(6)	-	1	2	1-3(2)	2	2,3(3)	2,3(2)	1b-S,	3		
9	3-5(4)	1	4-6(4)	5-7(6)	1-4(2)	1	1	1	1	1	1-3(2)	1c-S,	3		
10	1-3(2)	1	1	1	1	1	1,2(2)	1-3(2)	1	1	1	1d-S,	3		
11	1,2(2)	2-4(4)	1-4(3)	1-3(1)	2,3(2)	1,2(2)	1,2(2)	2	1,2(2)	1,2(2)	2,3(2)	1e-S,	3		
12	1,2(1)	1	1	1	1,2(1)	1-3(1)	1-3(1)	1,2(2)	1	1,2(1)	1	1f-S,	3		
13	2-4(3)	-	8-20(13)	2-5(3)	1,2(2)	8-16(9)	1,2(1)	1	1,2(1)	11-25(12)	1-3(2)	1g-S,	3		
14	2-4(3)	2	4-7(5)	-	-	1	1	1	1	1	1	1h-S,	1,2(2)		
15	4-6(5)	-	-	-	-	-	-	-	-	-	-	-	-		

<sup>a</sup>Based on counts made on 10 paratypes.<sup>b</sup>Range (mode).

*Culex (Eumelanomyia) oresbius*

Fig 1



*Culex (Eumelanomyia) oresbius*

Fig 2

