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TAXONOMIC STUDY OF SOME SPECIES OF THE EDUCATOR GROUP OF *CULEX* (*MELANOCONION*) (DIPTERA: CULICIDAE)[1]

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ABSTRACT. *Culex* (*Melanoconion*) *keenani* Galindo and Mendez is synonymized with *Culex* (*Melanoconion*) *educator* Dyar and Knab, and *Culex* (*Melanoconion*) *vaxus* Dyar is resurrected from synonymy with *Culex* (*Melanoconion*) *educator*. Both species are redescribed and illustrated. Data about distribution and bionomics are discussed.

INTRODUCTION

During identification of *Culex* (*Melanoconion*) specimens collected in the Ribeira Valley, São Paulo State, Brazil, taxonomic problems were noted with regard to members of the Educator Group of Sirivanakarn (1983), mainly *Cx. educator* Dyar and Knab and its synonyms. Through the study of type material, it was possible to reach some conclusions about the true identity of these nominal species. The purpose of this paper is to clarify the taxonomic status of *Cx. vaxus* Dyar, which was formerly regarded as a synonym of *Cx. educator*, and to redescribe both species.

TAXONOMIC TREATMENT

Culex (*Melanoconion*) *educator* Dyar and Knab

1906. *Culex educator* Dyar and Knab, 1906: 217. Syntype L, Le (with associated ♀): Rio Aranjuez, near Puntarenas, Costa Rica (NMNH). Stone and Knight 1957:48 (type info.); Belkin, Schick and Heinemann 1965: 13 (type info.).

1913. *Culex apeteticus* Howard, Dyar and Knab, 1913:Fig. 91. Lectotype ♂: Upper Pequini River, Panama (NMNH). Howard, Dyar and Knab 1915:321 (♂, ♀; as *apateticus*); Dyar 1918:106 (syn., type info.; as *apateticus*); Stone and Knight 1957:43 (lectotype desig.; as *apateticus*); Stone, Knight and Starcke 1959:269 (corrected spelling); Belkin, Schick and Heinemann 1965:52 (type info.).

1922. *Culex* (*Choeroporpa*) *aneles* Dyar and Ludlow, 1922:63. Lectotype ♂: Cardenas River, Canal Zone, Panama (NMNH). Dyar 1928:325 (syn.); Stone and Knight 1957:43 (lectotype desig.); Belkin, Schick and Heinemann 1965:53 (type info.).

1961. *Culex* (*Melanoconion*) *keenani* Galindo and Mendez, 1961:2. Holotype ♂: Pacora, Panama (NMNH). **NEW SYNONYMY.**

Culex (*Melanoconion*) *educator* of Rozeboom and Komp 1950:90; Lane 1953:467 (in part); Cova Garcia, Sutil and Rausseo 1966:185; Sirivanakarn 1983:279.

Female. Almost entirely clothed with brownish scales. *Head*: Antenna dark, length about 1.67 mm; flagellum normal, whorls with 6 setae. Proboscis entirely dark-scaled, length 1.36–1.44 mm, mean 1.40 mm. Maxillary palpus entirely covered with dark scales, length 0.23–0.25 mm, mean 0.24 mm, about 0.17 of proboscis length. Vertex with broad spatulate scales, these dark dorsally, dingy white laterally; forked scales dark; occipital region with some pale whitish falcate scales.

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Cibarium (Fig. 1): Length about 148 μm; lateral flange slightly curved; cibarial bar concave, dorsal surface and posterior margin smooth; about 6 curved, rectangular, and blunt teeth with serrate distal margin; tooth length about 16 μm; line of origin evident; teeth attached to cibarial bar, apically free from enclosure; hollow area of teeth prominent, extending from base to apex. Posterior hard palate nearly rectangular in outline, darker in median longitudinal area; dorsal apodeme small; hyaline area between cibarial dome and posterior hard palate moderately spiculate; cibarial dome nearly pentagonal, concavo-convex, surface with long, triangular, sharply pointed, posteriorly directed denticles. Palatal setae situated on lateral edges of anterior hard palate, 2 on each side. Sensilla trichodea arranged in linear series of 2,3 single setae on each side. *Thorax*: Integument light brown. Scutum with very fine falcate scales of uniform size and color, brownish with coppery reflections; scutal setae prominent, brownish with golden or reddish reflections; acrostichal setae absent. Scutellar scales same as scutal scales, lateral lobes each with 4 large setae, median lobe usually with 5,6 large setae. Antepronotum without scales, with scattered dark setae. Postpronotum with scales same as scutal scales; with 4 brownish setae on posterodorsal margin. Pleural setae golden brown, darker on prealar knob: about 7,8 upper proepisternal, 6,7 prealar, 6–11 upper mesokatepisternal, 9–13 lower mesokatepisternal, 6–8 upper mesepimeral, and one lower mesepimeral. Pleura with small patch of white spatulate scales on upper corner and on lower posterior border of mesokatepisternum. *Wing*: Length 2.29–2.42 mm, mean 2.36 mm; cell R_2 4.37–5.63 of R_{2+3}, mean 4.95; cell M_2 0.76 of cell R_2; subcosta intersects costa beyond furcation of R_{2+3}. Dorsal scaling: appressed spatulate scales on costa, subcosta, R, R_1, R_{4+5}, distal 0.7 of M_{1+2}, M_{3+4}, Cu, Cu_1, Cu_2, and proximal 0.5–0.6 of 1A; linear plume scales on R_s, R_{2+3}, M, proximally on M_{1+2}, distal 0.4–0.5 of 1A; inclined narrow spatulate scales on R_2 and R_3; remigium with appressed spatulate scales and 2,3 distal setae. Ventral scaling: appressed spatulate scales on costa, subcosta, R_s, R_{2+3}, basally on R_2, basally on R_3, M, basally on M_{1+2}, and basally on M_{3+4}; linear plume scales on proximal 0.5 of R_1, proximal 0.5 of R_{4+5}, Cu_1, Cu_2, and on middle of 1A; inclined narrow spatulate scales on distal 0.5 of R_1, on R_2, on R_3, distal 0.5 of R_{4+5}, M_{1+2}, M_{3+4}, distally on 1A; Cu and proximal 0.5 of 1A devoid of scales. *Halter*: Scabellum and pedicel pale; capitellum dark. *Legs*: Dark-scaled except for usual pale scales on femora, posterior surface of forefemur with indistinct longitudinal stripe of dingy pale scales, posteroventral surface of midfemur with dingy white scales, hindfemur mainly pale-scaled, with complete dorsal stripe of dark scales gradually widening distally, expanded over whole of anterior and posterior surfaces at apex. Tibiae and tarsi dark-scaled. *Abdomen*: Tergum I with median posterior patch of dark scales; terga II–VII dark-scaled with basolateral patches of white scales. Sterna II–VII mainly dark-scaled, with basal white bands. *Genitalia* (Fig. 1): Tergum IX narrowed in middle, with small flattened lobes bearing about 8 slender setae. Upper vaginal lip distinct and narrow; lower vaginal lip and insula indistinct, with about 10–12 clustered insular setae. Upper vaginal sclerite with inverted U-shape, thickest at bottom of U. Postgenital lobe short, rounded distally, with 14,15 setae on either side of midline, mostly on ventral surface.

Male. Like female except for the following sexual differences. *Head*: Antenna strongly verticillate; length about 1.41 mm. Maxillary palpus dark; length about 2.0 mm, exceeding proboscis length by length of about apical 0.3 of palpomere 4 and palpomere 5; palpomeres 4 and 5 densely setose, palpomere 3 with 5–7 strong setae at apex. *Abdomen*: Tergum II entirely dark-scaled; terga III–VII with basolateral white patches; tergum VIII (ventral) with basolateral white patches and a deep V-shaped median posterior emargination. Sterna not examined in detail. *Genitalia* (Fig. 1): Tergum IX lobes as figured. Gonocoxite stocky; ventrolateral setae strongly developed, mesal surface with small setae scattered from base to level of subapical lobe, lateral

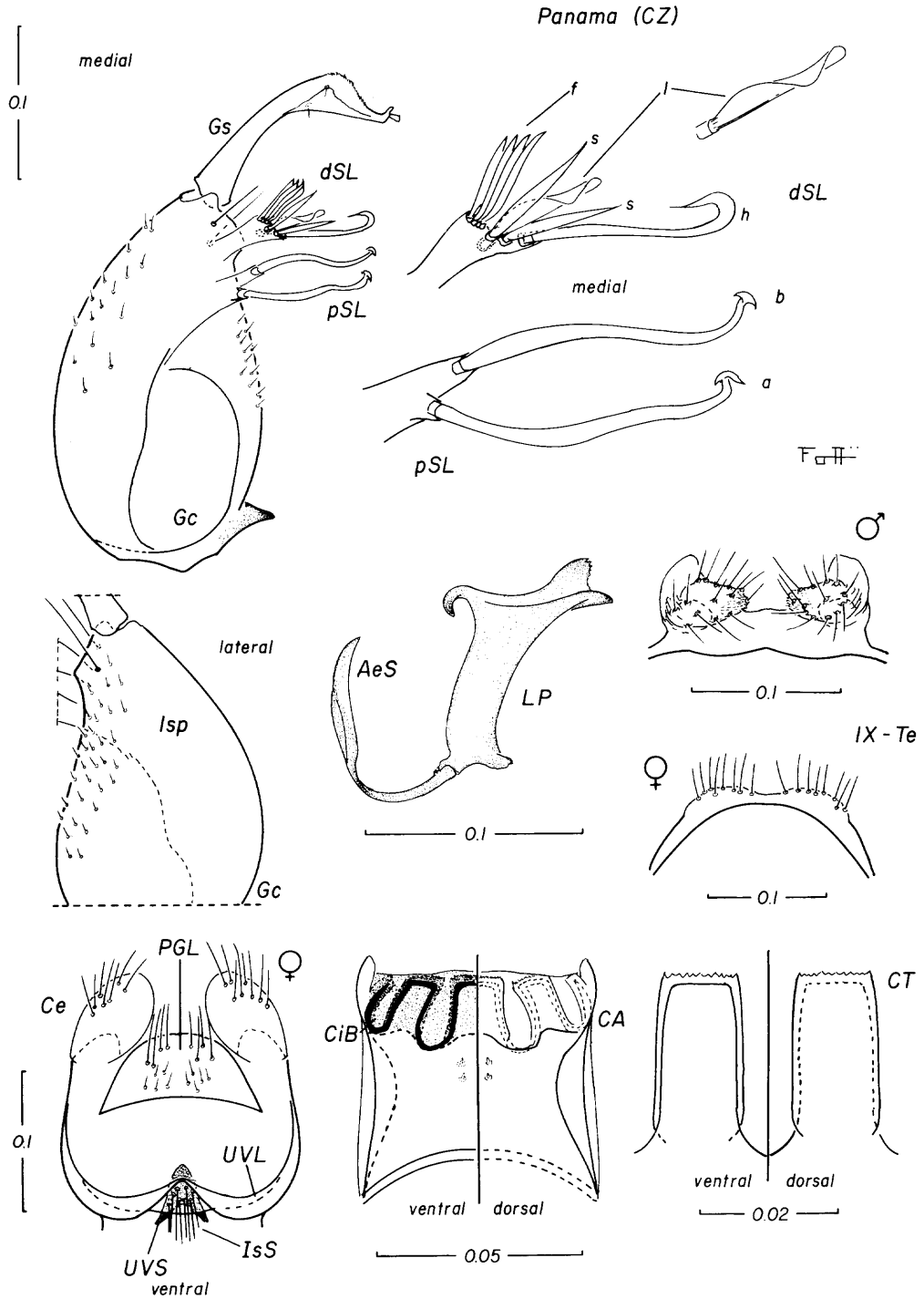

Fig. 1. *Culex (Mel.) educator,* female and male genitalia. a = seta *a* of pSL, AeS = aedeagal sclerite, b = seta *b* of pSL, CA = cibarial armature, Ce = cercus, CiB = cibarial bar, CT = cibarial tooth, dSL = distal division of subapical lobe, f = foliform seta of dSL, Gc = gonocoxite, Gs = gonostylus, h = hooked seta of dSL, IsS = insular seta, l = leaf seta of dSL, LP = lateral plate, lsp = lateral setal patch, PGL = postgenital lobe, pSL = proximal division of subapical lobe, s = saberlike seta of dSL, UVL = upper vaginal lip, UVS = upper vaginal sclerite, IX-Te = tergum IX. Scales in mm.

surface with patch of short sparse setae (lsp) at level of subapical lobe, proximal part of ventrolateral surface with scales; subapical lobe clearly divided, divisions approximated; proximal division with 2 arms, basal arm shorter, each with one long apical sinuous seta (setae *a* and *b*); distal division elongate, with 8 apical setae: a long hooked seta (*h*), a short and a long saberlike seta (*s*), a narrow foliform seta (*l*) and 4 narrow appressed flat setae (*f*). Gonostylus slender, curved and widened distally on lateral side, crest slightly wrinkled, extending on ventral surface before apical snout; gonostylar claw short, broadest apically, leaflike. Phallosome with lateral plates and aedeagal sclerites equivalent in length; aedeagal sclerite slender and curved in lateral view; distal part of lateral plate with apical, ventral, and lateral processes, apical process small, somewhat triangular in outline, apex with small teeth, occasionally indistinct, margin between ventral process and apex of apical process concave, ventral process long and curved laterally, lateral process shorter, nearly pointed and directed dorsolaterally, base of lateral plate with stout dorsal process; aedeagal sclerites not connected by dorsal aedeagal bridge. Proctiger elongate; paraproct narrowed distally, expanded basally, crown with row of about 9 short simple blades. Cercal sclerite long and narrow; 2,3 cercal setae. Tergum X large, somewhat square in outline.

Pupa (Fig. 2). Position and development of setae as figured; range and modal number of branches in Table 1. *Cephalothorax*: Lightly tanned; legs, postscutal area, and metathorax darker. *Trumpet*: Moderately tanned; index 5.28–7.55, mean 6.18; tracheoid area darker, extending almost 0.5 from base; pinna narrow, U-shaped, about 0.3 of trumpet length, lateral margins variable, usually straight and without spicules, sometimes rolled and with conspicuous spicules; atrial wall sometimes with strong spicules; meatus with short slit. *Abdomen*: Lightly tanned; anterior margins of terga darker; length 1.83–2.26 mm, mean 2.03 mm. *Genital lobe*: Lightly tanned in both female and male; length 0.12–0.13 mm, mean 0.12 mm in female, 0.24–0.29 mm, mean 0.27 mm in male. *Paddle*: Lightly tanned, midrib and buttress darker; midrib developed except at apex; buttress strong only at base; margins smooth; length 0.51–0.64 mm, mean 0.58 mm, width 0.33–0.47 mm, mean 0.39 mm, index 1.36–1.67, mean 1.51. Seta 2-P about 0.5 length of 1-P.

Larva (Fig. 3). Position and development of setae as figured; range and modal number of branches in Table 2. *Head*: Wider than long; lightly and unevenly tanned, darker on anterior part of dorsal apotome, posterior surface of lateralia, antennal prominence, and collar. Dorsomentum nearly triangular with a large median tooth and 4,5 smaller ones on each side. Antennal length 0.54–0.63 mm, mean 0.58 mm; antenna lightly pigmented, with dark ring at base. Seta 1-A inserted 0.66–0.71 from base of antenna, with 22–32 aciculate branches; setae 2,3-A apical in position. Antennal puncture distinct. A ventral hyaline gill-like pouch at base of antenna. Setae 2,3-C absent; 5-C with short aciculae apically; 6-C long, sparsely aciculate. *Thorax*: Integument hyaline, covered with spicules. Setae 1-M and 1,13-T well developed, multi-branched, 1-T smaller than 1-M and 13-T. *Abdomen*: Integument hyaline, with minute, inconspicuous spicules on segments I–V, spicules more evident on VI–VIII. Seta 1-I,II weakly developed, with simple branches, 1-III-VII sparsely aciculate, well developed, multibranched. Seta 6-I,II long, double, branches unequally developed, 6-III-VI of nearly equal development, aciculate. Comb with 26–39 scales; scales long, pointed, fringed on sides; scales arranged in 3 irregular rows. *Siphon*: Index 5.77–6.72, mean 6.10; lightly tanned, darker at base and on distal portion of siphon; acus attached, long and slender on anterior side of attachment. Pecten of 13–21 spines, disposed in a row at slightly more than basal third of siphon, ventral edge of spines fringed with numerous close-set denticles. Seta 1-S usually in pairs (of 11 siphons examined, 10 with 7, one with 7.5), 5 posterior pairs and 2 anterior pairs; 3 proximal posterior pairs with length nearly 4.0 width of siphon at point of insertion, and 2 distal pairs nearly 3.0 as

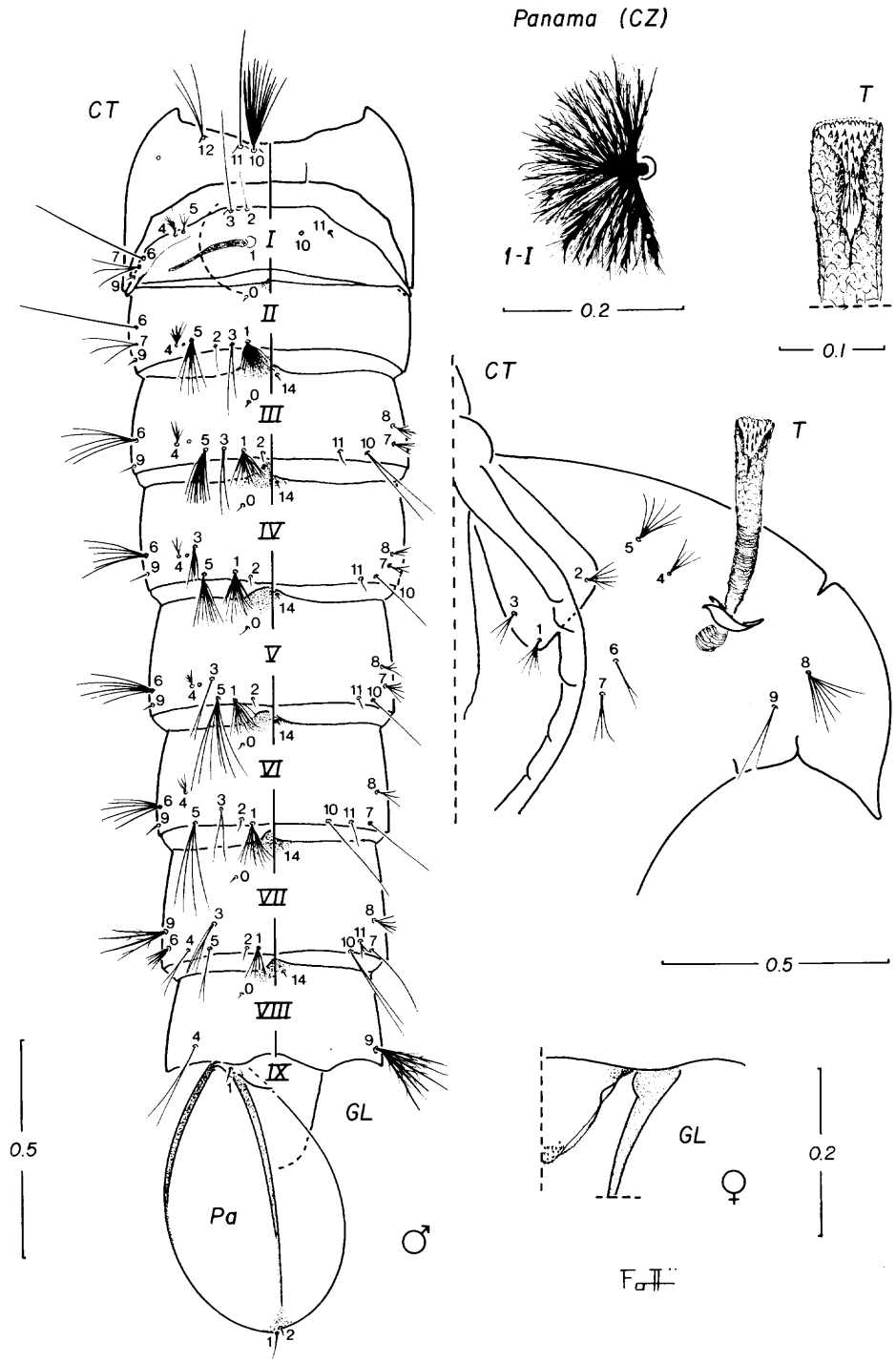

Fig. 2. *Culex (Mel.) educator,* pupa. CT = cephalothorax, GL = genital lobe, Pa = paddle, T = trumpet, I–IX = abdominal segments. Scales in mm.

Table 1. Number of branches for setae of the pupa of *Culex* (*Melanoconion*) *educator*.[1]

Seta no.	Cephalothorax	Abdominal segments									Paddle
	CT	I	II	III	IV	V	VI	VII	VIII	IX	P
0	—	—	1	1	1	1	1	1	1,2(1)	—	—
1	4–6(5)[2]	5–12(10)	16–30[4]	10–20(14)	12–17(12)	11–18(11)	7–12(10)	5–9(6)	—	1	1
2	6,7(6)	1	1–3(1)	1	1	1	1	1	—	—	1
3	3	1,2(1)	2	2	5–6(6)	2–4(2)	2,3(2)	3,4(4)	—	—	—
4	3–5(4)	6–10(6,8)	7,8(7)	4–6(4)	2–4(3)	5–8(6)	3–5(4)	1–3(2)	2,3(2)	—	—
5	4–7(6)	3–5(3)	6–9(6,9)	8–10(10)	8–12(9)	5–9(7)	2–6(4)	1–3(1,2)	—	—	—
6	2,3(2)	1	1	4–6(5)	5–7(6)	5–7(6)	5–9(6)	5–7(6)	—	—	—
7	2–4(3)	2–4(3)	3,4(3)	3–6(4)	2–4(3)	4–6(5)	1	1	—	—	—
8	6–9(8)	—	—	4–6(5)	2–4(3)	2–4(3)	3,4(3)	4–8(5)	—	—	—
9	2,3(2)	1,2(1)	1	1	1	1	1	3–5(4)	5,6(6)	—	—
10	10–19(13)	a[3]	—	2	1,2(1)	1,2(1)	1	1,2(2)	—	—	—
11	1	1,2(1)	—	1	1	1,2(1)	1,2(1)	2,3(3)	—	—	—
12	3,4(3)	—	—	—	—	—	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—	—	—
14	—	—	—	1	1	1	1	1	1	—	—

[1] Based on counts made on 11 specimens from Panama.
[2] Range (mode).
[3] Alveolus (= a) only.
[4] Variable.

long as width of siphon at point of insertion, infrequently the most proximal posterior pair inserted within pecten, 2 anterior pairs shorter than width of siphon at point of insertion; seta 2-S inserted in membrane near base of anterolateral spiracular lobe, curved anteriorly without secondary branch (specimens from Venezuela and north of Brazil have a small curved secondary branch at base of curved side). *Segment X*: Saddle complete, without acus and with conspicuous spicules on lateral areas at posterior end; length 0.26–0.32 mm, mean 0.29 mm, siphon/saddle index 3.08–3.55, mean 3.26. Seta 2-X with one long and 1–3 short branches; 4-X usually with 6 paired setae, rarely with 5 or 7 on one side, 3 anterior pairs frequently with 7 branches (6–9), 3 posterior pairs often with 4 branches (2–6). Anal papillae long, slender, gradually tapering to blunt tip, dorsal pair about 0.78 length of saddle, ventral pair about 1.39 length of saddle.

Diagnosis. *Culex educator* is characterized by the following features. *Male genitalia*: Subapical lobe with a narrow foliform seta (*l*) inserted basad of a long saberlike seta (*s*) (Fig. 1). *Pupa*: Pinna narrow, U-shaped, lateral margin variable, usually straight and smooth, sometimes rolled with conspicuous spicules; atrial wall sometimes with strongly developed spicules (Fig. 2). Trumpet index 5.28–7.55, mean 6.18. *Larva*: Seta 5-C with short aciculae apically; seta 1-I,II weakly developed, with smooth branches, seta 1-I usually with 4 branches (3–8), 1-II normally with 3,4 branches (2–6). Abdominal integument with minute, inconspicuous spicules, more evident on segments VI–VIII. Comb with 26–39 pointed scales, scales arranged in 3 irregular rows. Seta 2-S without a small secondary branch in specimens from Panama.

Material examined. Type material. *Culex educator*: Syntype larvae, larval and pupal exuviae (337a) all in poor condition, with 5 associated females, these in good condition, bearing the following collection data: COSTA RICA, near Puntarenas, Rio Aranjuez, 12 Sept 1905, coll. F. Knab (NMNH). *Culex keenani*: Holotype male with associated genitalia, in poor condition, on a microscope slide, bearing the following collection data: PANAMA, Pacora, 27 May 1959, collected in Shannon Trap. **Other material examined.** 72♂, 27♀, 4♂G, 59Pe, 25Le as follow. BRAZIL, Para, Belem, IPEAN, Escola de Agronomia, 3 Jun 1970, Aitken coll. (BRA 42-42, 43, 45, 46, 58, 72) 1♀, 5♂, 2♂G, 6Pe, 2Le. VENEZUELA, Carabobo, Mariara, about 0.8 km NW of Lago de Valencia, 29 Nov 1967, Hansell, Rauch, Vera M. coll. (VZ 68-30 [2 different preparations with the same collection number] and VZ 68-101) 1♀, 2♂, 1♂G, 3Pe, 2Le; Aragua, Maracay, W of Palo Negro, 11 Dec 1967, Vera M. coll. (VZ 114-103, 107) 1♀, 1♂, 1♂G, 2Pe. PANAMA, Canal Zone, Gamboa, Rio Chagres, "San Antonio," 17 Jan 1963, Quinonez coll. (PA 2-106, 110) 1♀, 1♂, 2Pe, 2Le; Bejuco, Lirio, 31 Aug 1963, Quinonez coll. (PA 542-101, 102) 1♀, 1♂, 2Pe; Darien, Pucro, 27 Feb 1964, Quinonez coll. (PA 631-113) 1♂, 1Pe; Panama City, Juan Diaz, 4 Nov 1965, Quinonez and Schick coll. (750-31) 1♂, 1Pe, 1Le; 5 Nov 1965, Quinonez coll. (PA 753-100) 1♂, 1Pe; 6 Nov 1965, Quinonez and Schick coll. (PA 754-21, 23, 24) 2♀, 2Pe, 3Le; Canal Zone, about 2 km NW of Fort Clayton, Rio Caimitillo "Lake," 19 Nov 1965, Quinonez and Schick coll. (PA 799-21, 22, 23) 3♂, 3Pe, 3Le; Colon, Colon, Cativa, 22 Nov 1965 (PA 805-91) 1♀, 1Pe, 1Le; Canal Zone, 15 km NW of Gamboa on railroad, Frijoles, "Lago Frijolitos," 1 Dec 1965, Quinonez coll. (PA 848-50, 51, 53, 54, 71, 72) 3♀, 3♂, 6Pe, 6Le; Pacora, Natl. Rt. 1 at Rio Pacora, 27 Jun 1972, coll. Arnell (PA 1063-12) 1♀, 1Pe, 1Le; Canal Zone, Balboa, Howard Field, 27 Jun 1972 (PA 1067-13) 1♀, 1Pe, 1Le; Buenos Aires, Rio Chagres, about 3 km N of Juan Mina, 4 Aug 1972, Arnell and Keenan coll. (PA 1161-10) 1♀, 1Pe, 1Le; Canal Zone (CZ 17-107) 1♂, 1Pe; (CZ 111-112) 1♀, 1Pe; (CZ 119-20, 21) 2♂, 2Pe, 2Le; (CZ 126-100–114) 7♀, 8♂, 15Pe; (CZ 127-106, 108, 111, 114) 3♀, 1♂, 4Pe; (CZ 129-108, 110, 111) 2♀, 1♂, 3Pe (NMNH); Tabernilla, A. Busck coll. 2♂ (NMNH), 2♂ (FSP-USP); Cano, 19 Dec 1913, N.H. coll. 1♂; Ancon, 1912, J. Zetek coll. 1♂; Close's Cano Saddle, May 1923, R.C. Shannon coll. 1♂; Porto Bello, Calderal, 5 Apr 1908, Jennings coll. 1♂ (NMNH); Trin-

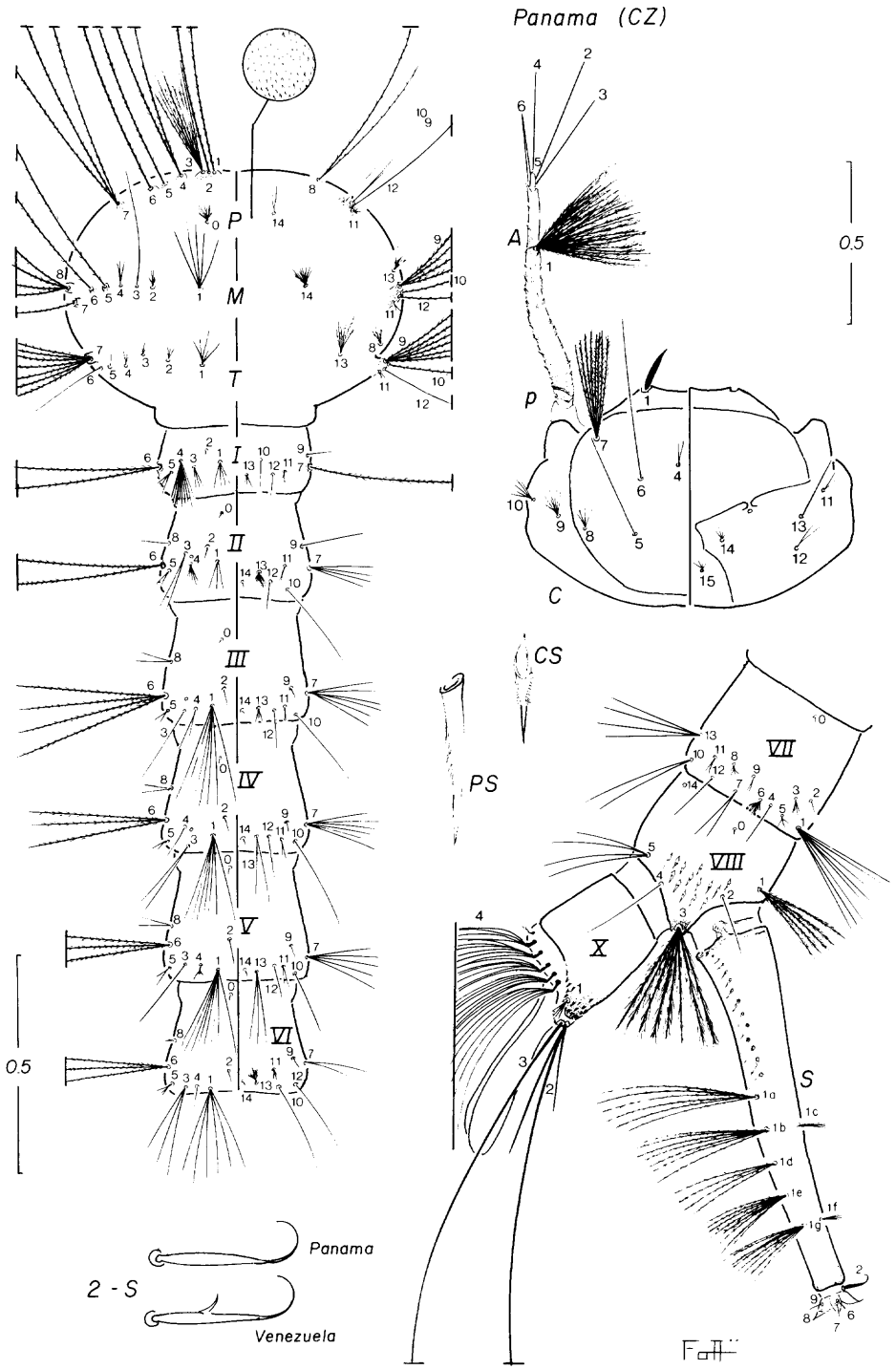

Fig. 3. *Culex (Mel.) educator,* larva. A = antenna, C = cranium, CS = comb scale, M = mesothorax, p = puncture, P = prothorax, PS = pecten spine, S = siphon, T = metathorax, I–X = abdominal segments. Scales in mm.

Table 2. Number of branches for setae of the fourth-instar larva of *Culex* (*Melanoconion*) *educator*.[1]

Seta	Head	Thorax			Abdominal segments								
no.	C	P	M	T	I	II	III	IV	V	VI	VII	VIII	X
0	a[2]	13–22[4]	—	—	—	1	1	1	1	1	1	1	—
1	1	1	3–6(5)	3–6(5)	3–8(4)	2–6(3,4)	5–9(7)	6–10(7,9)	6–8(8)	5–8(5,6)	8–12(8)	5–7(5)	3–5(4)
2	—	1	4–6(5)	3–6(4)	1,2(1)	1	1	1	1	1	1	1	2–4(3)
3	—	4–11(9)	1	4–7(6)	3–6(4)	2	1,2(1)	2,3(2)	1	2,3(3)	2–4(3)	7–9(8)	1
4	1–3(2)[3]	2	3,4(3)	2–4(3)	8–11(9,11)	4–8(5)	1–3(2)	1,2(1)	5–7(5)	1	1	1	2–9(7)
5	1,2(1)	1	1	1	2–4(3)	1,2(2)	1–3(2)	2,3(2)	2,3(2)	2,3(3)	2–4(3)	3–5(4)	—
6	1	1	1	1	2	2	4,5(4)	3,4(3)	2–4(3)	3,4(3)	7–14(10,11)	1a-S,	4–8(6)
7	8–14(9)	2,3(3)	1	6–8(7)	1	3–6(4)	5–9(6,8)	5–8(6)	5–7(5)	2,3(2)	1,2(2)	1b-S,	4–9(7)
8	4–6(4)	2,3(2)	4,5(5)	7–12(10,12)	—	1,2(1)	2	2	2,3(2)	2,3(2)	4–6(4)	1c-S,	3–5(4)
9	5–7(7)	1–3(2)	4,5(4)	5–7(6)	1,2(1)	1	1	1	1	1	2,3(2)	1d-S,	6–10(8)
10	4–6(5)	1	1	1	1	1	1	1	1	1	2	1e-S,	6–9(8)
11	2,3(2)	5–7[4]	2,3(2)	2–4(2)	3–5(3)	2,3(2)	2,3(2)	2,3(2)	2,3(2)	2,3(3)	2,3(2)	1f-S,	6–9(7)
												1g-S,	3,4(4)
12	2–4(2)	1	1	1	1–3(2)	1,2(1)	1–3(2)	1,2(1)	1	1	1	1h-S,	7
13	2	—	19,20	5–9(6)	2–4(3)	13–21[4]	2,3(3)	2,3(2)	2–4(3)	29–37(29,33)	4	2-S,	1
14	2–5(4)	2,3(2)	9–17(13)	—	—	1	1	1	1	1	—	1	—
15	3–5(4)	—	—	—	—	—	—	—	—	—	—	—	—

[1] Based on counts made on 11 specimens from Panama.
[2] Alveolus (= a) only.
[3] Range (mode).
[4] Variable.

idad Rv., 3 Jun 1912, A. Busck coll. 3♂ (NMNH), 4♂ (FSP-USP); 4 Jun 1912, 1♂; 9 Jun 1912, 2♂ (NMNH); Miraflores, Nov 1913, E. Martini coll. 1♂ (NMNH), 2♂ (FSP-USP); Matachin, 16 Nov 1908, Jennings coll. 11♂ (NMNH), 8♂ (FSP-USP).

Distribution. According to literature records, the distribution of *Cx. educator* extends from Mexico to Argentina. Since *Cx. vaxus* has been considered a synonym of *Cx. educator* since Dyar (1923) and because these two species are distinguished and defined for the first time in this paper, it seems likely that there are many misidentifications of them in the literature and in museums. Therefore, we can only consider with certainty that *Cx. educator* is present at locations from which we have examined specimens. The species is apparently absent from the south of South America. Its distribution in the north of South America likely includes *Cx. vaxus*.

Bionomics. Immature stages of *Cx. educator* have been collected in the following types of habitats: artificial ponds and small ground pools in a domestic area, marshy canal, small ground pools in a dry stream bed in a cultivated area, swamp margin in partial forest, small ground pools in secondary growth, small ground pools along a water course, swamp interior, lakes, lake margins, lake margins in forest, ponds in grazing areas, margin of a swampy area at the edge of a river in a grazing area. They were taken in full sun, partial or deep shade in stagnant or slow-moving water. The water is clear or turbid, permanent, semipermanent, or temporary. Some breeding places have no vegetation; others have very little or abundant algae, and grassy, herbaceous, floating (*Pistia, Eichhornia, Lemna*), and submerged (*Elodea*) vegetation.

Culex (*Melanoconion*) *vaxus* Dyar

1920. *Culex* (*Choeroporpa*) *vaxus* Dyar, 1920: 73 (♂, L). Lectotype ♂: Surinam (NMNH). Dyar 1923:179 (syn. with *educator*); Stone and Knight 1957:58 (lectotype desig.); Belkin, Schick and Heinemann 1965:64 (type info.). **RESURRECTED FROM SYNONYMY.**

1920. *Culex* (*Choeroporpa*) *bibulus* Dyar, 1920:74 (♂, L). Holotype ♂: Surinam (NMNH). Dyar 1928:328; Komp 1935:7 (syn. with *educator*); Belkin, Schick and Heinemann 1965:64 (type info.). **TRANSFERRED SYNONYMY.**

Culex (*Choeroporpa*) *educator* of Root 1927: 586; Lane 1953:467 (in part); Duret 1953: 70; Duret 1954:112.

Culex (*Melanoconion*) *theobaldi* of Rozeboom and Komp 1950:97; Duret 1953:70; Duret 1954:103; Duret 1969:8.

A small species closely resembling *Cx. educator,* but differing in features of the adults, male genitalia, larva, and pupa.

Female. *Head*: Antenna dark, length about 1.81 mm; flagellum normal, whorls normally with 6 setae. Proboscis entirely dark-scaled; length 1.44–1.68 mm, mean 1.55 mm. Maxillary palpus entirely dark-scaled, usually with 4 palpomeres, occasionally 5, the 5th variously developed, length 0.26–0.34 mm, mean 0.29 mm, about 0.19 of proboscis length. Vertex (Fig. 4D,E) with broad spatulate scales, these variable in color from yellowish to dark, dingy white laterally; forked scales variable from yellowish to dark brown; occipital region with some white falcate scales. *Cibarium* (Figs. 4A,B; 5): In general as in *Cx. educator,* with the following primary differences. Length about 185 μm. Cibarial bar with 8–10 teeth (Figs. 4A, 5); tooth length about 19 μm. *Thorax*: Integument light brown to black. Scutum with very fine falcate scales, these variable in color as follows: some specimens with dark brown scales with reddish-brown reflections on acrostichal area (AA), scutal fossa (SF), and supraalar area (SaA), background scales golden; or background scales dark brown with reddish-brown reflections and some golden scales on prescutellar area (PrA); or background scales light brown with golden reflections and some golden scales on lateral region of SF, posteriorly on dorsocentral area (DA) and laterally on PrA; or golden scales posteriorly on DA, laterally on PrA and SaA, or golden scales on anterior promontory (AnP),

and laterally on PrA; or all scutal scales dark brown with coppery reflections. Scutal setae prominent, dark brown with golden or reddish reflections or golden brown; median anterior promontory setae, anterior scutal fossal setae and antealar setae dark brown with reddish reflections or golden brown or golden; acrostichal setae absent. Scutellar scales same as scutal scales, golden or occasionally dark brown; lateral lobes each with 4 large setae, median lobe with 6–8 large setae. Antepronotum without scales, with scattered dark or dark and golden setae. Postpronotum with narrow scales, mostly dark brown with reddish sheen, occasionally with small number of golden scales ventrally or totally golden, with 4–6 dark or golden setae on posterodorsal margin. Pleural setae (Fig. 4C) golden brown to golden yellow: about 6–11 upper proepisternal, 6–11 prealar, 6–9 upper mesokatepisternal, 8–12 lower mesokatepisternal, 5–11 upper mesepimeral, and 1,2 lower mesepimeral. Pleura with scales on mesokatepisternum (Fig. 4C), a patch of whitish spatulate scales on upper corner and on lower posterior border, occasionally with small number of nearly colorless spatulate upper mesepimeral scales. *Wing*: Length 2.54–3.07 mm, mean 2.78 mm; cell R_2 3.51–5.91 of vein R_{2+3}, mean 4.59; cell M_2 0.81 of cell R_2; subcosta intersects costa beyond furcation of R_{2+3}. Dorsal scaling (Fig. 4F): appressed spatulate scales on costa, subcosta, R, R_1, R_{4+5}, distal 0.8 of M_{1+2}, M_{3+4}, Cu, Cu_1, Cu_2, and proximal 0.5 of 1A; linear plume scales on R_s, R_{2+3}, base of R_3, proximally on M_{1+2}, and distal 0.5 of 1A; inclined narrow spatulate scales on R_2 and R_3; remigium with appressed spatulate scales and 1–4 distal setae. Ventral scaling (Fig. 4G): appressed spatulate scales on costa, subcosta, R_s, R_{2+3}, nearly proximal 0.3 of R_2, proximal 0.5 of R_3, on M, and on proximal 0.3 of M_{1+2}; linear plume scales on proximal 0.5 of R_1, proximal 0.5 of R_{4+5}, Cu_1, Cu_2, and on middle of 1A; inclined narrow spatulate scales on distal 0.5 of R_1, distal 0.7 of R_2, distal 0.5 of R_3, distal 0.5 of R_{4+5}, distal 0.7 of M_{1+2}, M_{3+4}, and distally on 1A; Cu and proximal 0.4 of 1A devoid of scales. *Halter*: Scabellum and ventral portion of pedicel pale; capitellum and dorsal portion of pedicel dark. *Legs*: As in *Cx. educator*. *Abdomen*: In general as in *Cx. educator,* with the following differences. Tergum II dark-scaled with basolateral pale patches, or with median anterior patch of dark scales, or with basal pale band; tergum III dark-scaled with basolateral patch of pale scales, or with basal pale band; terga IV–VII dark-scaled with basolateral patches of pale scales, or with median anterior patches of pale scales, or with basal pale bands. Sternum II with basal pale band, occasionally with some pale basal and dark apical scales laterally; sterna III–VII with broad basal pale bands, bands usually constricted in middle. *Genitalia* (Fig. 5): In general as in *Cx. educator,* with the following differences. Tergum IX lobes bearing 4–11 setae; about 9–14 insular setae. Postgenital lobe with 5–11 setae on either side of midline.

Male. Like female except for sexual differences as follows. *Head*: Antenna strongly verticillate, length about 1.76 mm. Proboscis entirely dark. Maxillary palpus dark, length about 2.50 mm, extending beyond tip of proboscis by length of about apical 0.5 of palpomere 4 and palpomere 5; palpomeres 4 and 5 densely setose; palpomere 3 with 5,6 strong setae at apex. *Abdomen*: Tergum II with basolateral and median anterior white patches or with basal white band or with a few white scales on basolateral areas or entirely dark-scaled; terga III–VII with basal white bands or dark-scaled with basolateral white patches; tergum VIII (ventral) with basolateral white patches and a deep V-shaped median posterior emargination. Sterna with basal white bands, often incomplete on anterior sterna; sternum VIII (dorsal) with basal white bands or with basolateral white patches. *Genitalia* (Fig. 5): In general, as in *Cx. educator,* with the following primary differences. Tergum IX lobes as figured. Distal division elongate, with 8 apical setae: a long hooked seta (*h*), a short and a long saberlike seta (*s*), a wide asymmetrical foliform seta (*l*), and 4 narrow appressed flat setae slightly different in length (*f*).

Pupa (Fig. 6). General chaetotaxy as fig-

Fig. 4. *Culex* (*Mel.*) *vaxus*, female. A,B, Dorsal aspects of cibarial armature; C, lateral aspect of thorax showing presence of upper mesokatepisternal scales; D,E, dorsal scaling of head; F, dorsal scaling on distal portion of right wing; G, ventral scaling on distal portion of right wing.

ured; range and modal number of branches presented in Table 3. In general as in *Cx. educator,* but with the following differences. *Cephalothorax*: Moderately to heavily tanned. *Trumpet*: Moderately to heavily tanned; index 5.03–8.52, mean 6.08; tracheoid area slightly darkened, extending about 0.5 from base; pinna narrow, U-shaped, about 0.24 of trumpet length, lateral margins straight and smooth, or rolled with conspicuous spicules. Atrial wall without strong spicules. *Abdomen*: Lightly to heavily tanned; length 1.82–

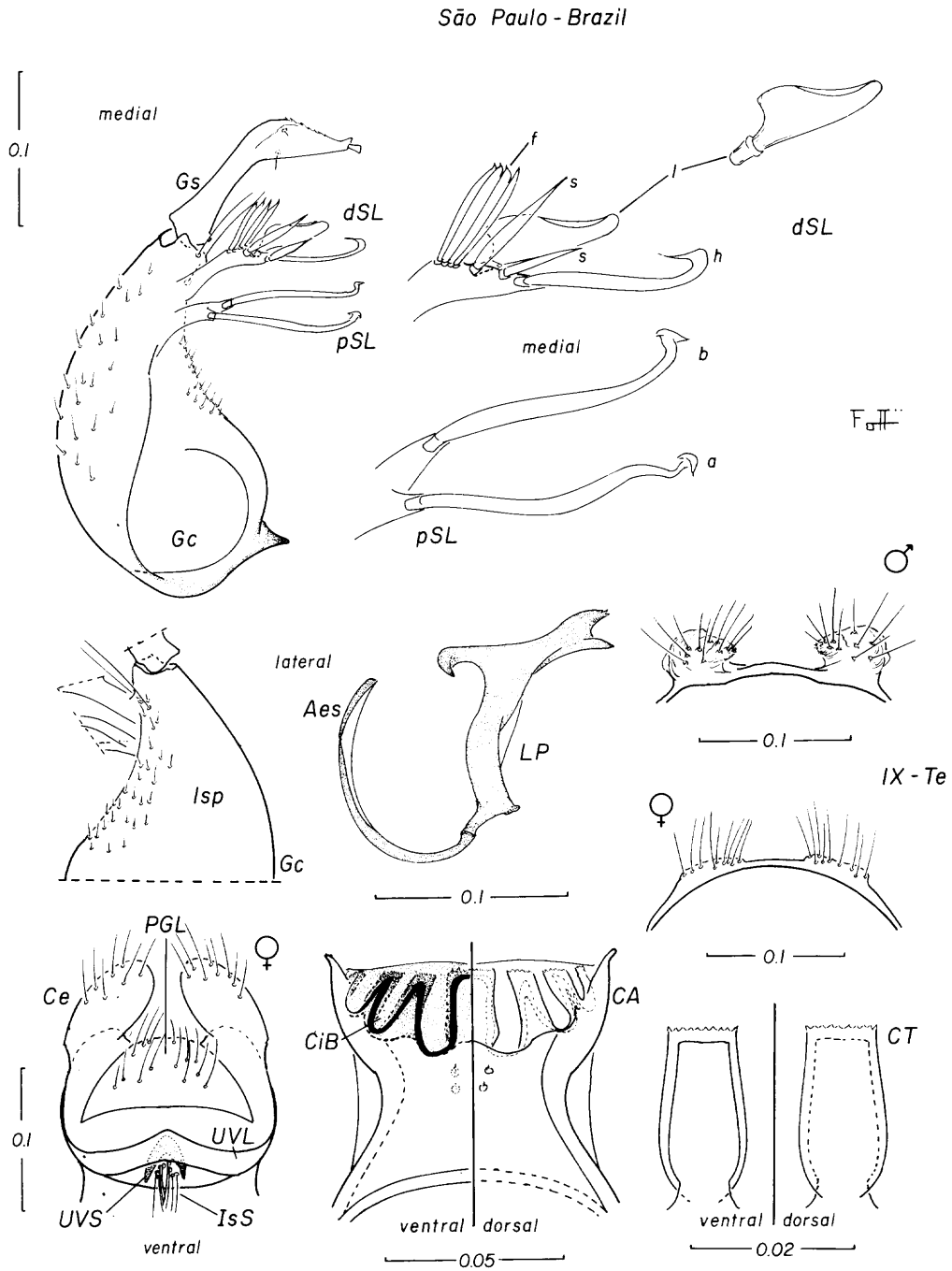

Fig. 5. *Culex* (*Mel.*) *vaxus*, female and male genitalia. Abbreviations same as in Fig. 1. Scales in mm.

2.59 mm, mean 2.25 mm. *Genital lobe*: Lightly tanned in female, darker in male; length 0.12–0.17 mm, mean 0.14 mm in female, 0.29–0.32 mm, mean 0.31 mm in male. *Paddle*: Lightly tanned, midrib and buttress darker; midrib strong except at apex; buttress strong only at base; margins smooth; length 0.56–0.76 mm, mean 0.66 mm, width 0.39–

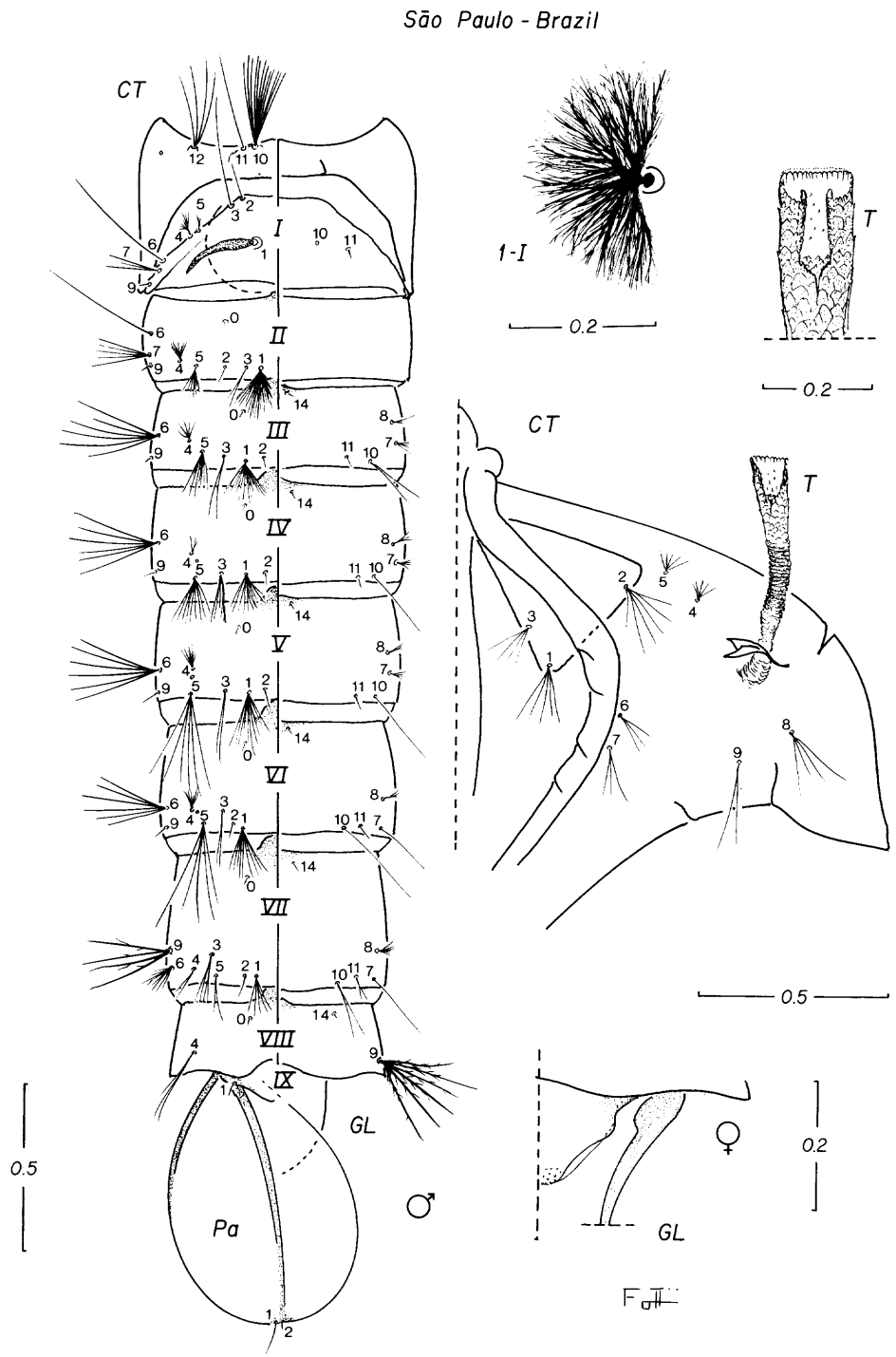

Fig. 6. *Culex* (*Mel.*) *vaxus*, pupa. Abbreviations same as in Fig. 2. Scales in mm.

Table 3. Number of branches for setae of the pupa of *Culex* (*Melanoconion*) *vaxus*.[1]

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	4–7(5)[2]	6–11(10)	9–33(29)	13–24(16)	10–16(11)	9–14(11,12)	7–11(9)	4–7(5)	—	1	1,2(1)
2	5–8(6)	1	1	1	1	1	1	1	—	—	1,2(1)
3	3,4(4)	1	2,3(2)	2	4–8(6)	2,3(2)	2–4(2)	3–5(4)	—	—	—
4	3–6(5)	7–11(8)	5–8(8)	3–6(5)	2–4(3)	5–10(7)	3–6(4)	2,3(2)	2,3(3)	—	—
5	3–6(5)	2–4(3)	5–8(6)	7–11(9)	6–10(9)	5–8(6)	3–6(5)	1–3(1,2)	—	—	—
6	2–4(3)	1	1,2(1)	5–8(5)	5–7(6)	4–7(6)	4–6(6)	5–10(9)	—	—	—
7	2,3(3)	2–4(3)	3–5(4)	4–6(5)	3–6(4)	3–7(5)	1	1	—	—	—
8	3–7(5)	—	—	3–6(4)	2–4(3)	2–4(3)	2–4(3,4)	4–8(6)	—	—	—
9	1–3(2,3)	1,2(1)	1	1	1	1	1	3–6(4)	3–7(6)	—	—
10	8–16(13)	a[3]	—	2	1,2(1)	1,2(1)	1	1–3(2)	—	—	—
11	1	1,2(1)	—	1,2(1)	1,2(1)	1,2(1)	1,2(1)	2,3(2)	—	—	—
12	2–5(4)	—	—	—	—	—	—	—	—	—	—
13	—	—	—	—	—	—	—	—	—	—	—
14	—	—	—	1	1	1	1	1	1	—	—

[1] Based on counts made on 10 specimens.
[2] Range (mode).
[3] Alveolus (= a) only.

0.49 mm, mean 0.45 mm, index 1.31–1.64, mean 1.44. Seta 1-P single, occasionally bifid; 2-P single, rarely double, shorter than 1-P.

Larva (Fig. 7). General chaetotaxy as figured; range and modal number of branches presented in Table 4. In general as in *Cx. educator* but with the following differences. Lightly to heavily but unevenly tanned; darker on antennal prominence, posterior part of lateralia, sometimes becoming small spots, anterior part of dorsal apotome except for 2 lighter spots on anterior part on either side of median line and collar. Antennal length 0.54–0.66 mm, mean 0.59 mm; antenna lightly tanned, with dark ring at base and at level of seta 1-A. Seta 1-A inserted 0.65–0.70 from base of antenna, with 23–35 aciculate branches. *Thorax*: Integument hyaline, covered with conspicuous spicules. *Abdomen*: Integument hyaline, with conspicuous spicules, spicules more evident on posterior segments. Seta 1-I,II well developed, usually with 7 sparsely aciculate branches, 1-III-VII sparsely aciculate, well developed, multibranched. Seta 6-I,II long, most often double, rarely triple. Comb with 11–29 scales; scales long, pointed, fringed on sides; scales arranged in roughly 2, sometimes 3 irregular rows. *Siphon*: Index 4.48–6.45, mean 5.37; moderately to heavily tanned, darker at base, on distal portion and sometimes with darkened ring near middle. Pecten of 15–22 spines, spines disposed in a row at basal 0.4 of siphon. Seta 1-S usually in 7 pairs (of 10 siphons examined, one with 8.5, 8 with 7, and one with 6.5), 5 posterior pairs and 2 anterior; 2 proximal posterior pairs with length nearly 5.0 width of siphon at point of insertion, 2 median about 4.0 and distal 3.0; 2 anterior pairs with length less than width of siphon at point of insertion; seta 2-S inserted in membrane near base of anterolateral spiracular lobe, anteriorly curved with slender curved secondary branch at base of curved side. *Segment X*: Saddle with distinct spicules on dorsal and lateral areas at posterior end, spicules dorsal to seta 1-X stouter; length 0.30–0.37 mm, mean 0.34 mm, siphon/saddle index 2.77–3.28, mean 2.94. Seta 1-X frequently with 4 branches (3–5). Seta 4-X with 6 paired setae, 3 anterior pairs usually with 8 branches, 3 posterior pairs frequently with 4,5 branches (3–8). Anal papillae long, slender, dorsal pair nearly 0.7 times length of saddle, ventral pair as long as saddle.

Diagnosis. *Culex vaxus* is characterized by the following features. *Adult*: Scutal scales variable from totally dark brown to golden and mixed with other dark brown scales, dispersed in different patterns of golden and dark brown scales. *Male genitalia*: Subapical lobe with a wide asymmetrical foliform seta (*l*) inserted at same level as long saberlike seta (*s*) (Fig. 5). *Pupa*: Pinna narrow, U-shaped, lateral margins usually straight and smooth, sometimes rolled with well developed spicules. Atrial wall without strong spicules (Fig. 6). Trumpet index 5.03–8.32, mean 6.08. *Larva*: Seta 5-C with aciculate branches; seta 1-I,II well developed, usually with 7 aciculate branches. Abdominal integument with conspicuous spicules. Comb with 11–29 pointed scales arranged in 2,3 irregular rows. Seta 2-S always with a small, curved secondary branch.

Material examined. Type material. *Culex vaxus*: Lectotype male (no. 22743) with genitalia poorly mounted on microscope slide (no. 64797). Adult in good condition, bearing the following collection data: Surinam, S. Amer. (BB II 671), Mrs. J. Bonne-Wepster coll. (NMNH). Paralectotypes: 2 males in good condition bearing the same lectotype collection data (no. 22743) (NMNH). *Culex bibulus*: Holotype male (no. 22744) with associated genitalia and larval exuviae both poorly mounted on microscope slides. Adult in good condition, bearing the following collection data: Surinam, S. Amer. (BB 713), Mrs. J. Bonne-Wepster coll. (NMNH). **Other material examined.** 161♂, 133♀, 73♂G, 232Pe, 167Le, 4 4th-instar larvae as follow. Misidentified as *Cx. spissipes*: BRAZIL, São Paulo, Juquiá, Dec 1938, J. Lane coll., J. Lane det. 1946, 1950, 4♂, 4♂G (FSP-USP no. 5972–5975); as *Cx. educator*: Mar 1936, J. Lane coll., Komp det. 1937, 1♂, 1♂G (FSP-USP no. 6087); Amazonas, Maués, Jan, Feb 1937, C. Worontzow coll., J. Lane det. 1946, 6♂, 6♂G (FSP-USP no. 6129–6140); Bahia, Miragagipe, May 1937, SFA coll. 1♂, 1♂G (FSP-USP

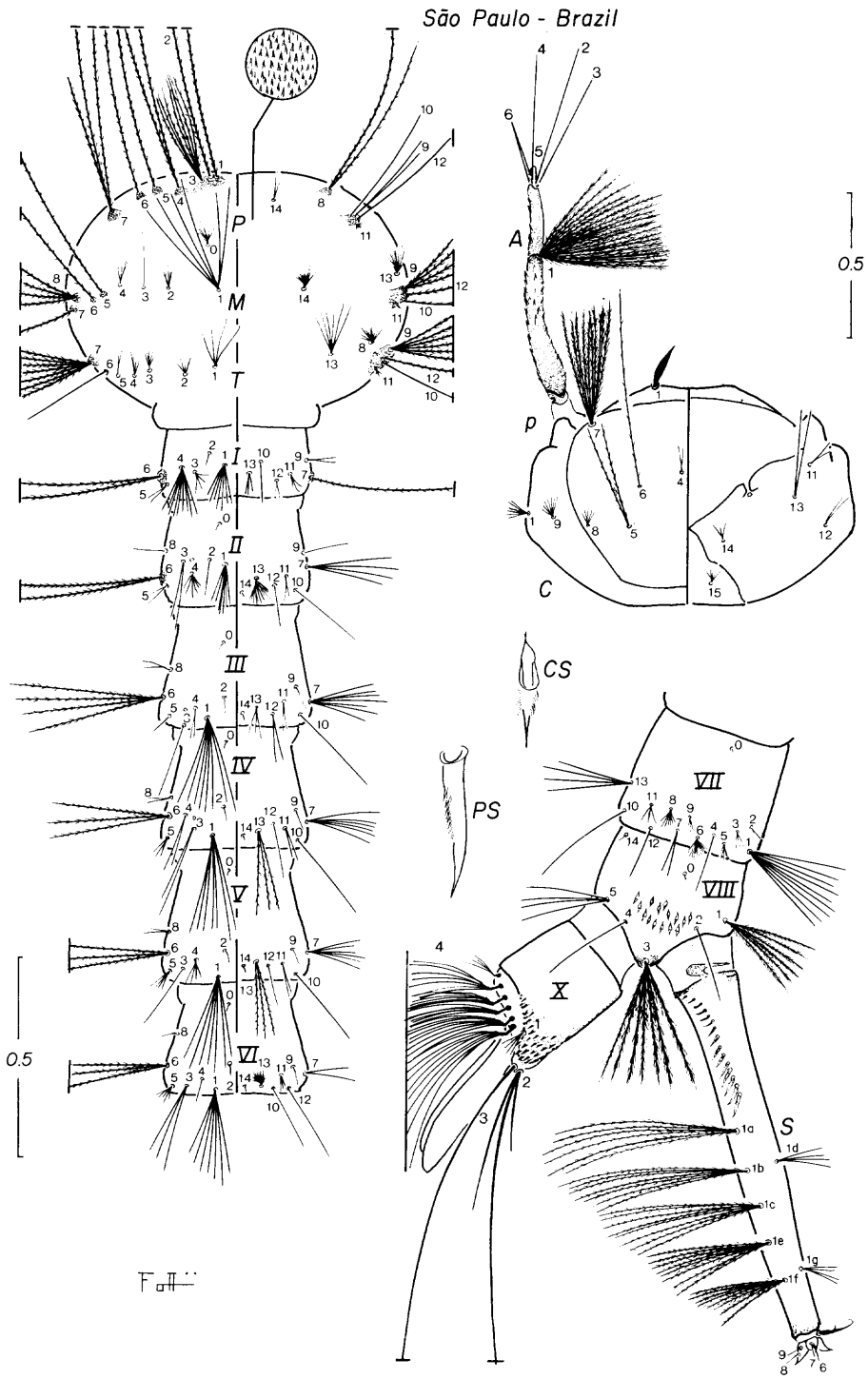

Fig. 7. *Culex* (*Mel.*) *vaxus*, larva. Abbreviations same as in Fig. 3. Scales in mm.

Table 4. Number of branches for setae of the fourth-instar larva of *Culex* (*Melanoconion*) *vaxus*.[1]

Seta	Head	Thorax			Abdominal segments								
no.	C	P	M	T	I	II	III	IV	V	VI	VII	VIII	X
0	a[2]	16–23(16,19)	—	—	—	1	1	1	1	1	1	1	—
1	1	1	5,6(6)	3–6(5)	5–10(7)	5–9(7)	6–11(8)	6–9(7,8)	6–9(7)	6–10(7)	8–10(9)	5–7(5,6)	3–5(4)
2	—	1	5–8(5)	3–5(4)	1,2(1)	1,2(1)	1	1	1	1	1	1	2–4(3)
3	—	6–12(8)	1	4–6(5)	3–6(4)	1–3(2)	1,2(1)	1,2(2)	1	2–4(3)	3,4(3)	6–10(7)	1
4	1–3(2)[3]	2,3(2)	3–5(4)	3–5(4)	7–12(9)	5–9(6)	1–3(2)	1,2(1,2)	4–8(5)	1,2(1)	1	1	3–9(8)
5	2,3(2)	1,2(1)	1	1,2(2)	3–6(4)	1,2(1)	2–4(3)	2–4(3)	2–5(4)	2–5(4)	2–6(5)	3–5(4)	—
6	1	1	1	1	2,3(2)	2,3(2)	3–5(4)	3,4(3)	3,4(3)	3,4(3)	9–24(13)	1a-S,	5–8(6)
7	8–12(10)	2–4(3)	1	6–9(7)	1	2–5(4)	4–9(6)	5–8(6)	4–10(6)	2,3(2)	1,2(2)	1b-S,	5–9(7)
8	4–7(5)	1–3(2)	4–8(5)	11–21(11,19)	—	1,2(1)	2,3(2)	2,3(2)	2,3(2)	2–4(3)	5–9(7)	1c-S,	6–9(8)
9	6–12(7)	2,3(2)	4,5(4)	5–7(6)	1–3(2)	1	1	1	1	1	2–4(3)	1d-S,	2–5(4)
10	5–9(6)	1	1	1	1	1	1	1	1	1	1,2(1)	1e-S,	6–9(7,8)
11	2,3(2)	6–8(8)	2,3(3)	2–5(4)	3,4(3)	2	2	2,3(2)	1,2(2)	2,3(3)	2,3(3)	1f-S,	6–10(8)
12	2,3(2)	1	1	1	2,3(2)	1,2(1)	1,2(2)	1,2(1)	1	1	1	1g-S,	3–5(4)
13	2,3(2)	—	21–42[4]	6–8(7)	2–5(3)	13–26(20)	2–4(3)	2,3(3)	3,4(3)	25–43(37)	3–5(4)	2-S,	2
14	2–5(3)	2,3(2)	18–25[4]	—	—	1	1	1	1	1	—	1	—
15	4–6(5)	—	—	—	—	—	—	—	—	—	—	—	—

[1] Based on counts made on 10 specimens.
[2] Alveolus (= a) only.
[3] Range (mode).
[4] Variable.

no. 7848). FRENCH GUIANA, Guyane, Cayenne, foret de Cabassou, 17 Jan 1968, J. Clastrier coll. (FGC 3300-14) 1♂, 1♂G (NMNH); Rondônia, Ariquemes, Vila Marechal Rondon, Chácara Luiza, 5 May 1988, Castro and Oliveira coll. 4♂, 4♂G, 2♀; Luz coll. 2♀, 1♂, 1♂G, 2Pe, 2Le; Mato Grosso do Sul, Corumbá, Gruta da Lagoa do Flamengo, 26 May 1986, Galati coll. 4♂, 4♂G; São Paulo, Dourado, Rio Jacaré-Pipira, 15 Apr 1980, Rabello coll. 1♂, 1♂G; 6, 20 May 1980, 5♂, 5♂G; 10, 17 Jun 1980, 6♂, 6♂G; 8 Jul 1980, 1♂, 1♂G; 7 Jan 1981, 1♂, 1♂G; 3, 17 Feb 1981, 3♂, 3♂G; 24 Mar 1981, 4♂, 4♂G; 28 Apr 1981, 1♂, 1♂G; 30 Aug 1982, 1♂, 1♂G; São João da Boa Vista, Fazenda Santa Helena, 16, 17 Nov 1981, 1♂, 1♂G; 20, 21 Oct 1982, 1♂, 1♂G; Iguape, Santa Barbara, Rio Pequeno, 30 Jan 1989, Peyton and Wilkerson coll. (BR17) 1♂, 1Pe, 1Le; Iguape, 31 Jan 1989 (BR19) 1♂, 1Pe, 1Le; Rio Ribeira, 10 km from Iguape (BR25) 43♀, 32♂, 75Pe, 54Le, one 4th-instar larva; Ilha Comprida, 3 Feb 1989 (BR33) 1♀, 4♂, 5Pe, 5Le; (BR34) 7♀, 2♂, 9Pe, 7Le; (BR35) 2♀, 3♂, 5Pe, 3Le; (BR37) 24♀, 15♂, 38Pe, 23Le; (BR38) 17♀, 20♂, 37Pe, 26Le; Icapara, 4 Feb 1989 (BR40) 1♀, 3♂, 4Pe, 1Le, 3 4th-instar larvae; 6 km N from Iguape, 6 Feb 1989 (BR42) 1♀, 1Pe; Rio Ribeira, 3 Mar 1989 (BR157) 3♂, 3Pe, 2Le; Pariquera-Açú, Fazenda Experimental, Rio Jacupiranga, marginal lake, Feb 1980, Rabello coll. 1♂, 1♂G, 1Pe, 1Le; 16 Sep 1983, Natal coll. 3♀, 2♂, 2♂G, 5Pe, 4Le; 25 Jul 1984, 2♀, 8♂, 8♂G, 10Pe, 9Le; 12 Sep 1984, 7♀, 1♂, 1♂G, 8Pe, 8Le; rice field ditch, 24 Jul 1985, 4♀, 2♂, 2♂G, 6Pe, 4Le; Registro to Pariquera-Açú Road, 3 Aug 1984, 1♀, 1♂G, 2Pe, 2Le; Pariquera-Mirim, 5 Oct 1983, 1♀, 2♂, 2♂G, 3Pe, 2Le; 1 Dec 1983, 4♀, 4Pe, 4Le; 23 Jul 1984, 2♂, 2♂G, 2Pe, 2Le; 24 Jul 1984, 1♂, 1♂G, 1Pe, 1Le; 28 May 1985, 2♂, 2♂G, 2Pe, 2Le; Cananéia, Itapitangui, Fazenda Folha Larga, 20 Sep 1983, 1♂, 1♂G, 1Pe, 1Le; 9 Nov 1983, 1♀, 1Pe; 10 Apr 1984, 2♂, 2♂G, 2Pe, 1Le; 11 Apr 1984, 2♀, 2Pe; Fonte Station, 17 Oct 1985, 1♂, 1♂G, 1Pe, 1Le. Adults on microslides: Pariquera-Açú, Fazenda Experimental, 8 Nov 1979, Rabello coll. 1♀; 17, 24 Jan 1980, 3♀; 3 Mar 1980, 1♀; 10 Apr 1980, 2♀; 11 Dec 1980; 1♀; Avenida São Paulo, 12 Dec 1979, 1♂; Cananéia, Sítio Taquari, 25 Mar 1980, 1♂; Dourado, Rio Jacaré-Pipira, 10, 24 Mar 1981, 3♂.

Distribution. *Culex vaxus* is recorded from Surinam to Argentina. Until now, this species has been misidentified as *Cx. educator* and *Cx. theobaldi,* and we can only state with certainty that it is present at locations from which we have examined specimens, or through the examination of accurate male genitalia drawings and descriptions. The species is apparently absent from Central America. Its distribution in South America may include other regions besides those from which we have examined specimens.

Bionomics. Immature stages of *Cx. vaxus* were collected from a wide variety of habitats. They were taken in heavy or partial shade or in full sun in the following habitats: stream margins, a marsh, a marshy depression, flood pools, ruts, borrow pits, lake margins, and rice field ditches. The water was turbid or colored, always fresh, stagnant or with a slow current. The sites were permanent, semipermanent, or temporary, without aquatic vegetation or with scarce or abundant emergent (aquatic grasses), submerged, and floating (*Pistia*) vegetation and green algae.

DISCUSSION

Culex educator was described by Dyar and Knab in 1906. Later, Howard, Dyar and Knab (1913) described *Cx. apeteticus,* which was synonymized with *Cx. educator* by Dyar (1918). Subsequently, Dyar (1920) described *Cx. vaxus,* which he considered to be "closely allied in both genitalia and larva to *educator.*" In the same paper Dyar described *Cx. bibulus. Culex vaxus* was considered a synonym of *Cx. educator* by Dyar (1923) and a synonym of *Cx. bibulus* by Komp (1935). In 1922, Dyar and Ludlow described *Cx. aneles* and distinguished it from *Cx. educator* by the presence of a "small and obliquely ribbed leaf on the outer division of the subapical lobe of gonocoxite." This leaf was considered "absent" in *Cx. educator.* Dyar (1928) included *Cx. aneles* in the synonymy of *Cx. educator.*

Culex theobaldi (Lutz) was considered a

species distinguishable from *Cx. educator* only by the coloration of the scutal scales, golden on the anterior half of the scutum in *Cx. theobaldi* and entirely dark in *Cx. educator* (Rozeboom and Komp 1950). However, Forattini and Sallum (1989) examined the type material of *Cx. theobaldi,* recognized two different species in this material, and considered *Cx. chrysonotum* Dyar and Knab to be conspecific with *Cx. theobaldi.* This established the correct application and usage of the name *theobaldi.* Examination of the type material of *Cx. educator, Cx. bibulus, Cx. vaxus,* and *Cx. keenani* provided criteria for the correct taxonomic interpretation and recognition of these species. As a result, one of them was recognized as *Cx. vaxus* (= *Cx. bibulus*), here resurrected from synonymy with *Cx. educator,* and the other "*theobaldi*" species was recognized as a new species which was named *Cx. eknomios* by Forattini and Sallum (1992). As the examination proceeded and close attention was given to characters of the subapical lobe of the gonocoxite, lateral plate, and ninth tergal lobes, it became obvious that the characteristic features of *Cx. keenani* noted by Galindo and Mendez (1961) were artifacts caused by the dissection and mounting of the genitalia of the holotype male. The shape and the insertion point of the foliform seta (*l*) of the outer division of the subapical lobe of the gonocoxite, and the shape of the lateral plate and the ninth tergal lobes have led us to consider *Cx. keenani* to be conspecific with *Cx. educator.*

Culex educator and *Cx. vaxus* are easily separated by the following characters. *Adults*: Scutal scales uniform in size and color, always very fine, falcate, brownish with coppery reflections in *Cx. educator*; varying in color from totally dark brown to golden and mixed with other dark brown scales in various patterns in *Cx. vaxus. Cibarial armature*: Teeth rectangular in shape in both species but wider and less numerous in *Cx. educator* than in *Cx. vaxus. Male genitalia*: Distal division of subapical lobe bearing a characteristic narrow foliform seta (*l*) inserted basal to the long saberlike seta (*s*) in *Cx. educator* (Fig. 1); distal division of subapical lobe bearing a wide asymmetrical foliform seta (*l*) inserted at the same level as the long saberlike seta (*s*) in *Cx. vaxus* (Fig. 5). *Larva*: In *Cx. educator,* seta 5-C with minute aciculae apically, usually single; abdominal integument with minute inconspicuous spicules, these more evident on segments VI–VIII; seta 1-I,II weakly developed, 1-I usually with 4 simple branches, 1-II often with 3,4 simple branches; seta 6-VII with 7–14 branches; 8-VII frequently with 4 branches; comb with 26–39 long, pointed scales always disposed in 3 irregular rows; seta 2-S without a small secondary branch in specimens from Panama. In *Cx. vaxus,* seta 5-C with aciculate branches, usually double; abdominal integument with conspicuous spicules; seta 1-I,II well developed, often with 7 aciculate branches, 6-VII with 9–24 branches; 8-VII usually with 7 branches; comb with 11–29 long, pointed scales arranged in 2,3 irregular rows; seta 2-S always with a small curved secondary branch. *Pupa*: In *Cx. educator,* pinna narrow, U-shaped, lateral margin available, usually straight and smooth, sometimes rolled with conspicuous spicules; atrial wall sometimes with strongly developed spicules. In *Cx. vaxus,* pinna narrow, U-shaped, lateral margins usually straight and smooth, sometimes rolled with well developed spicules; atrial wall without strong spicules.

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