



REVISION OF THE SPISSIPES SECTION OF *CULEX* (*MELANOCONION*) (DIPTERA: CULICIDAE)¹

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ABSTRACT. Twenty-two species in the Spissipes Section of *Culex* (*Melanoconion*) are recognized and two taxonomic changes are made: *Culex alvarezi* Sutil Oramas, Pulido Florenzano and Amarista Meneses is synonymized with *Culex spissipes* (Theobald), and *Culex nicaroensis* Duret has been determined not to belong to the subgenus *Melanoconion* and is here treated as a member of the genus *Culex* without subgeneric assignment. Descriptions of adult female and male, female cibarium, and genitalia of both sexes are provided. Eight groups and three subgroups are characterized. Available data on distribution and bionomics of each species are given. Maps showing the entire known range of the species are given. Keys for species identification based on morphological characters of adults and male genitalia are provided.

INTRODUCTION

The subgenus *Melanoconion* of *Culex* is considered to be of medical importance because several species are actual or potential vectors of arboviruses (Reisen and Monath 1988, Shope et al. 1988, Walton and Grayson 1988) and many species readily bite humans. Previous taxonomic studies have emphasized the importance of morphological characters of the male genitalia, adults, and female cibarium to differentiate species (Rozeboom and Komp 1950, Galindo 1969, Sirivanakarn 1978, 1983, Forattini and Sallum 1992). However, these works are limited in scope, and lack complete species descriptions and identification keys.

The history of taxonomic treatments of *Culex* (*Melanoconion*) was well documented by Sirivanakarn (1983). Sirivanakarn distinguished 3 sections (*Ocellatus*, *Spissipes*, and *Melanoconion*) within the subgenus, based mainly on the shape of the aedeagal sclerite of the phallosome, shape of the scales on the dorsal surface of the vertex, and presence or absence of black spots on the antealar and supraalar areas of the scutum. Larvae and pupae also possess characters of importance to the identification of these sections. Pecor et al. (1992) determined that the *Ocellatus* Section did not belong to the subgenus and it remains without subgeneric assignment. No modern revisionary study has been published since Sirivanakarn (1983). Great difficulty has been encountered in identifying individual species and groups. The key given by Sirivanakarn (1983) does not make identification at the species level possible. There are no up-to-date keys for individual species in each of the 2 sections and their respective groups, making specific determinations very difficult. As specific recognition is fundamental for ecological, biological, epidemiological, and vector capacity studies, the present study was carried out in order to search for morphological characters of the adult and male genitalia that might be useful for the accurate identification of species within the *Spissipes* Section. Based on extensive field collections conducted during ecological studies carried out in the Ribeira Valley and in other localities in Sao Paulo State, Brazil, a more detailed taxonomic study is now possible.

MATERIALS AND METHODS

The material examined during this study came from collections made in Sao Paulo State, Brazil, and from the Entomological Collection of the Department of Epidemiology of the School of Public Health, University of Sao Paulo, Brazil (FSP-USP). Type specimens of nominal species were examined except for the following: *Culex alvarezi* Sutil Oramas, Pulido Florenzano and Amarista Meneses, *Culex haynei* Komp and Curry, *Culex delpontei* Duret, *Culex pereyrai* Duret, *Culex portesi* Senevet and Abonnenc, *Culex cayennensis* Floch and Abonnenc, *Culex ocssa* Dyar and Knab, and *Culex simulator* Dyar and Knab (larva). Adults of *Culex epanastasis* Dyar were not examined and the male genitalia are those of the holotype. Female specimens were identified by means of comparison with the adult male and male genitalia and, when available, with specimens associated with immature stages.

The format of the species treatment is traditional. The synonymy for each species follows that given by Pecor et al. (1992) with a few alterations, where necessary. Detailed descriptions of the adult male and female and male genitalia are given only for *Culex spissipes* (Theobald); the other species are compared with *Cx. spissipes* and only the characters that are not common to both species are given. A taxonomic discussion, information on bionomics, medical importance, and distribution, and a list of material examined are also provided.

Collection data are given as follows: COUNTRY, State, City, Locality, collection day/month/year, collector, determiner, year of identification, collection method, habitat, number of specimens examined, and life stages. Life stages are indicated by the symbols ♂, ♀, L; the letter G denotes genitalia and Cib denotes cibarium. We avoided repetition of collection data by omitting similar data. The type specimens examined are listed in the "Material examined" section for each species.

Illustrations of the male and female genitalia and cibarial armature of the female are based on specimens examined. Some of the illustrations were published in previous works (Forattini and Sallum 1985, 1989a, 1989c, 1990, 1992).

Examinations of some adults and female cibarium were made in a JEOL, JSM-P15 scanning electron microscope. Measurements were taken from specimens mounted on microscope slides. Except for the female cibarium, all other morphological characters were measured by using an ocular micrometer (WILD-MMS-235) in a WILD-M5 APO stereomicroscope. Measurements were based on 3-5 specimens, when available.

Distribution data are based on literature rec-

ords and on collection data associated with specimens examined. The specimens studied have been deposited in the School of Public Health, University of Sao Paulo (FSP-USP) and in the Department of Entomology, National Museum of Natural History (NMNH), Smithsonian Institution, Washington, DC.

Morphological terminology follows Harbach et al. (1984) except for the wing, which follows that recommended by Belkin (1962), and the sensilla trichodea, which follows McIver (1982).

KEYS TO SECTIONS OF *CULEX* (*MELANOCONION*) AND SPECIES OF THE SPISSIPES SECTION

Adult

1. Decumbent scales of vertex broad, spatulate. Melanoconion Section "*partim*"
Decumbent scales of vertex mainly or partially narrow, falcate; broad spatulate scales restricted to small patch on lateral sides. 2
- 2(1). Narrow falcate scales of vertex numerous; lateral patch of broad spatulate scales small, almost indistinct in dorsal view (Figs. 11A, 11B) Spissipes Section "*partim*"
Narrow falcate scales of vertex restricted to a small patch on median dorsal area of vertex; lateral patch of broad spatulate scales large, well evident in dorsal view (Figs. 11C-11F). 3
- 3(2). Pleural integument yellowish or light cream, sharply contrasting with light brown to dark brown scutal integument. Spissipes Section "*partim*"
Pleural integument similar in color to scutal integument or with striking pattern of dark and pale stripes on mesepimeron and mesokatepisternum Melanoconion Section "*partim*"

Spissipes Section

1. Hindtarsomeres with distinct or indistinct white or pale rings on joints, hindtarsomere 5 pale or white-scaled. 2
Hindtarsomeres dark-scaled. 10
- 2(1). Pleura with a distinct patch of broad spatulate white scales on upper corner of mesokatepisternum; scutal scales mainly dark, few light golden scales in variable position and on prescutellar area . . . 3
Pleura without a distinct patch of broad spatulate scales on upper corner of mesokatepisternum, rarely with 2, 3 scales; scutal scales totally dark or with few light golden scales on prescutellar area . . . 6
- 3(2). Postspiracular area with patch of white scales, rarely absent on male; capitellum whitish 4
Postspiracular area without patch of scales; capitellum dark 5
- 4(3). Pedicel of antenna yellowish, slightly darker on inner part. *Cx. akritus*
Pedicel of antenna entirely dark. *Cx. ikelos*
- 5(3). Hindtarsomeres 1-4 with white rings on joints, 5 entirely white-scaled *Cx. taeniopus*
Hindtarsomere 1 dark-scaled, 2-4 with indistinct pale rings, 5 slightly paler . . . *Cx. cedeveri* "*partim*"
- 6(2). All femora with distinct patch of silver white scales at apex. 7
All femora without patch of silver white scales at apex 8
- 7(6). *Male*: palpomeres 2-4 entirely dark, palpomere 5 with small patch of white scales on base of dorsal surface *Cx. pedraoi*
Male: palpomeres 2-5 with distinct ring of white scales at base *Cx. epanastasis*
- 8(6). Pleural integument light brown without pattern of dark spots; hindtarsomeres with indistinct pale rings on joints of 1-4, 5 pale *Cx. paracrybda*
Pleural integument yellowish with distinct pattern of dark and pale spots; hindtarsomeres with distinct white rings on joints of 1-4, 5 white-scaled 9
- 9(8). Pleural integument with dark spots on upper and lower parts of mesepimeron, upper corner and anterior surface of mesokatepisternum, postspiracular and subspiracular areas, prealar knob, postpronotum, and proepisternum; prescutellar area with dark scales; capitellum dark. *Cx. vacchettus*
Pleural integument with dark spots on postpronotum, proepisternum, postspiracular area, prealar knob, and anterior part of mesokatepisternum, upper corner of mesokatepisternum with indistinct

- dark spot, mesepimeron entirely yellowish; prescutellar area with light golden scales; capitellum whitish *Cx. pereyra*
- 10(1). Mesokatepisternum with patch of broad, spatulate scales on upper corner 11
Mesokatepisternum without patch of broad spatulate scales on upper corner 12
- 11(10). Vertex with erect forked scales totally dark; narrow falcate scales dark on median dorsal area along coronal suture and whitish laterally
. *Cx. cedecei* "partim" (Nearctic), *Cx. ribeirensis* (Neotropical)
- Vertex with erect forked scales light golden on median dorsal area, dark laterally; narrow falcate scales entirely light golden or, occasionally, with bronzy sheen along coronal suture *Cx. adamesi*
- 12(10). Acrostichal setae present along area 13
Acrostichal setae absent or present on posterior portion of area 14
- 13(12). *Female*: scutum with dark brown scales and a patch of golden scales on anterior two-thirds, or on anterior half, or on anterior promontory and lateral and posterior portions of scutal fossa and on antealar and prescutellar areas; *male*: scutum entirely with bronzy scales; terga II-VII entirely dark-scaled *Cx. spissipes*
Female: scutum with dark brown to blackish scales; *male*: scutum occasionally with light golden scales on prescutellar area; terga II-VII with basolateral patches of white scales, occasionally becoming narrow basal white bands *Cx. lapsi*
- 14(12). Mesepimeron with a patch of small light golden setae on median portion *Cx. vomerifer*
Mesepimeron without a patch of setae on median portion 15
- 15(14). Terga II-VII entirely dark-scaled *Cx. jubifer*, *Cx. simulator*
Terga II-VII dark-scaled with basolateral patches of white scales 16
- 16(15). Vertex with erect forked scales totally light golden or yellowish; *male*: palpomeres 4, 5 without setae or with few weak short setae *Cx. nicaroensis* (subgenus uncertain)
Vertex with erect forked scales totally dark brown; *male*: palpomeres 4, 5 strongly setose 17
- 17(16). Pleural integument yellowish with or without pattern of dark spots 18
Pleural integument light brown or dark brown without conspicuous pattern of dark spots 21
- 18(17). Pleural integument yellowish, dark brown on dorsal part of postpronotum, sharply contrasting with the dark color of scutum *Cx. delpometi*
Pleural integument yellowish with dark spots on postpronotum, postspiracular area, and, occasionally, on prealar knob 19
- 19(18). Narrow falcate scales of vertex dark anteriorly, whitish posteriorly *Cx. portesi*
Narrow falcate scales of vertex dark on median dorsal area along coronal suture, whitish laterally 20
- 20(19). Pleural integument yellowish with dark spots on postpronotum, postspiracular area, prealar knob, and anterior portion of mesokatepisternum *Cx. ocella*
Pleural integument yellowish with dark spots on postpronotum and postspiracular area *Cx. faurana*
- 21(17). Vertex with erect forked scales totally light brown, narrow falcate scales light bronzy *Cx. laurani*
Vertex with erect forked scales dark brown to black, narrow falcate scales dark on median dorsal area along coronal suture *Cx. crybda*

Male genitalia

1. Aedeagal sclerite narrow, curved in lateral view, narrowly connected to the lateral plate
. *Melanoconion* Section
Aedeagal sclerite broad, curved in lateral view, broadly connected to the lateral plate . . . *Spissipes* Section

Spissipes Section

1. Gonostylus with a robust preapical spine on ventral side; paraproct crown with robust blades (Fig. 36) *Cx. nicaroensis* (subgenus uncertain)
Gonostylus without robust spine on ventral side; paraproct crown with narrow simple blades (Fig. 21) 2
- 2(1). Gonostylus irregular on distal part, ventral surface concave with an acute projection before apical snout, dorsal side with a subapical acute projection ending as a long, sinuous, slender filament; apical snout hooklike; gonostylar claw long, hooked; lateral process of lateral plate of phallosome serrated at apex; tergum IX lobe large, hill-like with a small projection on base (Fig. 18)
. *Cx. spissipes*

- Gonostylus not as above; lateral process of lateral plate of phallosome smooth, or absent; tergum IX lobe variable in shape, not as above 3
- 3(2). Gonostylus with conspicuous subapical crest of long, slender spicules on dorsal side; gonocoxite with an elongate process, bearing a subapical slender seta on the base of subapical lobe; distal division of subapical lobe with an apical broad, asymmetrical, curved, foliform seta (*l*), a subapical strong, curved, hooked seta (*h*); proximal division with hyaline, branched processes (Fig. 34) *Cx. lopesi*
Gonostylus without crest of spicules on dorsal side; gonocoxite without an elongate process on base of subapical lobe; distal division of subapical lobe variable, not as above; proximal division without branched processes 4
- 4(3). Proximal division of subapical lobe with an apical infundibular hyaline expansion, a subapical hyaline, hooked-falciform seta and few slender setae on basal portion; distal division of subapical lobe divided into two arms (Fig. 21) 5
Proximal division of subapical lobe without infundibular hyaline expansion, hooked-lateiform seta and slender setae on basal portion; distal division of subapical lobe not divided (Fig. 27) 10
- 5(4). Distal division of subapical lobe divided near base, bearing 2 unequal arms; tergum IX lobe small, club-shaped or moundlike (Fig. 24) 6
Distal division of subapical lobe divided near middle, bearing 2 subequal arms; tergum IX lobe small, conical (Fig. 22) 8
- 6(5). Lateral plate with apical, ventral, and lateral processes; tergum IX lobe small, club-shaped (Fig. 26) *Cx. perevrai*
Lateral plate without ventral and lateral processes, apical process present, tergum IX lobe small, moundlike (Fig. 24) 7
- 7(6). Distal division of subapical lobe with the proximal arm well enlarged; apical process of lateral plate of phallosome nearly straight, blunt at apex (Fig. 24) *Cx. delpantei*
Distal division of subapical lobe with the proximal arm poorly enlarged; apical process of lateral plate of phallosome curved, hooked at apex (Fig. 25) *Cx. paraclybda*
- 8(5). Ventral process of lateral plate of phallosome short; lateral process short, bifid at apex; apical margin concave (Fig. 23) *Cx. epinastasi*
Ventral process of lateral plate of phallosome long; lateral process long, tapered, pointed; apical margin nearly straight (Fig. 21) 9
- 9(8). Gonocoxite with sparse patch of short seta on tergoanal surface proximal to subapical lobe; distal division of subapical lobe narrow, elongate (Fig. 21) *Cx. adamesi*, *Cx. pedou*, *Cx. ribetrensis*
Gonocoxite with a more dense patch of moderately long setae on tergoanal surface proximal to subapical lobe; distal division of subapical lobe shorter, more robust than above (Fig. 22) *Cx. crybda*
- 10(4). Gonostylus with submedian triangular, hyaline expansion on ventral side; distal division of subapical lobe of gonocoxite with a large, asymmetrical foliform seta (*l*) at apex (Fig. 27) 11
Gonostylus without hyaline expansion near middle on ventral side; distal division of subapical lobe variable, not as above (Fig. 19) 13
- 11(10). Tergum IX lobe with long and sinuous setae (Fig. 28) *Cx. portesi*
Tergum IX lobe with short, slender, sparse setae (Fig. 27) 12
- 12(11). Gonocoxite with patch of 6-10 small setae on tergoanal surface proximal to subapical lobe; foliform seta (*l*) of distal division of subapical lobe nearly rounded on distal margin (Fig. 29) *Cx. sacchettae*
Gonocoxite without a patch of 6-10 small setae on tergoanal surface proximal to subapical lobe; foliform seta (*l*) of distal division of subapical lobe angular on distal margin (Fig. 27) *Cx. vomerifer*
- 13(10). Tergum IX lobe columnar, distally wrinkled, proximal division of subapical lobe short, strong, more robust than distal division; lateral plate of phallosome with apical process short, broad at base, distally rounded (Fig. 19) 14
Tergum IX lobe different in shape; proximal division of subapical lobe long, columnar; lateral plate of phallosome with apical process short, nearly triangular, weakly sclerotized, or absent 17
- 14(13). Tergum IX lobe elongate, fingerlike, rounded at apex, interlobar area concave; ventral process of lateral plate of phallosome short (Fig. 19) 15
Tergum IX lobe shorter, rounded or blunt at apex, interlobar area nearly straight; ventral process of lateral plate of phallosome long (Fig. 20-2) 16
- 15(14). Foliform seta (*l*) of distal division of subapical lobe narrow, more tapered on proximal side (Fig. 19) *Cx. taeniopus*

- Foliform seta (*l*) of distal division of subapical lobe moderately wide, nearly spoonlike in shape, evenly tanned (Fig. 20-1) *Cx. ecclevei*
- 16(14). Foliform seta (*l*) of distal division of subapical lobe long, nearly lozenge in shape, broad at base, tapered, nearly pointed at apex, evenly tanned; tergum IX lobe columnar, rounded at apex (Fig. 20-2) *Cx. akritis*
- Foliform seta (*l*) of distal division of subapical lobe wide, asymmetrical, petiolate, striate; tergum IX lobe nearly rectangular in outline (Fig. 20-3) *Cx. iketos*
- 17(13). Distal division of subapical lobe with a slender, pointed, flexible seta (*l*) on base of long saberlike seta (*s*); apical process of lateral plate of phallosome short, nearly triangular, weakly sclerotized; tergomal surface of gonocoxite with a long, slender, pointed seta on base of distal division of subapical lobe of gonocoxite (Fig. 35) *Cx. faurani*
- Distal division of subapical lobe with a wide foliform seta (*l*); lateral plate of phallosome without apical process; tergomal surface of gonocoxite with a foliform seta on base of distal division of subapical lobe or near base of gonostylus. 18
- 18(17). Tergum IX lobe small, broad at base; distal division of subapical lobe of gonocoxite with a long, robust, hooked apical seta (*h*) and a wide asymmetrical, striate seta near base; tergomal surface of gonocoxite with a foliform seta near base of gonostylus (Fig. 30) 19
- Tergum IX lobe large; distal division of subapical lobe of gonocoxite with 8 setae; tergomal surface of gonocoxite with a wide, asymmetrical, petiolate, striate seta on base of distal division of subapical lobe (Fig. 33) 20
- 19(18). Gonostylus with a short apical snout; seta *h* of distal division of subapical lobe of gonocoxite with a strong hook at apex, this seta subequal in length to distal division (Fig. 30) *Cx. oceanica*
- Gonostylus with an elongate apical snout, seta *h* of distal division of subapical lobe with a weak hook at apex, this seta longer than distal division (Fig. 31) *Cx. panocassa*
- 20(18). Gonocoxite with a heavily pigmented protuberance with 10, 11 alveoli near base of gonostylus on lateral side; lateral surface with sparse patch of moderately developed setae and few short, slender setae from base to the level of subapical lobe (Fig. 33) *Cx. jubifer*
- Gonocoxite without a heavily pigmented protuberance near base of gonostylus on lateral side; lateral surface with a patch of long, robust setae from subapical lobe to near base of gonostylus (Fig. 32) *Cx. smulator*

SPECIES TREATMENTS

Spissipes Group

Presently, only *Cx. spissipes* belongs to this group. Adults can be easily recognized by having: narrow decumbent scales of vertex mainly light golden posteriorly, bronzy anteriorly, erect forked scales totally dark; acrostichal setae present; pleural integument of thorax similar in color to scutal integument, light to dark brown; upper corner of mesokatepisternum without a patch of scales; and tarsi dark-scaled. The female has a patch of golden scales anteriorly on the scutum. The male has the scutum totally dark-scaled, palpomeres dark, and abdominal terga II-VII dark-scaled without basolateral patches of white scales. The female has cibarial teeth spatulate in outline; dorsal surface of cibarial bar irregularly folded; tooth origin line present, irregular, poorly evident; sensilla trichodea at least 8 in number; and cibarial dome with long, triangular, sharply pointed denticles. The male genitalia can be recognized by: shape of gonostylus, gonostylar claw long, apically curved, gonostylus without spicules on basal half of medial side; gonocoxite stocky, robust, without scales on proximal part of ventrolateral surface, distal division

of subapical lobe columnar, unique, with a wide, asymmetrical foliform seta (*l*) on subapical position and 4 apical setae, which include a large hooked seta (*h*), a saberlike seta (*s*), and 2 short, pointed setae (*f*); lateral plate of phallosome with apical, lateral, and ventral processes; apical process short, broad with the apical margin convex and smooth, lateral process blade-like, serrate at apex; and tergum IX lobe hill-like with a small, basal, inner projection.

Culex (Melanoconion) spissipes (Theobald, 1903)

Melanoconion spissipes Theobald, 1903:242 (♀?). Holotype ♀: Trinidad (NHM).

Bourroul 1904:70 (Brazil); Howard, Dyar and Knab 1915:312 (♀; tax.); Bonne and Bonne-Wepster 1925:268 (in part ♀; Surinam; mis-identification of ♂); Dyar 1925b:169 (Panama); Dyar 1925c:214 (Venezuela); Martini 1935:60 (Mexico, Belize); Foote 1954:94 (tax.); Barreto-Reyes 1955:60 (Colombia); Prosen et al. 1963:110 (Bolivia); Belkin 1968: 20 (type info.); Takahashi 1968:329 (♂, ♀; tax.); Stone 1970:164 (Honduras); Heinemann

and Belkin 1979:108 (Ecuador); Darsie and Hobbs 1982:73 (Guatemala); Sirivanakarn 1983:278 (δ^+ , \varnothing).

Melanoconion fur Dyar and Knab. 1907a:13 (\varnothing). Holotype \varnothing : Colon, Canal Zone, Panama (NMNH).

Bonne-Wepster and Bonne 1921:20 (syn. with *Cx. spissipes*): Lane 1951:334 (resurrected from syn.); Stone et al. 1959:275 (syn. with *Cx. spissipes*): Belkin et al. 1965:54 (type info.); Takahashi 1968:329 (tax.).

Culex (Helicoporia) menytes Dyar. 1918:125 (δ). Holotype δ : Trinidad River, Panama (NMNH).

Dyar 1923b:190 (δ^+); Dyar 1928:286 (δ^-); Floch and Abonnenc 1942:6 (French Guiana: as *Cx. menytes*); Rozeboom and Komp 1950:93 (δ^+ ; type loc. info.); Belkin et al. 1965:54 (type info.); Cova Garcia et al. 1966a:213 (δ^+); Takahashi 1968:331 (syn.).

Culex (Upsiloporia) haynei Komp and Curry, 1932:82 (δ^*). Holotype δ (only genitalia). Mojinga Swamp, lower Chagres River, Canal Zone, Panama (NMNH).

Komp 1935:3 (syn. with *Cx. menytes*): Stone and Knight 1957:59 (type info.); Belkin et al. 1965:54 (type info.).

Culex (Melanoconion) alvarezii Sutil Oramas, Pulido Florczano and Amarista Meneses, 1987:85 (δ^+). Holotype δ : Chiricoa, San Camilo, Apure, Venezuela (DERM). **New Synonymy.**

Female. Body covered with dark brown scales and with a patch of golden scales on scutum. **Head:** Antenna dark, length about 1.80 mm; flagellum normal, whorls with 6 setae. Proboscis entirely dark-scaled, length 1.95–2.15 mm (\bar{x} = 2.06 mm). Maxillary palpus dark-scaled, length 0.40–0.42 mm (\bar{x} = 0.41 mm), about 0.20 length of proboscis, usually with 4 palpomeres, occasionally with a small palpomere 5. Vertex (Figs. 11A, 11B) with narrow falcate scales, these light golden posteriorly, bronzy anteriorly, a small patch of broad appressed dingy white scales laterally; erect forked scales numerous, black; occipital region with some narrow whitish falcate scales. **Cibarium:** Length about 202 μ m; cibarial bar concave, weakly sclerotized, dorsal surface irregularly folded, posterior margin irregular; about 10–14 curved, spatulate, and blunt teeth; tooth length about 17 μ m; line of origin irregular; hollow area of teeth moderately large, nearly triangular. Cibarial dome nearly pentagonal, concavoconvex, surface with long, triangular, sharply point-

ed, posteriorly directed denticle. Palatal setae variably separated from one another, situated on lateral edges of anterior hard palate, 4 in total number. Sensilla trichodea disposed in 2 irregular rows of 4–6 single setae on each side. **Thorax:** Integument light brown to dark brown. Scutum with falcate scales, background scales dark brown with reddish reflections and with pattern of golden scales extending as a patch on anterior two-thirds, or on anterior half, or on anterior promontory and on lateral and posterior portions of scutal fossa and on antealar and prescutellar areas. Scutal setae prominent, brownish black with reddish or golden sheen; acrostichal setae present, disposed along acrostichal area (Figs. 12A, 12B); 3 pairs of empty alveoli present on anterior portion of prescutellar area. Scutellar scales similar to scutal scales; median lobe with golden scales or with golden scales mixed with a few dark scales and with 8 large setae; lateral lobes dark-scaled, each with 3, 4 large setae. Antepronotum without scales, with scattered dark setae. Postpronotum with narrow falcate golden scales, with 4–6 large setae on posterior-dorsal margin. Pleural integument light to dark brown, slightly darker on postpronotum, proepisternum, postspiracular, prespiracular, and subspiracular areas, anterior region of mesokatepisternum, picular knob, and lower mesepimeron. Pleural setae golden, dark brown with golden reflections on prealar knob; 10–15 upper proepisternal, 6–8 prealar, 9–12 upper mesokatepisternal, 12–15 lower mesokatepisternal, 12–18 upper mesepimeral, and 1 lower mesepimeral. Pleura with scales on mesokatepisternum only, a row of nearly colorless spatulate scales on posterior margin, sometimes reaching the level of upper corner (Fig. 13B). Metepisternum with 3, 4 minute setae. Mesopronotum dark, bare. **Wing:** Dark-scaled. Length 3.59–4.07 mm (\bar{x} = 3.92 mm); cell R_2 , 5.22–5.61 of vein R_{2+3} (\bar{x} = 5.39); cell M_1 , 0.84 of cell R_2 ; subcosta intersects costa slightly distal to furcation of R_{1+2} . Dorsal scaling (Figs. 14C, 14D): appressed spatulate scales on costa, subcosta, R_1 , R_{1+2} , distal 0.7 of M_{1+2} , M_{2+3} , Cu, Cu_1 , Cu_2 , and 1A; linear plume scales on R_3 , R_{2+3} , proximally on R_2 , proximally on R_1 , M_1 , and proximal 0.3 of M_{1+2} ; inclined narrow spatulate scales on R_2 and R_3 ; remigium with appressed spatulate scales and 2–4 distal setae. Ventral scaling (Figs. 14E, 14F): appressed spatulate scales on costa, subcosta, R_3 , R_{1+2} , proximally on R_3 , M_1 , and proximal 0.5 of M_{1+2} ; linear plume scales on proximal 0.2 of R_1 , Cu_1 , Cu_2 , and on middle of 1A; inclined narrow spatulate scales on distal 0.8 of R_1 , R_2 , R_3 , R_{1+2} , distal 0.5 of M_{1+2} , M_1 , and distally on 1A; Cu and proximal 0.5 of 1A devoid of scales. **Halter:** Scabellum and pedicel whitish; capitellum dark.

Legs: Anterior surface of forecoxa with patch of dark scales; anterior surface of midcoxa with vertical line of dark scales; anterior surface of hindcoxa with vertical line of nearly colorless scales. Antero- and posteroventral surfaces of foretrochanter with dark scales; anteroventral surface of midtrochanter dark-scaled; anteroventral surface of hindtrochanter and posteroventral surface of mid- and hindtrochanters with whitish scales. Femora mostly covered with light cream-colored scales on ventral surface. Tibiae and tarsi totally dark-scaled. **Abdomen:** Tergum I with a median posterior patch of dark scales; terga II-VIII entirely dark-scaled or with small basolateral patches of light cream-colored scales. Sterna II-VII dark-scaled with basal bands of whitish scales; sternum VIII without scales or with a few dark scales on lateral portions. **Genitalia** (Fig. 18): Tergum IX narrowed in middle with small flattened lateral lobes, each bearing 23-30 slender setae. Upper vaginal lip distinct, narrow; lower vaginal lip and insula indistinct, with 8, 9 clustered insular setae. Upper vaginal sclerite distinct, nearly rectangular in outline. Postgenital lobe short, rounded distally, with 9-12 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 1.20 mm. Maxillary palpus dark-scaled; length about 1.47 mm, extending beyond proboscis tip by length of apical 0.7 of palpomere 4; palpomeres 4 and 5 densely setose, palpomere 3 with 14-16 strong setae on outer apical area. **Thorax:** Scutum entirely covered with brownish scales with golden or reddish reflections. Scutellar scales same as scutal scales. **Abdomen:** Terga II-VII totally dark-scaled; tergum VIII with basolateral patches of whitish scales and a deep V-shaped emargination. Sterna dark-scaled. **Genitalia** (Fig. 18): Tergum IX as figured. Gonocoxite stocky, outer margin convex, inner margin nearly straight; ventrolateral setae strongly developed, ventromesal surface with small setae scattered from base to level of subapical lobe, setae stronger basally, lateral surface with a patch of long, slender setae (lsp) at level of subapical lobe, tergomal surface with a few short setae proximal to subapical lobe; proximal part of ventrolateral surface without scales; subapical lobe distinctly divided, divisions separated; proximal division unique, elongate, columnar, with 2 nearly parallel, long, robust, apically hooked setae (setae *a* and *b*), seta *b* sinuous, stronger than *a*; distal division elongate, columnar with 4 apical and 1 subapical setae, apical setae include a long, strong, hooked seta (*h*), a relatively long, pointed, saberlike seta (*s*), and 2 short, narrow, ap-

pressed, pointed setae (*f*). subapical seta includes a large, asymmetrical, foliiform seta (*l*) more tanned on proximal side and slightly curved at apex. Gonostylus slender, curved at midlength, distal part irregular, ventral surface concave with an acute projection before apical snout; distal 0.5 of concave side of ventral surface with a prominent subapical crest of spicules, distal 0.25 of dorsal side bearing an acute projection that ends as a long, sinuous, slender filament; apical snout hooklike; gonostylar claw long, hooked at apex; mesal side with 2 small setae before gonostylar claw. Phallosome with lateral plates and aedeagal sclerites equivalent in length; aedeagal sclerite broad and curved in lateral view, broadly fused to lateral plate; lateral plate with apical, lateral, and ventral processes; apical process short, broad, apical margin convex and smooth in lateral view; ventral process heavily sclerotized, long, pointed at apex, curved laterally; lateral process blade-like, serrate at apex; base of lateral plate with stout dorsal process. Aedeagal sclerite not connected by dorsal aedeagal bridge; basal piece triangular-shaped with blunted extremities. Proctiger elongate; paraproct narrow distally, expanded basally, crown with a row of 7-11 simple blades. Cercal sclerite long and narrow; 2-4 cercal setae. Tergum X somewhat triangular in outline, inner margin slightly concave.

Material examined. 14 ♂, 14 ♀, 6 ♀ cib, 3 ♀ G. *Cx. spissipes*, **Holotype:** TRINIDAD, C. W. Hewlett. *Cx. fur*, **Holotype:** PANAMA, Canal Zone, Colon. *Cx. nenytes*, **Holotype:** PANAMA, Trinidad River. **Other specimens:** BRAZIL, Sao Paulo State, Pariqueira-Açu County, Experimental Station, 9 Apr 1981, Forattini et al. coll., Sallum det. 1990, CDC light trap, 1 ♂, 1 ♂ G; 18 Mar 1982, 1 ♀; 18 Sep 1980, 1 ♀; 9 Apr 1981, 1 ♀; 7, 21 Jan 1982, 2 ♀; 18 Mar 1982, 3 ♀, 1 ♀ G; 21 Aug 1978, 1 ♀; 14 Jan 1980, 1 ♀, 1 ♀ G; 7 Jan 1982, 1 ♀; 18 Mar 1982, 3 ♀; 7 Apr 1982, 4 ♀; 18 Mar 1982, 1 ♀; 23 Nov 1978, 1 ♀, 1 ♀ G; 9 Feb 1981, 1 ♀; 9 Oct 1980, E. X. Rabello coll., det. 1980, 1 ♀ cib; 18 Mar 1982, det. 1982, 1 ♀ cib; 22 Apr 1982, 2 ♀ cib; 7 Dec 1978, Forattini et al. coll., det. 1990, Shannon trap, 1 ♀; 5 Feb 1979, 1 ♀; 3, 6 Dec 1979, 2 ♀; 18 Sep 1980, 1 ♀; 12 Mar 1981, 1 ♀; 26 Mar 1981, 1 ♂, 1 ♂ G; 9 Apr 1981, 1 ♀, 2 ♂, 2 ♂ G; 26 Mar 1981, 1 ♀; 22 May 1984, battery-powered aspirator, 1 ♂, 1 ♂ G; 4 Mar 1985, 2 ♂, 2 ♂ G; 9 Apr 1985, 2 ♂, 2 ♂ G; 22 May 1984, manual net, 1 ♂, 1 ♂ G; 9 Apr 1985, 1 ♂, 1 ♂ G; Pariqueira-Açu County, Pariqueira-Mirim District, 10 Apr 1985, battery-powered aspirator, 2 ♂, 2 ♂ G; Cananea County, Itapitangui District, Folha Larga Farm, 23 Jan 1984, CDC light trap, 1 ♀; 23 Jul 1986,

manual net, 1 ♂, 1 ♂G; Iguape County, Palmeiras Farm, 19 Jun 1989, CDC light trap supplemented with dry ice, 5 ♀, 2 ♀cib; 21 Feb 1989, CDC light trap, 4 ♀; Amazon State, Parauari River, Mar 1937, Worontow coll., J. Lane det. 1946, 1 ♀; Parque Nacional do Jau, Carabinani River, left margin, 12, 13 Apr 1994, Hutchings and Ferreira coll., Sallum det. 1994, CDC light trap 1 m above ground, 5 ♀: 13, 14 Apr 1994, 1 ♀; 14, 15 Apr 1994, 2 ♀; 8–16 Apr 1994, Malaise trap, 3 ♀; 10–13 Apr 1994, 1 ♀; 10–13 Apr 1994, Shannon trap, 1 ♀; 14 Apr 1994, manual net, 1 ♀; right margin, 8, 9 Apr 1994, CDC light trap 1 m above ground, 1 ♀; 11, 12 Apr 1994, 2 ♀; 15, 16 Apr 1994, 4 ♀; 8, 9 Apr 1994, CDC light trap, ground level, 1 ♀; 10, 11 Apr 1994, 2 ♀; 15, 16 Apr 1994, 1 ♀; 14 Apr 1994, manual net, 1 ♀; Miriri River, left margin, 4–6 Jun 1994, Malaise trap, 1 ♀. VENEZUELA, Caraipito State, Jul 1937, Anduze coll., Lane det. 1946, 1 ♀.

Distribution (Fig. 1). Known from Central and South America, including Belize, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guatemala, Honduras, Mexico, Panama, Surinam, Trinidad, and Venezuela (Pecor et al. 1992).

Bionomics. According to literature records, immature stages of *Cx. spissipes* were collected in the following habitats: margins of lakes in forest, margins of swamps, and in ground pools. The water was permanent or temporary, clear or colored, always fresh, with or without scum, with abundant grassy and floating aquatic vegetation or with dense accumulation of fallen leaves. The breeding places were heavily or partially shaded. Adult females were collected on human bait in forest areas as well as in cultivated areas and near margins of lakes. Adults were attracted to CDC light traps, CDC light traps supplemented with dry ice, CDC traps baited with a small rodent, chicken, or pigeon, in Chamberlain and Shannon traps, using battery-powered aspirators and hand nets, in primary or second-growth forest, and in shaded swamp forest, partial forest, and cultivated areas (Takahashi 1968; Heinemann and Belkin 1978a, 1978b, 1979; Heinemann et al. 1980; Darsie and Hobbs 1982; Forattini et al. 1989b).

Culex spissipes is a potential vector of Bimui, Carapani, Oriboea, and Itaiqi viruses of the family Bunyaviridae and strain III-B of Venezuelan equine encephalitis (VEE) virus of the family Togaviridae (Shope et al. 1988; Walton and Grayson 1988).

Discussion. Theobald (1903) described *Cx. spissipes* from a female from Trinidad. Later, Dyar and Knab (1907a) described *Cx. fur*, which was considered conspecific with *Cx. spissipes* by Bonne-Wepster and Bonne (1921). Later, Bonne

and Bonne-Wepster (1925) published a drawing of a male genitalia identified as *Cx. spissipes*. Even considering that the association of male and female could not be correct, Rozeboom and Komp (1950) reproduced the Bonne and Bonne-Wepster's male genitalia drawing. Later, Lane (1951) resurrected *Cx. fur* from synonymy with *Cx. spissipes*, and considered *Culex chrysonotum* Dyar and Knab and *Culex theobaldi* (Lutz) synonymous with *Cx. spissipes*. Foote (1954) did not agree with Lane's suggestion but he made no mention of *Cx. fur*. Later, Stone et al. (1959) synonymized *Cx. fur* with *Cx. spissipes* and, finally, Takahashi (1968) synonymized *Culex menytes* Dyar with *Cx. spissipes* and considered *Culex haynei* Komp and Curry conspecific with *Cx. spissipes* as was suggested by Komp (1935). As a result, *Cx. fur*, *Cx. menytes*, and *Cx. haynei* are considered to be synonymous with *Cx. spissipes* Sutill Oramas et al. (1987) described *Cx. alvarezi*, and although it has not been possible to examine the type material of *Cx. alvarezi*, we are considering this species conspecific with *Cx. spissipes*. While examining male specimens of *Cx. spissipes* from Brazil and the drawings of different authors reproduced in the *Melanoconion* catalog by Pecor et al. (1992), it was possible to compare these with the drawing and description of *Cx. alvarezi*. Special attention was given to male genitalia characters, and it became evident that there were striking similarities between *Cx. alvarezi* and *Cx. spissipes*, especially in the gonostylus, tergum IX lobes, and lateral plate of the phallosome. However, some differences observed in the subapical lobe of the gonocoxite could be due to an inaccurate position of the genitalia structures, and consequently, the drawing of the structures was inadequate.

According to Sirivanakarn (1983), *Cx. spissipes* can be easily recognized by having acrostichal setae. However, these setae were observed in *Culex lopesi* Sirivanakarn and Jakob, *Cx. portesi*, *Culex sacchettiae* Sirivanakarn and Jakob, and *Culex vomerifer* Komp. Although the acrostichal setae are disposed along the acrostichal area in *Cx. lopesi*, in the last three species they are found on the posterior part (Forattini and Sallum 1989a, 1990). Furthermore, the female of *Cx. spissipes* can be easily recognized by having a conspicuous pattern of golden scales extending as a patch on the anterior 0.50–0.75 of the scutum or as a lateral band from the anterior dorsocentral line to the posterior part of the scutal fossa, with a narrow extension dorsally. The male adult of *Cx. spissipes* differs from the female in having the scutum entirely covered with bronzy scales. However, in both male and female the abdominal terga are totally dark-sealed

or, sometimes, the female has small basolateral patches of cream-colored scales on terga II-VIII. Based on the cibarial armature, *Cx. spissipes* can be easily recognized by the features pointed out by Forattini and Sallum (1992). The male genitalia of *Cx. spissipes* can be easily characterized by several unique diagnostic and differential characters. These characters are represented by the uniquely shaped gonostylus (Fig. 18); tergum IX lobes are hill-like, showing a small projection on inner basal portion; the lateral plate of the phallosome has apical, lateral, and ventral processes. apical process short, broad, apical margin convex, smooth in lateral view, lateral process blade-like, serrate at apex; proximal division of subapical lobe of gonocoxite not divided, columnar, with 2 strong apical, newly parallel setae (*a* and *b*); distal division of subapical lobe elongate, columnar, bearing 5 setae, 1 subapical and 4 apical, subapical seta is a wide, asymmetrical, foliform seta (*l*) that is curved at apex, apical setae include a long, strong, hooked seta (*h*), a relatively long, saber-like seta (*s*) and 2 short, narrow, appressed, pointed setae (*f*).

Taeniopus Group

The Taeniopus Group includes *Culex taeniopus* Dyar and Knab, *Culex cedecei* Stone and Hair, *Culex akrios* Forattini and Sallum, and *Culex ikelos* Forattini and Sallum. Adults of these species can be recognized by having: narrow falcate black scales on a small area along coronal suture and dingy white scales on lateral sides; acrostichal setae absent; scutum covered with dark brown scales and small patches of light golden scales, these variably placed: a small patch of broad, spatulate white scales on upper corner of mesokatepisternum; abdominal terga dark-sealed with basolateral patches of white scales. Male adults have small patches of white scales on base of palpoмеры 4 and 5. The female cibarial armature differs from all other groups of the Spissipes Section in possessing spatulate-shaped teeth; hollow area small; cibarial bar with numerous spicules on dorsal surface and on distal margin and the absence of the line of origin of the cibarial teeth. Male genitalia of the group can be recognized by: the shape of the gonostylus, which has an elongate apical snout, small spicules on basal half of mesal side, and 2 unequally developed setae on mesal side of widened part; the proximal division of subapical lobe is unique, shorter and stronger than distal

division, forked at apex, bearing 2 strong setae (*a* and *b*); distal division of subapical lobe elongate, columnar, with 8 setae, which include 1 long apically hooked seta (*h*), 2 saberlike setae (*s*), 3 subequal, narrow, appressed setae (*f*), a slender, flexible, pointed seta (*l*), and a foliform seta (*l*); tergum IX lobes wrinkled distally; lateral plate of phallosome with apical, ventral, and lateral processes, apical process broad, short, distal margin convex and smooth; and tergum X somewhat rectangular in outline, narrowed at midlength, forming a prominent rounded apical lobe.

Culex (Melanoconion) taeniopus Dyar and Knab, 1907

Culex taeniopus Dyar and Knab, 1907b:100 (♀).
Holotype ♀: Bluefields, Nicaragua (NMNH).

Rozeboom and Komp 1950:96 (in part. tax.; misidentification of ♂*); Barreto-Reyes 1955: 59 (Colombia); Galindo 1969:83 (tax.); Sirivanakarn and Belkin 1980:8 (♂, ♀; tax.); Sirivanakarn 1983:265 (♂*, ♀*).

Melanoconion annulipes Theobald, 1907:512 (♀*). Holotype ♀: Red Hills. (Kingston, Surrey), Jamaica (NHM).

Edwards 1932:213 (rejected name); Belkin 1969a:28 (tax.; syn.); Belkin 1969b:68 (reemphasis of Edwards 1932); Townsend 1990:43 (type info.).

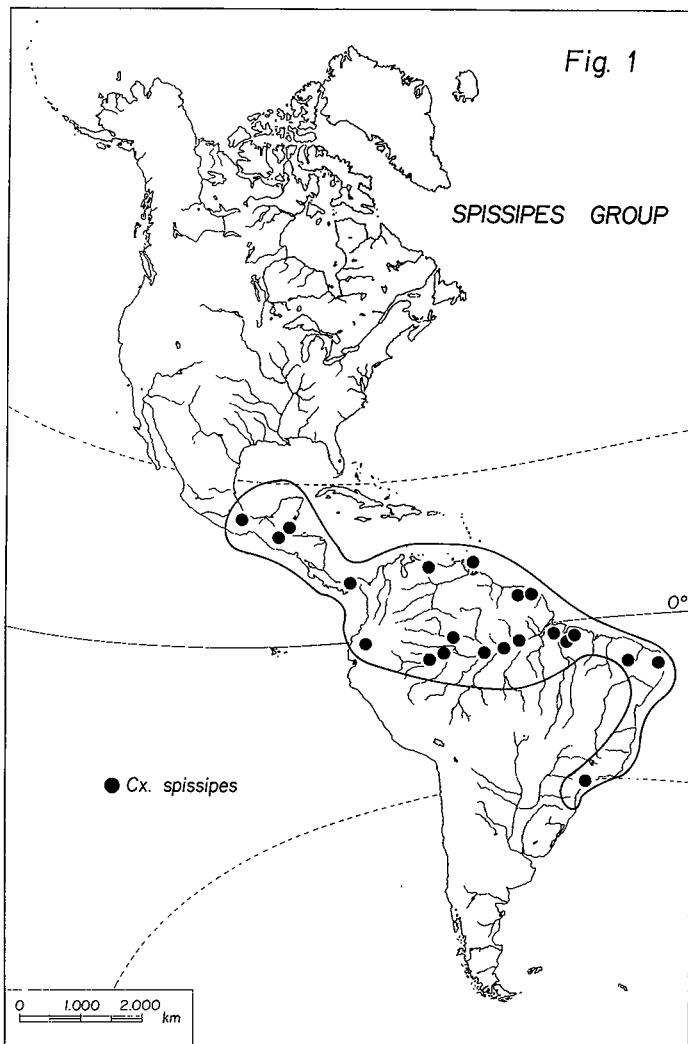
Culex (Melanoconion) opisthopus Komp, 1926: 44 (♂, ♀). Lectotype ♂: Puerto Castillo, Honduras (NMNH).

Dyar 1928:294 (♂*); Pratt et al. 1945:245 (Puerto Rico); Rozeboom and Komp 1950:94 (♂*); Lane 1953:403 (♂*, L*); Carpenter and LaCasse 1955:310 (in part, ♂*); misidentification of L*; Mexico; Stone and Knight 1957:54 (lectotype design.); Belkin et al. 1970: 82 (♂*, ♀*, P*, L*); Bertram 1971:745 (Belize); Scherer et al. 1971:969 (Venezuela); Fauran and Pajot 1974:106 (French Guiana); Belkin and Heinemann 1975:372, 377 (Bahamas, Cayman Islands); Mattingly 1976:227 (E*); Cupp et al. 1979:1060 (Guatemala); Sirivanakarn and Belkin 1980:7 (syn.).

Culex (Mochlostyrax) mychonde Komp, 1928 (in Dyar 1928:295) (♂). Holotype ♂ (only genitalia); Almirante, (Bocas del Toro), Panama (NMNH). Komp 1935:3 (syn. with *Cx. opisthopus*).

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Fig. 1. Distribution of the Spissipes Group (*Culex spissipes*).



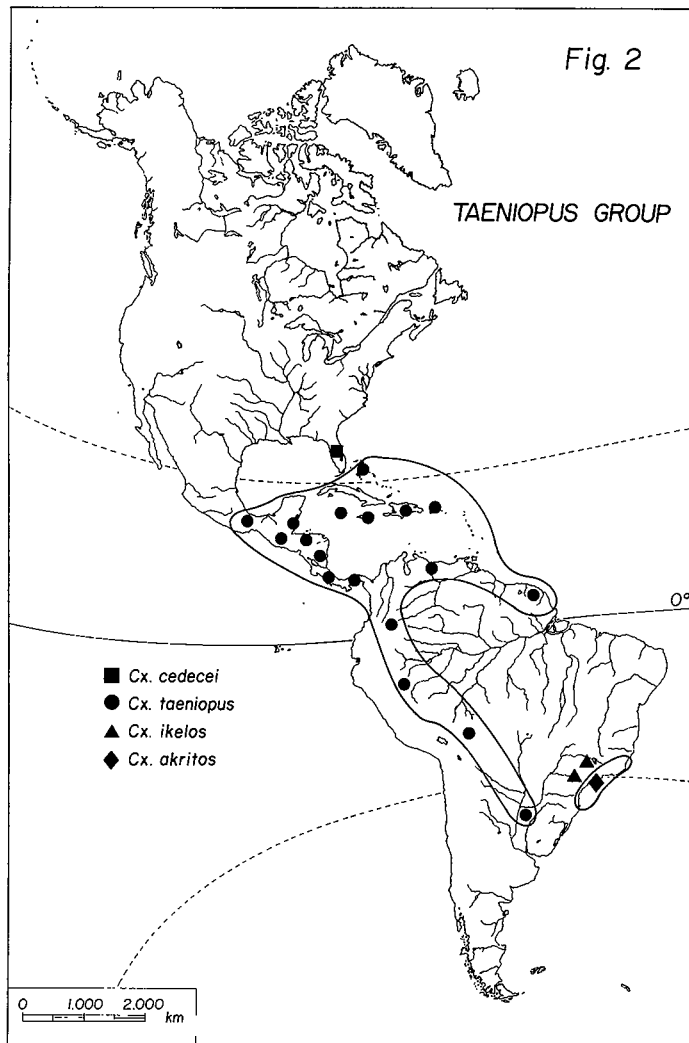
Female. Similar to *Cx. spissipes*, differing as follows. Body almost entirely covered with dark brown scales; hindtarsomeres with white rings on joints of segments 1–4 and segment 5 entirely white. **Head:** Antennal length about 2.03 mm; proboscis length 1.61–1.79 mm (\bar{x} = 1.70 mm); maxillary palpus length 0.30–0.34 mm (\bar{x} = 0.32 mm), about 0.20 of proboscis. Vertex with narrow falcate scales, these black in a small median dorsal area and dingy white on lateral sides. **Cibarium** (Fig. 19): Cibarium length about 216 μ m; dorsal surface and distal margin of cibarial bar with small spicules; 10, 11 cibarial teeth; tooth length about 17 μ m; line of origin of teeth not evident; hollow area of teeth small, somewhat triangular, more or less restricted to base. Palatal setae variably separated from one another, 5 in total number, 2 more-developed pairs on lateral margins of anterior hard palate and 1 smaller seta situated anteriorly, or 2 pairs of stronger setae on one margin of anterior hard palate and the smaller seta on the opposite. Sensilla trichodea arranged in linear series of 3, 4 elements on each side. **Thorax:** Integument dark brown to brownish black. Scutal scales dark brown with coppery reflections, occasionally with small patches of light golden scales on anterior pronotum and on prescutellar and supraalar areas; acrostichal setae absent. Prescutellar area sometimes with a small triangular protuberance on posterior region. Scutellar scales similar to scutal scales, totally dark or mixed with light golden scales: lateral lobes each with 3, 4 large setae, median lobe with 6 large setae. Postpronotum with narrow falcate scales, totally dark brown or sometimes with a patch of white broad spatulate scales on posteroventral margin; 6 dark setae on posterodorsal margin. Pleural integument dark brown with darker areas as in *Cx. spissipes*, mesepimeron dark with a paler spot on anteromedian region. Pleural setae dark brown with reddish reflections, upper proepisternal, less developed lower mesokatepisternal and upper mesepimeral setae yellowish; 10, 11 upper proepisternal, 6 prealar, 9–11 upper mesokatepisternal, 11 lower mesokatepisternal, 13 upper mesepimeral, and 1 lower mesepimeral. Pleura with patches of white spatulate scales on upper corner and on lower posterior margin of mesokatepisternum. **Wing:** Length about 2.58 mm; cell R_2 , 4.14 of vein R_{2+3} ; cell M, 0.89 of cell R_2 ; subcosta intersects costa slightly proximal to furcation of R_{2+3} . Dorsal scaling as in *Cx. spissipes*: remigium with 2, 3 distal setae. Ventral scaling: linear plumbe scales

on proximal 0.5 of R_1 , proximal 0.5 of R_{2+3} ; inclined narrow spatulate scales on distal 0.5 of R_1 , distal 0.5 of R_{2+3} . **Halter:** Capitellum dark, ventral surface with whitish scales. **Legs:** Anterior surface of forecoxa with a patch of dark scales, sometimes with pale scales at base, mid- and hindcoxae with vertical line of nearly colorless scales. Anteroventral surface of midtrochanter with dark or whitish scales. Mid- and hindfemora with a few white scales at apex. Tibiae and tarsi of fore- and midlegs dark; hindtibia with a few white scales at apex; hindtarsomeres 1–4 each with distinct rings of white scales on the base and apex, 5 entirely white. **Abdomen:** Terga II–VIII dark-scaled with basolateral patches of white scales. Sternum VIII dark-scaled with a few white scales laterally. **Genitalia** (Fig. 19): Tergum IX with 6–9 slender setae on each small lateral lobe; 8 insular setae. Postgenital lobe short, trapezoidal, distal margin nearly straight, with 8–10 setae on either side of midline.

Male. Like female except for the following sexual differences. **Head:** Antennal length about 1.59 mm. Maxillary palpus dark-scaled, palpomeres 4 and 5 with small basal patches of white scales, exceeding proboscis by about apical 0.5 of palpomere 4 (length not measured); palpomere 3 with 15, 16 long setae on outer apical area. **Abdomen:** Tergum II dark-scaled with median anterior and basolateral patches of white scales; terga III–V with basal bands and basolateral patches of white scales (remaining terga not examined). Sterna II–V mostly dark-scaled with basolateral patches of white scales. **Genitalia** (Fig. 19): Like *Cx. spissipes*, differing as follows. Tergum IX lobes approximated, columnar, fingerlike, distal part wrinkled, with slender setae mostly on distal part; interlobar area concave. Lateral surface of gonocoxite with a patch of short sparse setae (lsp) at level of subapical lobe; subapical lobe distinctly divided, divisions approximated; proximal division a single, short, robust, apically forked arm with 2 long, apically hooked setae (*a* and *b*), seta *a* robust, sinuous, seta *b* rodlike, nearly straight; distal division elongate, columnar, less robust than proximal division, with 8 apical setae, which include a long, strong, apically hooked seta (*h*), a short saberlike seta (*s*), a relatively long, saberlike seta (*s*), a moderately broad, asymmetrical foliform seta (*l*), darker on proximal side, 3 short, subequal, narrow, appressed setae (*f*), and a short, slender, apically pointed seta (*f*). Gonostylus slender, curved, widened distally on lateral side, tapering

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Fig. 2. Distribution of the Taenopus Group (*Culex akritos*, *Cx. edeccei*, *Cx. ikelos*, and *Cx. taenopus*).



to apex, bearing an inconspicuous, subapical crest on ventral side of expanded part and a few scattered spicules on basal part of mesal side; widened part with 2 setae on mesal side; apical snout elongate; gonostylar claw short, leaflike. Lateral plate of phallosome with apical, ventral, and lateral processes; apical process short, broad, apical margin convex and smooth; ventral process short, somewhat triangular in shape, pointed, slightly curved laterally; lateral process shorter, similar to ventral process. Paraproct crown with 6-8 simple blades; 2, 3 cercal setae. Tergum X large, somewhat rectangular in outline with a large rounded apical lobe.

Material examined. 7 ♂, 7 ♀, 1 ♀, 2 ♀, 2 ♀. *Cx. taeniopus*, *Holotype*: NICARAGUA, Bluefields. *Cx. annulipes*, *Holotype*: JAMAICA, Red Hills, M. Grabham. *Cx. opisthopus*, *Lectotype*: HONDURAS, Puerto Castillo. *Cx. mychonde*, *Holotype*: PANAMA, Almirante, (Bocas del Toro). *Other specimens*: GUATEMALA, locality unknown, S. Sirivanakarn 77, Sallum det. 1992, 4 ♂, 4 ♀, 2 ♀, 1 ♀. MEXICO, Quintana Roo (Q Roo), Cancun, 29 Nov 1974, D. J. Pletsch coll., Sallum det. 1992, 1 ♀; 20 Dec 1974, D. Najera coll., 4 ♀, 1 ♀, 1 ♀; Guerrero (GRO), Ixtapa, 9 Aug 1974, D. J. Pletsch coll., 2 ♂, 1 ♂.

Distribution (Fig. 2). Known from Bahamas, Belize, Cayman Islands, Colombia, Costa Rica, Dominican Republic, French Guiana, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Puerto Rico, and Venezuela (Pecor et al. 1992). This distribution could be incorrect, however, as this species has been confused with *Cx. cedecei*. It will be necessary to confirm the literature records by examination of specimens from throughout the geographic range.

Bionomics. Adults of *Cx. taeniopus* were captured resting in dense vegetation, in second-growth vegetation, in coral limestone fissures, and in crab holes. Resting places were partially or heavily shaded. Adults were attracted to human bait near sunset and also to CDC and New Jersey light traps in forest, in second-growth vegetation, and along the edges of swamps and rivers (Belkin and Heinemann 1975; Heinemann and Belkin 1977b, 1978a). Larvae have been found in stagnant water (Pratt et al. 1945).

Culex taeniopus was found to be susceptible to infection by VEE virus strain I-F under laboratory conditions (Cupp et al. 1979). This species is also considered to be a potential vector of Ossa, Guama, Ananindeua, Bimiti, Mirim,

and Guaratuba viruses of the Bunyaviridae (Shope et al. 1988; Walton and Grayson 1988).

Discussion. Adults of *Cx. taeniopus* differ from *Cx. cedecei* in having conspicuous white rings on the base and apex of hindtarsomeres 1-4, hindtarsomere 5 entirely white. The species differs from *Cx. akritos* and *Cx. ikelos* by the absence of a patch of broad, spatulate, white scales on the postspiracular area and in having the capitellum dark. From *Cx. akritos* it differs in having the pedicel of the antenna dark. Adult males of *Cx. taeniopus* can be easily distinguished from those of *Cx. akritos* in having the proboscis totally dark. *Culex taeniopus* also differs from *Cx. akritos* and *Cx. ikelos* in possessing 10 or 11 cibarial teeth and 5 palatal setae, 4 being subequal and posteriorly placed and one smaller and anteriorly placed. The male genitalia of *Cx. taeniopus* differ from those of *Cx. cedecei*, *Cx. akritos*, and *Cx. ikelos* in possessing a moderately broad foliform seta (f) that is darker on proximal side and from *Cx. akritos* and *Cx. ikelos* in having an inconspicuous crest on the ventral side of the widened part of the gonostylus, tergum IX lobes long, fingerlike, apically rounded, interlobar area concave, and lateral plate of phallosome with a very short ventral process.

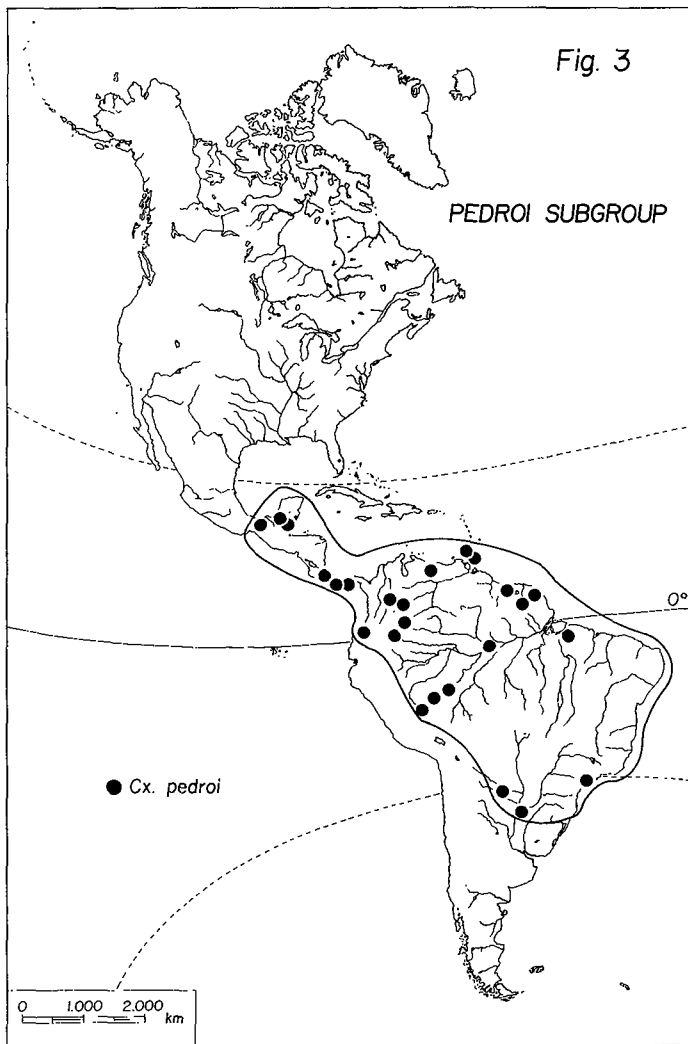
Culex (Melanocotium) cedecei Stone and Hair, 1968

Culex (Melanocotium) cedecei Stone and Hair, 1968:39 (♂, ♀*). *Holotype* ♂: Mahogany Hammock, Dade, Florida, USA (NMNH).

Wirth 1945:205 (♂; as *Cx. opisthopus*); Pratt et al. 1945:245 (P*, L*; as *Cx. opisthopus*); Foote 1954:78 (P*, L*; as *Cx. opisthopus*); Carpenter and LaCasse 1955:310 (in part, L*, as *Cx. opisthopus*); King et al. 1960:113 (Adult, L; as *Cx. opisthopus*); Belkin 1969a: 27 (syn. with *Cx. annulipes*); Belkin 1969b: 68 (syn. with *Cx. opisthopus*); Mattingly 1976:228 (E*); Cupp 1986 (in Weaver et al. 1986:619) (resurrected from syn.).

Female. Not examined.

Male. Similar to *Cx. spissipes*, differing as follows. Body almost entirely covered with dark brown scales; hindtarsomeres dark or with inconspicuous rings of pale scales on joints of tarsomeres 2-4, hindtarsomere 5 pale. **Head:** Antennal length and proboscis not measured; max-



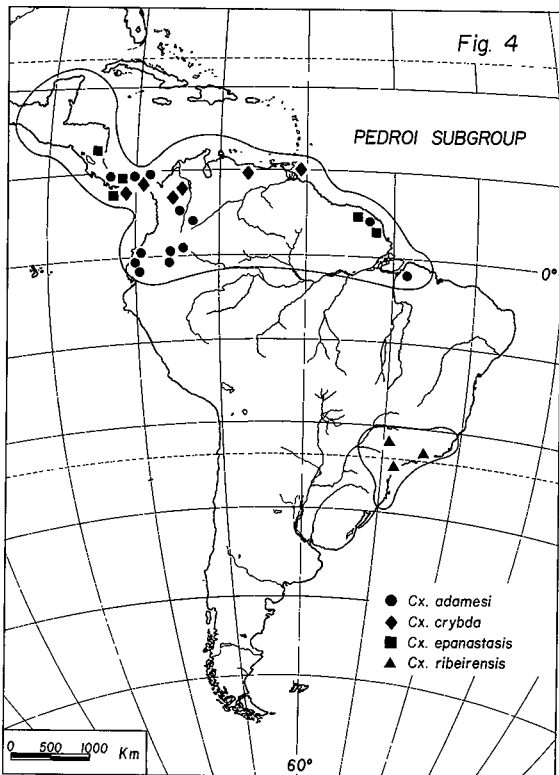


Fig. 4. Distribution of the Pedroi Subgroup, in part (*Culex adamesi*, *Cx. crybda*, *Cx. epanastasis*, and *Cx. ribeirensis*).

illary palpus (not measured) exceeding proboscis by about apical 0.5 of palpomere 4; palpomere 3 with long setae on outer apical area (setae not counted). Vertex with narrow falcate scales, these black in a small median dorsal area and dingy white on lateral sides. *Thorax*: Integument light to dark brown. Scutal scales dark brown with coppery reflections, light golden scales on prescutellar area; acrostichal setae absent. Scutellar scales light golden; lateral lobes each with 3 large setae, median lobe with 6 large

setae. Postpronotum with scales similar to scutal scales, totally dark brown, with 4 dark setae on posterodorsal margin. Pleural integument light to dark brown with darker areas as in *Cx. spissipes*, mesepimeron with an anteroposterior pale band on mid-region. Pleural setae dark brown with reddish reflections, upper proepisternal, less developed lower mesokatepisternal, and upper mesepimeral setae yellow: 6 prealar, 6 upper mesokatepisternal, 7-9 lower mesokatepisternal, 5-7 upper mesepimeral, and 1 lower mesepi-

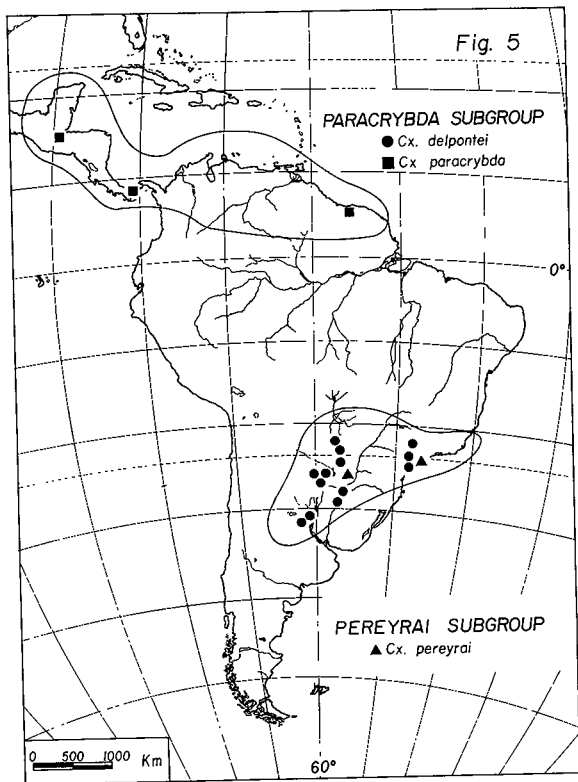


Fig. 5. Distribution of the Paracrybda Subgroup (*Culex delpontei* and *Cx. paracrybda*) and the Pereyrai Subgroup (*Cx. pereyrai*).

meral (upper proepisternum not counted). Pleura with small patches of white spatulate scales on upper corner and on lower posterior margin of mesokatepisternum. *Wing*: Length, cell R_2 and vein R_{2+3} , ratio and cell M_1 , and cell R_1 , ratio not measured; subcosta intersects costa slightly proximal to furcation of R_1 . Dorsal scaling as in *Cx. spissipes*; renigium with 2, 3 distal setae. Ventral scaling: appressed spatulate scales basally on R_1 , basally on R_2 , proximal 0.3 of M_{1+2} , proximal 0.3 of M_{2+3} , 0.5 of R_{2+3} ; inclined nar-

row spatulate scales on distal 0.5 of R_1 , distal 0.5 of R_{1+2} , distal 0.7 of M_{1+2} , distal 0.7 of M_{2+3} . *Halter*: Capitellum dark, ventral surface with whitish scales. *Legs*: Anterior surface of forecoxa with a patch of dark scales, sometimes with pale scales at base; mid- and hindcoxae with vertical line of nearly colorless scales. Antero-ventral surface of midtrochanter with dark or whitish scales. Tibiae and tarsi dark or, sometimes, hindtarsomeres 2-4 with indistinct pale rings at joints and tarsomere 5 indistinctly pale.

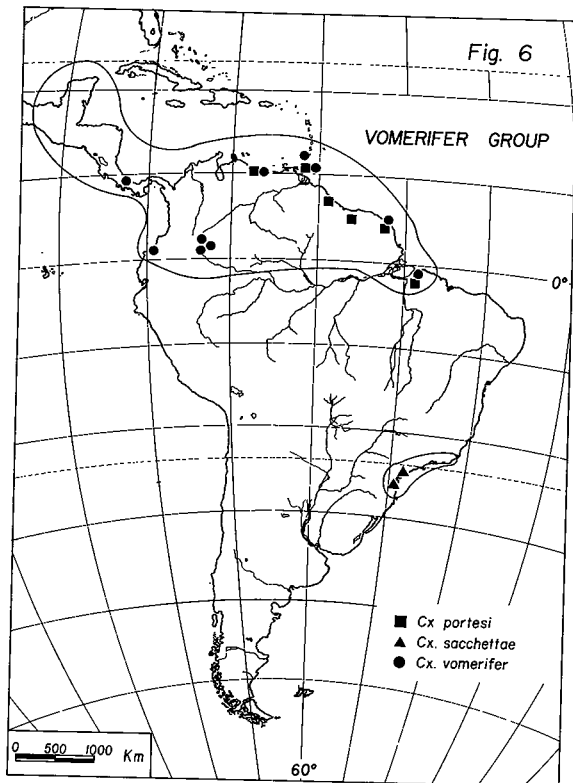
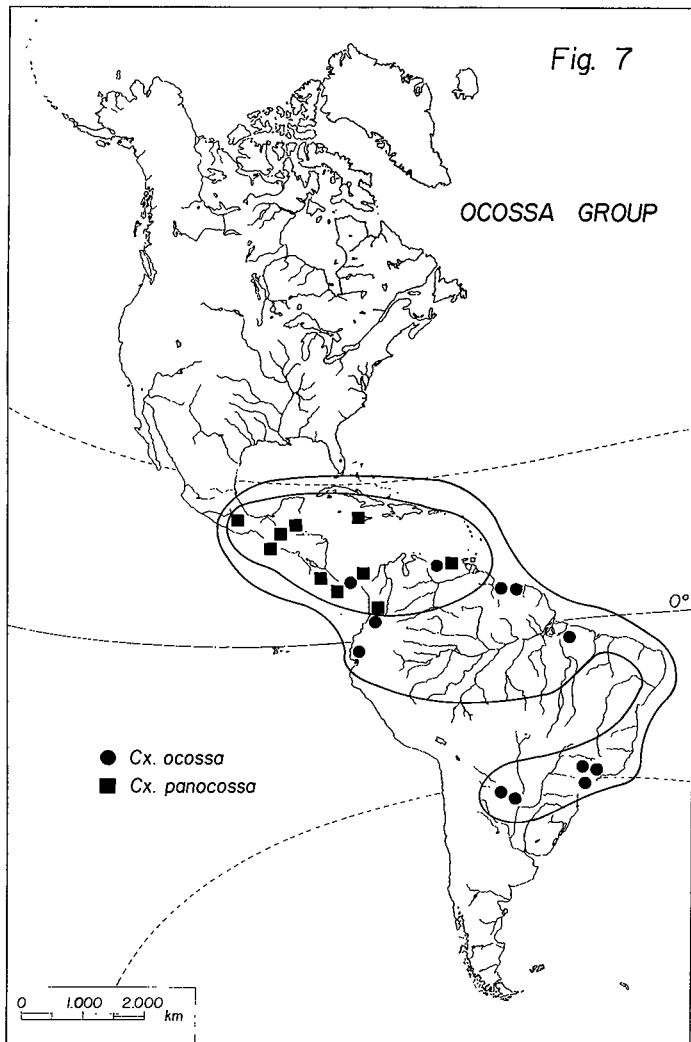


Fig. 6. Distribution of the Vomerifer Group (*Culex portesi*, *Cx. sachettiae*, and *Cx. vomerifer*).

Abdomen: Tergum II dark with a small median anterior patch of white scales; terga III-VII dark-scaled with basolateral patches of white scales, extending dorsally as narrow basal bands on terga III-V; tergum VIII without scales. Sterna II-VIII dark-scaled with basolateral patches of white scales. **Genitalia** (Fig. 20-1): Tergum IX lobes approximated, columnar, fingerlike.

distal part wrinkled with slender setae mostly on distal part; interlobar area concave. Lateral surface of gonocoxite with a patch of short sparse setae (lsp) at level of subapical lobe; subapical lobe distinctly divided, divisions approximated; proximal division a single, short, robust, apically forked arm with 2 long, robust, sinuous, apically hooked setae (*a* and *b*); distal division elongate,

Fig. 7. Distribution of the Ocoosa Group (*Culex ocoosa* and *Cx. panocosa*).



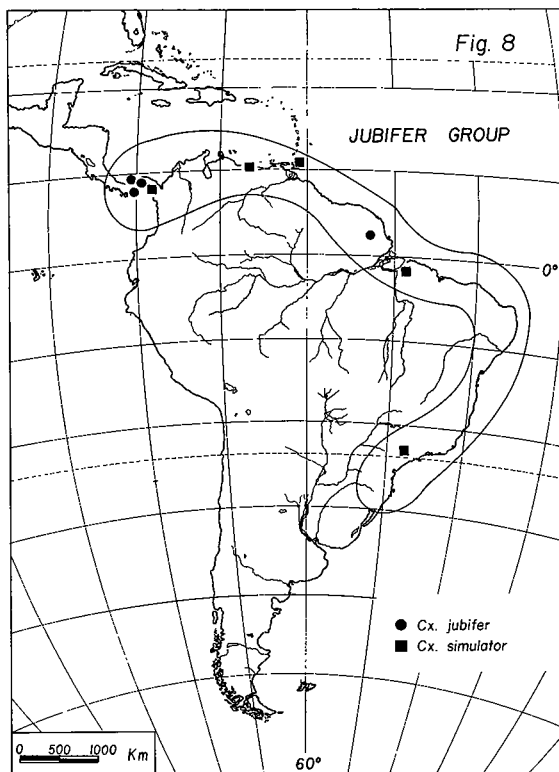


Fig. 8. Distribution of the Jubifer Group (*Culex jubifer* and *Cx. simulator*).

columnar; less robust than proximal division, with 8 apical setae including a long, strong, apically hooked seta (*h*), a short saberlike seta (*s*), a relatively long, saberlike seta (*s*), a moderately broad, asymmetrical foliform seta (*l*) evenly tapered, spoonlike in lateral aspect, inserted on lateral side, 3 short, subequal, narrow appressed seta (*f*), and a short, slender, pointed seta (*f*). Gonostylus slender, curved, widened distally on lateral side, tapering to apex, bearing an inconspicuous, subapical crest on ventral side and a few scattered spicules on basal part of mesal

side; widened part with 2 setae on mesal side; apical snout elongate; gonostylar claw short, leaflike. Lateral plate of phallosome with apical, ventral, and lateral processes: apical process short, broad, apical margin convex, smooth; ventral process short, somewhat triangular in shape, pointed, slightly curved laterally; lateral process very short, similar to ventral process. Paraproct crown with 8 simple blades; 2 cercal setae. Tergum X large, somewhat rectangular in outline with a well-developed rounded apical lobe.

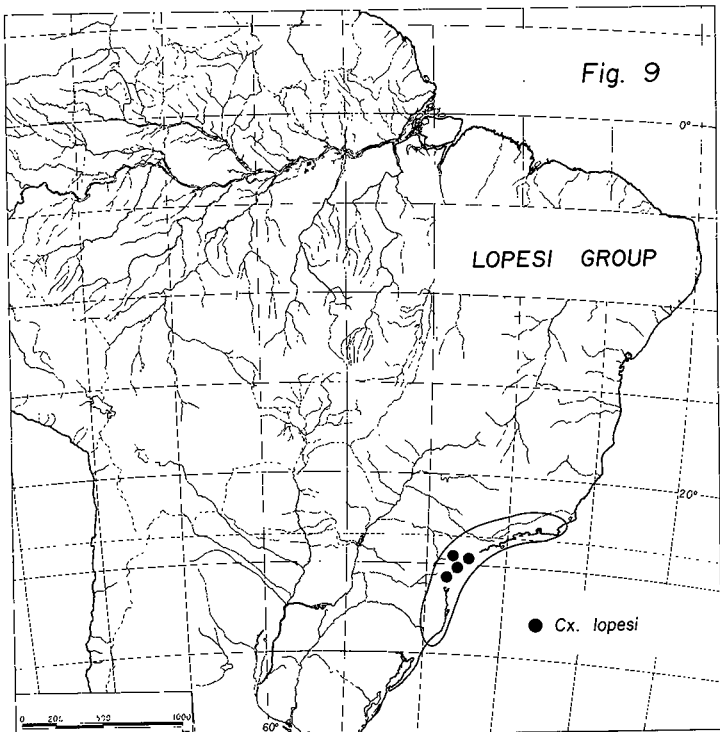


Fig. 9. Distribution of the Lopesi Group (*Culex lopesi*).

Material examined. 4 ♂, 2 ♀G. *Paratype:* USA, Georgia, Atlanta, 21 Jan 1967. Stone and Hair det., 1 ♂, 1 ♀G (no. 69792). *Other specimens:* Florida, Vero Beach & Everglades Pk. I.t., 10 Oct 1966. Stone and Hair det., 3 ♂, 1 ♀G (NMNH).

Distribution (Fig. 2). Reported from Florida, USA.

Bionomics. Larvae of *Cx. cedecei* were collected from solution holes on Big Ficus Hammock, apparently preferring permanent water for breeding (Stone and Hair 1968). They were taken from holes of the land crab *Cardisoma*

gualanum Latr. (Pratt et al. 1945) and also from potholes in coral limestone rocks (Hair 1968).

Adult populations appeared to reach a peak in October and November in the Everglades area (Hair 1968), showing a decrease after December (Stone and Hair 1968). Vector competence studies suggested that *Cx. cedecei* might be a vector of VEE virus, strain I-AB, strain I-E, and strain II (Weaver et al. 1986). This species exhibited preference for mammalian blood, especially that of rodents (Edman 1979).

Discussion. *Culex cedecei* differs from *Cx. taeniopus*, *Cx. akritus*, and *Cx. ikelos* in having

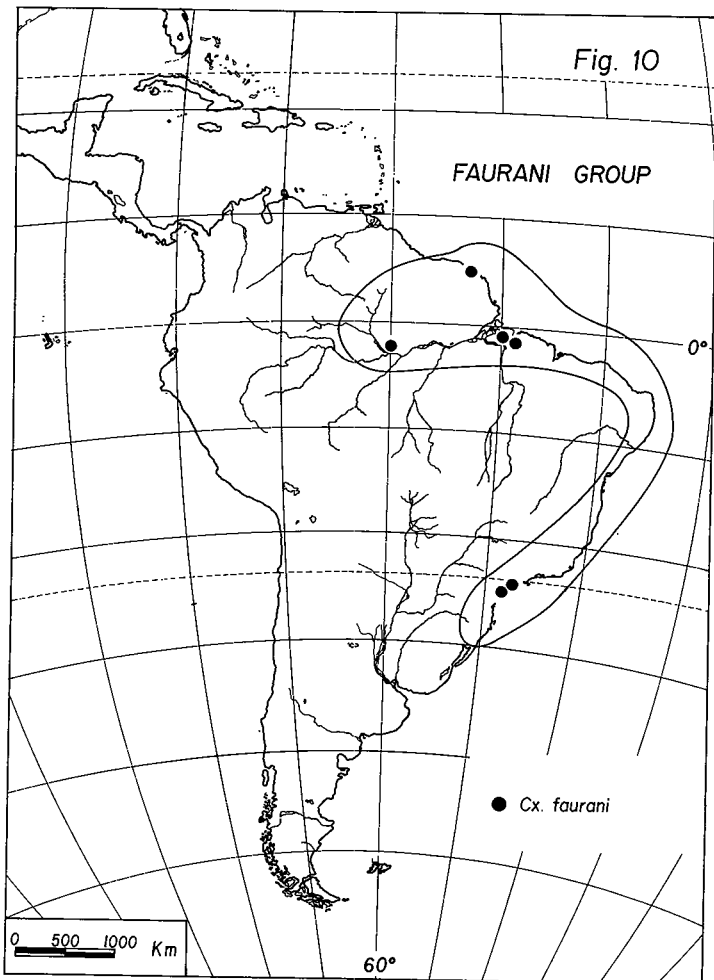


Fig. 10. Distribution of the Faurani Group (*Culex faurani*).

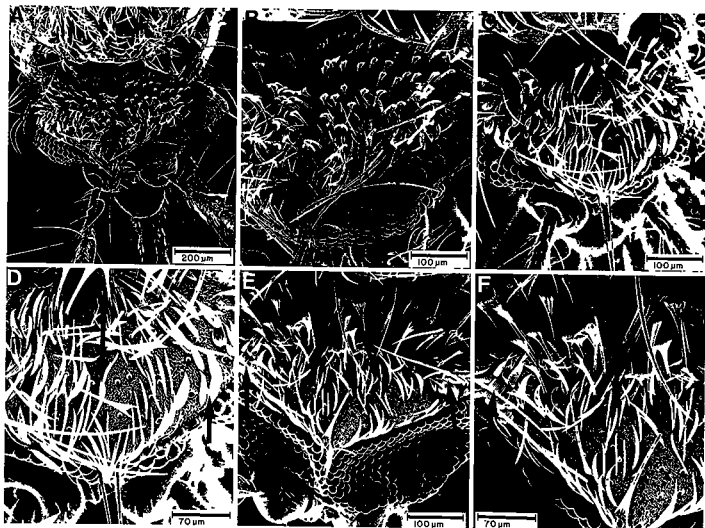


Fig. 11. Dorsal vestiture of head, female. A, B. *Culex (Mel.) spissipes*. C, D. *Cx. (Mel.) ocoosa*. E, F: *Cx. (Mel.)* sp. Atratus Group of the Melanoconion Section.

the apex of all femora dark and the hindtarsomeres entirely dark or, sometimes, with inconspicuous pale rings at joints of hindtarsomeres 2-4 and tarsomeres 5 pale. It differs from *Cx. akritos* and *Cx. ikelos* in not having a patch of broad spatulate white scales on the postspiracular area and in having the capitellum dark and also from *Cx. akritos* in possessing the pedicel of the antenna dark. Based on male adult features, *Cx. cedecei* differs from *Cx. ikelos* in having the proboscis totally dark. The male genitalia of *Cx. cedecei* differ from those of *Cx. taeniopus*, *Cx. akritos*, and *Cx. ikelos* in having the foliiform seta (*f*) wider than that of *Cx. taeniopus*, but narrower than those of *Cx. akritos* and *Cx. ikelos*, and foliiform seta (*f*) somewhat spoonlike in outline. It also differs from *Cx. akritos* and *Cx. ikelos* in possessing an inconspicuous crest on the ventral side of the subapical widened part of the gonostylus and in having the 9th tergal lobe long, fingerlike, apically rounded, interlobar area concave, and the lateral plate of phallosoma with a very short ventral process.

***Culex (Melanoconion) akritos*
Forattini and Sallum, 1995**

Culex akritos Forattini and Sallum, 1995:125 (♂^s, ♀^l). Holotype ♂: São Paulo, Brazil (F-SP).

Culex (Melanoconion) taeniopus of Forattini et al. 1989b:14; Forattini et al. 1991a:129; Forattini and Sallum 1992:72 (in part, specimens from Sao Paulo State, Brazil).

Female. Similar to *Cx. spissipes*, differing as follows. Body mostly covered with dark brown scales; hindtarsomeres 1-4 with conspicuous white rings on joints, 5 entirely white. **Head:** Antennal length about 2.47 mm; pedicel yellowish, but light brown on inner area; proboscis length 2.06-2.33 mm (\bar{x} = 2.18 mm); maxillary palpus length 0.38-0.41 mm (\bar{x} = 0.40 mm), about 0.20 of proboscis. Vertex with narrow falcate scales, these black in a small median dorsal area, becoming dingy white on lateral sides and along margin of eyes. **Cibarium:** Cibarium length about 249 µm; dorsal surface and distal

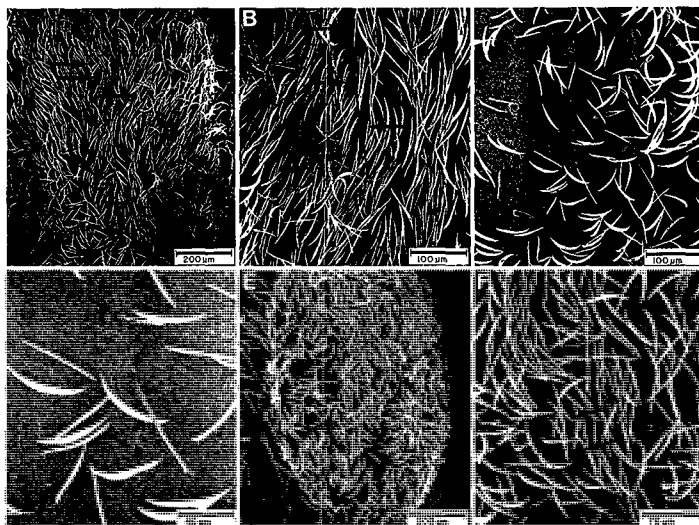


Fig. 12. Dorsal aspect of scutum, female. A, B. *Culex (Mel.) spissipes*, acrostichal setae present along the area. C, D. *Cx. (Mel.) sachettiae*, acrostichal setae present on posterior part. E, *Cx. (Mel.) pedroi*, acrostichal setae absent. F. *Cx. (Mel.) pedroi*, alveoli present on anterior portion of prescutellar area.

margin of cibarial bar with small spicules of different size; 10–20 cibarial teeth; tooth length about 18–20 μm ; line of origin of teeth not evident, hollow area of teeth small, somewhat triangular, more or less restricted to base. Palatal setae 6 in total number, 3 on each side; anterior pair of palatal setae situated slightly apart from the posterior pairs, smaller in size. Sensilla trichodea in linear series of 2–4 elements on each side. *Thorax* (Fig. 13D): Integument light brown to brownish black. Scutum with background scales dark brown with coppery reflections and with patches of light golden scales variably placed as follows: always on supraalar and prescutellar areas and/or on anterior promontory and/or anteriorly and/or posteriorly on scutal fossa and/or scutal angle and/or along acrostichal area. Scutal setae variable in color, totally dark brown with reddish or golden reflections, or median anterior promontory, median scutal fossal, antealar, supraalar setae, and dorsocentral setae golden; acrostichal setae absent. Prescutellar area with a small triangular protuberance centrally. Scutellar scales variable in color, to-

tally light golden or, sometimes, mixed with dark brown scales; lateral lobes each with 3, 4 large setae, median lobe with 6 large setae. Postpronotum with dark brown scales and a small patch of white, broad spatulate scales on posteroventral margin; with 4–7 dark setae on postero-dorsal margin. Pleural integument light brown to brownish black, darker areas similar to those of *Cx. spissipes*, but mesepimeron darker on posterior surface; pleural setae yellowish with golden reflections, prealar setae and the largest upper proepisternal setae darker: 10–15 upper proepisternal, 6–9 prealar, 7, 8 upper mesokatepisternal, 14–16 lower mesokatepisternal, 17–21 upper mesepimeral, and 1 lower mesepimeral. Pleura with small patch of white spatulate scales on postspiracular area and on upper corner and lower posterior margin of mesokatepisternum, occasionally with a few white, spatulate scales on upper mesepimeron. *Wing*: Length 3.39–3.76 mm (\bar{x} = 3.55 mm; cell R_2 4.12–4.96 of vein R_{1+2} , (\bar{x} = 4.61); cell M_2 0.83 of cell R_1 ; subcosta intersects costa slightly proximal to furcation of R_{2+3}). Dorsal scaling: ap-

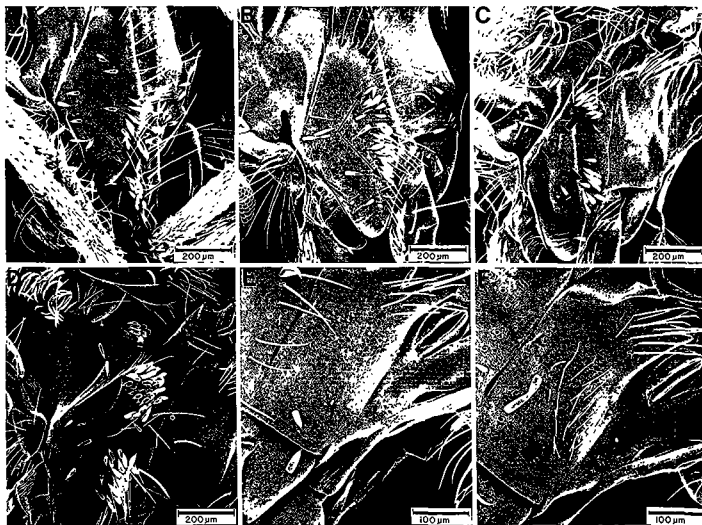


Fig. 13. Lateral aspect of thorax, female. A. *Culex (Mel.) pedroti*, lower mesokatepisternal patch of scales not extending dorsally from above lower mesokatepisternal setae. B. *Cx. (Mel.) spissipes*, lower mesokatepisternal patch of scales reaching upper mesokatepisternal setae. C. *Cx. (Mel.) ribirensis*, patch of scales on upper corner of mesokatepisternum. D. *Cx. (Mel.) akritos*, postspiracular scales. E. *Cx. (Mel.) portesi*, mesepimeron. F. *Cx. (Mel.) vomerifer*, middle area of mesepimeron with small setae.

pressed spatulate scales on M_{1+2} ; linear plume scales proximally on M_{1+2} ; renigium with 3-4 distal setae. Ventral scaling: appressed spatulate scales proximally on R_1 ; proximal 0.5 of R_2 , proximal 0.4 of M_{1+2} ; linear plume scales on proximal 0.3 of R_1 , proximal 0.4 of R_2 ; inclined narrow spatulate scales on distal 0.7 of R_1 , distal 0.5 of R_2 , distal 0.6 of R_{3+4} , distal 0.6 of M_{1+2} . *Halter*: Capitellum whitish. *Legs*: Anterior surface of forecoxa with patch of dark scales and few white scales on the base; anterior surface of mid- and hindcoxae with vertical line of nearly colorless scales; anteroventral surface of midtrochanter with whitish scales. Femora with a few white scales at apex, more evident on hindfemur. Tibiae dark-scaled with few whitish scales at apex on ventral surface. Hindtarsomeres 1-4 with distinct white rings on the base and apex, 5 largely white. *Abdomen*: Tergum II dark with median anterior and basolateral patches of whitish scales; terga III-VII dark-scaled with basolateral patches of white scales,

occasionally becoming narrow basal white bands on terga III-VI, tergum dark-scaled, sometimes with pale scales laterally. Sterna II-VII dark-scaled with basolateral patches of white scales, more evident on posterior sternum; sternum VIII without scales, occasionally with whitish scales anteriorly and dark scales posteriorly. *Genitalia*: Tergum IX lobes bearing 11-17 slender setae. Postgenital lobe trapezoidal, with 10-15 setae on either side of midline.

Male. Like female except for the following sexual differences. *Head*: Antennal length about 2.14 mm. Palpomeres 4 and 5 with basal patches of white scales; maxillary palpus length not measured, palpomere 3 with 14, 15 strong setae on outer apical area. *Thorax*: Postspiracular area with, or without, a small patch of white, spatulate scales. *Abdomen*: Terga II-VI dark-scaled with basal white bands and basolateral white patches (remaining terga not examined). Sterna II-VI with basolateral patches of white scales. *Genitalia* (Fig. 20-2): Tergum IX lobes approx-

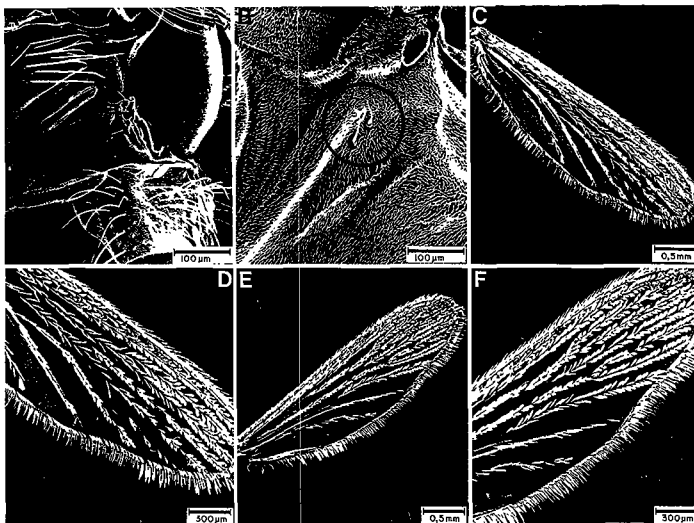


Fig. 14. Female. A. *Culex (Mel.) vomerifer*, minute setae on metepisternum. B. *Cx. (Mel.) ribeirensis*, detail of setae on metepisternum. C, D. *Cx. (Mel.) spissipes*, dorsal surface of right wing. E, F. *Cx. (Mel.) spissipes*, ventral surface of left wing.

inated, thumblike, long, distal part wrinkled, apically rounded, interlobar area nearly straight, setae slender and short. Gonocoxite with a patch of short sparse setae (lsp) at level of subapical lobe; subapical lobe distinctly divided, divisions approximated; proximal division entire, short, more robust than distal division, forked at apex, proximal portion swollen and wrinkled on mesal side, with 2 long, robust, apically hooked setae (setae *a* and *b*) and bearing a slender, short seta basal to setae *a* and *b* on lateral side; seta *a* sinuous, expanded at midlength with minute spicules on distal side of expanded part and slightly striated on proximal side, seta *b* long, rodlike, nearly straight; distal division with 8 setae: a long, strong, hooked seta (*h*), a short and a long, strong saberlike setae (*s*), a long, broad at base, tapered, nearly pointed at apex, evenly tanned, foliform seta (*f*), 3 subequal, apically rounded, narrow appressed setae (*j*), and a slender, flexible seta (*g*). Gonostylus slender, curved, widened distally on lateral side, tapering to apex, bearing a wrinkled subapical crest that extends from apical snout to widened part on ven-

tral side and a few scattered spicules on basal part of mesal side; widened part with 2 setae on mesal side; apical snout elongate; gonostylar claw short, leaflike. Lateral plate of phallosome with apical, ventral, and lateral processes, apical process short, broad, apical margin convex, smooth; ventral process short, blunt, laterally curved; lateral process shorter, pointed at apex. Paraproct crown with 8 simple blades; 2 cercal setae. Tergum X large, somewhat rectangular in outline, with a large rounded apical lobe.

Material examined. 6 ♂, 6 ♂G, 76 ♀, 6 ♀cib, 4 ♀G. **Holotype** ♂: BRAZIL, Sao Paulo State, Pariqueira-Açu County, Experimental Station, BR116 Road, 6 Oct 1986, Forattini et al. coll., collected with battery-powered aspirator (FSP-USP no. E-10517, slide no. 6913). **Paratypes:** same data as holotype, but differing as follows: coll. on human bait, 19 Dec 1978, 1 ♀; 3 Jul 1979, 1 ♀; 4 Dec 1979, 3 ♀; 16 Jan 1980, 2 ♀, 1 ♀cib; 17 Apr 1980, 1 ♀; 8 Sep 1986, 2 ♀; 3 Nov 1986, 7 ♀, 1 ♀G; CDC light trap, 15 Oct 1979, 1 ♀; 4 Dec 1980, 2 ♀; 12 Mar 1981, 1 ♂, 1 ♀G; 7 May 1981, 3 ♀, 1 ♀G; 10 Dec

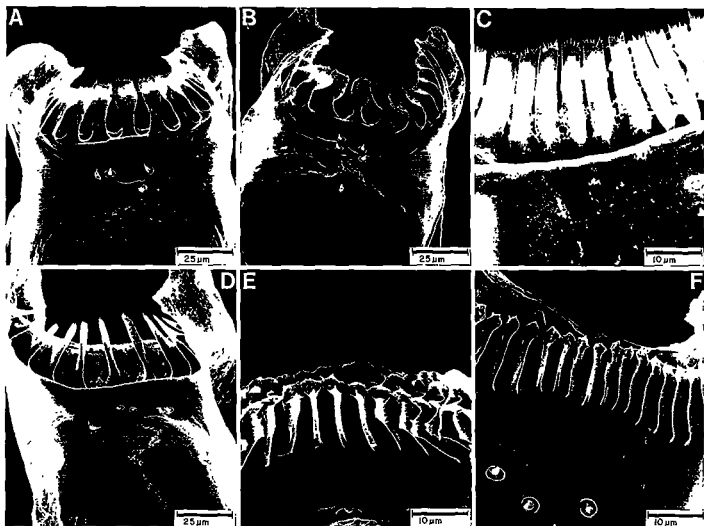


Fig. 15. Female cibarial armature, showing teeth shape and tooth origin line. A. *Culex* (Mel.) *ribeironis*. B. *Cx.* (Mel.) *sacchetiae*. C. *Cx.* (Mel.) *fauroni*. D. *Cx.* (Mel.) *lopesti*. E. *Cx.* (Mel.) *delpotei*. F. *Cx.* (Mel.) *ocusso*.

1981, 3 ♀, 1 ♂G; 7 Apr 1982, 1 ♀; 8 Sep 1982, 1 ♀, 1 ♂G; battery-powered aspirator, 20 Aug 1981, 2 ♀; 8 Oct 1986, 1 ♀; manual net, 6 Oct 1986, 1 ♂, 1 ♂G; Shannon trap supplemented with light, 19 Jul 1979, 1 ♀; 6, 9 Aug 1979, 2 ♀; 15 Oct 1979, 1 ♀; 8 Nov 1979, 1 ♀; 19 Nov 1979, 1 ♀; 3 Dec 1979, 1 ♀; 14, 17 Jan 1980, 5 ♀; 21 Jul 1980, 1 ♀, 1 ♀cib; 8 Apr 1981, 1 ♀; 21 Jan 1980, 1 ♀; Pariquera-Mirim, manual net, 23 May 1984, 1 ♂, 1 ♂G; battery-powered aspirator, 15 Jan 1986, 1 ♂, 1 ♂G; Cananea County, Itapitangui district, Itapoa Fatur, human bait, 28 Jan 1981, 1 ♀; Shannon trap supplemented with light, 9 Feb 1981, 1 ♀; 6 Apr 1981, 1 ♀; 4 May 1981, 1 ♀; 1 Mar 1982, 1 ♀; CDC light trap, 2 Sep 1981, 1 ♀; Vilarinho Farm, Shannon trap supplemented with light, 6 Sep 1983, 2 ♀; 4 Oct 1983, 2 ♀; CDC light trap, 5 Sep 1983, 1 ♀; 3 Oct 1983, 1 ♀; 6 Dec 1983, 1 ♂, 1 ♂G; Iguaçu County, human bait, 18 Oct 1982, 1 ♀; 3 May 1989, 5 ♀; CDC light trap, 8 Sep 1982, 1 ♀; 16 Nov 1982, 1 ♀; 9 Sep 1982, 5 ♀; 20 Mar 1989, 1 ♀; 3 May 1989, 4 ♀, 4 ♀cib.

Distribution (Fig. 2). Known only from the Ribeira Valley, São Paulo, Brazil.

Bionomics. Adults have been collected on human bait, from Shannon traps supplemented with light and CDC light traps, with battery-powered aspirators, and with hand nets from human environments and cultivated areas (Forattini et al. 1989b, 1991b).

Calisher et al. (1983) isolated strains of Guama serogroup bunyaviruses and other ungrouped virus (strain 76 V-25880) from specimens of *Cx. akritus* (identified as *Cx. taeniopus*) collected in the coastal region in São Paulo State.

Discussion. *Culex akritus* differs from *Cx. cedecei*, *Cx. taeniopus*, and *Cx. ikelos* in possessing the pedicel of the antenna yellowish, from *Cx. taeniopus* and *Cx. cedecei* in having a patch of broad, spatulate white scales on the postspiracular area and the capitellum whitish, from *Cx. cedecei* in having conspicuous white rings on joints of hindtarsomeres 1-4, 5 entirely white, and a few white scales at apex of all femora. Adult males of *Cx. akritus* differ from *Cx. ikelos* in having the proboscis totally dark, and the fe-

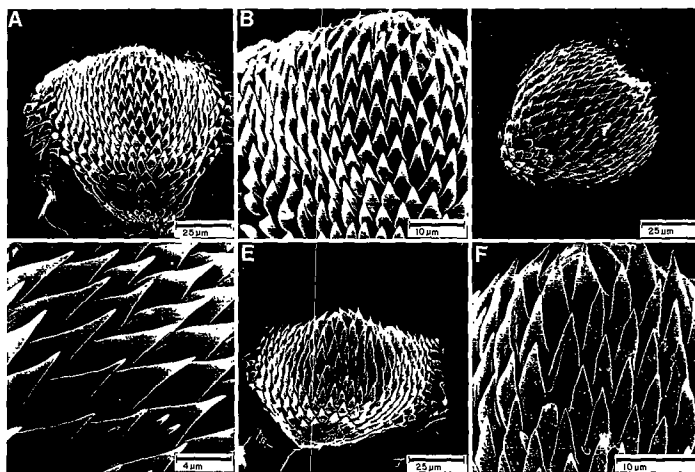


Fig. 16. Female cibarial dome. A, B. *Culex (Mel.) ribeirensis*. C, D. *Cx. (Mel.) pedroi*. E, F. *Cx. (Mel.) sacchettae*.

male differs from *Cx. taeniopus* and *Cx. ikelos* in having 15–20 cibarial teeth and 3 pairs of palatal setae. The male genitalia of *Cx. akritus* differ from those of *Cx. cedecei*, *Cx. taeniopus*, and *Cx. ikelos* in having a prominent crest on the ventral side of the gonostylus that extends from the apical snout to the widened subapical part, the foliiform seta (*f*) broad basally, narrowed apically, becoming somewhat triangular in outline, tergal IX lobes thumblike, rounded at apex, and interlobar area almost straight, the ventral process of lateral plate of phallosome long and curved, and the proximal division of subapical lobe of gonocoxite with a slender seta near the base of setae *a* and *b*.

***Culex (Melanoconion) ikelos*
Forattini and Sallum, 1995**

Culex ikelos Forattini and Sallum, 1995:132 (♂, ♀, L♀, P♀). Holotype ♂: São Paulo, Brazil (FSP).

Female. Similar to *Cx. spissipes*, differing as follows. Body mostly covered with dark brownish black scales; hindtarsomeres 1–4 with conspicuous white rings on joints, 5 white. **Head:** Antennal length about 2.13 mm; proboscis

length 1.90–2.11 mm (\bar{x} = 2.01 mm); maxillary palpus length 0.34 mm (\bar{x} = 0.34 mm), about 0.20 of proboscis length. Vertex with narrow falcate scales, these dark in a small median dorsal area, becoming dingy white laterally and along margin of eyes. **Cibarium:** Length about 226 μm; dorsal surface and distal margin of cibarial bar with small spicules of different size; about 12 teeth; tooth length about 21 μm; line of origin not evident; hollow area of teeth small, more or less restricted to base. Sensilla trichodea in linear series of 3 single setae on each side. **Thorax:** Integument light brown to brownish black. Scutum with background scales dark brown with coppery reflections and patches of light golden scales on anterior promontory and/or anterior part of scutal fossa and/or scutal angle and/or supraalar and prescutellar areas. Acrostichal setae absent. Prescutellar area sometimes with a small triangular protuberance. Scutellum covered with light golden scales mixed with dark brown scales; lateral lobes with 4 large setae; median lobe with 6, 7 large setae. Postpronotum with scales similar to scutal scales, mostly dark brown and with a small patch of broad spatulate white scales on posteroventral margin, and 5–8 dark setae on postero-dorsal margin. Pleural integument light brown to brownish black, with

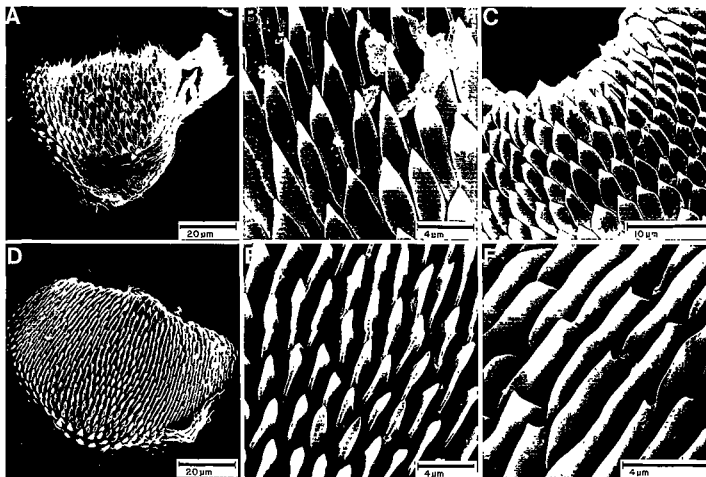


Fig. 17. Female cibarial dome. A, B. *Culex (Mel.) peregrini*. C. *Cx. (Mel.) ocosa*. D-E. *Cx. (Mel.) fannan*.

darker areas as in *Cx. spissipes*, but with mesepimeron darker on posterior surface; pleural setae yellowish; prealar setae and the largest upper proepisternal setae darker; 9-11 upper proepisternal, 6, 7 prealar, 5, 6 upper mesokatepisternal, 10, 11 lower mesokatepisternal, 15-22 upper mesepimeral, and 1 lower mesepimeral. Pleura with small patches of white spatulate scales on postspiracular area, on upper corner, and on lower posterior border of mesokatepisternum. *Wing*: Length 3.26-3.56 mm (\bar{x} = 3.41 mm; cell R_2 4.28-4.61 of R_{2+3} , (\bar{x} = 4.45); cell M_1 0.8 of cell R_2 ; subcosta intersects costa slightly proximal to furcation of R_{3+4} . Dorsal scaling: appressed spatulate scales on M_{1+2} ; linear plume scales on proximal 0.2 of R_1 ; proximally on M_{1+2} ; inclined narrow spatulate scales on 0.8 distal of R_1 ; renigium with 1-4 distal setae. Ventral scaling: appressed spatulate scales proximally on R_1 , on proximal 0.3 of R_2 , proximal 0.4 of M_{1+2} ; linear plume scales on proximal 0.4 of R_1 , proximal 0.4 of R_{2+3} ; inclined narrow spatulate scales on distal 0.6 of R_1 , distal 0.7 of R_2 , distal 0.6 of R_{3+4} , distal 0.6 of M_{1+2} . *Halter*: Capitellum whitish. *Legs*: Anterior surface of forecoxa with a patch of dark scales and few white scales at base; anterior surface of mid- and hindcoxae with vertical line of nearly col-

orless scales, hindcoxa sometimes with a patch of nearly colorless scales at base. Anteroventral surface of midtrochanter with whitish scales. Femora with small patches of white scales at apex, more evident on hindfemur. Tibiae dark with few white scales at apex on ventral surface. Hindtarsomeres 1-4 with white rings on base and apex, 5 white. *Abdomen*: Terga II-VII dark-scaled with basolateral patches of whitish scales; tergum VIII dark-scaled with white scales on lateral areas. Sterna II-VII dark-scaled with basolateral patches of white scales; sternum VIII with scattered white scales. *Genitalia*: Tergum IX lobes bearing 11-15 slender setae; insula with 10 clustered setae. Postgenital lobe trapezoidal with 11 setae on either side of midline.

Male. Like female except for the following sexual differences. *Head*: Antennal length about 1.90 mm. Proboscis dark-scaled with white ring at about 0.75 from base. Maxillary palpus dark-scaled with small patches of white scales at base of palpomeres 4 and 5; length about 2.88 mm, exceeding proboscis by about length of apical 0.3 of palpomere 4; palpomere 3 with 11-14 strong setae on outer apical area. *Thorax*: Postspracular area with a patch of white spatulate scales that is sometimes absent. *Abdomen*: Tergum II dark-scaled or with patches of white

scales on basolateral areas or with a narrow basal white band; terga III-VIII with patches of white scales on basolateral areas, becoming narrow basal white bands on terga III-VI. Sterna II-VII dark-scaled with patches of white scales on basolateral areas; sternum VIII without scales or with few white scales scattered on median region. *Genitalia* (Fig. 20-3): Tergum IX lobes large, nearly rectangular in outline, distal part wrinkled with unevenly dispersed slender setae, interlobar area nearly straight. Lateral surface of gonocoxite with a patch of short sparse setae (lsp) at level of subapical lobe; divisions of subapical lobe approximated; proximal division short, stronger than distal division, forked at apex with 2 long, robust, apically hooked setae (setae *a* and *b*), seta *a* sinuous, distinctly expanded on subapical part with diminute spicules on distal surface of basal half, seta *b* expanded on basal portion, strongly curved at midlength, narrowed distally; distal division thinner and larger than proximal division with 8 setae: a long hooked seta (*h*), a short, pointed saberlike seta (*s*), a long, robust saberlike seta (*s*), a wide, asymmetrical, striated foliiform seta (*l*), 3 subequal narrow appressed setae (*f*), and a slender, flexible seta (*f*). Gonostylus slender, curved, widened distally on lateral side, bearing an inconspicuous subapical crest on ventral side, extended between apical snout and widened part and a few scattered spicules on basal part of mesal side, expanded part with 2 setae unequally developed on mesal side; apical snout elongate; gonostylar claw short, leaflike. Lateral process of lateral plate of phallosome short, tapered, and pointed, ventral process long, nearly pointed, and laterally curved. Paraproct crown with 5-7 simple blades; 2-4 cercal setae. Tergum X large, nearly rectangular in outline, narrowed at midlength, forming a rounded apical lobe.

Material examined. 6 ♀, 10 ♂, 4 ♂G, 1 ♀cib, 1 ♀G. *Holotype* ♂: BRAZIL, Sao Paulo State, Sorocaba County, Campolim district, urban area, 10 Jan 1988. A. Fernandes coll., collected as larva from hoofprints in pasture (FSP-USP no. 10518, slide no. 6914). *Paratypes*: same data as holotype, 5 ♀, 6 ♂, 1 ♂G, 1 ♀G, Araraquara County, Lupo Farm, CDC light trap, 18 Jan 1983. E. X. Rabello, coll., 1 ♂, 1 ♂G; Sao Joao da Boa Vista County, Santa Helena Farm, "New Jersey" light trap, 5 Jan 1982, 1

♂, 1 ♂G; CDC light trap, 9 Feb 1982, 1 ♂, 1 ♂G; 11 Mar 1982, 1 ♀, 1 ♀cib.

Distribution (Fig. 2). Known only from Sao Paulo State, southern Brazil.

Bionomics. Immature stages were collected from hoof prints in pasture areas in an urban environment. Adults were collected in CDC light traps and New Jersey light traps in agricultural regions.

Discussion. *Culex akritos* differs from *Cx. taeniopus* and *Cx. cedecei* by possessing a patch of broad, spatulate white scales on the postspiracular area and the capitellum whitish, from *Cx. cedecei* by having hindtarsomeres 1-4 with conspicuous white rings on joints, 5 entirely white, and femora with a few white scales at apex, and from *Cx. akritos* by having the pedicel of the antenna dark. The adult male of *Cx. ikeles* differs from *Cx. taeniopus*, *Cx. cedecei*, and *Cx. akritos* by possessing a white ring on the proboscis, and the female adult differs by having 12 cibarial teeth and 2 pairs of equally developed palatal setae. The male genitalia of *Cx. ikeles* differ from other species of the group by having an inconspicuous crest extended between the apical snout and the widened part of ventral side of the gonostylus, a wide, asymmetrical, striated foliiform seta (*l*), tergam IX lobes moderately short, somewhat rectangular in outline, interlobar area nearly straight, and the ventral process of the lateral plate of the phallosome long, tapered, nearly pointed at apex, and laterally curved.

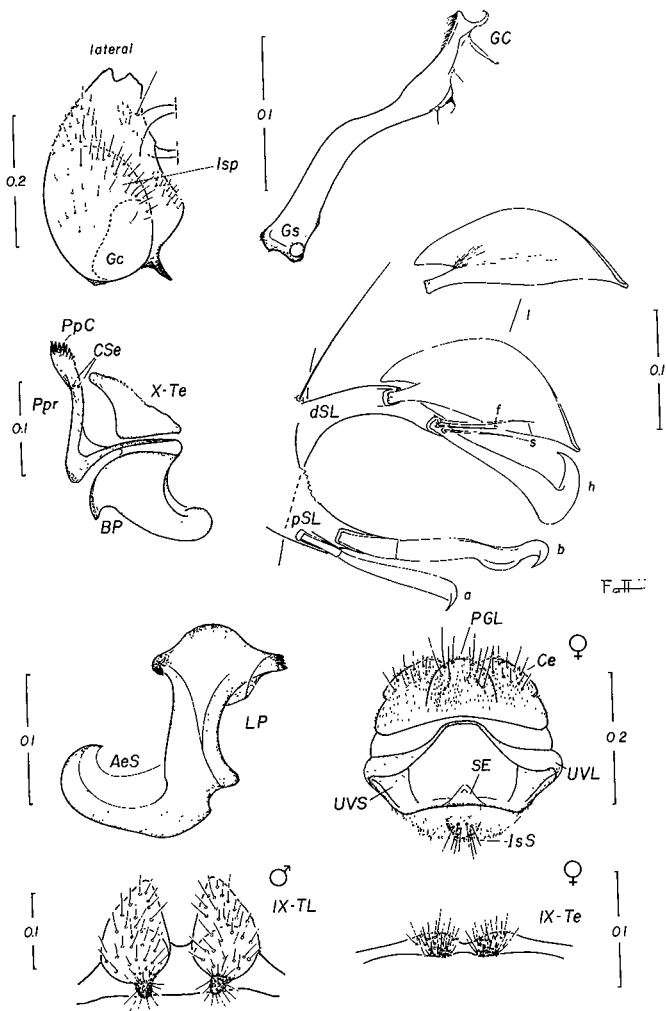
Crybda Group

According to the classification of the subgenus *Melanconion* proposed by Sirivanakarn (1983), the Pedroi Subgroup belonged to the Taeniopus Group and the Paracrybda and Pereyrai subgroups belonged to the Paracrybda Group. This division in groups was based mainly on cibarial teeth, which in the latter are very small, without hollow area, linear in outline, with 2 distinct parts, which include a thin sagittal plate and a small transverse plate, lozenge or hexagonal in dorsal view (Figs. 15E, 15F), and in the former are spatulate, blunt at apex, with hollow area, and with irregular serrated distal margin (Fig. 15A). However, on the basis of male genitalic features the Pedroi Subgroup is

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Fig. 18. *Culex (Mel.) spissipes*, male and female genitalia. AeS, aedeagal sclerite; BP, basal piece; Ce, cercus; Cse, cercal seta; dSL, distal division of subapical lobe; Gc, gonocoxite; GC, gonostylar claw; Gs, gonostylus; ISS, insular seta; LP, lateral plate; lsp, lateral setal patch; PGL, postgenital lobe; PpC, paraproct crown; Ppr, paraproct; pSL, proximal division of subapical lobe; SE, spermathecal eminence; UV1, upper vaginal lip; UVS, upper vaginal sclerite; IX-lc, tergam IX; IX-fl, tergam IX lobe; X-te, tergam X. Scales in mm.

Cx. (Mel.) spissipes (Sao Paulo, Brazil)



more closely related to the Paracrybda and Pereyra subgroups than to the Taenioptus and Vomifer subgroups of the Taenioptus Group of Sirivanakarn (1983). For this reason, we are proposing a new group, the Crybda Group, which includes the following three subgroups:

Pedroi Subgroup: *Culex adamesi* Sirivanakarn and Galindo, *Culex crybda* Dyar, *Culex epanastasis* Dyar, *Culex pedroi* Sirivanakarn and Belkin, and *Culex ribeirensis* Forattini and Sallun

Paracrybda Subgroup: *Cx. delpontei* and *Culex paracrybda* Komp

Pereyra Subgroup: *Cx. pereyra*

The Crybda Group can be easily recognized by having the gonocoxite conical in outline with scales on the proximal part of the ventrolateral surface; proximal division of the subapical lobe of the gonocoxite with an apical infundibular and hyaline expansion, a subapical broad hooked-falciform seta and few short setae scattered from the base to the level of insertion of the hooked-falciform seta; distal division of subapical lobe divided into 2 subequal or unequal arms (proximal and distal arms), proximal arm with 3 setae, which include a hooked seta (*h*), a saberlike seta (*s*), and a foliiform seta (*l*); distal arm with 5 setae, which include a saberlike seta (*s*) and 4 narrow, appressed setae (*f*); gonostylus slightly enlarged on subapical portion; tergum IX lobe small, cone-shaped or moundlike, widely separated and with few sparse, fine setae.

Pedroi Subgroup

Species of the Pedroi Subgroup closely resemble each other in general adult morphology, cibarial armature, and male genitalia. This subgroup differs from the other subgroups of the Crybda Group in having the tergum IX lobe small, cone-shaped, widely separated, and with small, slender setae; proximal division of the subapical lobe of the gonocoxite with few short, stiff setae basal to the subapical hooked-falciform seta, distal division of the subapical lobe of the gonocoxite divided into 2 subequal arms (proximal and distal arms); lateral plate of the phallosome with lateral and ventral processes, apical process absent, lateral process long, beak-like, dorsolaterally directed, ventral process short, nearly triangular, laterally curved. The adults of the Pedroi Subgroup differ from the other subgroups in having cibarial teeth spatu-

late in outline, blunt at apex, distal margin irregular, serrated; cibarial dome with triangular, pointed denticles and the pleural integument of thorax similar in color to scutal integument.

Culex (Melanoconion) pedroi Sirivanakarn and Belkin, 1980

Culex (Melanoconion) pedroi Sirivanakarn and Belkin. 1980:12 (δ^* [habitus], ♀^* [habitus], P*, I.^{1,2}). Holotype δ : Juan Mina (0.5 km S of Chagres River), Canal Zone, Panama (NMNH).

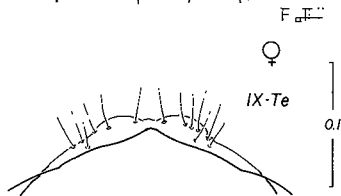
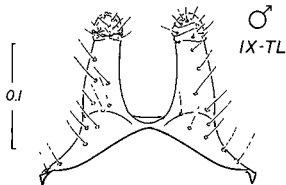
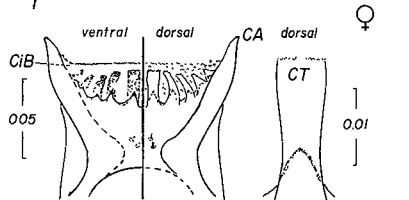
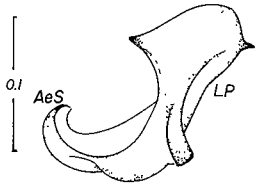
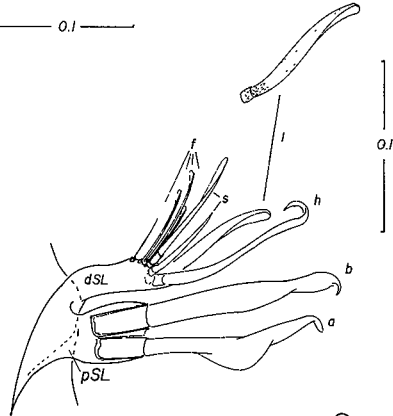
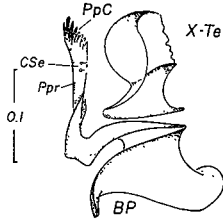
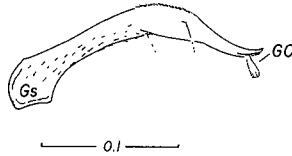
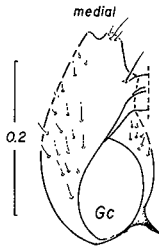
Bonne and Bonne-Wepster 1925:296 (δ^* ; as *Cx. taenioptus*); Dyar 1928:293 (δ^* ; as *Cx. taenioptus*); Cerqueira 1943:34 (Bolivia; as *Cx. taenioptus*); Rozeboom and Komp 1950:89, 96 (δ^* , P, L; as *Cx. taenioptus*); Duret 1953:70 (δ^* ; as *Cx. taenioptus*); Forattini 1965:184 (δ^* ; as *Cx. taenioptus*); Cova Garcia et al. 1966a:36 (δ^* ; as *Cx. taenioptus*); Sirivanakarn 1983:279 (δ^*); Clark-Gil and Darsie 1983:256 (Guatemala).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with blackish scales; apex of all femora and anterior surface of foretibia with conspicuous patches of silver-white scales; hindtarsomeres 1-4 with conspicuous white rings on joints, 5 entirely white. **Head:** Antennal length about 2.15 mm; proboscis length 1.63-1.87 mm (\bar{x} = 1.76 mm); maxillary palpus length 0.31-0.35 mm (\bar{x} = 0.33 mm), about 0.20 of proboscis length. Vertex with narrow falcate scales, these black anteriorly and dingy white posteriorly. **Cibarium** (Figs. 16C, 16D, and 21): Length about 168 μ m; dorsal surface and distal margin of cibarial bar with numerous spicules; 12-15 teeth; tooth length about 13 μ m; line of origin of teeth not evident. Sensilla trichodea in linear series of 2-4 single setae on each side. **Thorax** (Figs. 12E, 12F, and 13A): Integument dark brown to brownish black. Scutum with brownish black scales with reddish reflections; scutal setae black with reddish reflections; acrostichal setae absent. Scutellar scales similar to scutal scales in color and shape; median lobe with 6, 7 large setae; lateral lobes each with 4 large setae. Postpronotum with scales similar to scutal scales; with 4-7 large setae on posterodorsal margin. Pleural integument dark brown to black, slightly lighter on median portion of mesepimeron. Pleural setae

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Fig. 19. *Culex (Mel.) taenioptus*, female and male genitalia and female cibarial armature. Abbreviations same as Fig. 18, except for, CA, cibarial armature; CIB, cibarial bar; CT, cibarial tooth. Scales in mm.

Cx. (Mel.) taeniopus
(Guatemala)



black with reddish or golden reflections: 16–22 upper proepisternal. 4, 5 prealar, 9–13 upper mesokatepisternal. 8–13 lower mesokatepisternal, 9–13 upper mesepimeral, and 1 lower mesepimeral. Pleura with scales on mesokatepisternum only, a row of dark or grayish spatulate scales on lower posterior margin (Fig. 13A). *Wing*: Length 2.92–3.25 mm (\bar{x} = 3.08 mm); cell R_2 3.54–5.09 of vein R_{1+2} , (\bar{x} = 4.30); cell M_2 0.86 of cell R_2 ; subcosta intersects costa slightly proximal to furcation of R_{2+3} . Dorsal scaling: inclined narrow spatulate scales on R_2 and R_3 . Ventral scaling: appressed spatulate scales on proximal 0.2 of R_1 , proximal 0.2 of M_{1+2} ; linear plume scales on proximal 0.3 of R_1 , proximal 0.4 of R_{4+5} ; inclined narrow spatulate scales on distal 0.7 of R_1 , distal 0.8 of R_3 , distal 0.6 of R_{3+4} , distal 0.8 of M_{1+2} . *Halter*: Scabellum, basal two-thirds of pedicel, and ventral portion of capitellum whitish, distal 0.3 of pedicel and dorsal portion of capitellum dark. *Legs*: Apex of all femora with conspicuous patches of silver-white scales, dorsal surface of foretibia with a patch of silver-white scales at apex, occasionally absent, midtibia totally dark, anterior surface of hindtibia with few white scales at apex. Fore- and midtarsomeres 1–4 with inconspicuous pale rings on joints, 5 pale; hindtarsomeres 1–4 with conspicuous white rings on base and apex, 5 white. *Abdomen*: Terga II–VII dark-scaled with basolateral patches of white scales; tergum VIII with dark scales. Sterna II–VII dark-scaled with basal bands of white scales; sternum VIII with sparse dark scales. *Genitalia* (Fig. 21): Lateral lobes of tergum IV each with 7, 8 setae; 8 clustered insular setae. Postgenital lobe short, trapezoidal, distal margin nearly straight, with 8–13 setae on either side of midline.

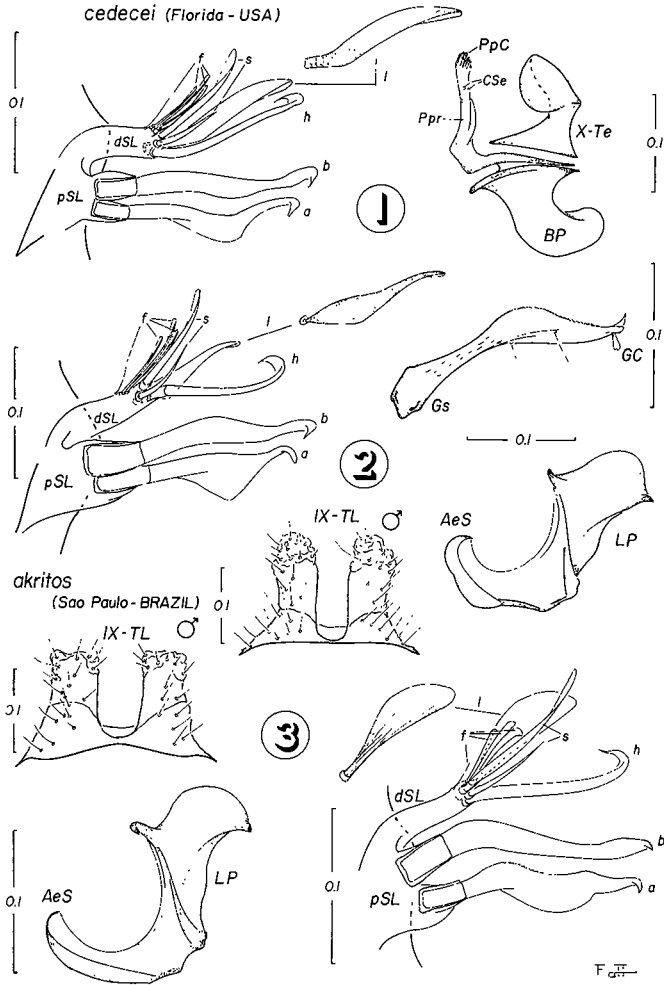
Male. Like female except for the following sexual differences. *Head*: Antennal length about 1.82 mm. Palpomeres 1–4 dark, 5 with a small patch of white scales on base of dorsal surface; maxillary palpus length about 2.78 mm, exceeding proboscis tip by length of apical 0.8 of palpomere 4; palpomere 3 with 8–10 strong setae on outer apical area. *Vertex*: Narrow falcate scales dark in a small median dorsal area along coronal suture. *Abdomen*: Tergum II dark-scaled with basomedian and basolateral patches of white scales; terga III–VI dark-scaled with basal bands of white scales; tergum VII with basolateral patches of white scales; tergum VIII without scales. Sterna II–VII dark with basal bands of white scales; sternum VIII with basolateral

patches of white scales. *Genitalia* (Fig. 21): Tergum IX lobes small, cone-shaped, widely separated, with few sparse fine setae. Gonocoxite conical; inner margin moderately concave; lateral surface with sparse patch of short, slender setae at level of subapical lobe (lsp); tergomesal surface with sparse patch of short setae proximal to subapical lobe; proximal part of ventrolateral surface with scales; proximal division of subapical lobe with an apical infundibular and hyaline expansion, 2 robust, sinuous, apically hooked setae (setae *a* and *b*) at apex, a subapical hyaline, broad, hooked-falciform seta and few short, slender, pointed setae from base to level of insertion of the hooked-falciform seta; distal division divided into 2 divergent arms, the proximal arm with 3 apical setae, which include a strong apically hooked seta (*h*), a moderately long falciform seta (*l*), and a shorter saberlike seta (*s*); distal arm with 5 apical setae, which include a long saberlike seta (*s*), 3 blunt, narrow, appressed setae (*f*), and 1 pointed, narrow appressed seta (*f*). Gonostylus slender, curved at midlength, subapical portion poorly enlarged on lateral view; ventral surface with crest extending from apical snout to enlarged subapical portion; apical snout tapered to a truncate apex; gonostylar claw short, leaflike, broadened apically. Lateral plate of phallosome with lateral and ventral processes, apical process absent, distal margin slightly concave; ventral process short, triangular, laterally curved; lateral process longer, beaklike, tapered, pointed at apex, dorsolaterally directed. Paraproct crown with 6–9 simple blades; 2–4 cercal setae. Tergum X large, somewhat rectangular in outline, rounded on apical margin.

Material examined. 40 ♂, 40 ♂G, 21 ♀, 3 ♀cib, 3 ♀G. *Paratype*: PANAMA, Canal Zone, Chilitre, Chagres River, 18 Jul 1972. Mosq. Mid. Amer., Sirivanakarn and Belkui det. 1980, 2 ♂, 1 ♂G (FSP no. F-7733, E-7734). *Other specimens*: BOLIVIA, Guajaramirim, Dec 1943, R. Gilmore coll., Sallum det. 1992. 1 ♂, 1 ♂G; PANAMA, Canal Zone, 1936, H. W. Komp coll., 1 ♀; TRINIDAD, Arena Forest, 1954, W. G. Downs coll., 1 ♀; VENEZUELA, Caripira, Jul 1937, P. J. Anduze coll., 1 ♀; locality unknown, 1953, 1 ♂G; BRAZIL, Goias, Goiana County, May 1938, F. Lane coll., 3 ♀, 2 ♂, 2 ♂G; Para, Belem, Utinga, Jul 1966, A. Toda coll., 1 ♂, 1 ♂G. Sao Paulo, Cananea County, Rio Taquari, 29 Jan 1980. Forattini et al. coll., Shannon trap supplemented with light, 1 ♂, 1

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Fig. 20. Male genitalia. 1. *Culex (Mel.) cedecet*. 2. *Cx. (Mel.) akrios*. 3. *Cx. (Mel.) ikelov*. Abbreviations same as Fig. 18. Scales in mm.



♂G; Itapitangui district, Itapoa Farm, 1 Feb 1982, 1 ♀; 20 Apr 1982, 1 ♂, 1 ♂G; Folha Larga Farm, 20 Aug 1985, CDC light trap, 1 ♀; Iguape County, Iguape-Bigua Road, 16 Nov 1982, CDC light trap baited with bird, 1 ♀; 6 Oct 1982, CDC light trap baited with small rodent, 1 ♀, 1 ♀cib; Pariqueira-Açu, Experimental Station, 8 Mar 1978, on human bait, 1 ♀, 1 ♀G; 7 Jan 1979, 1 ♀; 16 May 1979, 1 ♂, 1 ♂G; 13 Feb 1980, 1 ♀, 1 ♀G; 25 Jan 1979, Shannon trap, 1 ♂, 1 ♂G; 22 Mar 1979, 1 ♂, 1 ♂G; 4 Apr 1979, 3 ♂, 3 ♂G; 5 Apr 1979, 5 ♂, 5 ♂G; 16 Apr 1979, 1 ♂, 1 ♂G; 19 Apr 1979, 2 ♂, 2 ♂G; 6 Aug 1979, 1 ♀; 10 Dec 1979, 3 ♂, 3 ♂G; 4 Feb 1980, 1 ♂, 1 ♂G; 13 Jul 1978, CDC light trap baited with bird, 1 ♀, 1 ♀cib; 4 Dec 1978, 2 ♀, 1 ♀cib; 25 Jan 1979, 1 ♂, 1 ♂G; 5 Mar 1979, 3 ♂, 3 ♂G; 8 Mar 1979, 1 ♂, 1 ♂G; 16 Apr 1979, 1 ♂, 1 ♂G; 5 Apr 1979, 1 ♂, 1 ♂G; 20 Mar 1980, 1 ♂, 1 ♂G; 18 Oct 1979, CDC-LT, 1 ♂, 1 ♂G; 8 Mar 1979, 1 ♀; 10 Apr 1980, CDC light trap baited with bird, 1 ♀; 17 Jan 1980, 1 ♀, 1 ♀G; 15 Jan 1981, 1 ♀.

Distribution (Fig. 3). *Culex pedroi* is widespread from Tabasco, Mexico, to Corrientes, Argentina, including Brazil, Bolivia (new distribution), Colombia, Costa Rica, Ecuador, French Guyana, Guatemala, Guyana, Mexico, Panama, Surinam, Tobago, Trinidad, and Venezuela (Pecor et al. 1992).

Bionomics. Adults of *Cx. pedroi* were collected on human bait, in CDC light traps supplemented with birds or small rodents, in the canopy or at ground level of forests, from Shannon traps, Chamberlain traps, and other kinds of unspecified traps, in tropical forest, forest edges, partially forested areas, second-growth vegetation, swamp edges, and in human environments with intense agricultural activities. Adults were also found resting in holes in tree roots at swamp edges and animal holes in the forest floor. Immature stages were taken from a wide variety of habitats that were heavily or partially shaded. They were taken from the edges and interior of swamps and in semipermanent or temporary sites. The water was clear, reddish, or turbid, stagnant or with slow current, sometimes with scum, without aquatic vegetation or with scarce to abundant emergent (aquatic grasses), submerged, or floating vegetation, and plant debris or mud at the bottom (Heinemann and Belkin 1977a, 1977c, 1978a, 1978b, 1978c, 1979; Heinemann et al. 1980; Clark-Gil and Darsie 1983; Forattini et al. 1991b).

Records from the literature have shown that *Cx. pedroi* is a potential enzootic vector of eastern equine encephalitis (EEE) virus in Brazil and Trinidad (Vasconcelos et al. 1991), as well as of VEE and other arboviruses (Galindo et al. 1966, Galindo and Srihongse 1967, Srihongse and Galindo 1967).

Discussion. *Culex pedroi* is similar to *Cx. epanastasis*, *Cx. adamesi*, *Cx. ribeirensis*, and *Cx. crybda* in general adult morphology and in cibarial and genitalic features. It is easily separated from *Cx. adamesi*, *Cx. ribeirensis*, and *Cx. crybda* by having conspicuous patches of silver-white scales at the apex of all femora and hind-tarsomeres 1-4 with white rings at joints, 5 entirely white. The adult male differs from all these species in having a small patch of white scales on the base of palpomere 5. The cibarial armature of *Cx. pedroi* differs from *Cx. adamesi* in possessing small spicules on the distal margin and dorsal surface of the cibarial bar, and from *Cx. ribeirensis* by having 12-15 cibarial teeth. The cibarial armature of *Cx. crybda* and *Cx. epanastasis* was not examined. The male genitalia of *Cx. pedroi* are indistinguishable from those of *Cx. adamesi* and *Cx. ribeirensis*. They differ from *Cx. crybda* in having a sparse patch of fine setae on the tergomesal surface of the gonocoxite proximal to the subapical lobe, and by the distal and proximal divisions of the subapical lobe longer and less robust than in *Cx. crybda*, and from *Cx. epanastasis* in having the lateral plate of the phallosome with a long, beak-like, tapered, and pointed lateral process, the ventral process long, triangular, and curved, and the distal margin of the lateral plate nearly straight.

Culex (Melanoconion) adamesi Sirivanakarn and Galindo, 1980

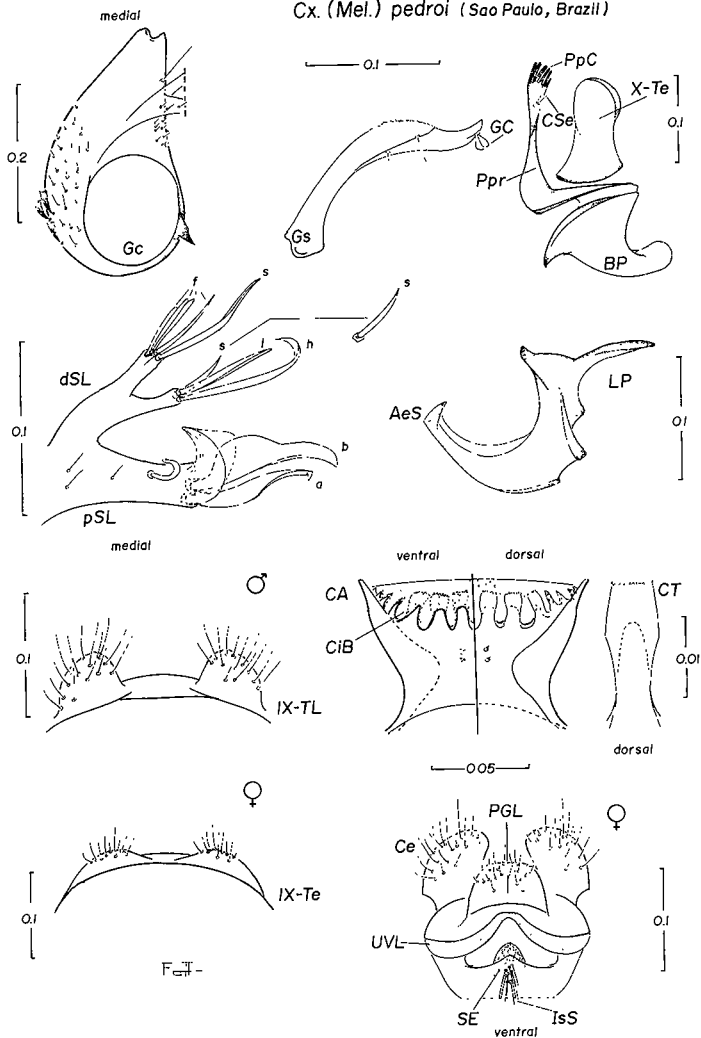
Culex (Melanoconion) adamesi Sirivanakarn and Galindo, 1980:26 (♂, ♀* [habitus], P*, L*). Holotype ♀: "Empire Firing Range," Canal Zone, Panama (NMNII).

Pecor et al. 1992:9 (♂G*).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with dark scales, with light golden scales on scutum; erect forked scales of vertex light golden on dorsal portion, dark posterolaterally. **Head:** Antennal length about 2.01 mm; pedicel of antenna dark,

Fig. 21. *Culex (Mel.) pedroi*, female and male genitalia and female cibarial armature. Abbreviations same as Figs. 18 and 19. Scales in mm.

Cx. (Mel.) pedroi (Sao Paulo, Brazil)



occasionally light cream on outer area and light brown on inner area; proboscis length 1.77–1.87 mm (\bar{x} = 1.82 mm). Maxillary palpus length 0.31–0.36 mm, about 0.20 of proboscis. Narrow falcate scales of vertex totally light golden or sometimes bronzy in a small median dorsal area along coronal suture; erect forked scales light golden on dorsal portion, dark posterolaterally. **Cibarium:** Length about 161 μ m; dorsal surface and distal margin of cibarial bar smooth; 16 teeth; tooth length about 13 μ m; line of origin of teeth not evident; hollow area of teeth small, restricted to base. Sensilla trichodea in linear series of 2, 3 single setae on each side. **Thorax:** Integument light brown to dark brown. Scutum with dark brown scales with reddish reflections and light golden scales on anterior pronotum, acrostichal area, posteriorly on dorsocentral area, scutal angle, posteriorly on scutal fossa, and on supraalar, antealar, and prescutellar areas. Scutal setae dark brown with reddish or golden reflections; acrostichal setae absent. Scutellar scales similar to scutal scales, golden; median lobe with 6 large setae; lateral lobes each with 4 large setae. Postpronotum with scales similar to scutal scales; with 5–8 large setae on posterodorsal margin. Pleural integument light brown to dark brown, slightly lighter on anteromedian portion of mesepimeron. Pleural setae dark brown with golden reflections, upper mesepimeral setae and less developed lower mesokatepisternal setae light golden; 17–32 upper preepisternal, 5–9 prealar, 9–11 upper mesokatepisternal, 12–18 lower mesokatepisternal, 15–26 upper mesepimeral, and 1 lower mesepimeral. Pleura with a patch of white spatulate scales on upper corner and a row of white spatulate scales on lower posterior margin of mesokatepisternum. **Wing:** Length 2.91–3.05 mm (\bar{x} = 3.00 mm); cell R_1 , 3.38–4.40 of R_{1+2} , (\bar{x} = 3.83); cell M_2 , 0.82 of cell R_2 ; subcosta intersects costa slightly proximal to furcation of R_{1+2} . Dorsal scaling: appressed spatulate scales on M_{1+2} ; inclined narrow spatulate scales on R_2 and R_3 . Ventral scaling: appressed spatulate scales on proximal 0.2 of R_2 ; linear plume scales on proximal 0.5 of R_1 , proximal 0.5 of R_{4+5} ; inclined narrow spatulate scales on distal 0.5 of R_1 , distal 0.8 of R_2 , distal 0.5 of R_{1+2} , M_{1+2} . **Halteres:** Capitellum whitish with few dark scales on inner margin. **Legs:** Anterior surface of forecoxa with a patch of dark scales and few white scales on the base. Antero- and posteroventral surfaces of foretrochanter with dark scales, antero- and posteroventral surfaces of mid- and hindtrochanters

with whitish scales. **Abdomen:** Terga II, III, VII dark-scaled with basolateral patches of white scales, occasionally becoming complete basal bands, terga IV–VI with basal bands of white scales; tergum VIII with dark scales. Sterna II–VII dark-scaled with basal bands of white scales; sternum VIII with sparse dark scales and few white scales basolaterally. **Genitalia:** Tergum IX with 13–17 setae on each lateral lobe; 7 clustered insular setae. Postgenital lobe with 12–15 setae on each side of midline.

Male. Like female except for the following sexual differences. **Head:** Antennal length and maxillary palpus length not measured; maxillary palpus exceeding proboscis tip by length of apical 0.5 of palponere 4; palponere 3 with 5 strong setae on outer apical area. **Abdomen:** Terga and sterna VII and VIII not examined. **Genitalia:** Indistinguishable from *Cx. pedroi*.

Material examined. 3 σ , 3 δ G, 6 φ , 1 φ G, 1 φ cib. **Paratypes:** PANAMA. Bocas del Toro, Chiriqui Grande, Apr 1963. A. Quinonez coll., Sirivanakarn and Galindo det. 1980. Cacao forest, 1 σ , 1 δ G; Punto de Pena, Chiriquito, 1 σ , 1 δ G; Almirante, Apr 1964, 1 φ , 1 φ G, 1 φ cib; Darien. Pucro, Tacarcuna River Valley, 1963. Gorgas M. Lab. coll., 1 φ (FSP no. E-7729–F-7732). **Other specimens:** BRAZIL. Para State, Belem County, IPEAN, 22 Oct 1970, Aitken and Toda coll., Sirivanakarn det. 1980, 1 σ , 1 δ G; Mocambo, Oct 1985, Barata coll., Salum det. 1986. CDC light trap, 3 φ , 1 φ cib; COLOMBIA. Boyaca, Puerto Boyaca, 25 Nov 1970. Mosq. Mid. Amer. coll., Sirivanakarn det. 1980, 1 φ .

Distribution (Fig. 4). *Culex adamesi* is known from Panama, Colombia, Ecuador, French Guyana, and northern Brazil (Sirivanakarn and Galindo 1980).

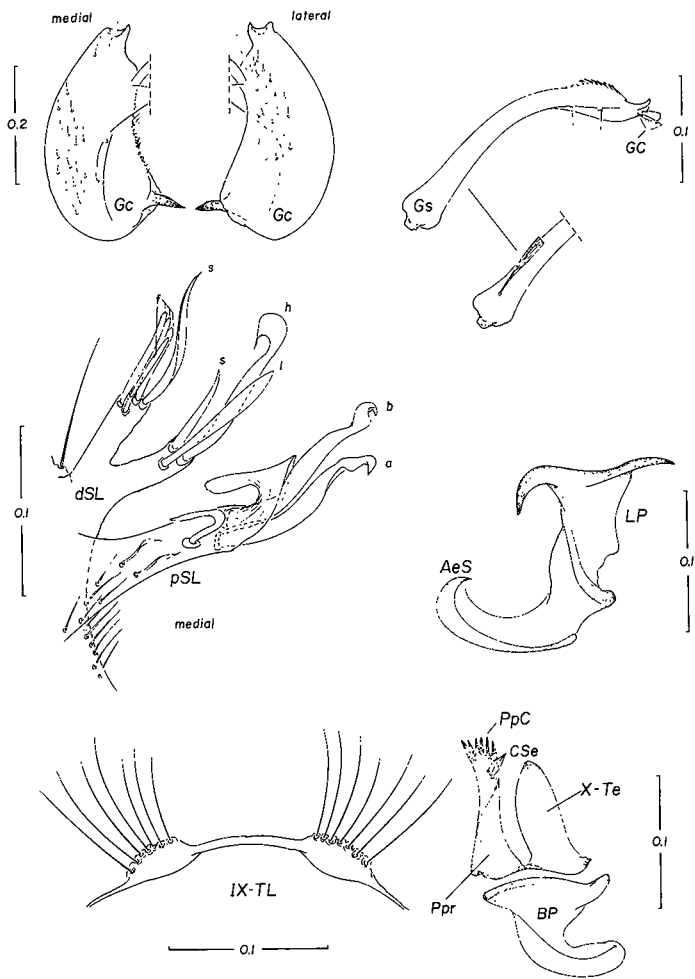
Bionomics. Adults of *Cx. adamesi* were collected in tropical rain forest, both in the canopy and at ground level, at forest edges, in partially forested areas with second-growth vegetation, swampy areas, and man-made environments with intense agricultural activities (banana crops). Adults were also collected in CDC light traps, Chamberlain and Shannon traps, and in other kinds of unspecified light traps (Heinemann and Belkin 1978a, 1978b, 1978c, 1979).

Immature stages were collected from temporary ground pools in forest. The water was clear, fresh, stagnant, with emergent (aquatic grasses) vegetation, and with plant debris (Heinemann and Belkin 1978a). Galindo (1969) collected im-

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Fig. 22. *Culex (Mel.) crysida*, male genitalia. Abbreviations same as Fig. 18. Scales in mm.

Cx. (Mel.) crybda (Pedregal, Panama)



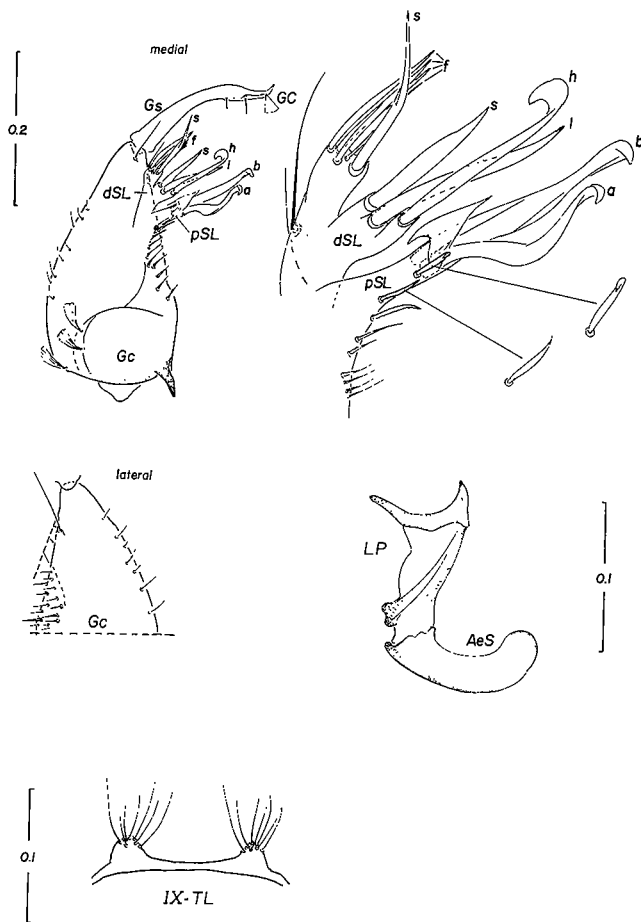
Cx. (Mel.) epanastasis (holotype)

Fig. 23. *Culex (Mel.) epanastasis*, male genitalia. Abbreviations same as Fig. 18. Scales in mm.

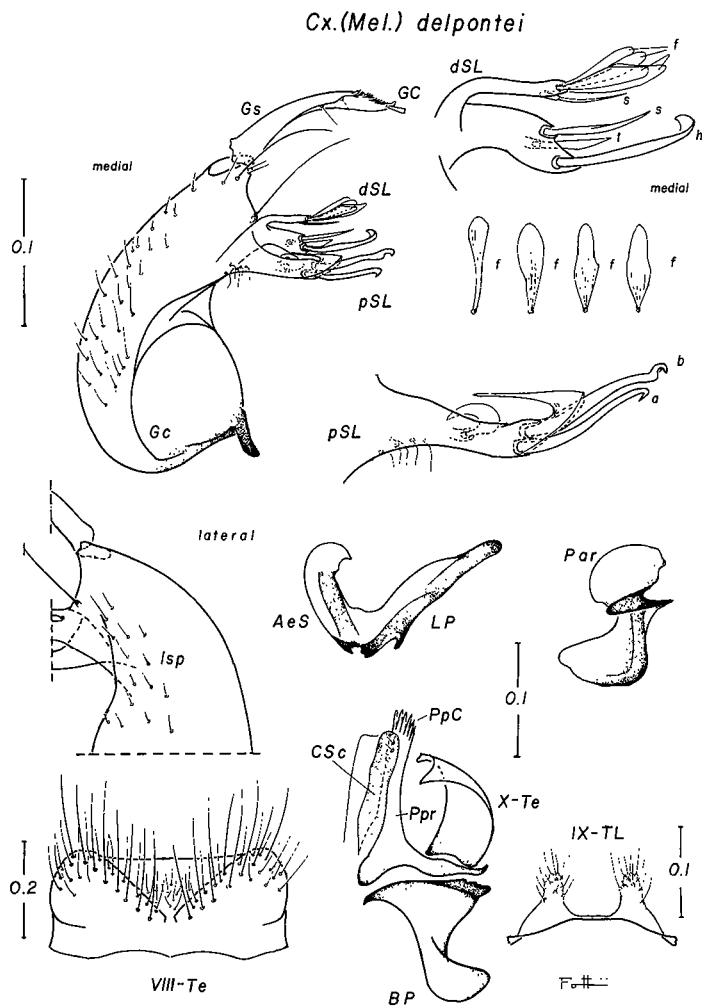


Fig. 24. *Culex (Mel.) delpontei*, male genitalia. Abbreviations same as Fig. 18, except for, CSc, cercal sclerite; Par, paramere; VIII-Te, tergum VIII. Scales in mm.

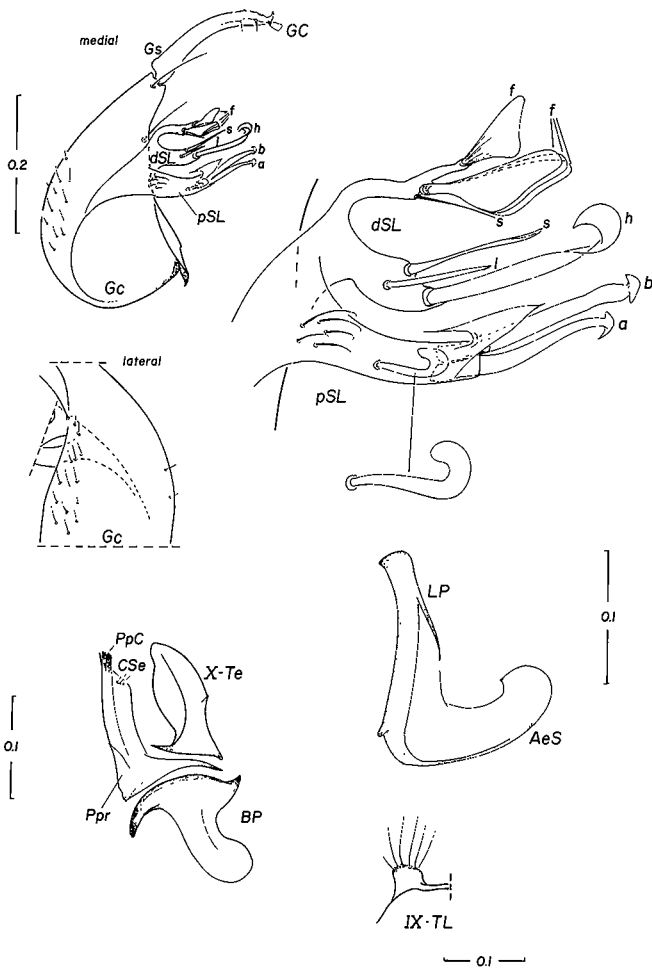
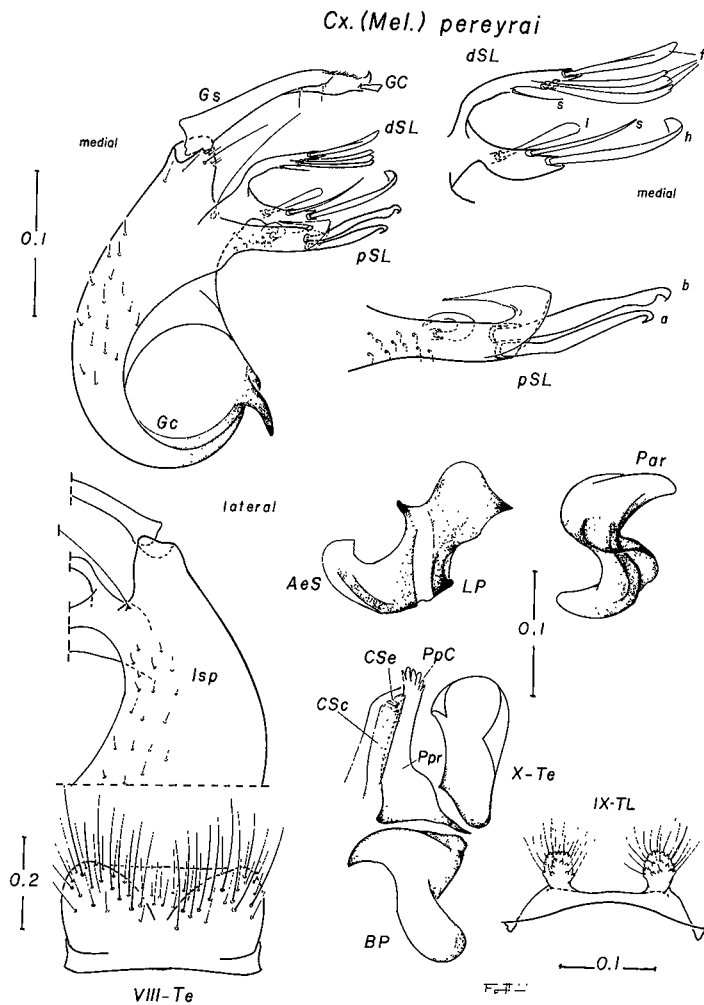
Cx. (Mel.) paracrybda (holotype)

Fig. 25. *Culex (Mel.) paracrybda*, male genitalia. Abbreviations same as Fig. 18. Scales in mm.



mature stages of *Cx. adamesi* from open swamp, in full sun with grasses and floating vegetation.

Discussion. *Culex adamesi* differs from *Cx. epanastasis* and *Cx. pedroi* in having the apex of all femora and hindtarsomeres 1-5 dark; from *Cx. crybda* in having a patch of spatulate white scales on the upper corner of the mesokatepisternum and patches of light golden scales on the scutum; from *Cx. ribeirensis* in having the narrow falcate scales of the vertex totally light golden (occasionally bronzy on a small area along coronal suture), the erect forked scales of the vertex golden in a median dorsal area, dark brown posterolaterally, and the scutum with a more conspicuous pattern of light golden scales. The cibarial armature of *Cx. adamesi* differs from *Cx. ribeirensis* and *Cx. pedroi* in not possessing spicules on dorsal surface and distal margin of cibarial bar. The male genitalia of *Cx. adamesi* differ from those of *Cx. crybda* in having a sparse patch of fine setae on the tergo-medial surface of the gonocoxite, proximal to the subapical lobe, and the distal and proximal divisions of the subapical lobes less robust than in *Cx. crybda*. They differ from *Cx. epanastasis* by having the lateral plate of the phallosome with a long, beaklike, tapered, and pointed lateral process, the ventral process long, triangular, and curved, with the distal margin of lateral plate nearly straight.

***Culex (Melanoconion) crybda*
Dyar, 1924**

Culex (Choerororpa) crybda Dyar, 1924:184 (♂). Holotype ♂: Atrato River, Murindo (Antioquia), Colombia (NMNH).

Dyar 1928:293 (syn. with *Cx. taeniopus*); Lane 1953:403 (♂; Venezuela); Stone 1961:46 (Trinidad); Belkin et al. 1965:9 (type loc. info.); Galindo 1969:87 (syn. with *Cx. epanastasis*); Heinemann and Belkin 1978a:131 (Panama); Sirivanakarn and Belkin 1980:11 (♂; resurrect from syn.); Sirivanakarn 1983:279 (2*).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with blackish scales. **Head:** Antenna, proboscis, and maxillary palpus not measured. Vertex with narrow falcate scales. **Cibarium:** Not studied. **Thorax:** Pleural integument dark-brown. Scutum with brownish black scales with coppery reflections; scutal setae dark brown with golden or reddish reflec-

tions; acrostichal setae absent. Scutellar scales similar to scutal scales, dark; median lobe with 6 large setae; lateral lobes each with 4, 5 large setae. Postpronotum with scales similar to scutal scales; with 4 large setae on posterodorsal margin. Pleural integument light brown, slightly darker on postpronotum, proepisternum, postspiracular and prespiracular areas, prealar knob, upper corner and anterior portion of mesokatepisternum, and lower mesepimeron. Pleural setae dark brown with golden reflections, upper mesepimeral and the less developed lower mesokatepisternal setae yellowish; setae not counted. Pleura with a row of white spatulate scales on lower posterior margin of mesokatepisternum. **Wing:** Length, cell R_1 and vein R_{1+2} ratio, and cell M_2 and cell R_2 ratio not measured; subcosta intersects costa slightly proximal to furcation of R_{2+3} . Dorsal scaling: inclined narrow spatulate scales on R_1 and R_2 . Ventral scaling: appressed spatulate scales on proximal 0.2 of R_{1+2} , proximal 0.2 of M_{1+2} ; linear plume scales on proximal 0.3 of R_1 , proximal 0.4 of R_{1+2} ; inclined narrow spatulate scales on distal 0.7 of R_1 , distal 0.8 of R_2 , distal 0.6 of R_{2+3} , distal 0.8 of M_{1+2} . **Halter:** Scabellum, basal two-thirds of pedicel, and ventral portion of capitellum whitish, distal 0.3 of pedicel and dorsal portion of capitellum dark. **Legs:** Anterior surface of forecoxa with a patch of dark scales and a few white scales on base. **Abdomen:** Terga II-VII dark-scaled with basolateral patches of white scales; tergum VIII with dark scales. Sterna II-VII dark-scaled with basal bands of white scales; sternum VIII with sparse dark scales. **Genitalia:** Lateral lobes of tergum IX each with 8-10 setae; 11 clustered insular setae. Postgenital lobe short, trapezoidal, distal margin nearly straight with 8 setae on either side of midline.

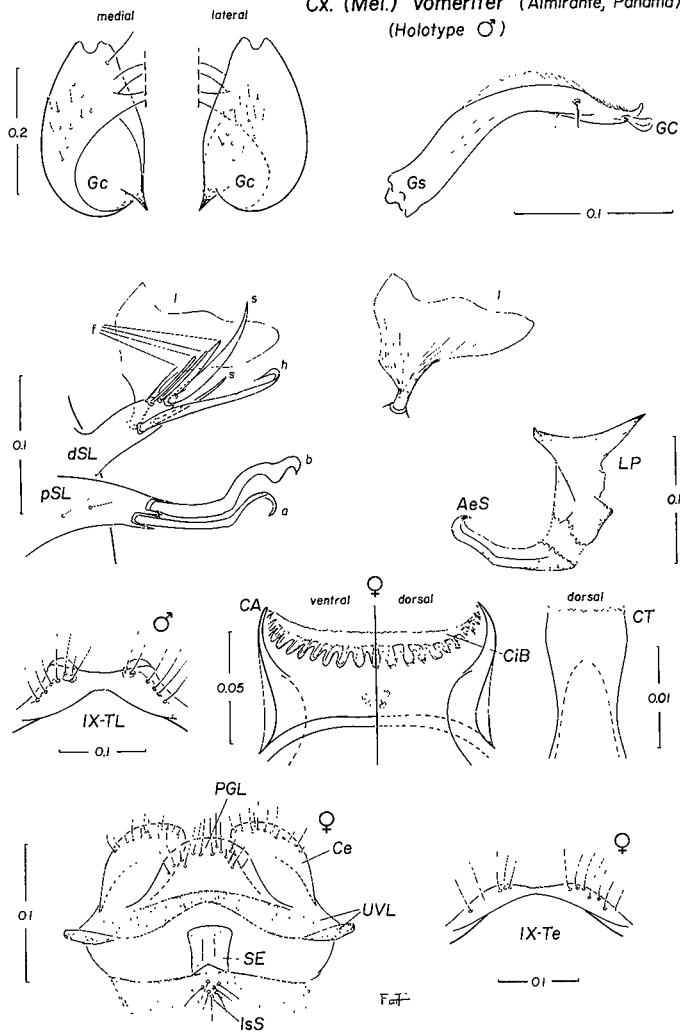
Male. Like female except for the following sexual differences. **Head:** Antenna and maxillary palpus not measured. Narrow falcate scales of vertex dark in a small median dorsal area along coronal suture. **Abdomen:** Tergum II dark; terga III-VI dark-scaled with basolateral patches of white scales (remaining terga removed with genitalia). **Genitalia** (Fig. 22): Similar to *Cx. pedroi*, differing as follows. Tergomesal surface of gonocoxite with a moderately developed patch of longer and slender setae proximal to subapical lobe; proximal and distal divisions of subapical lobe of gonocoxite shorter and more robust than in *Cx. pedroi*.

Material examined. 2 ♂, 2 ♂G, 1 ♀, 1 ♀G.

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Fig. 27. *Culex (Mel.) vomerifer*, female and male genitalia and female cibarial armature. Abbreviations same as Figs. 18 and 19. Scales in mm.

Cx. (Mel.) vomerifer (Almirante, Panama)
(Holotype ♂)



Holotype: COLOMBIA. Murindo, 1924. L. H. Dund. **Other specimens:** PANAMA. Pedregal, Tocumen, 11 Nov 1963, Gorgas M. Lab. coll., Mosq. Mid. Amer. det. 1978 (as *Cx. epanastasis*), collected as larvae, 1 ♂, 1 ♂G, 1 ♀, 1 ♀G.

Distribution (Fig. 4). According to Pecor et al. (1992), *Cx. crybda* is known from Brazil, Colombia, Panama, Trinidad, and Venezuela. However, literature records of *Cx. crybda* in Brazil should be reconsidered as the specimens identified by Lane (1953) belong to *Cx. ribetrensis*. Lane's (1953) record of *Cx. crybda* from Venezuela may refer to either *Cx. crybda* or *Cx. pedroi*.

Bionomics. Immature stages of *Cx. crybda* were collected from rodent burrows dug at the edge of forest swamps (Galindo 1969). They were also taken in heavy or partial shade in the following habitats: muddy water in tree holes 30 cm above the ground, edges of lakes in forests, interior and edges of swamps, and holes in tree roots. The water was clear, brown, or turbid, with grassy, woody, submerged, and/or floating vegetation. Adults were collected in CDC light traps in forest, partial forest, second-growth vegetation, and in bush at edges of swamps (Heinemann and Belkin 1978a, 1978c; Heinemann et al. 1980).

Culex crybda is a potential vector of Bussuquara and Guama viruses (Galindo 1969).

Discussion. *Culex crybda* differs from *Cx. epanastasis* and *Cx. pedroi* in having the apex of all femora, foretibiae, and hindtarsomeres totally dark-scaled; from *Cx. adamsi* and *Cx. ribetrensis* in not having a patch of white spatulate scales on the upper corner of the mesokatepisternum; from *Cx. adamsi* in having the erect forked scales of the vertex totally dark and the scutum with dark scales. The male genitalia of *Cx. crybda* differ from those of *Cx. adamsi*, *Cx. pedroi*, and *Cx. ribetrensis* in having a moderately developed patch of long and slender setae on the tergomesal surface of the gonocoxite proximal to the subapical lobe, and by the distal and proximal divisions of the subapical lobe of the gonocoxite more robust; from *Cx. epanastasis* in having the lateral plate of the phallosome with a long, beaklike, tapered, and pointed lateral process, the ventral process long, triangular, and curved, and the distal margin nearly straight.

***Culex (Melanoconion) epanastasis*
Dyar, 1922**

Culex (Choeroporpa) epanastasis Dyar, 1922: 191 (♂*). Holotype ♂: Arenal River, Toro Point, Canal Zone, Panama (NMNH).

Dyar 1928:296 (♂*); Komp 1935:4 (syn. with *Cx. taeniopus*); Galindo 1969:86 (resurrected from syn.); Heinemann and Belkin 1977b:453 (Nicaragua); Heinemann and Belkin 1978b: 408 (French Guiana); Sirivanakarn and Belkin 1980:10 (tax.).

Culex (Melanoconion) pseudotaeniopus Galindo and Blanton, 1954:240 (♂*, P*, L*). Holotype ♂: Mojinga Swamp, Canal Zone, Panama (NMNH). Galindo 1969:88 (tax.); Sirivanakarn and Belkin 1980:11 (syn.).

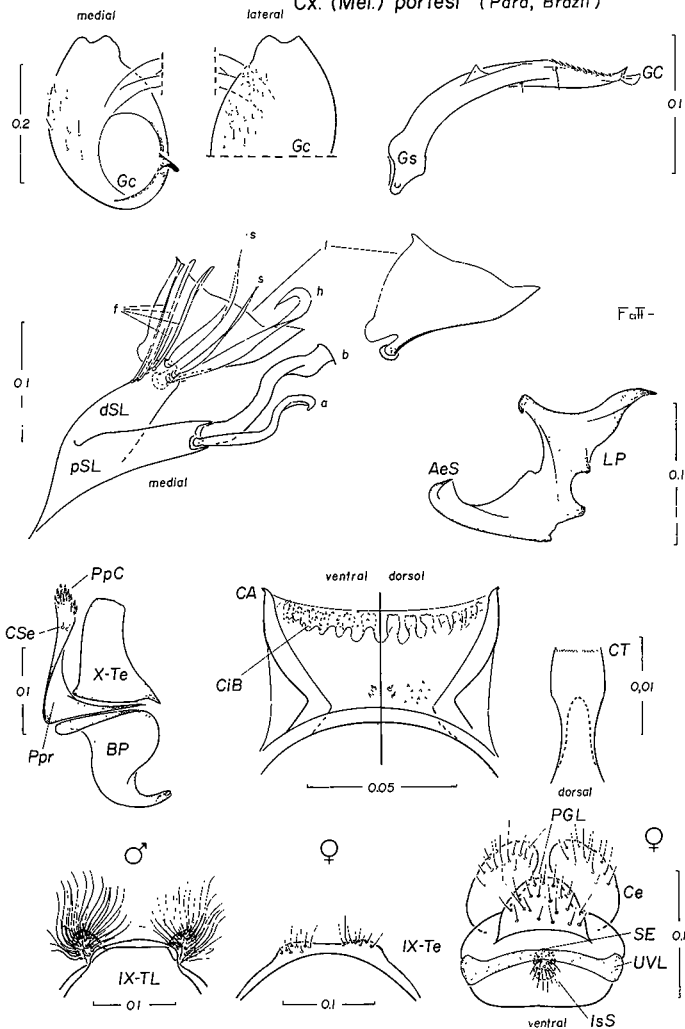
Female. Not examined.

Male. Adult not examined. **Genitalia** (Fig. 23): Similar to *Cx. spissipes*, differing as follows. Tergum IX lobes small, cone-shaped, widely separated, with few slender setae. Gonocoxite conical; inner margin moderately concave; lateral surface with sparse patch of short, slender setae at level of subapical lobe (lsp); tergomesal surface with a patch of moderately developed setae proximal to subapical lobe, which extends to the proximal division of subapical lobe; proximal part of ventrolateral surface with scales; subapical lobe distinctly divided, divisions approximated; proximal division of subapical lobe with an apical infundibular and hyaline expansion. 2 robust, sinuous, apically hooked setae (*a* and *b*) at apex, a subapical hooked-falciform seta and 1, 2 moderately developed, pointed setae on basal portion; distal division divided into 2 divergent, subequal arms, proximal arm short, with an apical hooked seta (*h*) and 2 subapical setae, which include a moderately long, saberlike seta (*s*) and a long, narrow foliform seta (*f*); distal arm short, with a long saberlike seta and 4 subequal, narrow, appressed setae (*f*). Gonostylus slender, curved at midlength, subapical portion poorly enlarged on lateral view; ventral surface with an inconspicuous crest before apical snout; apical snout tapered to a truncate apex; gonostylar claw short, leaflike, broadest apically. Lateral plate of phallosome with lateral and ventral processes, apical process absent, distal margin concave, ventral process large, upturned, curved horn, nearly

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Fig. 28. *Culex (Mel.) portesi*, female and male genitalia and female cibarial armature. Abbreviations same as Figs. 18 and 19. Scales in um.

Cx. (Mel.) portesi (Para, Brazil)



pointed, lateral process shorter, tapered, pointed, dorsolaterally directed. Paraproct crown with 10 simple blades: 2, 3 cercal setae. Tergum X not examined.

Material examined. 1 ♂G. *Holotype*: PAN-AMA, Canal Zone, Toro Point, Arenal River, J. B. Shropshire coll., 19 Jul 1922.

Distribution (Fig. 4). Known from French Guiana, Nicaragua, and Panama (Pecor et al. 1992).

Bionomics. Immature stages of *Cx. epanastasis* were collected in a wide variety of habitats. They were taken in deep or partial shade in the following habitats: tree holes near swamps, lake margins in forest, swamp margins in partial forest, and in ponds in swamps. These habitats had scarce or abundant herbaceous or floating vegetation, and the bottom with mud and/or plant debris. The water was temporary or permanent, stagnant, fresh, turbid, pale amber, or muddy. Adults were collected resting in partially cleared forests, in forests, and with CDC light traps in dense second-growth vegetation near ponds, and in dense vegetation near edge of swamps, from 0.3 to 12 m above ground. The places were in deep or partial shade (Heinemann and Belkin 1977b, 1978a, 1978b).

Discussion. *Culex epanastasis* differs from *Cx. crybda*, *Cx. adamesi*, and *Cx. ribeirensis* in having patches of silver-white scales at the apex of all femora, hindtarsomeres 1-4 with white rings at joints, 5 entirely white-scaled; from *Cx. adamesi* and *Cx. ribeirensis* in not having a patch of white scales on the upper corner of mesokatepisternum; from *Cx. adamesi* in having the erect forked scales of the vertex totally dark and the scutum covered only with dark brown scales. The adult male of *Cx. epanastasis* differs from *Cx. pedroi* in possessing conspicuous white rings on the base of palpomeres 2-5. The male genitalia of *Cx. epanastasis* differ from those of the other species of the Pedroi Subgroup in having the distal division of the subapical lobe of the gonocoxite divided into 2 shorter and more robust arms, proximal arm of distal division with an apical hooked seta (*h*) and 2 subapical setae that include a saberlike seta (*s*) and a narrow foliiform seta (*f*), distal arm of distal division with a long saberlike seta (*s*) and 4 subequal, narrow, appressed setae (*f*), lateral plate of the phallosome with a concave apical margin, a shorter and pointed lateral process, and an upturned, curved, hornlike, pointed ventral process.

Culex (Melanoconion) ribeirensis Forattini and Sallum, 1985

Culex (Melanoconion) ribeirensis Forattini and Sallum, 1985:171 (♂*, ♀*, P*, L*). *Holotype* ♀: Experimental Station, Ribeira Valley, Pariqueira-Açu, Sao Paulo, Brazil (FSP).

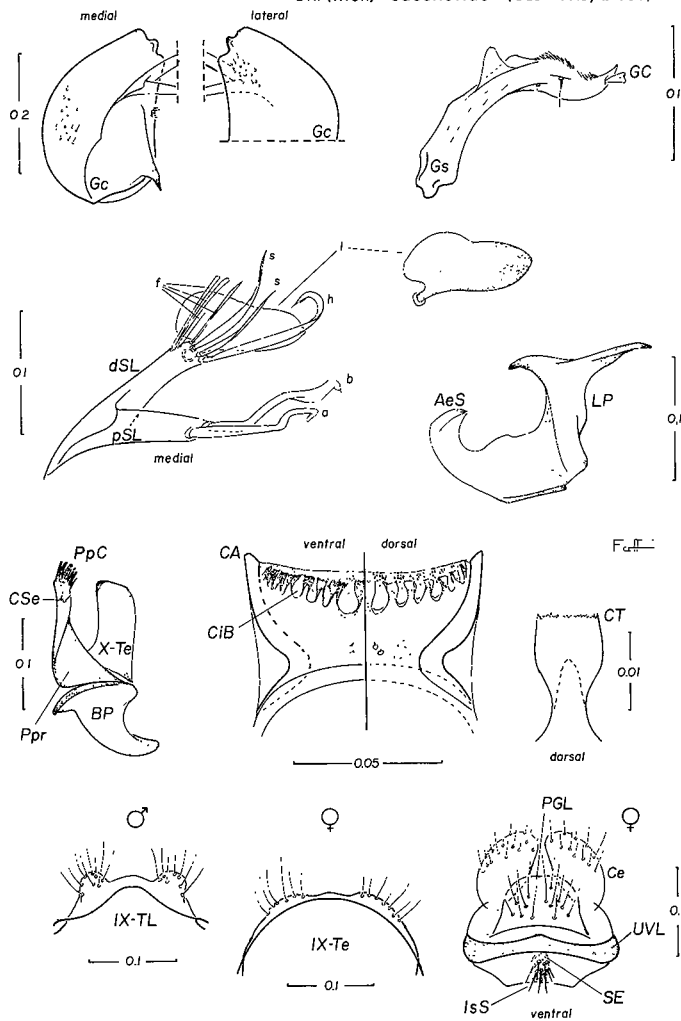
Forattini et al. 1988:537 (type info.): Sirivanakarn and Jakob 1979:139 (as *Cx. epanastasis*): Lane 1953:403 (♂; Brazil, as *Cx. crybda*).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with blackish scales with few patches of light golden scales on scutum. *Head*: Antennal length about 2.17 mm; proboscis length 1.84-2.00 mm (\bar{x} = 1.93 mm); maxillary palpus length 0.33-0.39 mm (\bar{x} = 0.36 mm), about 0.20 of proboscis length. Narrow falcate scales of vertex dark in a small median dorsal area along coronal suture, dingy white laterally. *Cibarium* (Figs. 15A, and 16A, 16B): Length about 187 μ m; dorsal surface and distal margin of cibarial bar with numerous spicules: 15-22 teeth; tooth length about 15 μ m; line of origin of teeth not evident; hollow area of teeth small, restricted to base; cibarial dome with short, triangular, not sharply pointed denticles. Sensilla trichodea arranged in linear series of 2-4 single setae on each side. *Thorax* (Figs. 13C and 14B): Integument light to dark brown. Scutum with brownish black scales with bronzy reflections and patches of light golden scales variable in position as follows: on anterior promontory and/or prescutal suture and/or antetalar, supraalar, and prescutellar areas rarely with scales totally dark; scutal setae black with reddish reflections; acrostichal setae absent. Scutellar scales dark mixed with light golden scales; median lobe with 6 large setae: lateral lobes each with 4 large setae. Postpronotum with dark scales and occasionally with few light golden scales on ventral portion; with 5-8 large setae on posterodorsal margin. Pleural integument light brown to dark brown, darker on proepisternum, postspiracular and prespiracular areas, prealar knob, lower anterior portion of mesokatepisternum, and upper and lower portions of mesepimeron. Pleural setae dark brown with golden reflections: 15-21 upper proepisternal, 6-9 prealar, 7-11 upper mesokatepisternal, 11-14 lower mesokatepisternal, 15-21 upper mesepimeral, and 1, 2 lower mesepimeral. Pleura with a patch of white spatulate scales on upper corner and on

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Fig. 29. *Culex (Mel.) sacchetti*, female and male genitalia and female cibarial armature. Abbreviations same as Figs. 18 and 19. Scales in mm.

Cx. (Mel.) sacchettae (Sao Paulo, Brazil)



lower posterior margin of mesokatepisternum (Fig. 13C). *Wing*: Length 3.05–3.31 mm (\bar{x} = 3.18 mm); cell R_2 3.34–4.64 of R_{2+3} , (\bar{x} = 4.17); cell M_2 0.83 of cell R_2 ; subcosta intersects costa at the same level or slightly proximal to furcation of R_{2+3} . Dorsal scaling: appressed spatulate scales on distal 0.6 of M_{1+2} ; linear plume scales on proximal 0.4 of M_{1+2} ; inclined narrow spatulate scales on R_1 and R_2 . Ventral scaling: appressed spatulate scales on proximal 0.2 of R_2 , proximal 0.3 of R_3 , proximal 0.4 of M_{1+2} ; linear plume scales on proximal 0.2 of R_1 , proximal 0.3 of R_{1+2} ; inclined narrow spatulate scales on distal 0.8 of R_1 , distal 0.8 of R_2 , distal 0.7 of R_3 , distal 0.7 of R_{1+2} , distal 0.6 of M_{1+2} , M_{2+3} . *Hal-ter*: Scabellum, basal two-thirds of pedicel and ventral portion of capitellum whitish, distal 0.3 of pedicel and dorsal portion of capitellum dark. *Legs*: Anterior surface of forecoxa with a patch of dark scales, a few white scales at base. *Abdomen*: Tergum II dark-scaled with basolateral patches of white scales, occasionally with a small anteromedian patch of white scales; terga III–VII dark-scaled with basolateral patches of white scales, often becoming narrow or large basal bands; tergum VIII dark-scaled with white scales laterally. Sterna II–VII dark-scaled with basal bands of white scales; sternum VIII with sparse dark scales, a few white scales basolaterally. *Genitalia*: Lateral lobes of tergum IX each with 6–11 setae; 8–10 clustered insular setae. Postgenital lobe with 7–10 setae on either side of midline.

Male. Like female except for the following sexual differences. *Head*: Antennal length about 1.83 mm. Maxillary palpus length about 2.65 mm, exceeding proboscis tip by length of apical 0.5 of palpomere 4; palpomere 3 with 15–21 strong setae on outer apical area. *Abdomen*: Tergum II dark-scaled with basomedian and basolateral patches of white scales; terga III–VII dark-scaled with basal bands of white scales. *Genitalia*: Indistinguishable from *Cx. pedroi*.

Material examined. 17 ♂, 17 ♂G, 25 ♀, 6 ♀G, 7 ♀cib. *Holotype*: BRAZIL, Sao Paulo State, Pariqueira-Açu County, Experimental Station, Apr 1984, Forattini and Casanova coll., Forattini and Sallum det. 1985, 1 ♀ (FSP no. E-6879). *Paratypes*: Jan, Mar 1979, Forattini et al. coll., 4 ♂, 4 ♂G; Apr 1979, 2 ♂, 2 ♂G; Cananeia County, Ariri, Mar 1979, 1 ♂, 1 ♂G; Itapitangui district, Itapoa Farm, Mar 1982, Forattini and Natal coll., 1 ♂, 1 ♂G; Iguape County, Iguape-Bigua Road, Oct 1982, Forattini et al.

coll., 1 ♂, 1 ♂G; Mar 1984, Forattini and Casanova coll., 2 ♀; Dourado County, Jacare-Pepira River, Apr 1980, Forattini et al. coll., 2 ♀, 1 ♀cib; Araraquara County, Lupo Farm, May 1981, 1 ♀; Nov 1981, 1 ♀. *Other specimens*: Iguape County, Palmeiras Farm, 18 Apr 1989, CDC light trap supplemented with CO₂, Sallum det. 1989, 6 ♀, 6 ♀cib; Pariqueira-Açu County, Experimental Station, 8 Mar 1978, on human bait, 1 ♀; 22 Aug 1978, 1 ♀; 5 Dec 1978, 1 ♀, 1 ♀G; 14 Jan 1979, 1 ♀; 24 Jan 1979, 1 ♀, 1 ♀G; 15 Jan 1980, 1 ♀, 1 ♀G; 12 Feb 1980, 1 ♀; 21 Aug 1978, Shannon trap supplemented with light, 1 ♀; 19 Mar 1979, 1 ♂, 1 ♂G; 18 Oct 1979, 1 ♂, 1 ♂G; 26 Jun 1980, 2 ♀, 1 ♀G; 3 Oct 1977, 2 ♂, 2 ♂G; 12 Dec 1977, 1 ♂, 1 ♂G; 3 Apr 1978, 1 ♂, 1 ♂G; 10 Dec 1979, 1 ♂, 1 ♂G; 13 Dec 1979, 1 ♂, 1 ♂G; 17 Jan 1980, CDC light trap, 1 ♀, 1 ♀G; 26 Jun 1980, CDC light trap baited with bird, 1 ♀, 1 ♀G; Jucua County, Dec 1938, J. Lane coll., Lane det. 1946 (as *Cx. crybda*). 4 ♂, 4 ♂G (FSP no. 6255-6258).

Distribution (Fig. 4). *Culex ribeirensis* is known from Sao Paulo and Rio de Janeiro states, southeastern Brazil. Records of *Cx. crybda* from Rio de Janeiro State (Lourenço-de-Oliveira 1984) refer to *Cx. ribeirensis*.

Bionomics. Immature stages of *Cx. ribeirensis* were found in shaded habitats on the ground. The water was fresh with abundant emergent (aquatic grasses) vegetation.

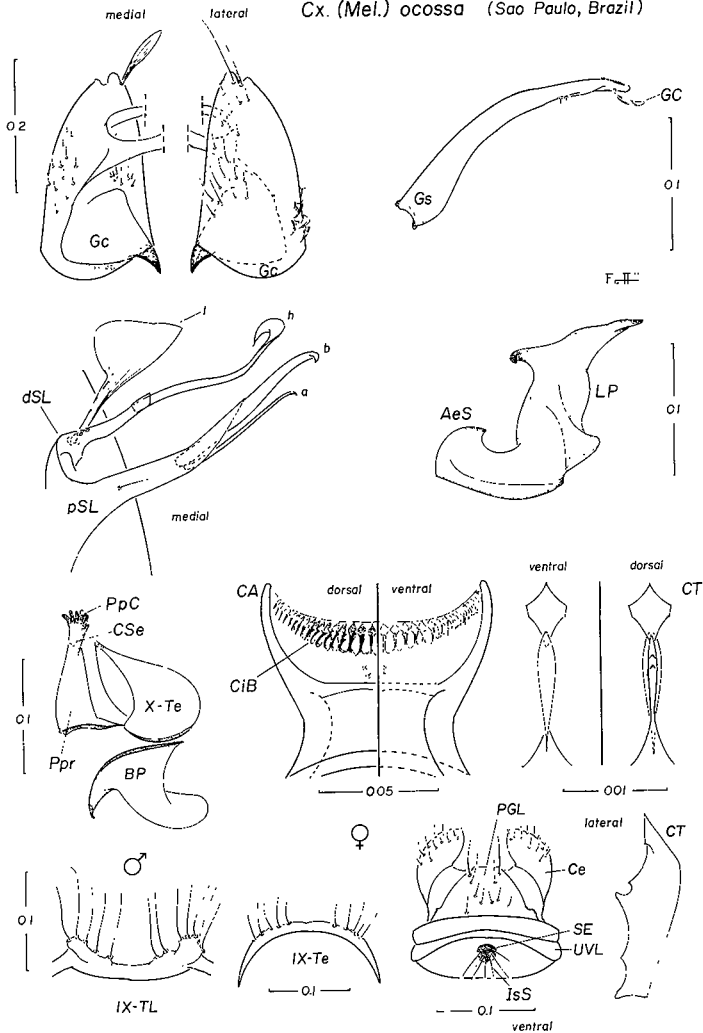
Culex ribeirensis appears to be a nocturnal species that exhibits an activity pattern that starts with a great peak at sunset and ends with a less pronounced peak at dawn. The greatest peak of activity has been observed in the hot, rainy season, from October to March. This species has shown a great tendency to become adapted to man-made environments with intense human activities, and it exhibits some degree of endophily and anthropophily. The presence of domestic animals in a peridomestic environment seems to attract females of this species, which may also suggest some tendency to domiciliation (Lourenço-de-Oliveira and Silva 1985; Lourenço-de-Oliveira and Heyden 1986; Forattini and Gomes 1988; Forattini et al. 1987a, 1989b, 1991b).

Discussion. *Culex ribeirensis* differs from *Cx. pedroi* and *Cx. epanastasis* in having the apex of all femora, foretibiae, and hindtarsomeres dark-scaled; from *Cx. crybda* in possessing a patch of white spatulate scales on the upper corner of the mesokatepisternum, and the scutum

→

Fig. 30. *Culex (Mel.) ocossa*, female and male genitalia and female cibarial armature. Abbreviations same as Figs. 18 and 19. Scales in mm.

Cx. (Mel.) ocosa (Sao Paulo, Brazil)



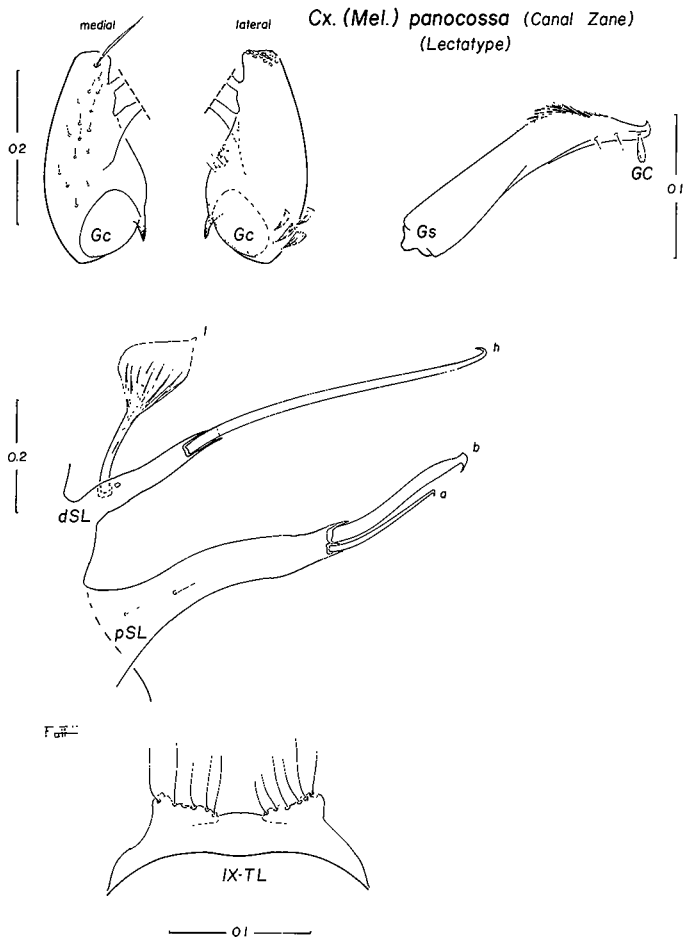


Fig. 31. *Culex (Mel.) panocossa*, male genitalia. Abbreviations same as Fig. 18. Scales in mm.

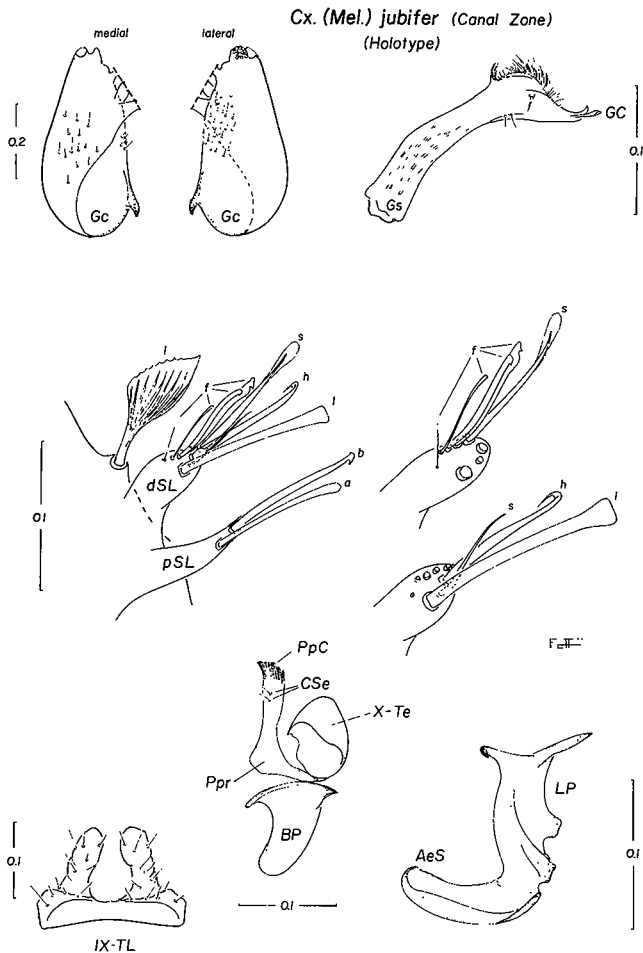


Fig. 33. *Culex (Mel.) jubifer*, male genitalia. Abbreviations same as Fig. 18. Scales in mm.

Cx. (Mel.) lopesi

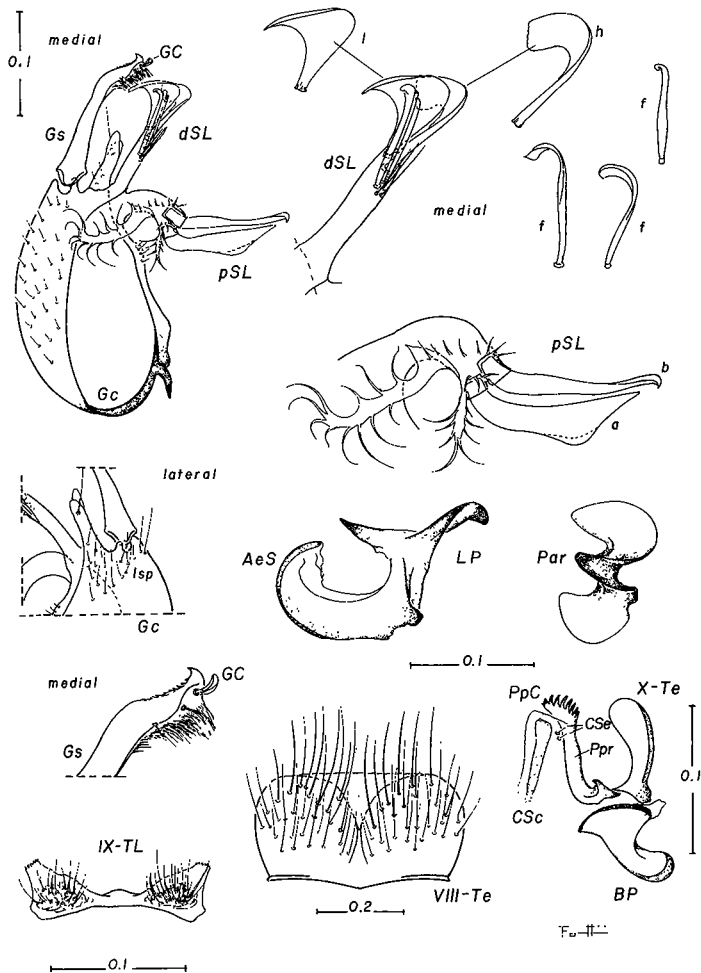


Fig. 34. *Culex (Mel.) lopesi*, male genitalia. Abbreviations same as Figs. 18 and 24. Scales in mm.

frequently with patches of light golden scales; from *Cx. adamesi* in having the erect forked scales of the vertex totally dark, the narrow falcate scales of the vertex dark in a small median dorsal area along the coronal suture and dingy white laterally, the scutum with scales totally dark, or frequently with patches of light golden scales that are less developed than in *Cx. adamesi*, the cibarial bar with numerous spicules on the distal margin and on the dorsal surface; and from *Cx. pedroii* in having more than 15 cibarial teeth. The male genitalia of *Cx. ribeirensis* cannot be distinguished from those of *Cx. adamesi* and *Cx. pedroii*, but differ from *Cx. crybda* in possessing a longer and less robust distal division of the subapical lobe of the gonocoxite and a less well developed patch of setae on the tergo-mesal surface of the gonocoxite proximal to the subapical lobe; from *Cx. epanastasis* in having the lateral plate of the phallosome with a long beaklike, tapered, and pointed lateral process, ventral process long, triangular, laterally curved, and distal margin nearly straight.

Paracrybda Subgroup

The Paracrybda Subgroup is similar to the Pedroii and Pereyrai subgroups in general morphology of the male genitalia. It differs from the Pedroii Subgroup in having thin, laminar cibarial teeth, each tooth with an anterior thin sagittal plate and a posterior transverse plate, lozenge or roughly hexagonal in outline, hollow area of teeth absent, and cibarial dome with long, blade-like, triangular, pointed denticles; from the Pereyrai Subgroup in possessing the tarsomeres totally dark or with inconspicuous pale rings on tarsomeres 1-4, with tarsomer 5 pale. The male genitalia of the Paracrybda Subgroup differ from those of the Pedroii and Pereyrai subgroups in having the lateral plate of the phallosome elongate in lateral view, without lateral and ventral processes, apical process present, elongate, hooked, or nearly straight, tergum IX lobe moundlike, somewhat columnar, distally rounded; from those of the Pedroii Subgroup in possessing the distal division of the subapical lobe divided into 2 elongate, unequal arms and proximal division of the subapical lobe with a patch of slender, curved setae basal to the subapical hooked-falciform seta.

Culex (Melanoconion) paracrybda Komp, 1936

Culex (Melanoconion) paracrybda Komp, 1936: 330 (♂*). Holotype ♂: Juan Diaz, Panama (NMNH).

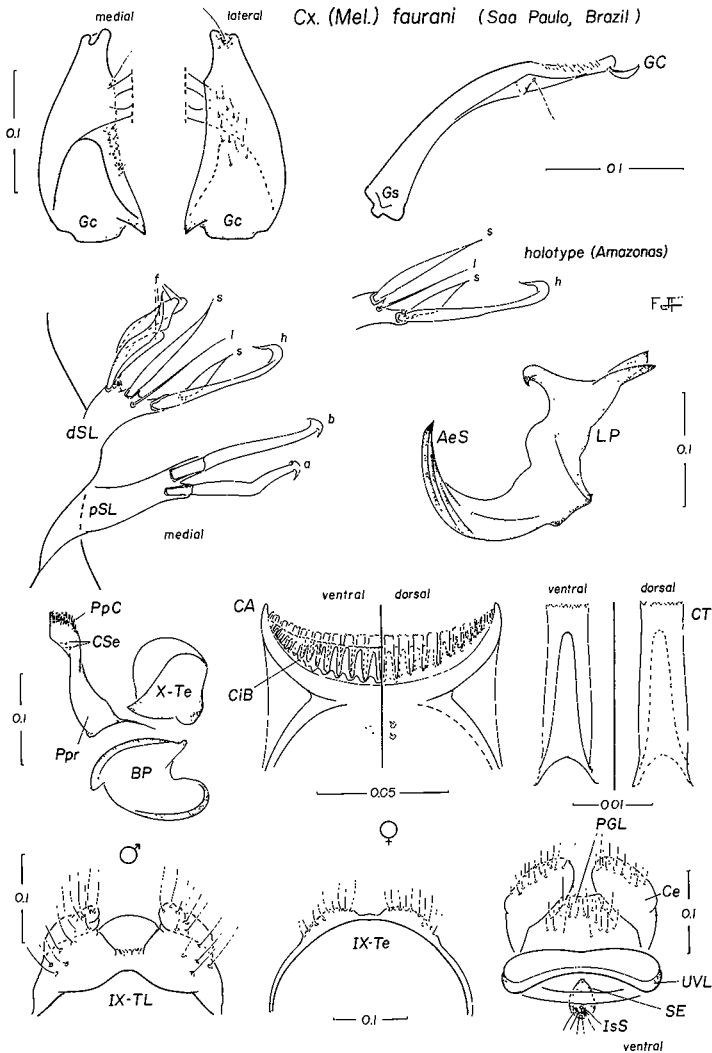
Rozeboom and Komp 1950:94 (♂*); Galindo 1969:87 (tax.); Duret 1969:10 (♂*); Panday 1975b:298 (Surinam); Sirivanakarn 1983:279 (♂*); Clark-Gil and Darsic 1983:255 (Guatemala).

Female. Not examined.

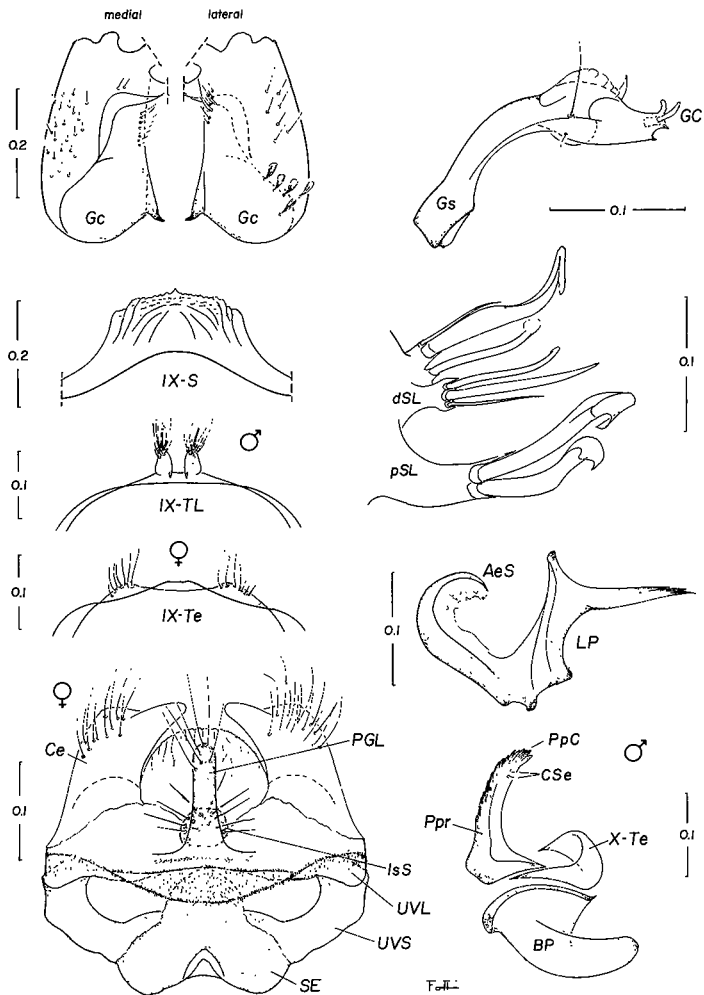
Male. Adult not examined. *Genitalia* (Fig. 25): Similar to *Cx. spissipes*, but differing as follows. Tergum IX lobe small, moundlike, nearly columnar-shaped, widely separated, with long and slender setae distally. Gonocoxite conical, inner margin moderately concave; tergo-mesal surface without setae or with 1 seta proximal to subapical lobe; lateral surface with sparse patch of short, slender setae (lsp); proximal part of ventrolateral surface without scales (with minute tubercles that may be scale insertions); subapical lobe distinctly divided, divisions approximated; proximal division with an apical infundibular and hyaline expansion, partially covering the basal portion of seta *b*, 2 long, sinuous, apically hooked setae (setae *a* and *b*) at apex, seta *b* more robust than seta *a*, a hyaline, broad, hooked-falciform subapical seta and 8, 9 moderately long, slender, and curved setae from base to level of insertion of broad, hooked-falciform seta; distal division divided into 2 well-separated, subequal arms (proximal and distal arms), proximal arm not strongly enlarged with an apical and 2 subapical setae, apical seta long, robust, hooked at apex (*h*), subapical setae include a moderately long, nearly saberlike seta (*s*) with a spoonlike apex and a shorter, foliform seta (*l*), both inserted on tubercles near middle of arm, distal arm more slender than proximal arm, cylindrical, with an apical and 4 subapical setae, apical seta a wide, asymmetrical foliform seta (*f*), subapical setae include 3 narrow, appressed, asymmetrical, foliform setae (*f*) and a more basal, slender, nearly saberlike seta (*s*). Gonostylus slender, curved, moderately narrowed distally; crest wrinkled on ventral surface before apical snout; apical snout short, upturned at apex; gonostylar claw short, leaflike, broadened apically. Lateral plate of phallosome long, columnar-shaped, apical process blunt, slightly hooked.

→

Fig. 35. *Culex (Mel.) furvum*, female and male genitalia and female cibarial armature. Abbreviations same as Figs. 18 and 19. Scales in mm.



Cx. nicaroensis (Habana, Cuba)



dark-scaled with few white scales on basolateral areas. Sterna II-IV white-scaled; sterna V, VI usually with white scales, occasionally, with dark scales apically; sternum VII usually with dark scales apically, rarely totally white. *Genitalia*: Lateral lobes of tergum IX each with 6-11 slender setae; 7, 8 clustered insular setae. Postgenital lobe short, distally rounded, with 7-13 setae on either side of midline.

Male. Like female except for the following sexual differences. *Head*: Antennal length about 1.78 mm; maxillary palpus length about 2.52 mm, exceeding proboscis from about apical 0.5 of palpomere 4; palpomere 3 with 8, 9 strong setae on outer apical area. *Abdomen*: Tergum II dark-scaled; terga III-VII dark-scaled with basolateral patches of white scales; tergum VIII with few scattered white scales. Sterna mostly white-scaled, sterna V-VII with few dark scales distally; sternum VIII dark-scaled with basolateral patches of white scales. *Genitalia* (Fig. 24): Tergum IX lobe small, moundlike, nearly columnar-shaped, widely separate, with long and slender setae on distal 0.5. Gonocoxite conical, inner margin moderately concave; tergomesal surface without seta proximal to subapical lobe; lateral surface with sparse patch of short, slender setae (lsp); proximal part of ventrolateral surface with scales; subapical lobe distinctly divided, divisions approximated; proximal division with an apical infundibular and hyaline expansion, 2 long, enlarged, sinuous, apically hooked setae (seta *a* and *b*) at apex, a hyaline, broad, hooked-falciform subapical seta and 5-11 long, slender, and curved setae from base to level of insertion of hooked-falciform seta; distal division divided into 2 approximated, unequal arms (proximal and distal arms), proximal arm robust, distally enlarged with a long, hooked apical seta (*h*), a moderately long saberlike seta (*s*), and a shorter foliiform seta (*f*), both inserted on prominent tubercles near middle of arm; distal arm slender, cylindrical with a stiff, short, nearly saberlike seta (*s*) and 2 narrow and 2 slightly wider, appressed setae (*f*). Gonostylus slender, curved, moderately narrowed distally, crest slightly wrinkled on ventral surface before apical snout; gonostylar claw short, leaflike, broadest apically. Lateral plate of phallosome long, columnar-shaped, apical process blunt and rounded at apex, lateral and ventral processes absent, dorsal process separated from margin of aedeagal sclerite by distinct angle. Paraproct crown with 6 single blades; 2, 3 cercal setae. Tergum X large, nearly rectangular in outline.

Material examined. 38 ♀, 16 ♂, 3 ♂G, 3 ♀cib, 2 ♀G. BRAZIL, Sao Paulo State, Iguape County, Iguape-Biguá Road, Oct 1982, Forattini et al. coll., Forattini and Sallum det. 1988. 13

♀, 2 ♀G; Palmeiras Farm, 18 Apr 1989, Sallum det. 1989, CDC light trap supplemented with CO₂, 3 ♀, 3 ♀cib; 5 Sep 1989, Gomes coll., Sallum det. 1990. 4 ♂, 4 ♀; 24 Oct 1989, 3 ♀, 1 ♂; 7 Nov 1989, 5 ♂, 5 ♀; 23 Jan 1990, 1 ♀; Valo Grande Ditch, 24 Oct 1989, collected as larvae, 2 ♂, 3 ♀; Pariquera-Açu County, Sao Paulo Avenue, urban area, Nov 1979, Forattini et al. coll., Forattini and Sallum det. 1988, New Jersey light trap, urban area, 1 ♂, 1 ♂G; Experimental Station, Nov 1981, CDC light trap, 1 ♀; Dec 1981, 2 ♀; Jan 1982, 2 ♀; Feb 1982, 1 ♀; 28 Apr 1992, Forattini et al. det., 1 ♂; Pariquera-Mirim district, May 1985, Forattini and Sallum det. 1988, 1 ♂, 1 ♂G; Jul 1985, 1 ♂, 1 ♂G; Sao Joao da Boa Vista County, Santa Helena Farm, Nov 1981, New Jersey light trap, 1 ♀.

Bionomics. Immature stages of *Cx. delponteii* were collected from riversides with abundant floating (*Pistia*), submerged, and emergent (aquatic grasses) vegetation and scarce green algae. The breeding sites were permanent and situated in primary rain forest and second-growth vegetation. The water was always fresh, clear or turbid, with slow current and in full sun. The water temperature was around 30°C and pH around 5.5.

In Argentina, adults of *Cx. delponteii* were collected with chicken and hamster baits and one specimen from a horse. Blood meal identification from engorged females showed that one specimen fed on an amphibian, a few others on several mammal species (mainly rodents), and 2 on avian and mammal species (Mitchell et al. 1987a, 1987b).

Several virus strains were isolated from *Cx. delponteii* in northern Argentina. Venezuelan equine encephalitis virus subtype VI and several Bunyaviridae were isolated from specimens collected in Chaco and Santa Fe provinces, showing that this species is a possible vector in enzootic patterns of these viruses. In addition, the great number of virus isolates (18 of 40 in Chaco and 5 of 6 in Santa Fe) suggested the possibility of transovarial transmission (Mitchell et al. 1985, 1987b).

Discussion. *Culex delponteii* differs from *Cx. paracrybda* in having tarsometes dark-scaled; pleural integument evenly yellowish and pleural setae light golden. The male genitalia of *Cx. delponteii* differ from those of *Cx. paracrybda* in having the lateral plate of the phallosome with a blunt, nearly straight, apically rounded apical process; distal and proximal arms of distal division of the subapical lobe of the gonocoxite approximated, distinctly unequal, proximal arm robust, apically enlarged, distal arm with 2 narrower and 2 wider, appressed setae (*f*) and a stiff, nearly saberlike seta (*s*); proximal division

of subapical lobe with a patch of moderately long, curved setae on basal portion and tergum IX lobe bearing long and slender setae on distal half.

Pereyrai Subgroup

The Pereyrai Subgroup is similar to the Paracrybda and Pedroi subgroups in general male genitalia morphology, but it seems to share more similarities with the Paracrybda Subgroup, especially in the shape of the subapical lobe of the gonocoxite and tergum IX lobes, and in the female cibarial armature.

The Pereyrai Subgroup differs from the Pedroi Subgroup in having the cibarial tooth with 2 distinct parts, an anterior part that is a thin, sagittal plate and a posterior part that is a transverse plate, lozenge or hexagonal in outline, and in having the pleural integument yellowish with a pattern of dark spots; from the Paracrybda Subgroup in having conspicuous white rings on hindtarsomeres 1-4, 5 totally white. The male genitalia of the Pereyrai Subgroup differ from those of the Pedroi and Paracrybda subgroups in possessing apical, lateral, and ventral processes on the lateral plate of the phallosome, a spatulate, foliform seta (*l*) inserted more basally on the proximal arm of the distal division of the subapical lobe and the tergum IX lobe slightly globose, club-shaped, bearing long and slender setae; from those of the Pedroi Subgroup in having the distal division of the subapical lobe divided into 2 unequal arms; from those of the Paracrybda Subgroup in having the lateral plate of the phallosome with a small, broad, distally rounded apical process; the distal arm of the distal division of the subapical lobe with a narrow, spatulate seta at apex (*f*), 3 narrow, appressed setae (*f*) on subapical portion and a narrow, nearly saberlike seta (*s*) near middle of the arm.

Culex (Melanoconion) pereyrai Duret, 1967

Culex (Melanoconion) pereyrai Duret, 1967:81 (♂*). Holotype ♂: Cecilio Baz. Caaguazú, Paraguay (NMNH).

Galindo 1969:88 (tax.); Forattini and Sallum 1989b:478 (♂*, ♀*, Brazil); Harbach et al. 1991:194 (type info).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with dark brown scales, hindtarsomeres 1-4 with white rings on joints, 5 white-scaled. **Head:** Antennal length about 2.10 mm, proboscis length 1.63-1.81 mm (\bar{x} = 1.73 mm); maxillary palpus

length 0.27-0.37 mm (\bar{x} = 0.31 mm), about 0.20 length of proboscis. Narrow falcate scales of vertex dark in a small median dorsal area, whitish laterally. **Cibarium** (Figs. 17A, 17B): Length about 176 μ m; dorsal surface of cibarial bar smooth, posterior margin with irregular sclerotized folds; about 27-30 thin, laminar teeth; tooth length about 12 μ m; tooth with 2 distinct parts, anterior and posterior, anterior part a thin sagittal plate, posterior part a transverse plate, lozenge or hexagonal in outline, both parts with minute spicules at margins; line of origin of teeth not evident; hollow area of teeth absent. **Sensilla trichodea** a linear series of 2-4 single setae on each side. **Thorax:** Scutal integument brown, scutal scales mostly dark brown with bronzy sheen, light golden scales on prescutellar area; scutal setae brownish black with reddish reflections; acrostichal setae absent. Scutellar scales light golden on lateral lobes, totally dark brown or mixed with light golden scales on median lobe, median lobe with 6 large setae, lateral lobes each with 4 large setae. Postpronotum with scales similar to scutal scales, totally dark brown; posterodorsal margin with 3-5 dark setae. Pleural integument yellowish with dark spots on proepisternum, postspiracular area, prealar knob, anterior surface of mesokatepisternum, and indistinctly darker on upper corner of mesokatepisternum. Pleural setae yellow with golden reflections, dark on prealar knob: 6-11 upper proepisternal, 5, 6 prealar, 5-8 upper mesokatepisternal, 7-10 lower mesokatepisternal, 4-8 upper mesepimeral, and 1 lower mesepimeral. Pleura with small patch of pale spatulate scales on lower posterior border of mesokatepisternum. **Wing:** Length 2.80-3.13 mm (\bar{x} = 2.96 mm); cell R_1 , 3.99-4.87 of vein R_{2+3} (\bar{x} = 4.40); cell M, about 0.84 of cell R_1 ; subcosta intersects costa at level of furcation of R_{2+3} . Dorsal scaling: appressed spatulate scales on distal 0.5 of M_{1+2} ; linear plume scales on proximal 0.5 of M_{1+2} ; renigium with 2, 3 distal setae. Ventral scaling: appressed spatulate scales on proximal 0.3 of R_2 , proximal 0.3 of R_3 ; linear plume scales on proximal 0.5 of R_1 , proximal 0.5 of R_{2+3} ; inclined narrow spatulate scales on distal 0.5 of R_1 , distal 0.7 of R_2 , distal 0.7 of R_3 , distal 0.5 of R_{4+5} . **Halter:** Capitulum whitish. **Legs:** Anterior surface of forecoxa with patch of dark scales, anterior surface of mid- and hindcoxae with vertical line of colorless scales. Antero- and posteroventral surfaces of foretrochanter with dark scales, antero- and posteroventral surfaces of mid- and hindtrochanters white-scaled. Posterior surface of all tibiae and fore- and midtarsomeres 1 and 2 with indefinite longitudinal stripe of dingy pale scales, fore- and midtarsomeres 2-4 with indefinite pale rings on joints, fore- and

midtarsomeres 5 paler, hindtarsomeres 1-4 with distinct white ring on base and apex, 5 entirely white. **Abdomen:** Terga II-VII dark-scaled with basolateral patches of white scales, occasionally appearing as narrow basal band on terga IV-VI, bands more evident on terga IV and V; tergum VIII dark-scaled with few white scales on basolateral areas. Sterna II-VII with broad basal white bands, sternum II sometimes entirely white-scaled; sternum VIII with lateral patches of white scales, occasionally mixed with some dark scales. **Genitalia:** Lateral lobes of tergum IX each with 7-10 slender setae; 7-9 clustered insular seta. Postgenital lobe short, somewhat trapezoidal in outline, apical margin nearly straight, with 10-17 setae on either side of midline.

Male. Like female except for the following sexual differences. **Head:** Antennal length about 1.77 mm; maxillary palpus length about 2.62 mm, exceeding proboscis from about apical 0.9 of palpomere 4; palpomere 3 with 6-8 strong setae on outer apical area. **Abdomen:** Tergum II dark-scaled or with small basolateral patches of white scales; terga III-VI with basal bands of white scales, tergum VII dark-scaled with basolateral patches of white scales; tergum VIII with few white scales on basolateral areas. Sternum II with white scales mixed with dark scales; sterna III-VIII with basal white bands. **Genitalia** (Fig. 26): Tergum IX lobes small, slightly globose, club-shaped, widely separated, bearing long and slender setae. Gonocoxite conical, inner margin moderately concave, tergomeral surface without setae or with 1-3 small setae proximal to subapical lobe; proximal part of ventrolateral surface with 1, 2 scales; subapical lobe distinctly divided, divisions approximated; proximal division with an apical infundibular and hyaline expansion, 2 long, enlarged, sinuous, apically hooked setae (setae *a* and *b*) at apex, a hyaline, broad, hooked-falciform seta beyond middle and 9-14 short, slender, and curved setae from base to level of insertion of the hooked-falciform seta; distal division divided into 2 well-separated arms, proximal arm robust, bearing a long hooked seta (*h*) at apex, a subapical saberlike seta (*s*), and a shorter, spatulate, foliiform seta (*l*) inserted on prominent tubercle near middle of arm; distal arm slender, cylindrical, bearing a stiff, short, nearly saberlike seta (*s*) inserted near middle of arm, 3 narrow, appressed setae (*f*) on distal 0.3 of arm, and a longer, narrow, spatulate seta (*f*) inserted at apex of arm. Gonostylus slender, curved, moderately narrowed distally, crest slightly wrinkled on ventral surface before apical snout; gonostylar claw short, leaflike, apically broadened. Lateral plate of phallosome with apical, lateral, and ventral

processes; apical process short, broad at base, apically rounded; ventral process curved laterally, lateral process slender, nearly pointed, dorsolaterally directed, dorsal process separated from aedeagal sclerite margin by distinct angle. Paraproct crown with row of 5-7 short simple blades; 3, 4 small cercal setae. Tergum X large, nearly rectangular in outline.

Material examined. 25 ♂, 30 ♀, 18 ♂G, 9 ♀cib, 4 ♀G. BRAZIL, Sao Paulo State, Iguape County, Iguape-Bigua Road, Oct 1982, Forattini et al. coll., Forattini and Sallum det. 1988, 7 ♀, 4 ♀G, 4 ♀cib; Nov 1982, 1 ♀; urban area. Oct 1976, 1 ♂, 1 ♂G; Palmeiras Farm, 22 Aug 1989, Gomes coll., Sallum det. 1990, 1 ♂, 1 ♀; 5 Sep 1989, 3 ♀, 2 ♂; 7 Nov 1989, 2 ♂, 3 ♀; 23 Jan 1990, 1 ♂, 2 ♀, 1 ♀cib; 19 Jun 1989, Forattini et al. coll., Sallum det. 1989, 1 ♀, 1 ♀cib; Vale Grande Ditch, 24 Oct 1989, Gomes et al. coll., Sallum det. 1990, 1 ♀; Pariquera-Açu County, Experimental Station, Feb 1979, Forattini et al. coll., Forattini and Sallum det. 1988, 1 ♀; Apr 1980, 1 ♀; Aug 1980, 1 ♀; Nov 1980, 2 ♂, 2 ♂G, 1 ♀; Dec 1980, 1 ♀; Jan 1981, 1 ♀; Feb 1981, 5 ♂, 5 ♂G; Mar 1981, 4 ♂, 4 ♂G; Apr 1981, 1 ♂, 1 ♀, 1 ♂G; Jun 1981, 1 ♀; May 1984, 1 ♂, 1 ♂G; Jul 1984, 3 ♂, 3 ♂G; 2 May 1992, Forattini et al. det. 1992, 1 ♂; 30 Nov 1989, Gomes coll., Sallum det. 1989, 3 ♀, 3 ♀cib; Pariquera-Mirim district, Jan 1985, Forattini et al. coll., Forattini and Sallum det. 1988, 1 ♂, 1 ♂G.

Distribution (Fig. 5). Known from the type locality (Paraguay, Caaguazu, Cecilio Baez) and localities in the Ribeira Valley, Sao Paulo State, southern Brazil.

Bionomics. Little data are available about the habits of the adults and immature stages. Adults were collected in patches of residual forest in modified rural areas and a few specimens were collected near houses in CDC light traps and on human bait (Forattini et al. 1991b).

Immature stages were collected in full sun or partial shade, from river edges and small lakes. The water was fresh, unpolluted, turbid or clear, stagnant or with a slow current, with scarce or abundant emergent (aquatic grasses), submerged and floating (*Pistia*) vegetation. The breeding sites were situated in primary rain forest or in second-growth vegetation.

Discussion. *Culex peryyai* differs from *Cx. delponteii* and *Cx. paracrybda* in having conspicuous white rings on the base and apex of hindtarsomeres 1-4, 5 totally white; from *Cx. paracrybda* in having the pleural integument yellowish with a pattern of dark spots; from *Cx. delponteii* in possessing the pleural integument with dark spots on the proepisternum, postspiracular area, prealar knob, and anterior surface

of the mesokatepisternum, and an indistinctly dark spot on the upper corner of the mesokatepisternum. The male genitalia of *Cx. pereyraei* differ from those of *Cx. delponteii* and *Cx. paracrybda* in having the lateral plate of the phallosome with apical, ventral, and lateral processes, the apical process short, broad, and rounded on the apical margin, tergum IX lobe small, slightly globose, club-shaped with long and slender setae, basal seta (*l*) of the proximal arm of the distal division of the subapical lobe of the gonocoxite nearly foliiform in shape, spatulate at apex; from those of *Cx. delponteii* in having the proximal and distal arms of the distal division of the subapical lobe well separated, in possessing on the distal arm of the distal division of the subapical lobe an apical, narrow, spatulate seta (*f*), 3 subapical narrow appressed setae (*j*), and a submedian short saberlike, stiff seta (*s*), proximal arm of the distal division not strongly enlarged, proximal division of the subapical lobe with a patch of short, curved setae basal to hooked-falciform seta; and from those of *Cx. paracrybda* in having a narrow, elongate, spatulate seta (*f*) at the apex of the distal arm of the distal division of the subapical lobe.

Vomerifer Group

The Vomerifer Group includes *Culex vomerifer* Komp., *Cx. ponesi*, and *Culex sacchetiae* Sirivanakarn and Jakob. It was initially proposed by Sirivanakarn (1983) as a subgroup of the Taeniopus Group. According to that author, the Taeniopus Group could be distinguished from the other groups of the Spissipes Section by having the forked scales of the vertex entirely dark, absence of acrostichal setae, abdominal terga with basolateral patches of pale scales, wing length exceeding 3.0 mm, and female cibarial tooth large, columnar with a hollow area on basal portion. Sirivanakarn (1983) recognized 3 subgroups in the Taeniopus Group: the Pedroi, Vomerifer, and Taeniopus subgroups. However, examination of general morphology of the male genitalia of the species of these subgroups has led us to propose a new taxonomic interpretation and the recognition of new groups. As a result, the Vomerifer and Taeniopus subgroups of Sirivanakarn (1983) are here considered as groups and the Pedroi Subgroup as a subgroup of the Crybda Group, which also includes the Paracrybda and Peryyai subgroups.

The Vomerifer Group can be easily recognized by having acrostichal setae on the anterior and posterior portions of the acrostichal area, scutal and scutellar scales totally dark, pleural integument yellowish with dark spots, and the upper corner of the mesokatepisternum without

a patch of scales. The male genitalia of the Vomerifer Group are easily identified by the absence of scales on the proximal part of the ventrolateral surface of the gonocoxite, lateral plate of the phallosome without the apical process, the ventral and lateral processes present, ventral process short, laterally curved, lateral process long, nearly pointed, dorsolaterally directed, distal division of the subapical lobe of the gonocoxite unique, columnar, bearing a wide, asymmetrical foliiform seta (*l*), gonostylus with a hyaline, triangular expansion near middle of ventral side, and tergum IX lobes small, apically rounded, and widely separated.

Culex (Melanocnion) vomerifer Komp, 1932

Culex (Melanocnion) vomerifer Komp. 1932: 79 (♂⁺). Holotype ♂: Almirante, [Bocas del Toro], Panama (NMNH).

Rozchoom and Komp 1950:97 (♂⁺); Stone 1961:47 (Trinidad); Forattini 1965:185 (♂⁺); Aitken and Galindo 1966:202 (tax.); French Guiana); Floch and Kramer 1965:1 (tax.); Galindo 1969:87 (tax.); Barreto-Reyes and Lee 1969:431 (Colombia); Heinemann and Belkin 1978b:394 (Venezuela); Heinemann and Belkin 1979:89, 108 (Brazil; Ecuador); Sirivanakarn and Jakob 1981a:194 (♂⁺); Sirivanakarn 1983:278 (♂⁺); Forattini and Salum 1992:74 (♀cib⁻).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with dark scales; pleural integument yellowish with dark spots on postpronotum, proepisternum, postspiracular area, prealar knob, anterior surface of mesokatepisternum, and upper and lower portions of mesepimeron; with a patch of small, light golden setae on middle area of mesepimeron. **Head:** Antennal length about 1.89 mm; proboscis length 1.42–1.61 mm (\bar{x} = 1.55 mm); maxillary palpus length 0.27–0.33 mm (\bar{x} = 0.29 mm), about 0.20 of length of proboscis. Vertex with narrow falcate scales dark on a small median dorsal area along coronal suture, dingy white laterally and on ocular line. **Cibarium** (Fig. 27): Length about 160 μ m; dorsal surface and distal margin of cibarial bar with minute spicules; about 18–20 teeth; tooth length about 11 μ m; line of origin of teeth not evident; hollow area somewhat triangular in outline, more or less restricted to base. Sensilla trichodea arranged in linear series of 2–4 single setae. **Thorax** (Figs. 13F and 14A). Scutum with dark brown to blackish scales with coppery reflections; acrostichal setae on anterior promontory

and on posterior portion of acrostichal area. Scutellar scales similar to scutal scales; median lobe with 6 large setae. Lateral lobes each with 3, 4 large setae. Postpronotum with scales similar to scutal scales; with 3, 4 large setae on posterodorsal margin. Pleural integument yellowish with dark spots on postpronotum, proepisternum, postspiracular area, prealar knob, anterior surface of mesokatepisternum, and upper and lower portions of mesepimeron. Pleural setae dark brown with reddish or golden reflections, upper mesepimeral and shorter lower mesokatepisternal setae light golden: 13 upper proepisternal, 6, 7 prealar, 9, 10 upper mesokatepisternal, 9–12 lower mesokatepisternal, 9–10 upper mesepimeral, and 1 lower mesepimeral; middle area of mesepimeron with a sparse patch of small light golden setae (Fig. 13F). Pleura with a row of broad, spatulate, nearly colorless scales on lower posterior margin of mesokatepisternum. *Wing*: Length 2.40–2.54 mm (\bar{x} = 2.47 mm); cell R_2 , 3.34–3.58 of vein R_{2+3} (\bar{x} = 3.46); cell M_2 of 0.80 of cell R_2 ; subcosta intersects costa slightly proximal to furcation of R_{2+3} . Dorsal scaling: appressed spatulate scales on distal 0.8 M_{2+3} ; inclined narrow spatulate scales on proximal 0.2 of M_{2+3} ; renigium with 1, 2 distal setae. Ventral scaling: appressed spatulate scales on proximal 0.4 of R_1 , proximal 0.4 of R_2 , proximal 0.2 of M_{2+3} ; linear plume scales on proximal 0.3 of R_1 , proximal 0.4 of R_{2+3} ; inclined narrow spatulate scales on distal 0.7 of R_1 , R_2 , R_3 , and R_{1+2} ; distal 0.8 of M_{2+3} . *Legs*: Anterior surface of forecoxa with patch of dark scales and a few whitish scales at base, midcoxa with vertical line of nearly colorless scales, hindcoxa without scales. Antero- and posteroventral surfaces of trochanters with whitish scales. *Abdomen*: Terga II–VII dark-scaled with basolateral patches of white scales; tergum VIII with dark scales. Sterna II–VII dark-scaled with basal bands of white scales; sternum VIII with dark scales. *Genitalia* (Fig. 27): Lateral lobes of tergum IX each with 5–8 setae; 8 clustered insular setae. Postgenital lobe short, broad, nearly trapezoidal on posterior portion, distal margin nearly straight, with 10, 11 setae on either side of midline.

Male. Adult not examined. *Genitalia* (Fig. 27): Tergum IX lobe small, cone-shaped, widely separated, with few sparse fine setae. Gonocoxite conical, inner margin slightly concave, tergomeral surface without seta proximal to subapical lobe; lateral surface with sparse patch of short, slender setae (lsp) at level of subapical lobe; proximal division of subapical lobe of gonocoxite with 2 long, apically hooked setae (seta *a* and *b*) at apex, seta *a* less robust than seta *b*, and 2 small, slender, pointed setae on basal por-

tion of division; distal division columnar with 8 apical setae, which include a 1 long, apically hooked seta (*h*), a short and a moderately long saberlike setae (*s*), 3 subequal, narrow, appressed setae (*f*), a short, slender, pointed seta (*j*), and a wide, asymmetrical, foliform seta (*l*); this seta more pigmented on inner portion and hyaline and striate on outer portion. Gonostylus slender, curved, moderately enlarged distally, with minute spicules on proximal half of mesal side, a characteristic, hyaline, triangular expansion on ventral side basal to subapical crest; subapical crest spiculate, evident from hyaline expansion to apical snout; gonostylar claw short, leaflike, broadest apically; lateral plate of phallosome without apical process, distal margin slightly concave, ventral and lateral processes present, ventral process moderately long, blunt, laterally curved with a triangular expansion laterally directed; lateral process longer, tapered, pointed at apex, dorsolaterally directed; basal piece damaged (not examined); paraprot crenum with 6 simple blades; 3 cercal setae. Tergum X somewhat rectangular in outline.

Material examined. 1 ♂G, 9 ♀, 5 ♀cib, 2 ♀G. *Holotype*: PANAMA, Almirante, Feb 1932, W. H. W. Komp (USNM). *Other specimens*: BRAZIL, Para State, Belém County, Mocambo, 8 Oct 1985, J. M. S. Barata coll., Sallum det. 1985, 1986, CDC light trap, 9 ♀, 5 ♀cib, 2 ♀G.

Distribution (Fig. 6). Known from Brazil (Para State), Colombia, Ecuador, French Guiana, Panama, Trinidad, and Venezuela. Records from Ecuador should be reviewed as specimens from that country were tentatively identified as *Cx. vomerifer* by Heinemann and Belkin (1979).

Bionomics. Immature stages were taken from root caves at swamp margins in deep shade. The water was brown with submerged and little woody vegetation. Adults were collected in the canopy and at ground level in "terra firme" and "varzea" forests, in partially cleared forest, second-growth vegetation, second-growth vegetation near swamp areas, and mangroves. The adult collections were made with CDC light traps, other kinds of light traps, sometimes baited with mice. Disney traps baited with hamster, and biting or landing on humans (Heinemann and Belkin 1978a, 1978b, 1979; Heinemann et al. 1980).

Numerous arboviruses have been isolated from *Cx. vomerifer*, showing that it can be a potential vector of Guama, Moju, Ananindua, Caraparu, Ossa, Vinces, Madrid, Murutu, and Itaquí viruses of the Bunyaviridae (Shope et al. 1988).

Discussion. Adults of *Cx. vomerifer* differ from *Cx. portesi* and *Cx. sacchettiae* in having a patch of minute light golden setae on the middle

portion of the mesepimeron, pleural integument with dark spots on the postpronotum, procipternum, postspiracular area, prealar knob, anterior portion of the mesokatepisternum, and upper and lower portions of the mesepimeron, cell R_2 , 3.34 length of vein R_{2+3} , midcoxa with a vertical line of dark scales; from *Cx. portesi* in having the anterior surface of the forecoxa with a patch of dark scales; and from *Cx. sachettae* in having tarsomeres dark-scaled. The cibarial armature of *Cx. vomerifer* differs from *Cx. sachettae* and *Cx. portesi* in having 18–20 cibarial teeth; from *Cx. sachettae* in having the cibarial bar with sparse spicules on the dorsal surface and posterior margin, cibarial teeth nearly rectangular in outline, distal part not very enlarged, and apical portion small. The male genitalia of *Cx. vomerifer* differ from those of *Cx. portesi* and *Cx. sachettae* by the shape of foliform seta (*f*) of the subapical lobe of the gonocoxite (Fig. 27); from those of *Cx. portesi* in having the tergum IX lobe small, conical, widely separated with small and slender setae; and from those of *Cx. sachettae* in having the tergomal surface of the gonocoxite proximal to the subapical lobe without a patch of 6–10 small setae.

Culex (Melanoconion) portesi
Senevet and Abonnenc, 1941

Culex (Melanoconion) portesi Senevet and Abonnenc, 1941:41 (δ^1). Holotype δ^1 : French Guiana (NL).

Rozeboom and Komp 1950:95 (δ^* ; tax.); Lane 1951:334 (syn. with *Cx. vomerifer*); Floch and Kramer 1965:1 (δ^* ; tax.); Aitken and Galindo 1966:202 (δ^* , \varnothing ; resurrected from syn.; Brazil, Trinidad); Belkin 1968:53 (type info.); Panday 1975a:144 (Surinam); Mattingly 1976:244 (E δ^*); Heinemann and Belkin 1978b:394 (Venezuela); Sirivanakarn and Degallier 1982:153 (δ^* , \varnothing^* , P δ^* , L δ^* ; British Guiana); Sirivanakarn 1983:278 (δ^*); Forattini and Sallum 1992:74 (\varnothing cib *).

Culex (Melanoconion) cayensis Floch and Abonnenc, 1945:4 (δ^1). Holotype δ^1 : Cayenne, [Guyane], French Guiana (NE).

Floch and Abonnenc 1947:6 (syn.); Floch and Kramer 1965:3 (δ^1 ; resurrected from syn.); Belkin 1968:14 (type info.); Harrison 1973:277 (type info.); Sirivanakarn and Degallier 1982:154 (syn.).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with dark scales, pleural integument yellowish with dark spots on postpronotum, postspiracular area, and

prealar knob. **Head:** Antennal length about 1.78 mm; proboscis length 1.45–1.59 mm (\bar{x} = 1.53 mm); maxillary palpus length 0.25–0.28 mm (\bar{x} = 0.26 mm), about 0.20 of length of proboscis. Vertex with narrow falcate scales, dark anteriorly, dingy white posteriorly. **Cibarium** (Fig. 28): Length about 194 μ m; dorsal surface and distal margin of cibarial bar with minute spicules, about 16–19 teeth; tooth length about 15 μ m; line of origin of teeth not evident; hollow area somewhat triangular in outline, more or less restricted to base. Sensilla trichodea arranged in linear series of 1–3 single setae. **Thorax:** Scutum with dark brown to blackish scales with coppery reflections; acrostichal setae on anterior promontory and on posterior portion of acrostichal area. Scutellar scales similar to scutal scales; median lobe with 5, 6 large setae, lateral lobes each with 4 large setae. Postpronotum with scales similar to scutal scales with 4–6 large setae on posterodorsal margin. Pleural integument yellowish with dark spots on postpronotum, postspiracular area, and prealar knob. Pleural setae yellowish, prealar, upper mesokatepisternal, more developed lower mesokatepisternal, and lower mesepimeral setae dark: 10–13 upper proepisternal, 3–5 prealar, 8–12 upper mesokatepisternal, 10–13 lower mesokatepisternal, 6–8 upper mesepimeral, and 1 lower mesepimeral. Pleura with a row of broad, spatulate, nearly colorless scales on lower posterior margin of mesokatepisternum. **Wing:** Length 2.25–2.38 mm (x = 2.32 mm); cell R_2 , 3.92–5.44 of vein R_{1+2} (\bar{x} = 4.56); cell M, 0.81 of cell R; subcosta intersects costa slightly proximal to furcation of R_{1+2} . Dorsal scaling: appressed spatulate scales on distal 0.7 of M_{1+2} ; inclined narrow spatulate scales on M, proximal 0.3 of M_{1+2} ; remigium with 1, 2 distal setae. Ventral scaling: appressed spatulate scales on proximal 0.4 of R_1 , proximal 0.4 of R_2 , proximal 0.4 of M_{1+2} , proximal 0.2 of M_{3+4} ; linear plume scales on proximal 0.3 of R_1 , proximal 0.5 of R_{2+3} ; inclined narrow spatulate scales on distal 0.7 of R_2 , distal 0.6 of R_3 , distal 0.6 of R_4 , distal 0.5 of R_5 , distal 0.6 of M_{1+2} , M_{3+4} . **Legs:** Anterior surface of forecoxa with patch of nearly colorless scales, midcoxa with vertical line of nearly colorless scales, hindcoxa without scales. Anteroventral surface of foretrochanter with dark scales, posteroventral surface of foretrochanter and antero- and posteroventral surfaces of mid- and hindtrochanters with whitish scales. **Abdomen:** Terga II–VII dark-scaled with basolateral patches of white scales; tergum VIII with dark scales. Sterna II–VII dark-scaled with basal bands of white scales; sternum VIII with sparse dark scales and few white scales on lateral areas. **Genitalia** (Fig. 28): Lateral lobes of tergum IX each with 8–12 setae; 8–10 clus-

tered insular setae. Postgenital lobe short, broad, nearly trapezoidal on posterior portion, distal margin nearly straight, with 9–12 setae on either side of midline.

Male. Like female except for the following sexual differences. *Head:* Antenna and maxillary palpus not measured, setae on outer apical surface of palpomere 3 not counted. *Abdomen:* Tergum II with dark scales, terga III–VII dark-colored with basal bands of white scales. Sterna II–VII dark-colored with basal bands of white scales; sternum VIII with dark scales. *Genitalia* (Fig. 28): Like *Cx. vomerifer*, differing as follows. Tergum IX lobes small, nearly rounded, widely separated, with numerous long, sinuous setae. Lateral surface of gonocoxite with a patch of moderately long, slender setae at level of subapical lobe (sps). Distal division of subapical lobe with 8 apical setae, which include a long, apically hooked seta (*h*), a short and a moderately long saberlike setae (*s*), 3 subequal, narrow, appressed setae (*f*), a short, slender, pointed seta (*j*), and a wide, asymmetrical foliform seta (*l*), this seta more pigmented on proximal side and hyaline on distal side. Paraproct crown with 8, 9 simple blades; 1, 2 cercal setae.

Material examined. 61 ♀, 4 ♂, 2 ♂G, 5 ♀cib, 4 ♀G. TRINIDAD, Nariva Swamp, Bush-Bush Forest, M. Takahashi coll., Aitken and Galindo det. 1964, 1 ♂, 2 ♀; BRAZIL, Para State, Belem County, Utinga, Jul 1966, A. Toda coll. and det., 1 ♂, 1 ♂G; Jul 1967, 1 ♂, 1 ♂G; Ipan, 1966, 1 ♀, 1 ♂; Mocambo, 8 Oct 1985, Barata coll., Sallum det. 1985, CDC light trap, 31 ♀, 5 ♀cib, 4 ♀G; Amazonas State, Parque Nacional do Jau, Carabinani River, right side, 6–9 Apr 1994, Hutchings and Ferreira coll., Sallum det. 1994, CDC light trap, 11 ♀; 8, 9 Apr 1994, CDC light trap, 1 m aboveground, 2 ♀; 10, 11 Apr 1994, 5 ♀; 11, 12 Apr 1994, 1 ♀; 12, 13 Apr 1994, 1 ♀; 15, 16 Apr 1994, 3 ♀; left side, 14, 15 Apr 1994, CDC light trap, 2 ♀; 13, 14 Apr 1994, CDC light trap, 1 m aboveground, 2 ♀.

Distribution (Fig. 6). Known from Brazil, French Guiana, Surinam, Trinidad, Venezuela (Pecor et al. 1992), and British Guiana (Sirivanakarn and Degallier 1982). Forattini and Sallum (1989a) misinterpreted records of *Cx. portesi* and considered that it was found in southern Brazil. The distribution of *Cx. portesi* is, at present, restricted to northern South America.

Bionomics. According to Sirivanakarn and Degallier (1982), *Cx. portesi* is a common species in lowland swamp forests (from sea level to about 30 m) and seems to be absent from inland primary forests. However, it has been collected in a well-preserved area of the Amazon forest (see material examined). Adults were collected

on human bait, traps baited with mammals, Disney traps baited with rodents (*Proechimys*), light traps at ground level, and in the canopy of "terra firme" and "varzea" forests. Adults appear to bite during the night and feed on rodents and opossums (Heinemann and Belkin 1979). Adults of *Cx. portesi* were also collected on humans, resting in root caves, in animal holes in the ground, and under leaves in forest, partially cleared forest, swamps, and mangrove forest. They were also collected in traps baited with chickens or mice and in Chamberlain and Malaise traps (Heinemann and Belkin 1978a).

Immature stages were collected at swamp margins and in small or large ground pools in partially cleared forests. The sites were permanent, semipermanent, or temporary, in partial shade. The water was clear or turbid, always fresh, and occasionally with herbaceous vegetation and/or plant debris on the bottom (Aitken 1972, Heinemann et al. 1980).

Studies on abundance and seasonal variability associated with gonotrophic and parity studies showed that *Cx. portesi* is a potential vector in the enzootic and epizootic cycles, related with rodents, of Mucambo virus in northeastern South America (Aitken 1972).

Discussion. *Culex portesi* differs from *Cx. vomerifer* and *Cx. sacchettiae* in having the pleural integument yellowish with dark spots on the postpronotum, prealar knob, and postspiracular area, anterior surface of the forecoxa with a patch of colorless scales, cell R₂₊₃ nearly 3.92–5.44 length of vein R₂₊₃, 16–19 cibarial teeth; from *Cx. sacchettiae* in having hindtarsomeres dark, midcoxa with a vertical line of nearly colorless scales, dorsal surface and distal margin of cibarial bar with sparse spicules, cibarial tooth not very enlarged on apical half; and from *Cx. vomerifer* in not having a patch of small golden setae on the middle area of the mesepimeron. The male genitalia of *Cx. portesi* differ from those of *Cx. sacchettiae* and *Cx. vomerifer* by the shape of the subapical lobe of the gonocoxite, and tergum IX lobes small, nearly rounded, with numerous long, sinuous setae; and additionally from *Cx. sacchettiae* by the absence of a cluster of small setae on the tergomal surface of the gonocoxite proximal to the subapical lobe.

Culex (Melanoconion) sacchettiae Sirivanakarn and Jakob, 1981

Culex (Melanoconion) sacchettiae Sirivanakarn and Jakob, 1981a:191 (♂*, ♀). Holotype ♂: Cananea (Brucouha), Sao Paulo, Brazil (FSP).

Srivananakarn and Jakob 1979:139 (as *Cx. vomerifer*); Forattini et al. 1988:537 (type info.); Forattini and Sallum 1989a:117 (δ^+ , ♀ , P⁺, L⁺).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with dark scales, pleural integument yellowish with dark spots on postpronotum, proepisternum, postspiracular and subspiracular areas, prealar knob, anterior surface and upper corner of mesokatepisternum, upper and lower areas of mesepimeron, hindtarsomeres 1–4 with white rings on joints, 5 white. **Head:** Antennal length about 1.92 mm; proboscis 1.60–1.84 mm (\bar{x} = 1.72 mm); maxillary palpus 0.29–0.36 mm, mean 0.31 mm, about 0.20 of proboscis, occasionally with a small palpomere 5. Vertex with narrow falcate scales, these scales dark in a small median dorsal area along coronal suture, dingy white laterally. **Cibarium** (Fig. 15B, 16E, 16F, and 29): Length about 197–224 μm ; dorsal surface and distal margin of cibarial bar with minute spicules roughly agglomerate, irregular in size; tooth spatulate, narrow on basal portion, enlarged on distal portion, about 12–15 teeth; tooth length about 14–19 μm ; line of origin of teeth not evident; hollow area somewhat triangular in outline, more or less restricted to base. Sensilla trichodea arranged in linear series of 3, 4 single setae. **Thorax** (Figs. 12C, 12D): Scutum with dark brown to blackish scales with bronzy reflections; acrostichal setae on anterior promontory and on posterior portion of acrostichal area. Scutellar scales similar to scutal scales; median lobe with 6 large setae, lateral lobes each with 4 large setae. Postpronotum with scales similar to scutal scales; with 4, 5 large setae on posterodorsal margin. Pleural integument yellowish with dark spots on postpronotum, proepisternum, postspiracular and subspiracular areas, prealar knob, anterior surface and upper corner of mesokatepisternum, upper and lower areas of mesepimeron. Pleural setae dark brown with reddish and golden reflections, less developed mesokatepisternal setae light golden: 8–16 upper proepisternal, 3, 6 prealar, 5–9 upper mesokatepisternal, 9–15 lower mesokatepisternal, 4–7 upper mesepimeral, and 1 lower mesepimeral. Pleura with a row of broad, spatulate, nearly colorless scales on lower posterior margin of mesokatepisternum, occasionally with 3, 4 spatulate, hyaline scales on upper corner. **Wing:** Length 2.58–2.83 mm (\bar{x} = 2.69 mm); cell R_2 6.12–7.12 of vein R_{4+5} (\bar{x} = 6.39); cell M_2 of 0.77 of cell R_2 ; subcosta intersects costa at level of furcation of R_{5+6} . Dorsal scaling: appressed spatulate scales on distal 0.7 of M_{1+2} , proximal 0.7 of 1A; linear plume scales on proximal 0.3

of M_{1+2} , distal 0.3 of 1A; inclined narrow spatulate scales on M_1 , proximal 0.2 of M_{1+2} ; renigium with 2, 3 distal setae. Ventral scaling: appressed spatulate scales on proximal 0.4 of R_2 , proximal 0.4 of R_3 , proximal 0.3 of M_{1+2} , proximal 0.2 of M_{1+2} ; linear plume scales on proximal 0.5 of R_1 , proximal 0.3 of R_{2+3} ; inclined narrow spatulate scales on distal 0.5 of R_1 , R_2 , R_3 , distal 0.7 of R_{2+3} , distal 0.7 of M_{1+2} , M_{1+2} . **Legs:** Hindcoxa without scales. Antero- and posteroventral surfaces of foretrochanter dark-scaled; anteroventral surface of midtrochanter dark-scaled and posteroventral surface with whitish scales, hindtrochanter with whitish scales. Apex of all femora with a patch of white scales, more evident on hindfemur. Tibiae dark; fore- and midtarsomeres 1 dark, fore- and midtarsomeres 2–4 with indistinct basal pale rings, 5 pale, hindtarsomere 1 with narrow basal pale band, hindtarsomeres 2–4 with white rings on base and apex, 5 entirely white. **Abdomen:** Terga II, VII dark-scaled with basolateral patches of white scales, tergum II occasionally with white scales on basomedian region; terga III–VI dark with basolateral patches of white scales, occasionally becoming complete narrow basal white bands; tergum VIII with dark scales. Sternum II white-scaled with small patches of dark scales on apical region; sterna III–VII with basal white bands; sternum VIII with white scales laterally. **Genitalia** (Fig. 29): Lateral lobes of tergum IX each with 4–6 setae; 8 clustered insular setae. Postgenital lobe wide, short, nearly trapezoidal shaped on distal part, distal margin nearly straight, with 10, 11 setae on either side of midline.

Male. Similar to female except for the following sexual differences. **Head:** Antennal length about 1.74 mm; maxillary palpus length about 2.50 mm, exceeding proboscis from about apical 0.5 of palpomere 4; palpomere 3 with 11–13 strong setae on outer apical surface. **Abdomen:** Tergum II with white scales on anteromedian and basolateral regions, or totally dark-scaled; terga III–VII with basal white bands. Sterna II–VII with basal white bands; sternum VIII with basolateral patches of white scales. **Genitalia** (Fig. 29): Like *Cx. vomerifer*, differing as follows. Tergomesal surface with a patch of 6–10 clustered minute setae proximal to subapical lobe. Proximal division of subapical lobe of gonocoxite with 2–4 small, stiff setae on basal portion of division; distal division with 8 apical setae, which include a long hooked seta (*h*), a short and a long saberlike seta (*s*), a wide, asymmetrical, foliform seta (*l*) with the distal margin slightly rounded and more tanned on proximal area, 3 subequal, narrow, appressed setae (*f*), and a more basal, short, slender, pointed seta (*j*).

Basal piece similar to that of *Cx. spissipes*. Paraproct crown with 7 simple blades; 2, 3 cercal setae.

Material examined. 53 ♀, 20 ♂, 20 ♂G, 1 ♀G, 7 ♀cib. *Holotype:* BRAZIL. São Paulo State, Cananea County, Bracouha, 30 Apr 1976, O. S. Lopes coll., Sirivanakarn det. 1981, 1 ♂, 1 ♂G. *Allotype:* Iguape County, Banubuzal BR6-301, 30 Mar 1976, 1 ♀. *Other specimens:* Cananea County, Itapitangui, Itapoa Farm, Apr 1980, Forattini et al. coll., Forattini and Sallum det. 1987, 2 ♀; Apr 1980, 1 ♀; May 1980, 1 ♀; Jun 1980, 1 ♀; Jul 1980, 1 ♀; Oct 1980, 4 ♀. 1 ♀cib: Nov 1980, 2 ♀; Dec 1980, 1 ♀, 1 ♂, 1 ♂G; Jan 1981, 11 ♀, 2 ♀cib, 1 ♀G, 1 ♂, 1 ♂G; Feb 1981, 2 ♀, 1 ♂, 1 ♂G, 1 ♀cib; Mar 1981, 1 ♀; Dec 1981, 2 ♀, 1 ♂, 1 ♂G, 1 ♀cib; Feb 1982, 2 ♀; May 1986, 3 ♂, 3 ♂G; Vilarinho Farm, Mar 1983, 1 ♂, 1 ♂G; Apr 1983, 1 ♂, 1 ♂G; Pariqueira-Açu County, Experimental Station, Jan 1978, 1 ♀; Dec 1979, 3 ♀, 1 ♂, 1 ♂G; Dec 1979, 2 ♀; Jan 1980, 4 ♀; Feb 1980, 1 ♀; Jul 1980, 1 ♀; Dec 1980, 2 ♂, 2 ♂G; Jan 1981, 1 ♀, 1 ♂, 1 ♂G, Apr 1981, 1 ♀; May 1981, 1 ♂, 1 ♂G; Aug 1981, 1 ♂, 1 ♂G; Sep 1982, 1 ♂, 1 ♂G; Iguape County, Iguape-Bigua Road, Oct 1982, 3 ♂, 3 ♂G; Palmeiras Farm, 20 Jun 1989, 2 ♀, 2 ♀cib; 5 Dec 1989, Gomes coll., Lab. Ent. FSP-USP det. 1990, 5 ♀.

Distribution (Fig. 6). Known from the Ribeira Valley, São Paulo State, and from Paranaguá County, Paraná State: both localities belong to the Tropical Atlantic System of southern Brazil.

Bionomics. Immature stages of *Cx. sacchettae* were collected from ground pools with abundant submerged aquatic vegetation (*Sphagnum*). Adults were collected in primary forest in the Tropical Atlantic System, in second-growth vegetation, in domiciliary and peridomiciliary environments, and in localities with intense agricultural activities with artificial irrigation systems. This species seems to have potential to adapt to man-made environments. Analysis of specimens collected in intradomiciliary environments showed that a high proportion of them had fed on human blood (Forattini et al. 1987a, 1987b, 1989a, 1989b, 1990).

Discussion. *Culex sacchettae* differs from *Cx. vomerifer* and *Cx. portesi* in having hindtarsomeres 1-4 with conspicuous white rings on base and apex, 5 entirely white, pleural integument yellowish with dark spots on the postpronotum, proepisternum, postspiracular and subspiracular areas, prealar knob, anterior surface and upper corner of the mesokatepisternum, and upper and lower areas of the mesepimeron, midcoxa with a vertical line of dark scales, cell R₂₊₃ 12 length of vein R₂₊₃, dorsal surface and distal margin of cibarial bar with numerous spicules in

irregular patches, cibarial teeth 12-15, well enlarged on distal half; from *Cx. vomerifer* in not having a patch of small, light golden setae on the middle of the mesepimeron; and from *Cx. portesi* in having the forecoxa with a patch of dark scales. The male genitalia of *Cx. sacchettae* differ from those of *Cx. vomerifer* and *Cx. portesi* by the shape of the wide, asymmetrical foliiform seta (f) of the distal division of the subapical lobe of the gonocoxite (Fig. 29), in possessing a patch of 6-10 minute, clustered setae on the tergomesal surface of the gonocoxite proximal to the subapical lobe, and additionally from those of *Cx. portesi* in having the tergum IX lobe small, nearly rounded, with small, slender setae.

Ocoosa Group

The Ocoosa Group includes *Cx. ocoosa* and *Culex panocossa* Dyar. Members of the group can be easily recognized by having the vertex with a small patch of narrow falcate dark scales restricted to a small median dorsal area along the coronal suture, lateral patch of broad spatulate scales large, well evident in dorsal view, extending from lateral areas to the median dorsal patch of narrow falcate scales, pleural integument yellowish with some dark spots, tarsi totally dark, and halter whitish. The cibarial armature of the Ocoosa Group is similar to that of the Paracrybda Subgroup. The Ocoosa Group differs from the other groups in possessing small teeth without hollow area, each tooth with 2 distinct parts, anterior and posterior, anterior part a thin sagittal plate, posterior part a transverse plate, lozenge or roughly hexagonal in outline, with minute spicules at margins of both parts, cibarial dome nearly circular in outline with leaf-like, sharply pointed denticles. The male genitalia of the Ocoosa Group are distinguished by having the tergum IX lobe short, broad at base, prominent laterally, proximal division of the subapical lobe of the gonocoxite long, columnar, unique with 2 setae at apex (setae a and b) encircled by a hyaline sheath and 1, 2 slender, stiff setae on basal portion, distal division slender, columnar with a long, hooked seta at apex and a wide, petiolate, striate, foliiform seta (f) and 2 empty alveoli near base of division, tergomesal surface with a foliiform seta distal to the subapical lobe near the gonostylus, lateral plate of the phallosome without the apical process, ventral process long and laterally curved, lateral process long, tapered, pointed at apex, and proximal part of the ventrolateral surface of the gonocoxite with scales.

Culex (Melanoconion) ocosa
Dyar and Knab, 1919

Culex (Melanoconion) ocosa Dyar and Knab, 1919:6 (♂). Lectotype ♂: British Guiana [Georgetown, Guyana] (NMNH).

Dyar 1923a:120 (syn. with *Cx. aikenii*); Dyar 1928:337 (in part, see *Cx. panacosca*: Colombia, Panama, Surinam, Venezuela; as *Cx. aikenii*); Stone and Knight 1957:54 (lectotype desig.); Belkin 1970:59 (resurrected from syn.); Belkin et al. 1970:93 (♂*, P*, L*); Heinemann and Belkin 1979:80 (Brazil); Sirivanakarn and Jakob 1981b:195 (Argentina); Sirivanakarn 1983:279 (♂*, ♀*).

Female. Similar to *Cx. spissipes*, but differing as follows. Adult mostly covered with dark scales; pleural integument yellowish with dark spots on postpronotum, postspiracular area, anterior surface of mesokatepisternum, and prealar knob. **Head:** Antennal length about 1.73 mm; proboscis length 1.41–1.62 mm (\bar{x} = 1.52 mm); maxillary palpus 0.25–0.28 mm (\bar{x} = 0.27 mm), about 0.20 length of proboscis; maxillary palpus always with 4 segments. Vertex (Figs. 11C, 11D) with a patch of narrow falcate dark scales on a small median dorsal area along coronal suture, patch of broad appressed dingy white scales conspicuous, lateral to the median dorsal patch of dark scales. **Cibarium** (Figs. 15E, 17C, and 30): Length about 156 μ m; cibarial bar with a distinct transverse cuticular thickening in median portion, dorsal surface and posterior margin smooth, about 25–28 teeth; tooth length about 12 μ m; tooth with 2 distinct parts, anterior and posterior; anterior part a thin sagittal plate, posterior part a transverse plate, lozenge or roughly hexagonal in outline; minute spicules at margins of both parts; line of origin of teeth not evident; hollow area absent. Cibarial dome nearly circular, with leaflike, sharply pointed denticles. Sensilla trichodea disposed in linear series of 1–3 single setae on each side. **Thorax:** Scutum with dark brown scales with coppery reflections, light golden scales on lateral sides of prescutellar area; acrostichal setae absent. Scutellar scales similar to scutal scales, entirely dark; median lobe with 6 large setae, lateral lobes each with 3, 4 large setae. Postpronotum with dark scales similar to scutal scales, with 3, 4 large setae on posterodorsal margin. Pleural integument yellowish with dark spots on postpronotum, postspiracular area, anterior portion of mesokatepisternum, and prealar knob. Pleural setae light golden, brown with reddish sheen on prealar knob: 17–21 upper proepisternal, 3–7 prealar, 8–10 upper mesokatepisternal, 8–11 lower mesokatepisternal, 4–7 upper mesepimeral, and 1

lower mesepimeral. Pleura with a row of broad, spatulate nearly colorless scales on lower posterior margin of mesokatepisternum. **Wing:** Length 2.47–2.82 mm (\bar{x} = 2.63 mm); cell R_2 of 4.74–5.33 of vein R_{1+2} (\bar{x} = 5.12); cell M_1 , 0.84 of cell R_2 ; subcosta intersects costa slightly proximal to furcation of R_{1+2} . **Dorsal scaling:** inclined narrow spatulate scales on proximal 0.3 of M_{1+2} . **Ventral scaling:** appressed spatulate scales on proximal 0.3 of M_{1+2} ; linear plume scales on proximal 0.3 of R_{1+2} , proximal 0.3 of R_{4+5} ; inclined narrow spatulate scales on distal 0.7 of R_{1+2} , distal 0.7 of R_{4+5} , distal 0.7 of M_{1+2} . **Halter:** Capitellum whitish. **Legs:** Anterior surface of forecoxa with a patch of dark scales and few white scales on base; anterior surface of mid- and hindcoxae with vertical line of hyaline scales; antero- and posteroventral surfaces of foretrochanter with dark scales, mid- and hindtrochanters with whitish scales. Femora with indistinct patches of pale scales at apex of ventral side; fore-, mid-, and hindtibiae with indistinct longitudinal line of pale scales. Tarsi totally dark. **Abdomen:** Terga II–VIII dark-scaled with basolateral patches of white scales. Sterna II–VII with basal bands of white scales, sternum VIII with sparse scales, scales dark centrally, white laterally. **Genitalia** (Fig. 30): Lateral lobes of tergum IX with 4, 5 slender setae; 7, 8 clustered insular setae; postgenital lobe nearly trapezoidal, distal margin straight with 4–6 setae on either side of midline.

Male. Like female except for the following sexual differences. **Head:** Antennal length about 1.60 mm; maxillary palpus length about 2.17 mm, exceeding proboscis tip by length of apical 0.5 of palpomere 4; palpomere 3 with 6–8 strong setae on outer apical area. Vertex with few narrow falcate dark scales on anterior portion of coronal suture. **Abdomen:** Terga II–VII dark-scaled with basolateral patches of white scales; tergum VIII with sparse white scales, and a deep V-shaped emargination, inner hyaline membrane of V-shaped emargination with numerous flattened setae. Sterna II–VII dark-scaled with basal bands of white scales; sternum VIII dark-scaled with basolateral patches of white scales. **Genitalia** (Fig. 30): Tergum IX lobe short, broad at base, prominent laterally, with 6, 7 marginal setae. Gonocoxite conical; ventromesal surface with few short and slender setae, setae stronger basally; lateral surface with a sparse patch of moderately long and slender setae from base to level of subapical lobe; tergomesal surface with a patch of moderately long setae proximal to subapical lobe and a narrow, striate, foliform seta distal to subapical lobe near gonostylus; proximal part of ventrolateral surface with scales; subapical lobe distinctly divided, divi-

sions well separated; proximal division columnar with 2 apically hooked setae (setae *a* and *b*), seta *a* shorter and thinner than seta *b*, seta *b* long, robust, encircled at base by a hyaline sheath and 1 slender, stiff seta near middle of division; distal division long, columnar, slender, with a robust, hooked seta at apex and an expanded, petiolate, striate foliiform seta (*l*) and 2 empty alveoli (setae missing) near base. Gonostylus slender, wider at base, tapering to apex, subapical crest poorly distinct before apical snout on ventral side, apical snout a small, upturned ridge; gonostylar claw leaflike; 2 small setae near dorsal side before gonostylar claw. Lateral plate of phallosome without apical process, ventral and lateral processes present, ventral process long, pointed, laterally curved, lateral process longer, tapered, pointed at apex. Paraproct crown with 6–9 simple blades; 2 cercal setae. Tergum X nearly triangular in outline, rounded at apex.

Material examined. 16 ♂, 20 ♀, 10 ♂G, 5 ♀cib, 3 ♀G. BRAZIL. Sao Paulo State, Cananea County, Itapoá Farm, 26 Jan 1981, Rabello coll., Sallum det. 1981. Shannon trap supplemented with light, 1 ♂, 1 ♂G; Dourado County, Jacare-Pepira River, 7 Jan 1981, CDC light trap, 1 ♂, 1 ♂G; Iguape County, Palmeiras Farm, 18 Apr 1989, Gomes coll., Sallum det. 1989, CDC light trap supplemented with CO₂, 7 ♀, 2 ♀cib, 1 ♀G; 7 Nov 1989, 1 ♂; Rio Grande Diich, 24 Oct 1989, 1 ♀, 1 ♂; Pariqueira-Açu County, Experimental Station, 26 Oct 1978, Rabello coll., Sallum det. 1981, Shannon trap supplemented with light, 1 ♀, 1 ♀G; 20 Nov 1978, 1 ♂, 1 ♂G; 8 Mar 1979, 1 ♂, 1 ♂G; 6 Mar 1980, 1 ♂, 1 ♂G; 17 Apr 1980, 1 ♂, 1 ♂G; 15 Jan 1981, 1 ♂, 1 ♂G; 25 Jan 1979, forest, 1 ♀; 6 Mar 1980, 1 ♀, 1 ♀G; 7 Apr 1980, 1 ♀; 23 Oct 1981, CDC light trap, irrigated rice field, 1 ♀; 26 Nov 1981, 1 ♀; 10 Dec 1981, 3 ♀, 3 ♀cib; 23 Dec 1981, 1 ♀; 4 Feb 1982, Sallum det. 1982, 1 ♀; 20 Feb 1982, 1 ♀; 9 Apr 1985, Sallum det. 1985, battery-powered aspirator, forest edge, 1 ♂, 1 ♂G; 28 Apr 1992, Forattini et al. coll., Sallum det. 1992, 4 ♂; Pariqueira-Mirim district, 5 Mar 1985, Rabello coll., Sallum det. 1985, Shannon trap supplemented with light, 1 ♂, 1 ♂G; Sao Joao da Boa Vista County, Santa Helena Farm, 11 Mar 1982, Sallum det. 1982, New Jersey light trap, peridomestic environment, 1 ♂, 1 ♂G; Amazonas State, Tefe County, Nossa Senhora de Fatima Farm, 3 Aug 1994, Lourenço-de-Oliveira coll., Sallum det. 1995, on cattle, 1 ♀.

Distribution (Fig. 7). Known from Central to South America, including Argentina, Brazil, Colombia, Ecuador, Guyana, Panama, Surinam, and Venezuela (Pecor et al. 1992).

Bionomics. Immature stages of *Cx. ocossa* were collected in the following habitats: artificial lakes in peridomestic environments and grazing areas, river and lake margins in forests, drainage ditches in cultivated areas, in gardens, and by the side of roads along cacao plantations. The breeding sites were always permanent. The water was always fresh, clear, light amber or brown in color, stagnant or with a slow current, with abundant floating vegetation (*Pistia*, *Eichhornia*, *Salvinia*, *Azolla*), submerged (*Elodea*) and herbaceous vegetation, and algae. Some sites had the bottom covered with mud or plant debris and others with cement. The sites were in full sun or partial shade (Heinemann and Belkin 1978a, 1978b, 1979).

In the Ribeira Valley, Sao Paulo State, southern Brazil, Forattini et al. (1991b) collected a great number of adults from January to March. The mosquitoes were found in domiciliary environments and appeared to have a tendency to feed on humans. Adults appeared to be nocturnal, showing an activity peak around midnight, decreasing gradually until sunrise.

Literature records show that *Cx. ocossa* may be involved in the transmission of western equine encephalitis (WEE) virus in Chaco and Corrientes in Argentina (Sirivanakarn and Jakob 1981b). However, the epidemiologic importance of *Cx. ocossa* may be underestimated as it was considered synonymous with *Culex aikenii* Aiken and Rowland until 1970. As a result, many virus isolations were made from specimens identified as *Cx. aikenii*. *Culex aikenii* (*Cx. ocossa* and *Cx. panocossa*) was found naturally infected with a wild strain of VEE virus, and was infected and was able to transmit the strain I-D of VEE virus in laboratory conditions (Galindo and Grayson 1971, Galindo 1972, Galindo and Adames 1973).

Discussion. *Culex ocossa* differs from *Cx. panocossa* in having the pleural integument yellowish with dark spots on the postpronotum, postspiracular area, anterior portion of the mesokatepisternum, and prealar knob. The male genitalia of *Cx. ocossa* differ from those of *Cx. panocossa* in having the gonostylus with a small, upturned apical snout and a less developed subapical crest, in possessing few long curved setae on the distal portion of the gonocoxite near the gonostylus, the tergomesal surface of the gonocoxite with a moderately wide striate leaf seta *l* distal to the subapical lobe and a patch of moderately long setae proximal to the subapical lobe, proximal division of the subapical lobe of the gonocoxite subequal in length to setae *a* and *b*, distal division of the subapical lobe shorter than the hooked seta (*h*), and seta *h* with a strong hook at apex.

Culex (Melanoconion) panocossa
Dyar, 1923

Culex (Gnophodomyia) panocossa Dyar, 1923a: 120 (♂). Lectotype, ♂: Bas Obispo, Canal Zone, Panama (NMNH).

Dyar 1923b:188 (♂*; as *Cx. aikenii*); Dyar 1925a:21 (syn. with *Cx. aikenii*); Bonne and Bonne-Wepster 1925:275, 277 (♂*, ♀, L: as *Cx. aikenii*); Dyar 1928:337 (in part, ♂*: as *Cx. aikenii*); Anduze 1941:15 (Venezuela; as *Cx. aikenii*); Thompson 1947:79 (Jamaica; as *Cx. aikenii*); Rozeboom and Komp 1950:99 (♂*: as *Cx. aikenii*); Lane 1953:423 (♂*, ♀, P.L.: as *Cx. aikenii*); Foote 1954:14 (L*, P*: as *Cx. aikenii*); Barreto-Reyes 1955:60 (Colombia; as *Cx. aikenii*); Stone and Knight 1957:54 (lectotype design.); Cova Garcia et al. 1966a:175 (♂*: as *Cx. aikenii*); Cova Garcia et al. 1966b:213 (L*: as *Cx. aikenii*); Belkin 1970:60 (resurrected from syn.; Costa Rica, Mexico); Belkin et al. 1970:93 (♂*); Bertram 1971:745 (Belize); Clark-Gil and Darsie 1983:255 (Guatemala).

Female. Not examined.

Male. Similar to *Cx. spissipes*, but differing as follows. **Head:** Antenna, maxillary palpus not measured; setae on palpomere 3 not counted. Vertex with few narrow falcate dark scales on a small area on anterior portion of coronal suture. Lateral patch of broad appressed dingy white scales well evident in dorsal view, extending laterally to the small median dorsal patch of narrow dark scales. **Thorax:** Scutum with dark brown scales with coppery reflections, light golden scales on lateral sides of prescutellar area; acrostichal setae absent. Scutellar scales similar to scutal scales, entirely dark, median lobe with 6 large setae, lateral lobes each with 3, 4 large setae. Postpronotum with dark scales similar to scutal scales with 3, 4 large setae on posterodorsal margin. Pleural integument yellowish with dark spots on postpronotum and postspiracular area. Pleural setae light golden (number of setae not counted). Pleura with a row of broad, spatulate nearly colorless scales on lower posterior margin of mesokatepisternum. **Wing:** Not examined in detail. **Halter:** Capitulum whitish. **Legs:** Not examined in detail; tarsi dark-scaled. **Abdomen:** Not examined in detail. Terga dark-scaled with basolateral patches of white scales; tergum VIII with a deep V-shaped emargination, inner hyaline membrane of V-shaped emargination without flattened setae. **Genitalia** (Fig. 31): Like *Cx. ocossa*, but differing as follows. Ventrolateral surface of gonocoxite with a patch of strong setae on distal portion near gonostylus; tergomesal surface with a sparse patch

of short, slender setae proximal to subapical lobe and a narrow, foliiform, pointed seta distal to subapical lobe; proximal division of subapical lobe columnar, long, setae *a* and *b* shorter than the division, basal portion with 2 slender, stiff setae; distal division moderately long and slender, with an apical seta with a weak hook at apex (*h*), a wide, striate, petiolate foliiform seta (*l*), and an alveoli (seta missing) near base. Gonostylus subequal from base to the apical third, apical third slightly enlarged, nearly triangular in outline in lateral view, tapered at apex; apical snout elongate; subapical crest well evident from apical snout to subapical enlarged portion. Paraproct crown with 7, 8 simple blades; 2 cercal setae.

Material examined. 1 ♂, 1 ♂G. *Lectotype:* PANAMA, Canal Zone, Bas Obispo, J. B. Shropshire coll.

Distribution (Fig. 7). Known from Belize, Colombia, Costa Rica, El Salvador, Guatemala, Jamaica, Mexico, Panama, and Venezuela (Peacor et al. 1992).

Bionomics. Immature stages of *Cx. panocossa* were found in lake margins, swamps, and semipermanent pools. The water was always clear, with a slow current, and abundant floating (*Pistia stratiotes*, *Piaropus azureus*, *Lemna*, *Salvinia*) and grassy vegetation. These sites were in full sun or rarely in partial shade. Adults were collected on human bait and in light traps (Belkin et al. 1970; Heinemann and Belkin 1977a, 1977b, 1978c).

Culex panocossa may be a potential vector of VEF virus in Panama (U.S. Department of Agriculture 1973).

Discussion. *Culex panocossa* differs from *Cx. ocossa* in having the pleural integument yellowish with dark spots on the postpronotum and postspiracular area. The male genitalia of *Cx. panocossa* differ from those of *Cx. ocossa* in having the apical snout of the gonostylus elongate, crest of the gonostylus well evident from before apical snout to the subapical enlarged portion, gonocoxite with a dense patch of long, curved setae on the ventrolateral surface near the gonostylus, gonocoxite with a narrow, pointed, nonstriate seta on the tergomesal surface distal to the subapical lobe, and a few sparse, short setae proximal to the subapical lobe, proximal division of the subapical lobe of the gonocoxite longer than setae *a* and *b*, distal division of the subapical lobe shorter than the hooked seta (*h*), and seta *h* with a poorly developed hook at apex.

Jubifer Group

The Jubifer Group includes *Culex jubifer* Komp and Brown and *Cx. simulator*. It differs

from the other groups of the Spissipes Section in not having acrostichal setae. In possessing the narrow falcate scales of the vertex entirely whitish, the forked scales light cream anteriorly and light brown posteriorly, the pleural integument light cream with darker areas on the postpronotum and prealar knob, the upper corner of the mesokatepisternum without a patch of broad, spatulate scales, terga II-VII entirely dark-scaled, and sterna with whitish scales. The cibarial armature of both species was not examined. The male genitalia of the Jubifer Group differ from those of the other groups in possessing a large, petiolate, apically expanded leaf on the tergomesal surface of the gonocoxite near the base of the distal division of the subapical lobe on the lateral side, the proximal part of the ventrolateral surface of the gonocoxite with scales, proximal and distal divisions of the subapical lobe elongate, columnar, proximal division forked at apex, seta *a* slightly basal to seta *b*, distal division with a robust, apically hooked seta and a short, slender, saberlike seta (*s*) at apex, a long, saberlike seta (*s*) and a long, robust, apically hooked seta (*l*) on subapical part, 3 subequal, narrow, appressed, nearly spatulate setae (*f*) and a slender, pointed seta (*f*) on basal portion, gonostylus with a well evident subapical crest on the ventral side and a small projection basal to the subapical crest, lateral plate of the phallosome without the apical process, apical margin concave, ventral process long, laterally curved, lateral process long, tapered, pointed, and tergum X somewhat square, distally rounded.

***Culex (Melanoconion) simulator*
Dyar and Knab, 1906**

Culex simulator Dyar and Knab, 1906:218 (L^{*}).
Lectotype L: Arima, Trinidad (NMNH).

Howard et al. 1913:figs. 352, 575 (L^{*}); Howard et al. 1915:302 (L); Dyar 1928:333 (L^{*}); Rozeboom and Komp 1950:98 (tax.); Foote 1954:89 (L^{*}; tax.); Stone and Knight 1957:56 (lectotype desig.); Cova Garcia et al. 1966a:179 (♂^{*}; Venezuela; as *Cx. jubifer*); Cova Garcia et al. 1966b:203 (L^{*}; as *Cx. jubifer*); Forattini et al. 1970:43 (Brazil; as *Cx. jubifer*); Forattini et al. 1973:468 (as *Cx. jubifer*); Sirivanakarn and Heinemann 1980:41 (♂^{*}, ♀^{*}, P¹; L^{*}; Panama).

Culex (Melanoconion) venezuelensis Anduze, 1949:64 (♂^{*}). Holotype ♂: Caripito, Monagas, Venezuela (FSP).

Cova Garcia et al. 1966a:173 (♂^{*}); Forattini et al. 1970:50 (type info.); Sirivanakarn 1983:274 (syn.).

Female. Not examined.

Male. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with light brown scales with golden reflections. **Head:** Antenna, maxillary palpus, proboscis not measured, maxillary palpus extending beyond proboscis tip by length of apical 0.5 of palpomere 4; palpomere 3 with 5, 6 strong setae on outer apical area. Vertex with narrow, falcate, whitish scales; forked scales light cream anteriorly and light brown posteriorly. **Thorax:** Pleural integument light brown. Scutum with light brown scales with golden reflections; scutal setae prominent, brown with golden reflections; acrostichal setae absent; 3 pairs of alveoli present on anterior portion of prescutellar area. Scutellar scales similar to scutal scales, lateral lobes each with 3 large setae, median lobe with 6 large setae. Postpronotum with scales similar to scutal scales; with 3 large setae on posterodorsal margin. Pleural integument light cream, slightly darker on postpronotum and prealar knob. Pleural setae light golden; 6 upper proepisternal, 5 prealar, 7 upper mesokatepisternal, 7 lower mesokatepisternal, 3 upper mesepimeral, and 1 lower mesepimeral. Metepisternum not examined. Mesopostnotum light brown. Pleura with a row of nearly colorless spatulate scales on posterior margin of mesokatepisternum. **Wing:** Length not measured; subcosta intersects costa slightly proximal to furcation of R₁₊₂. Dorsal scaling: appressed spatulate scales on distal 0.5 of M₁₊₂; linear plume scales on proximal 0.2 of R₁, proximal 0.5 of M₁₊₂; remigium with 2 distal setae. Ventral scaling: appressed spatulate scales on proximal 0.5 of R₁, proximal 0.5 of R₁, proximal 0.2 of M₁₊₂; linear plume scales on proximal 0.5 of R₁, proximal 0.5 of R₁₊₂; inclined narrow spatulate scales on distal 0.5 of R₁, distal 0.5 of R₁, distal 0.5 of R₁, distal 0.5 of R₂₊₃, distal 0.8 of M₁₊₂. **Legs:** Anterior surface of fore- and midcoxae with hyaline scales, hindcoxa without scales; antero- and posteroventral surfaces of trochanters with whitish scales. Ventral surface of all femora with light cream scales. Ventral surface of fore- and midtibiae with longitudinal line of pale scales; hindtibia and tarsi dark-scaled. **Abdomen:** Terga II-VII totally dark-scaled; tergum VIII not examined. Sterna II-VII with whitish scales; sternum VIII not examined. **Genitalia** (Fig. 32, holotype of *Cx. venezuelensis*, syn. of *Cx. simulator*): Tergum IX lobe large, somewhat elliptical in outline, with short, sparse setae on distal part and with an inner, bare projection on basal portion. Gonocoxite robust, nearly oval in outline, outer margin convex, inner margin almost straight, ventrolateral surface convex; ventrolateral setae strongly developed, tergomesal surface with sparse, short, slender setae proximal

to subapical lobe and a large, petiolate, striate, distally expanded seta near base of distal division of subapical lobe, distal part of this setae somewhat rounded, lateral surface with a patch of long, robust setae from subapical lobe to near base of gonostylus (bsp), proximal part of ventrolateral surface with scales. Subapical lobe of gonocoxite distinctly divided, divisions separated: proximal division columnar, forked at apex, with 2 long, robust, hooked setae (setae *a* and *b*); seta *a* basal to seta *b*; distal division elongate, columnar with 2 apical, 2 subapical, and 4 basal setae; apical setae include a robust, apically hooked seta (*h*) and a short, slender, saberlike seta (*s*), subapical setae include a long, saberlike seta (*x*) and a long, robust, apically hooked seta (*l*), basal setae include 3 subequal, narrow, appressed, nearly spatulate setae (*f*) and a slender, pointed seta (*f*) basal to the other 3 *f* setae. Gonostylus slightly expanded on basal and subapical parts, narrowed on median part and apex; apical snout elongate; ventral side of gonostylus with a small, triangular projection basal to subapical crest, subapical crest prominent, extending before apical snout to the triangular projection on ventral side; gonostylar claw short, leaflike, forked at apex; mesal side of gonostylus with sparse spicules on basal part. Lateral plate of phallosome without apical process, distal margin slightly concave, ventral and lateral processes present, ventral process long, pointed at apex, laterally curved; lateral process long, tapered, pointed at apex. Paraproct crown with 8–11 simple blades; 2 cercal setae. Tergum X somewhat square, distally rounded.

Material examined. 5 ♂, 6 ♀G. *Cx. venezuelensis*. **Holotype:** VENEZUELA, Caripito, Monagas, P. J. Anduze coll., P. J. Anduze det. 1949. 1 ♂G (FSP no. 10090). **Other specimens:** BRAZIL. Para State, Belem County, Utinga, Jul 1966. A. Toda coll. and det., 2 ♂, 2 ♀G (FSP no. E-475, E-476; as *Cx. jubifer*); Sao Paulo State, Cabreua County, Apr 1937, Ramalho coll., J. Lane det. 1946. 3 ♂, 3 ♀G (FSP no. 6088, 6089, and 6149; as *Cx. jubifer*).

Distribution (Fig. 8). Known from Panama, Trinidad, Venezuela (Pecor et al. 1992), and Brazil (Sao Paulo and Para states).

Bionomics. Immature stages of *Cx. simulator* were found in a small ground pool in elfin woodland, in partial shade. The water was temporary, stagnant, fresh, yellowish, with little vegetation, and a mud bottom. Adults were collected in partial forest (Heinemann et al. 1980).

Discussion. *Culex simulator* seems to be indistinguishable from *Cx. jubifer* by adult and cibarial armature. According to Sirivanakarn and Heinemann (1980), these species can be easily recognized by the male genitalia. To Sirivanak-

arn and Heinemann (1980), the genitalia of *Cx. simulator* differ from those of *Cx. jubifer* by the absence of a small projection on the ventral side of the subapical part of the gonostylus. However, this projection is observed in *Cx. simulator* (Fig. 32). *Culex simulator* also differs from *Cx. jubifer* in having a patch of long, robust setae, extending from the subapical lobe to near the base of the gonostylus, the large seta on the base of the distal division of the subapical lobe of the gonocoxite somewhat rounded on the distal part, tergum IX lobe elliptical in outline with short, sparse setae on the distal part and with a bare projection on the inner basal part and the lateral surface of the gonocoxite strongly convex.

Culex (Melanoconion) jubifer Komp and Brown, 1935

Culex (Choeroporpa) jubifer Komp and Brown, 1935:254 (♂^{*}). Holotype ♂: PANAMA, Canal Zone, lower Chagres River, Mojinga Swamp (NMNH).

Rozeboom and Komp 1950:92 (♂^{*}); Lane 1953: 435 (♂^{*}); Fauran and Pajot 1974:106 (French Guiana); Sirivanakarn 1983:279 (♂^{*}, ♀^{*}).

Female. Not examined.

Male. Adult not examined. **Genitalia** (Fig. 33): Similar to *Cx. spissipes*, but differing as follows. Tergum IX lobes large, nearly columnar, apically approximated with sparse, short setae. Gonocoxite conical, outer margin convex, inner nearly straight; ventrolateral setae strongly developed; tergomensal surface with sparse, short, slender setae proximal to subapical lobe and a large, petiolate, striate, distally expanded seta near base of distal division of subapical lobe, distal part of this seta somewhat triangular in outline, lateral surface with a sparse patch of moderately developed setae and few short, slender setae from base to the level of subapical lobe (bsp) and a small, heavily pigmented protuberance with 10, 11 alveoli (setae missing) near base of gonostylus, proximal part of ventrolateral surface with scales. Subapical lobe of gonocoxite distinctly divided, divisions separated: proximal division columnar, forked at apex, with 2 long, robust, hooked setae (setae *a* and *b*), seta *a* basal to seta *b*; distal division elongate, columnar with 2 apical, 2 subapical, and 4 basal setae, apical setae include a robust, apically hooked seta (*h*) and a short, slender, saberlike seta (*s*), subapical setae include a long, saberlike seta (*x*) and a long, robust, apically hooked, foliform seta (*l*), basal setae include 3 subequal, narrow, appressed, nearly spatulate setae (*f*) and a slender, pointed seta (*f*) basal to the other 3 *f* setae. Gonostylus slightly widened on basal and sub-

apical parts, narrowed on median part and apex; apical snout elongate; ventral side of gonostylus with a small, triangular projection basal to subapical crest, an external rounded ridge, and a prominent subapical crest, extending before apical snout to the triangular projection on ventral side; gonostylar claw short, leaflike; mesal side of gonostylus with sparse spicules on basal part and 2, 3 minute setae. ventral seta more developed than dorsal seta. Lateral plate of phallosome without apical process. distal margin slightly concave, ventral and lateral processes present, ventral process long, pointed at apex, laterally curved; lateral process long, tapered, pointed at apex. Paraproct crown with 8 simple blades; 2, 3 cercal setae. Tergum X nearly square, distally rounded.

Material examined. 1 ♂G. *Holotype* PANAMA, Canal Zone, lower Chagres River. Mojinga Swamp, Brown coll., Aug 1932.

Distribution (Fig. 8). According to Pecor et al. (1992), *Cx. jubifer* is known from Panama to Brazil. However, the specimens from southern Brazil considered by Forattini et al. (1970) as *Cx. jubifer* were actually *Cx. simulator*. Records from Venezuela should be reviewed because the male genitalia drawing given by Cova Garcia et al. (1966a) appears to be of *Cx. simulator*. Records from French Guiana may refer to *Cx. simulator*, as they were based on specimens identified before the recognition of the specific characters given by Sirivanakarn and Heinemann (1980) that made possible the distinction between *Cx. jubifer* and *Cx. simulator*. As a result, *Cx. jubifer* may be found only in Middle America.

Bionomics. Immature stages of *Cx. jubifer* were collected in stream pools, streamside rock-holes, large and small ground pools, swamp ponds, swamp areas, small ground pools near streams, and in collared peccary (*Tayassu* sp.) water holes, in forests, partial forests, second-growth, and marginal forests. The habitats were in deep shade, partial shade, or full sun. The water was clear, dark or muddy, stagnant or with a moderate current, and without aquatic vegetation (Heinemann and Belkin 1978a).

Discussion. *Culex jubifer* differs from *Cx. simulator* in having a heavily pigmented protuberance with 10, 11 alveoli on the lateral surface of the gonocoxite near the base of the gonostylus, the large seta (*l*) on the base of the distal division of the subapical lobe of the gonocoxite somewhat triangular on the distal part, tergum IX lobe nearly columnar, apically approximated, with sparse, short setae, and the gonocoxite nearly conical, not strongly convex on the lateral surface.

Lopesi Group

Based on peculiar male genitalia features. Sirivanakarn and Jakob (1979) considered *Culex lopesi* Sirivanakarn and Jakob as "the most unusual" species of the subgenus *Melanocoonion*. The authors included this species in this subgenus because it shared a feature with most other species, the absence of acrostichal setae. However, Forattini and Sallum (1990) showed that like *Cx. spissipes*, *Cx. lopesi* has a complete row of acrostichal setae and that the larva and pupa of this species also shared features with other *Melanocoonion* species.

The Lopesi Group can be easily recognized by having the scutum entirely covered with dark brown scales, acrostichal setae present, disposed along acrostichal area, pleural integument light brown to dark brown, mesokatepisternum without a patch of broad, spatulate scales on the upper corner, tarsi dark-scaled, narrow falcate scales of the vertex dark anteriorly, whitish posteriorly. The cibarial armature of the Lopesi Group can be recognized by the cibarial teeth that are long, thin, relatively pointed, rod-shaped, finely serrated at the apex, widely separated from one another and the distal 0.5 of each tooth not attached to the cibarial bar, the dorsal surface and distal margin of cibarial bar smooth, hollow area of teeth small, restricted to base, and line of origin present, nearly straight. The male genitalia of the Lopesi Group are easily distinguished from those of the other groups by having a well-developed crest of spicules on the apical part of the dorsal side of the gonostylus, tergomal surface of the gonocoxite with a long, columnar process on the base of the distal division of the subapical lobe and a small protuberance with short, slender setae proximal to the subapical lobe, proximal part of the ventrolateral surface with scales, distal division of the subapical lobe with a characteristic apical, broad, asymmetrical, curved foliform seta (*l*), a subapical, strong, curved, hooked seta (*h*), 3 basal, narrow, appressed, apically hooked setae (*j*), and 3 basal, short, slender, stiff setae (*f*), proximal division of the subapical lobe a stout arched stem with 2 long, robust, apical setae (*a* and *b*) and a variably developed, hyaline, branched process on the basal part and apex of the division, seta *a* well developed, nearly triangular in outline on apical part, tergum IX lobe somewhat triangular with a cluster of short, slender setae on the basal portion, lateral plate of the phallosome without apical process, ventral process long, triangular, and pointed, and lateral process longer, blunt at apex.

Culex (Melanoconion) lopesi
Sirivanakarn and Jakob, 1979

Culex (Melanoconion) lopesi Sirivanakarn and Jakob, 1979:139 (δ^*). Holotype δ : Porto do Ribeira, Iguape, Sao Paulo, Brazil (NMNH).

Sirivanakarn 1983:279 (δ^*): Forattini and Salum 1990:57 (δ^* , φ^* , P*, L*).

Female. Similar to *Cx. spissipes*, but differing as follows. Body mostly covered with dark brown to blackish scales. **Head:** Antennal length about 2.37 mm; proboscis length 1.65–1.86 mm (\bar{x} = 1.76 mm); maxillary palpus length 0.33–0.36 mm (\bar{x} = 0.34 mm), about 0.20 length of proboscis. Vertex with narrow, falcate scales, these scales dark anteriorly, whitish posteriorly. **Cibarium** (Fig. 15D): Length about 192 μ m; dorsal surface and distal margin of cibarial bar smooth; about 11–15 long, thin, relatively pointed and rod-shaped teeth; tooth length about 22 μ m, teeth widely separated from one another, distal margin of each tooth finely serrate; tooth origin line nearly straight; posterior half of each tooth free from enclosure on cibarial bar; hollow area of tooth small, restricted to base. Sensilla trichodea disposed in linear series of 1–4 single setae on each side. **Thorax:** Integument light brown to dark brown. Scutum covered with dark brown scales with bronzy reflections; acrostichal setae present, disposed along acrostichal area. Scutellar scales similar to scutal scales, totally dark brown; median lobe with 6 large setae; lateral lobes each with 3, 4 large setae. Postpronotum with scales similar to scutal scales, entirely dark brown; with 3–6 large setae on posterodorsal margin. Pleural integument light brown to dark brown. Pleural setae dark brown with golden reflections, darker on prealar knob: 8–13 upper proprepisternal, 6–8 prealar, 6–12 upper mesokatepisternal, 9–16 lower mesokatepisternal, 11–17 upper mesepimeral, and 1 lower mesepimeral. Pleura with a small patch of whitish spatulate scales on lower posterior border of mesokatepisternum. **Wing:** Length 3.15–3.84 mm (\bar{x} = 3.58 mm); cell R_2 3.68–3.98 of R_{2+3} (\bar{x} = 3.85); cell M_1 0.83 of cell R_2 . Dorsal scaling: appressed spatulate scales on distal 0.5 of M_{1+2} ; linear plume scales on R_5 , R_{7+8} . M. proximal 0.5 of M_{1+2} ; renitium with 2, 3 distal setae. Ventral scaling: appressed spatulate scales on proximal 0.3 of R_2 , proximal 0.3 of R_3 ; linear plume scales on proximal 0.5 of R_1 , proximal 0.5 of R_{1+2} ; inclined narrow spatulate scales on distal 0.5 of R_1 , distal 0.7 of R_2 , distal 0.7 of R_3 , distal 0.5 of R_{4+5} . **Halteres:** Scabellum and ventral portion of pedicel pale; capitulum and dorsal portion of pedicel dark. **Legs:** Anteroventral surface of hindtrochanter white-scaled, occasional-

ly dark-scaled. **Abdomen:** Terga II, VIII dark-scaled with basolateral patches of white scales; terga III–VII dark-scaled with basolateral patches of white scales, sometimes becoming basal pale bands on segments III–VI. Sternum VIII without scales on middle, without small lateral patches of white scales. **Genitalia:** Lateral lobe of tergum IX with 9 setae; insula with 12 clustered setae. Postgenital lobe with 11–17 setae on either side of midline.

Male. Like female except for the following sexual differences. **Head:** Antennal length about 1.96 mm; maxillary palpus length about 2.73 mm, extending beyond proboscis by length of apical 0.5 of palpomere 4; palpomere 3 with 9–12 strong setae on outer apical area. **Abdomen:** Tergum II mostly dark-scaled with few white scales on basomedian area; terga III–VII with basal bands of white scales. Sterna with basal white bands, occasionally incomplete on anterior sternum; sternum VIII with basolateral patches of white scales. **Genitalia** (Fig. 34): Tergum IX lobes small, almost triangular shaped, bearing few slender, short, clustered setae on basal region. Gonocoxite conical, outer margin convex, inner margin moderately concave; tergomeral surface with a small protuberance with few short, slender setae proximal to subapical lobe and a columnar process bearing a subapical slender seta on the base of subapical lobe on lateral side, lateral surface with small patch of slender, short setae (lsp) apical to subapical lobe, proximal part of ventrolateral surface with scales; proximal division of subapical lobe of gonocoxite a stout arched stem with 2 long, robust, apical setae and variably developed, hyaline, branched processes, seta *a* spatulate, nearly triangular in outline on distal part, seta *b* enlarged, slightly sinuous, and apically hooked, this division with long, hyaline branched expansions basally; distal division columnar, elongate, with 8 setae as follows: an apical broad, asymmetrical, curved foliform seta (*l*), a subapical strong, curved, hooked seta (*h*), 3 basal, narrow appressed, hooked setae (*f*) subequal in length, and 3 basal, short, slender, stiff setae (*f*) inserted almost at the same level. Gonostylus slender, curved, distally widened, with a fringe of delicate spicules on apical dorsal side and a short crest, extending on ventral side before apical snout; gonostylar claw short with a curled apex. Lateral plate of phallosome without apical process, distal margin slightly concave, ventral and lateral processes present, well developed, ventral process long, nearly triangular, pointed, lateral process longer, blunt, dorsolaterally directed. Paraproct crown with 9 simple blades: 2, 3 cercal setae. Tergum X somewhat rectangular in outline, rounded on apical margin.

Material examined. 11 ♂, 12 ♂G, 20 ♀, 3 ♀cib, 6 ♀G. *Paratype:* BRAZIL, Sao Paulo State, Iguape County, Porto do Ribeira. 3 Jul 1976. O. S. Lopes coll., Sirivanakarn and Jakob det. 1978. CDC light trap, 1 ♂, 1 ♂G (FSP). *Other specimens:* BRAZIL, Parana State, Parana County, Apr 1977. Forattini et al. coll., Forattini and Sallum det. 1987, 1 ♂, 2 ♂G; Sao Paulo State, Canancia County, Itapitangui district, Fonte Station, Oct 1982, 1 ♀; Jul 1983, 1 ♂, 1 ♂G, 1 ♀; 19 Oct 1988, 2 ♀, 1 ♂; Folha Larga Farm, 22 Mar 1983, 1 ♂, 1 ♂G; Sep 1983, 1 ♀; Nov 1985, 1 ♂, 1 ♂G; Itapoa Farm, Jul 1980, 1 ♀; Sep 1980, 1 ♀; 2 Sep 1980, 1 ♀, 1 ♀G; 3 Nov 1980, 1 ♀, 1 ♀G; 24 Feb 1981, 1 ♀, 1 ♀G; Apr 1982, 1 ♀; Iguape County, Iguape-Bigua Road, Sep 1982, 2 ♂, 2 ♂G; Nov 1982, 1 ♀; 14 Mar 1984, 1 ♂, 1 ♂G, 1 ♀; Parquera-Açu County, Experimental Station, Oct 1979, 1 ♂, 1 ♀; Jan 1981, 2 ♀, 1 ♀cib, 1 ♀G; Mar 1982, 1 ♀; 4 Mar 1982, 1 ♀, 1 ♀G; Jun 1982, 1 ♀, 1 ♀cib; urban area, Sao Paulo Ave., Feb 1979, New Jersey light trap, peridomestic environment, 1 ♂G; 30 Oct 1980, 1 ♂, 1 ♂G; Nov 1980, 1 ♀, 1 ♀cib, 1 ♀G.

Distribution (Fig. 9). Known from the Ribeira Valley, Sao Paulo State, and nearby localities in Parana State, Brazil.

Bionomics. Immature stages were collected in small ground pools and drainage ditches with abundant grassy vegetation. Adults were collected in forest and in peridomestic environments, on human bait, and with battery-powered aspirators, manual nets, and CDC light traps (Forattini et al. 1986, 1989b; Gomes et al. 1987). A female was found to have fed on avian blood (Forattini et al. 1987a).

Discussion. As the Lopesi Group is a monospecific group, *Cx. lopesi* differs from the other species of the Spissipes Section in having the many distinctive characters that are indicated in the group diagnosis.

Faurani Group

According to the classification of subgenus *Melanoconion* proposed by Sirivanakarn (1983), *Culex faurani* Duret belongs to a monospecific group, the Faurani Group, which can be easily recognized by the male genitalia. Forattini and Sallum (1992) found peculiar characters in the cibarial armature that seem characteristic of the Faurani Group.

The Faurani Group can be easily recognized by possessing the narrow falcate scales of the vertex entirely light bronzy, the erect forked scales light brown or, occasionally, slightly darker, scutal scales entirely dark, mesepimeron uniformly tanned, tibiae and tarsi dark-scaled,

absence of acrostichal setae, and a patch of scales on the upper corner of the mesokatepisternum. The cibarial armature of the Faurani Group differs from the other groups of the Spissipes Section in having the cibarial tooth with a rigid parallelogram outline, teeth disposed in a linear series, hollow area absent, posterior margin of cibarial bar with numerous spicules, dorsal surface of cibarial bar smooth, line of origin of teeth evident, nearly straight, cibarial dome with numerous, narrow, bladellike denticles. The male genitalia of the Faurani Group differ from those of the other groups in possessing the gonostylus with an elongate apical snout, the proximal part of the ventrolateral surface of the gonocoxite without scales, the proximal division of the subapical lobe forked at apex, seta *a* basal to seta *b*, distal division short, with 7 apical and 1 subapical setae, apical setae include a moderately long and a short saberlike seta (*s*), a relatively long, flexible, slender seta (*h*), 3 subequal, narrow appressed setae (*f*), and a short, narrow, spatulate seta (*j*), subapical seta a long, robust, hooked seta (*h*), lateral plate of phallosome with apical, ventral, and lateral processes, apical process small, weakly sclerotized, nearly triangular, ventral process long, laterally curved, lateral process long, nearly pointed, thickened margin of aedeagal sclerite unequally sclerotized with a wrinkled aspect and basal piece nearly square in outline.

Culex (Melanoconion) faurani Duret, 1968

Culex (Melanoconion) faurani Duret, 1968:77 (♂⁹). Holotype (♂): BRAZIL, Amazonas, Manaus (NMNH).

Galindo 1969:88 (tax.); Harbach et al. 1991:193 (type info.); Forattini and Sallum:1992:76 (♀cib⁹).

Female. Similar to *Cx. spissipes*, differing as follows. Adult mostly covered with dark scales. **Head:** Antennal length about 2.42 mm; pedicel of antenna dark, occasionally yellowish. Proboscis length about 2.07 mm; maxillary palpus length about 0.34 mm, about 0.20 length of proboscis. Vertex with narrow falcate light bronzy scales. Lateral patches of broad, spatulate scales moderately developed, these scales grayish or dingy white; erect forked scales light brown or slightly darker; occipital region with light bronzy scales. **Cibarium** (Figs. 15C, 17D-17F, and 35): Length about 164 μm; dorsal surface of cibarial bar smooth, posterior margin with numerous spicules unequal in size; about 29 narrow, long teeth with sides more or less parallel, apically truncate, and finely serrate; tooth length

about 17 μm ; line of origin evident, nearly straight; hollow area of teeth absent, Cibarial dome nearly circular, surface with numerous bladefike denticles, posteriorly directed. Sensilla trichodea disposed in linear series of 2, 3 single seta on each side. **Thorax:** Pleural integument light brown to dark brown. Scutum with narrow, falcate dark brown scales with golden or coppery reflections. Scutellar scales similar to scutal scales in color and shape; median lobe with 6, 7 large setae, lateral lobes each with 3, 4 large setae. Postpronotum with scales similar to scutal scales; with 3–5 large setae on posterodorsal margin. Pleural integument light brown to dark brown, slightly darker on postpronotum, proepisternum, postspiracular area, upper mesokatepisternum, prealar knob, and mesepimeron. Pleural setae yellowish, brown with golden reflections on prealar knob, upper mesokatepisternum, lower mesepimeron, and the stronger upper proepisternal and stronger lower mesokatepisternal setae: 13 upper proepisternal, 5 prealar, 8 upper mesokatepisternal, 7 lower mesokatepisternal, 10 upper mesepimeral, and 1 lower mesepimeral. Pleura with a row of broad, spatulate, whitish scales on lower posterior border of mesokatepisternum. **Wing:** Length almost 3.49 mm; cell R_1 , 4.93 of vein R_{2+3} ; cell M_1 , 0.78 of cell R_2 ; subcosta intersects costa slightly proximal to furcation of R_{2+3} . Dorsal scaling: linear plume scales on proximal part of M proximally to incu; inclined narrow spatulate scales on distal part of M distally to mcu; remigium with 2, 3 distal setae. Ventral scaling: appressed spatulate scales on 0.2 proximal of R_2 , 0.3 proximal of R_3 , 0.2 proximal of M_{1+2} ; linear plume scales on proximal 0.5 of R_{2+3} ; inclined narrow spatulate scales on R_1 , distal 0.8 of R_2 , distal 0.7 of R_3 , distal 0.5 of R_{2+3} , distal 0.8 of M_{1+2} . **Legs:** Anterior surface of all coxae with hyaline scales. Antero- and posteroventral surfaces of trochanters with whitish scales. **Abdomen:** Terga II–VIII dark-scaled with basolateral patches of white scales. Sterna II–VII dark-scaled with basal bands of white scales; sternum VIII with dark scales. **Genitalia** (Fig. 35): Lateral lobes of tergum IX each with 9–13 setae; 8–10 clustered insular setae. Postgenital lobe nearly trapezoidal in outline, distal margin nearly straight, with 12–16 setae on either side of midline.

Male. Like female, except for the following sexual differences. **Head:** Antennal length about 1.95 mm; maxillary palpus length about 2.52 mm, extending beyond proboscis tip by length of apical 0.5 of palpomere 4; palpomere 3 with 7–10 strong setae on outer apical area. **Abdomen:** Tergum II dark-scaled with basolateral and basomedian patches of white scales; tergum III dark-scaled with basolateral patches of white

scales, occasionally with basal white band; terga IV–VII dark-scaled with basal bands of white scales; tergum VIII not examined in detail. Sterna dark-scaled with basal bands of white scales; sternum VIII not examined in detail. **Genitalia** (Fig. 35): Tergum IX lobes small, nearly rounded with an inner apical projection with slender, pointed setae; interlober area small, concave. Gonocoxite conical, inner margin slightly concave; tergomesal surface with a sparse patch of short, slender setae proximal to subapical lobe; lateral surface with sparse patch of moderately long and slender setae (lsp) extending from middle to the level of subapical lobe; subapical lobe distinctly divided, divisions approximated; proximal division columnar, forked at apex with 2 long, robust, hooked setae (setae *a* and *b*), seta *a* sinuous, basal to seta *b*, seta *b* nearly straight; distal division shorter than proximal division with 7 apical and 1 subapical setae; apical setae include a moderately long and a short saberlike setae (*s*), a relatively long, slender, flexible seta (*l*) on lateral side on the base of the moderately long saberlike seta, 3 subequal, narrow, appressed setae (*f*), and a shorter, narrow, appressed, spatulate seta (*f*), subapical seta includes a long, robust, hooked seta (*h*). Gonostylus narrow, curved, widened on subapical part and tapered to apex, apical snout elongate, blunt at apex; subapical crest evident on ventral side from apical snout to widened subapical part; gonostylar claw leaflike, broadest at apex. Lateral plate of phallosome with apical, ventral, and lateral processes; apical process short, weakly sclerotized, nearly triangular in outline, apical margin V-shaped, ventral process long, laterally curved, lateral process long, pointed, dorsolaterally directed; aedeagal sclerite broad at base, narrowed to apex, thickened margin unequally sclerotized with a wrinkled aspect; basal piece nearly square in outline; paraproct crown with 9–12 simple blades; 1–3 cercal setae. Tergum X somewhat square in outline.

Material examined. 34 δ , 34 δ G, 10 δ , 7 δ cib, 2 δ G. **Holotype:** BRAZIL, Amazonas States, Manaus County, 28 Jun 1963, Duret coll., 1 δ , 1 δ G. **Other specimens:** Para State, Belem County, Utinga, Jul 1966, A. Toda coll., Sallum det. 1993. 2 δ , 2 δ G: Sao Paulo State, Pariqueira-Açu County, Experimental Station, 8 Mar 1978, E. X. Rabello coll., Sallum det. 1982, CDC light trap, 1 δ , 1 δ G: 29 Jan 1981, 1 δ , 1 δ G: 9 Apr 1981, 1 δ , 1 δ G: 6 Mar 1980, Shannon trap supplemented with light, 2 δ , 2 δ G: 7 Apr 1980, 2 δ , 2 δ G: 10 Apr 1980, 1 δ , 1 δ G: 17 Apr 1980, 1 δ , 1 δ G: 26 Feb 1981, 9 δ , 9 δ G, 1 δ , 1 δ cib, 1 δ G: 12 Mar 1981, 5 δ , 5 δ G: 26 Mar 1981, 3 δ , 3 δ G: 21 May 1984, Forattini et al. coll., Sallum det. 1984, 1

♂, 1 ♂G; 21 May 1984, battery-powered aspirator, 1 ♂, 1 ♂G; 28 May 1984, 1 ♂, 1 ♂G; Cananea County, Itapitangui district, Vilarinho Farm, 7 Feb 1984, CDC light trap, 1 ♂, 1 ♂G; Fonte Station, 14 May 1984, battery-powered aspirator, 1 ♂, 1 ♂G; Iguape County, Iguape-Bigua Road, 4 Oct 1982, E. X. Rabello coll., Sallum det. 1982, CDC light trap, 7 ♀, 4 ♀cib, 1 ♀G; 6 Oct 1982, 2 ♀, 2 ♀cib.

Distribution (Fig. 10). Known from the Amazon Region (Para and Amazonas states) and Ribeira Valley, Sao Paulo State, Brazil, and French Guiana (Cascade).

Bionomics. Immature stages were found in ground pools in places where the vegetation was cut down and burned. Adults were collected in CDC light traps, Shannon traps supplemented with light, and with battery-powered aspirators in primary or residual forests.

Discussion. *Culex faurani*, the only species in the Faurani Group, can be easily recognized by the characters presented for the group.

As a result of detailed comparison between populations from northern and southern Brazil, it is possible to recognize differences in the male genitalia, mainly in the aspect of the inner arm of the distal division of the subapical lobe of the gonocoxite. The southern population has a longer inner arm. In addition, the distance between the short seta *s* and the slender, flexible seta *l* is longer in the southern population, and in the northern population seta *h* and the short seta *s* are inserted nearly at the same level on the apex of the inner arm (Fig. 35). Finally, it seems important to note that *Cx. faurani* differs from the other species of the Spissipes Section in possessing the basal piece of the phallosome nearly square in outline (Fig. 35). It is somewhat triangular in the other species (Fig. 18).

REMARKS

According to Berlin and Belkin (1980) and Sirivanakarn (1983), the adult of *Culex (Melanoconion)* can be recognized by the absence of the following: metallic coloration on the legs and abdominal terga, antepronotal scales, acrostichal setae (except in *Cx. spissipes*), microsetae at base of halter, and setae on metamerom; and by possessing broad and short plume scales on wing veins, basolateral patches of white scales on abdominal terga II-VII (absent in *Cx. simulator*, *Cx. jubifer*, and male of *Cx. spissipes*), scutal and antepronotal integument brown to blackish, and fewer than 20 upper proepisternal setae. However, while examining specimens of *Melanoconion* by scanning microscopy we observed 3, 4 small setae at base of halter (Figs. 14A, 14B) in species of the Spissipes Section as

well as in other species of the Melanoconion Section. In addition, the presence of setae on the metamerom, considered characteristic of subgenus *Tinolestes*, was observed in *Culex bastagarius* Dyar and Knab of the Melanoconion Section; acrostichal setae were found in *Cx. spissipes*, *Cx. lopesi*, *Cx. portesi*, *Cx. sacchetti*, and *Cx. vomerifer*; and *Cx. adamesi*, *Cx. pedroi*, and *Cx. ribeirensis* have 15-32 well-developed upper proepisternal setae. In conclusion, it seems that *Melanoconion* can be recognized by the absence of metallic coloration on the legs and abdominal terga, absence of antepronotal scales, and presence of broad and short plume scales on wing veins. The other characters can be useful to distinguish groups or species.

The subgenus *Melanoconion*, as interpreted by the above authors, can be recognized by the following male genital features: the proximal and distal divisions of the subapical lobe of the gonocoxite columnar, presence of scales on the proximal part of the ventrolateral surface of the gonocoxite, and paraproct crown with fewer than 20 simple blades. However, we observed both the presence and absence of scales on the proximal part of the ventrolateral surface of the gonocoxite. Consequently, this character should not be considered for the recognition of the subgenus *Melanoconion*.

The Spissipes Section

The Spissipes Section was first proposed by Galindo (1969) as the "*Culex spissipes*" group. Galindo recognized this group based on feeding habits of adults; the larva uniformly dark, with a large siphon; subdorsal pairs of seta 1-S inserted distal to the subventral pairs (except in *Cx. spissipes*); seta 7-I always double, and antenna uniformly tanned from base to apex.

Subsequently, the "*Culex spissipes*" group was recognized by Sirivanakarn (1983) as the Spissipes Section. Sirivanakarn defined the Spissipes Section as that group of species that, in the adult stage, have narrow decumbent scales on the vertex and small or indistinct patches of broad spatulate scales on the lateral portions (Figs. 11A, 11B), and male genitalia with a broadly sclerotized aedeagal sclerite in lateral aspect (Fig. 19). The larval stage has seta 8-P usually with 4-6 branches (except the Jubifer Group) and seta 7-P usually with 4, 5 branches (except the Jubifer Group). The pupal stage has seta 9-VIII inserted at or close to the caudolateral angle of the segment and seta 11-C usually double. Finally, Forattini and Sallum (1992), while examining cibarial features of the females of some species, observed certain characters of the cibarial bar and cibarial dome that are useful

for delimitation of this section and identification of species.

By means of a series of comparative observations made on adults and female and male genitalia, it seems that *Culex nicaroensis* Duret does not belong to the subgenus *Melanoconion*. It differs from the other species in possessing scales on the anteprotonotum (these scales are absent in *Melanoconion* species); the postgenital lobe is rodlike, strongly sclerotized, with setae inserted only on the apical portion (Fig. 36); the cerci have a beaklike projection in the inner apical margin (Fig. 36) (in *Melanoconion* this margin is rounded, without a beaklike projection [Fig. 19]); and the upper vaginal sclerite is well developed and well sclerotized (Fig. 36) (it is somewhat rectangular, poorly developed in *Melanoconion* species [Fig. 21]). In male genitalia features, we observed that *Cx. nicaroensis* differs from *Melanoconion* species in possessing a hyaline crest near the middle of the outer surface of the gonostylus (Fig. 36) (a similar crest is found in species of subgenus *Tinolestes*; the hyaline crest found in *Cx. sacchettiae*, *Cx. vomerifer*, and *Cx. portesi* differs in development, shape, and position [Figs. 27–29]). sternum IX is nearly trapezoidal (Fig. 36) in *Cx. nicaroensis* (it is nearly rectangular in species of *Melanoconion*), and the lateral plate of the phallosome of *Cx. nicaroensis* is similar in shape to that of species of subgenus *Anodiopora* (*Culex originator* Gordon and Evans).

In conclusion, present knowledge leads us to suggest the following scheme of classification for the Spissipes Section.

Spissipes Section		
Group	Subgroup	Species
Spissipes	—	<i>Cx. spissipes</i>
Taenioptus	—	<i>Cx. akritos</i> , <i>Cx. cedeciei</i> , <i>Cx. ikelos</i> , <i>Cx. taenioptus</i>
Crybda	Pedroi	<i>Cx. adamesi</i> , <i>Cx. crybda</i> , <i>Cx. epantastus</i> , <i>Cx. pedroi</i> , <i>Cx. ribirensis</i>
	Paracrybda	<i>Cx. delpontei</i> , <i>Cx. paracrybda</i>
	Pereyrai	<i>Cx. pereyrai</i>
Vomerifer	—	<i>Cx. portesi</i> , <i>Cx. sacchettiae</i> , <i>Cx. vomerifer</i>
Ocoosa	—	<i>Cx. ocoosa</i> , <i>Cx. panocossa</i>
Jubifer	—	<i>Cx. jubifer</i> , <i>Cx. simulator</i>
Lopesi	—	<i>Cx. lopesi</i>
Faurani	—	<i>Cx. faurani</i>

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