

WYEOMYIA (PROSOPOLEPIS) CONFUSA (LUTZ): SUBGENERIC VALIDATION, SPECIES DESCRIPTION, AND RECOGNITION OF WYEOMYIA FLUI (BONNE-WEPSTER AND BONNE) AS THE SENIOR SYNONYM OF WYEOMYIA KERRI DEL PONTE AND CERQUEIRA

R. LOURENÇO-DE-OLIVEIRA,¹ RALPH E. HARBACH,² M. G. CASTRO,¹ M. A. MOTTA¹
AND E. L. PEYTON³

ABSTRACT. *Prosopolepis* Lutz is validated as a monotypic subgenus of *Wyeomyia* Theobald and the type species, *Wyeomyia confusa* (Lutz), is redescribed. The description includes illustrations of the male and female genitalia, the 4th-stage larva, and the pupa. *Prosopolepis flui* Bonne-Wepster and Bonne is resurrected from synonymy with *Wy. confusa* and recognized as the senior synonym of *Wyeomyia kerri* del Ponte and Cerqueira. *Wyeomyia flui* does not belong in the subgenus *Prosopolepis* and remains in the genus *Wyeomyia* without subgeneric placement. *Trichoprosopon pusillum* Lutz and Nuñez-Tovar is not synonymous with *Wy. confusa* and is provisionally regarded as a nomen dubium within *Wyeomyia*. The identity of *Wy. confusa* is fixed by neotype selection.

KEY WORDS Culicidae, *Wyeomyia*, *Prosopolepis*, *Wyeomyia confusa*, *Wyeomyia flui*, *Wyeomyia kerri*

INTRODUCTION

Prosopolepis was first established as a genus by Lutz (1905) for a single species named *Prosopolepis confusus*. Dyar and Knab added *Prosopolepis jocosa* to the genus in 1908, they included *Wyeomyia prolepidis* Dyar and Knab in the genus in 1919, and Bonne-Wepster and Bonne (1920) added a 4th species, which they described as *Prosopolepis flui*. Eight years later, Dyar (1928) included all 4 nominal species in the genus *Dendromyia* Theobald. He placed *jocosa* and *prolepidis* in a new subgenus, *Melanolepis* Dyar, and recognized *confusus* and *flui* as related forms of uncertain subgeneric placement, stating that *Prosopolepis* was "probably entitled to subgeneric rank; but without a male I am unable to place [*confusa*]." As a consequence the specific name of *confusus* was emended to *confusa* to agree in gender with the generic name. In his world catalog of mosquitoes, Edwards (1932) recognized *Dendromyia* as one of 4 subgenera of the genus *Wyeomyia* Theobald and placed *Prosopolepis* in synonymy with *Dendromyia*. He also listed *Prosopolepis flui* as a questionable synonym of *Wyeomyia (Dendromyia) confusa*, probably because Dyar (1928) stated that "There is no perceptible difference between this species and *confusa*. . . . They are probably the same; but I hold them apart on the locality solely . . ." In 1942 Lane and Cerqueira synonymized *Trichoprosopon pusillum* Lutz and Nuñez-Tovar with *Wy. confusa*, and correctly recognized *flui* as a separate species. Al-

though these authors noted that *Wy. flui* was morphologically similar to *Wyeomyia kerri* (del Ponte and Cerqueira): "W. kerri muito próxima desta espécie," the name *Prosopolepis flui* was formally established as a synonym of *Wy. confusa* by Lane (1951). Lane (1953) retained this synonymy in his *Neotropical Culicidae*, and *Wy. confusa*, with its 2 junior synonyms, remained in *Dendromyia* until Motta and Lourenço-de-Oliveira (1995) excluded *confusa* (along with all but 6 species) from the subgenus. Consequently, *Wy. confusa* was left without subgeneric placement and *Prosopolepis* became a synonym of the generic name of *Wyeomyia*.

Wyeomyia confusa was described from an unknown number of syntype females collected in forest near the city of São Paulo, Brazil (Lutz 1905). The depository of the syntypes was not mentioned by the author and their location is unknown (Belkin et al. 1971, Knight and Stone 1977). Lane and Cerqueira (1942) stated that they designated a neotype for *Wy. confusa*, but the location of this specimen, as well as other specimens that they used to describe and illustrate the larva, pupa, and male genitalia of this species, is unknown. The strange head and remarkable maxilla of the larva illustrated by Lane and Cerqueira are unusual among the *Sabellini*, and this prompted R.E.H. and E.L.P. to try to obtain specimens for taxonomic study nearly a decade ago. Unexpectedly, all reputed larvae of *Wy. confusa* obtained from various institutions turned out to be misidentified specimens of *Sabellus (Davismyia) petrocchiae* (Shannon and del Ponte) (Harbach and Peyton 1991), and this provided additional evidence that the specimens of *Wy. confusa* studied by Lane and Cerqueira (1942) were indeed lost. Recent collections and rearings of *Wy. confusa* in southeastern Brazil eventually provided the material on which the present study is based.

The problems dealt with in this paper are purely taxonomic in nature. As a result of anatomical

¹ Laboratório Transmissores de Hematozoários, Instituto Oswaldo Cruz, Av. Brasil, 4365, 21045-900 Rio de Janeiro, RJ, Brazil.

² Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, United Kingdom.

³ Walter Reed Biosystems Unit, Museum Support Center, Smithsonian Institution, Washington, DC 20560.

study, and the parallel study that excluded *Wy. confusa* from the subgenus *Dendromyia* (Motta and Lourenço-de-Oliveira 1995), *Prosopolepis* is raised here to subgeneric rank and a neotype is designated to fix the identity of the nominate species. Furthermore, we have found, in agreement with Lane and Cerqueira (1942), that the lectotype of *P. flui* is not conspecific with *Wy. confusa*, but represents the species that has been known by the name of *Wyeomyia kerri* since 1938. *Wyeomyia flui* does not belong in the subgenus *Prosopolepis* and must remain in *Wyeomyia* without subgeneric placement.

Except for letter designations applied to the lobes of the male gonostylus (Belkin et al. 1970), the morphologic terminology follows Harbach and Knight (1980, 1982). The illustrations are based on specimens deposited in the Instituto Oswaldo Cruz, Rio de Janeiro, Brazil. The 3-letter abbreviation *Prl.* is recommended for the subgenus *Prosopolepis*.

TAXONOMIC TREATMENT

Wyeomyia Theobald

Subgenus *Prosopolepis* Lutz, New status

1905. *Prosopolepis* Lutz, 1905:313 (new genus). Type species: *Prosopolepis confusus* Lutz, by monotypy. Dyar 1928:89 (to subgenus? in *Dendromyia*); Edwards 1932:86 (syn. with *Wyeomyia* subgenus *Dendromyia*); Motta and Lourenço-de-Oliveira 1995 (syn. with *Wyeomyia* by exclusion of type species from *Dendromyia*).
 1910. *Prosopolepis* Theobald, 1910:594 (*lapsus calamii*?).

Wyeomyia (Prosopolepis) confusa (Lutz)

1905. *Prosopolepis confusus* Lutz, 1905:312. Neotype ♀ (by present designation): Reserva Florestal da Cantareira [forest near São Paulo], São Paulo State, Brazil, 6 Oct. 1993, M. A. Motta, 1439 (IOC).

Wyeomyia (Dendromyia) confusa of Edwards 1932: 87 in part, excl. *Wy. flui* (list); del Ponte and Cerqueira 1938:228, 231 (tax.); Lane 1939:142 (lit. sum., syn.); Lane and Cerqueira 1942:493, 537, 541, 544, 545, 616–619, 744–755, 792, 793, 826, 827 (A, mG, P, L keys; syn.; f, m, mG*, P*, L*; type info.; distr.); Davis 1944a:214 (A bion.); Lane 1953:867, 872, 874, 875, 997–1000 in part, excl. syn. (A, mG, P, L keys; lit. sum.; f, m, mG*, P*, L*; type info.; distr.); Horsfall 1955:325, 328 in part? (A, L? bion.); Stone et al. 1959:85 in part, excl. *Wy. flui* (type info., lit.); Forattini et al. 1968:135, 137, 139, 143–150, 152–155, 158–160, 164, 165 (A bion.); Belkin et al. 1971:11 (type info.); Neves and Pedersoli 1976:553 (list); Knight and Stone 1977:329 in part, excl. syn. (type info., lit.); Gui-

marães and Arlé 1984:313, 314, 317–321 (A bion.); Guimarães et al. 1985:174, 176, 177, 179, 180 (A bion.); Guimarães and Victório 1986:95, 96, 98, 101 (A bion.); Guimarães et al. 1987: 278–280, 282–285 (A bion.); Guimarães et al. 1989:248–250, 252 (A bion.); Forattini et al. 1993a:317, 319, 323, 324 (A bion.); Forattini et al. 1993b:402, 404, 407–409 (A bion.); Harbach and Peyton 1993:4 (tax. note).

Wyeomyia confusa of Davis 1944a:214 (A bion.); Davis 1944b:229, 232 (L bion.); Davis 1945:255 (A bion.); Horsfall 1955:325, 328 (A, L bion.); Forattini 1965:160, 162 (A bion.); Forattini et al. 1970:85 in part, incl. *Sabettus petrocchiae* (specimen data); Forattini et al. 1988:545 (coll. data); Motta et al. 1998:189–193 (genetics).

Wyeomyia (Dendromyia) pusillum of Belkin et al. 1965:73 (type info.).

Dendromyia (Prosopolepis?) confusa of Dyar 1928:89, 90 (lit. sum., f); Lane 1936:181 (coll. rec.).

Dendromyia confusa of del Ponte 1939:541.

Prosopolepis (Prosopolepis) confusus of Dyar and Shannon 1924:482 (tax.).

Prosopolepis confusus of Peryassú 1908:311 (f); Surcouf and Gonzalez-Rincones 1911:255 (f, lit. sum.); Howard et al. 1915:160, 161 (f, tax.); Dyar 1919:141, 142 (tax.); Peryassú 1923:87 (A bion., L? bion.); Bonne and Bonne-Wepster 1925:134, 135 (f).

Prosopolepis confusus of Theobald 1910:594 (f).

Adult. Sexes essentially identical in body size and general appearance, exhibiting slight secondary sexual differences in antennal structure; medium-sized mosquito with dark scaling bearing the usual dull bluish reflections typical of *Wyeomyia*.

FEMALE. **Head.** Eyes joined dorsally and ventrally. Vertex, occiput, and postgena covered with broad flat scales, vertex predominantly dark-scaled with white scales along margin of eye and small median posterior patch of white scales that grade into surrounding dark scales, with blue iridescence particularly noticeable from dorsoanterior angle; occiput with transverse row of short dark erect scales posteriorly; postgena white-scaled. Ocular setae rather long, dark; 2 long, dark, approximated interocular setae; postgenal setae short, pale. Clypeus dark, most of dorsal surface covered with anteriorly directed, narrow grayish white to silvery spatulate scales. Antenna dark; length 2.1–2.3 mm ($\bar{x} = 2.2$ mm), slightly shorter than proboscis; pedicel brown, grading to yellow distally and ventrolaterally, with minute pale setae and small inconspicuous dark scales on mesal surface; flagellum rather weakly veticillate, flagellomeres similar in length, flagellomere 1 with small cluster of dark scales on mesal side. Proboscis short, straight, slightly expanded distally; length 2.3–2.6 mm ($\bar{x} = 2.4$ mm), about 0.8 length of forefemur; entirely dark-scaled with faint bluish reflections, faintly

lighter ventrally; with brown basal labial setae. Maxillary palpus short, about 0.1 length of proboscis; dark-scaled, ventral surface without scales. **Thorax:** Scutum and scutellum covered with moderately broad dark scales with dull bluish and hint of green reflections, anterior promontory with few white scales in middle; dark to golden brown setae on anterior promontory (15–23, mode 18), supraalar area (21–17), and each lobe of scutellum (4 long, 5 short). Mesopostnotum with 4–9 (mode 7) dark setae of different lengths, without scales; integument dark brown in middle and grading to yellowish brown at sides. Antepronotum with dark scales similar to scutal scales; anterior margin with about 10 dark setae. Narrow dorsal area of postpronotum dark-scaled, remainder of postpronotum and pleura with small silvery white spatulate scales on pale yellowish brown integument, scales absent from lower anterior area of mesokatepisternum, meso- and metamera, and metapleuron; upper proepisternal scales continuous with translucent scales covering most of lower proepisternal area; pre- and postprocoxal membranes without scales. Pleural setae golden yellow: 6–8 upper proepisternal, 2, 3 (mode 3) prespiracular, 4–7 (mode 6) lower mesokatepisternal inserted above and below upper margin of mesomeron, and 8–14 (mode 10) upper mesepimeral. **Wing:** Length 3.7–4.7 mm ($\bar{x} = 4.3$ mm), vein R_{2+3} 0.3–0.4 mm, cell R_2 1.4–1.7 mm ($\bar{x} = 1.5$ mm), vein R_{4+5} 1.4–2.0 mm ($\bar{x} = 1.9$ mm), vein M_2 0.9–1.1 mm, cell M_2 1.3–1.4 mm; scales brown with weak bluish reflection at certain angles, dorsal surface with plume scales obviously ligulate on R , R_s , and R_{2+3} , ventral surface with plume scales ligulate on branches of radius and medius and distally on CuA and 1A; alula with fine dark setae on margin distally; upper and lower calypters without setae. **Halter:** Scabellum without scales, integument yellow; pedicel and most of capitellum dark-scaled, mesal surface of capitellum with patch of pale scales. **Legs:** Coxae with pale integument, bearing silvery white spatulate scales and pale setae like those of pleura; trochanters mainly with silvery white scales, with dark scales distally; femora, tibiae, and tarsi mainly dark-scaled with faint bluish reflections; ventroposterior margins of femora and tibiae white scaled; foretarsomeres dark-scaled; midtarsomere 2 white-scaled ventrally (from distal 0.30 to a few scales close to the joint with midtarsomere 3); midtarsomeres 3–5 completely white on one side; hindtarsomere 1 with few light scales ventrally, hindtarsomeres 4 and 5 white scaled on one side. **Abdomen:** Terga mainly dark-scaled with blue and hint of green reflections, white-scaled laterally, line of demarcation between dark and pale scales essentially straight; tergum I with numerous long pale setae, laterotergite covered with silvery white scales that are more or less contiguous with a patch of similar scales extending downward along posterior margin of metapostnotum; posterior and lateral edges of terga II–VII lined with short pale setae.

tae; sterna white-scaled. **Genitalia** (Fig. 1): Tergum VIII (not figured) with straight anterior margin and evenly rounded lateral and posterior margins, covered with scales, posterior 0.2–0.3 with long brown setae, most setae 0.3–0.5 length of tergum. Sternum VIII with anterior and lateral margins more or less straight, antero- and posterolateral corners rounded, posterior margin strongly concave with a rather deep notch at middle, with more or less V-shaped patch of long setae originating before notch and extending caudolaterally along posterior margin, all but narrow anterior area covered with scales. Tergum IX narrow, length about 0.3 width, posterior margin slightly emarginate with 0–3 submarginal setae on either side of midline. Cerci short, flattened, borne obliquely to sagittal plane of body, distinctly 2-segmented in dorsal view, segments more or less equal in size; proximal segment with sclerotized dorsal surface only, without setae; distal segment largely sclerotized except for median proximal area adjacent to postgenital lobe, with relatively long setae distally on approximately 0.7 of outer (dorsolateral) surface and 0.3 of inner (ventromesal) surface, usually with 1 or 2 large scale-like setae proximal to other setae on outer surface. Postgenital lobe extends beyond apices of cerci, about as long as broad in dorsal view; lateral margins more or less straight and parallel but sometimes weakly concave or convex; distal margin emarginate in middle; dorsal surface with irregular line of 2–4 (mode 3) longer setae extending from near midlength to apex on either side of emargination; ventral surface with a prominent median proximal extension reaching upper vaginal lip, with rather dense covering of small setae spreading caudolaterally from point on midline near base of proximal extension. Upper and lower vaginal lips broader than usual, lower vaginal lip produced ventromedially into a broad tonguelike insula bearing a shallow central depression and a row of 8–15 short stout setae on lateral margins. Three spermathecal capsules, one smaller than the others.

MALE. Similar to female except for sexual characters. **Head:** Antenna slightly more verticillate. Maxillary palpus about 0.8 length of proboscis. Proboscis length 1.9–2.0 mm ($\bar{x} = 1.9$ mm). **Wing:** Length 3.4–3.6 mm ($\bar{x} = 3.5$ mm). **Genitalia** (Fig. 2): Tergum VIII (ventral in position) with posterior margin more or less straight, posterolateral corners evenly rounded, posterior border lined with 4, 5 rows of long setae. Tergum and sternum IX joined laterally; tergum IX lobes distinctly separated, small, each with 3–5 short flattened setae that become progressively more expanded with an obtuse angle on mesal side toward midline of tergum. Gonocoxite elongate, sternal side swollen at basal 0.3, tapered in distal 0.5, tergomesal surface entirely membranous, approximately distal 0.7 of sternal and lateral surfaces covered with short setae and scales, tergal surface with 2 long tergomesal setae (homologous in part with "tergal triad" of Belkin

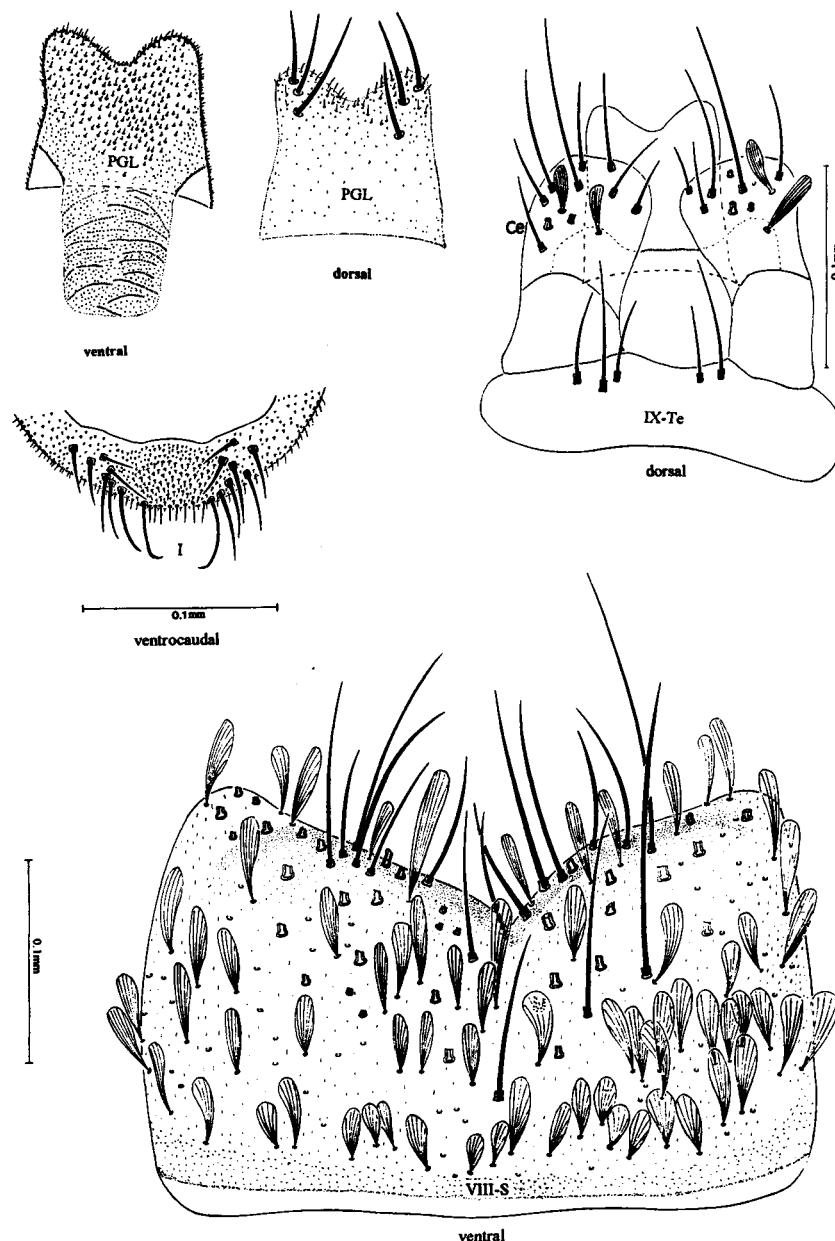


Fig. 1. *Wyeomyia confusa*, female genitalia. Ce, cercus; I, insula; PGL, postgenital lobe; VIII-S, sternum VIII; IX-Te, tergum IX; X-Te, tergum X.

et al. [1970]) inserted at level of proximal edge of basal mesal lobe; basal mesal lobe roughly triangular in outline, proximal margin particularly irregular, surface covered with small slender setae and bearing one large seta at distolateral angle. Gonostylus large, broad (in side view) and long, about 0.8 length of gonocoxite, proximal 0.5 with dense covering of minute spicules on sternomesal surface, distal portion with 5 lobes and a large membranous tergal process ("longitudinal membranous flap" of Belkin et al. [1970]) associated with lobes A and

E; lobe A, a rather indistinct membranous tergal lobe bearing a variable number of very small conical spicules along its tergolateral margin; lobe E, a small sclerotized roughly digitiform process between lobes A and M', with small setae at apex and associated with a narrow longitudinal sclerite borne midlaterally between lobes A and M, tergal process arises on mesal side of gonostylus between lobes E and A; lobe M', the principal distal extension of stem of gonostylus, bearing a dense covering of short laterally bent setae distally on tergolateral sur-

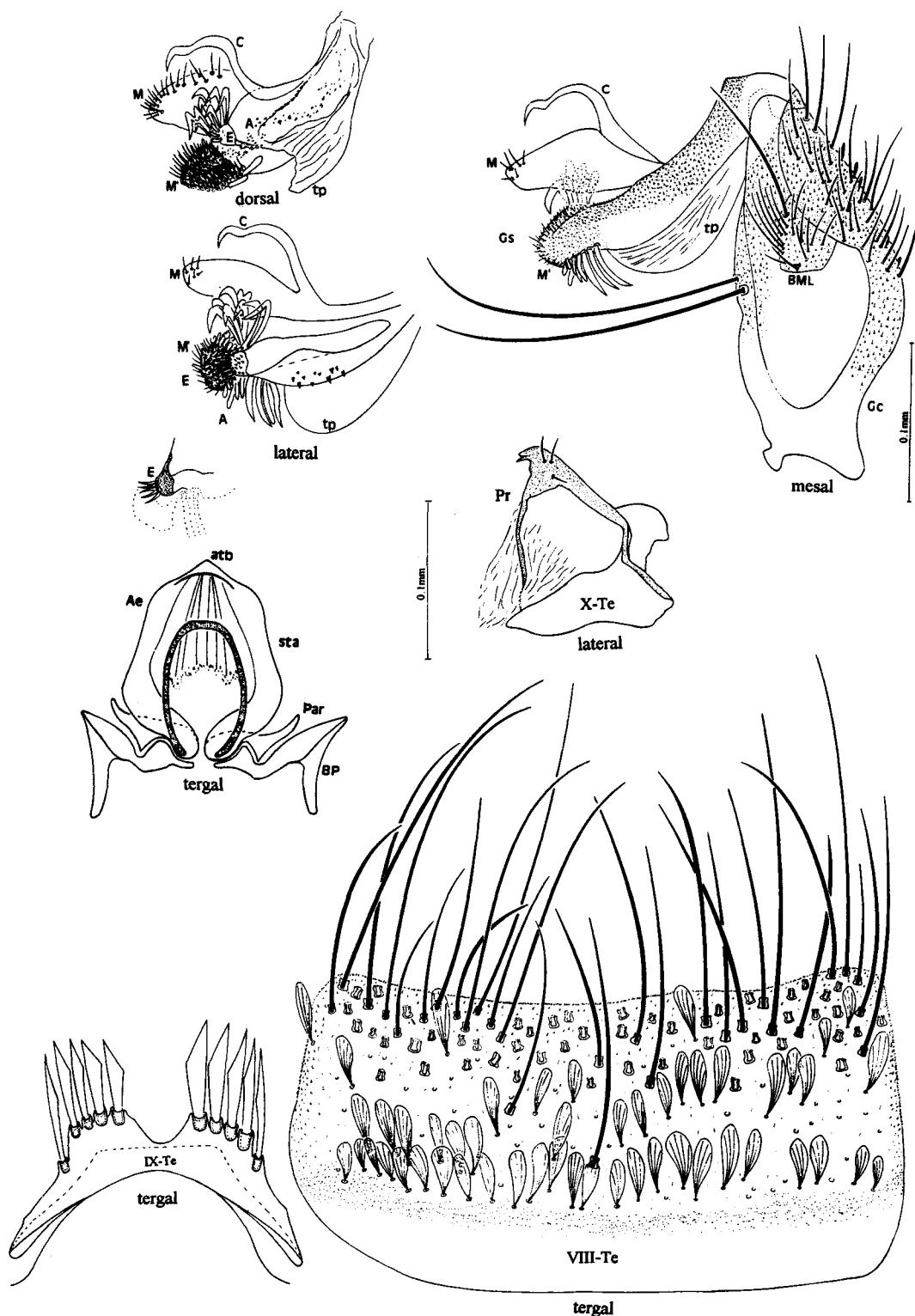


Fig. 2. *Wyeomyia confusa*, male genitalia. A, C, E, M, and M', lobes of gonostyli; Ae, aedeagus; atb, apical tergal bridge; BML, basal mesal lobe; BP, basal piece; Gc, gonocoxite; Gs, gonostyli; Par, paramere; Pr, proctiger; sta, submedian tergal arms; tp, tergal process; VIII-Te, tergum VIII; IX-Te, tergum IX.

face, which become progressively longer and stouter toward tergomesal margin, also bearing a dense cluster of flattened and apically bent setae near middle of sternolateral surface (this area and setae may represent lobe B in other *Wyeomyia*); lobe M, a prominent sternolateral lobe of gonocoxite roughly equal in size to lobe M', a rather fleshy lobe with small slender setae scattered over lateral surface to apex, bearing lobe C on sternal margin near base; lobe C, a long slender proximally directed process arising basally from sternolateral edge of lobe M, characteristically bent at base (obvious only in tergal view) and twisted distally (obvious in side view). Aedeagus slightly longer than broad, broadest in basal 0.5; submedian tergal arms fused to form a narrow median tergal bridge; apical tergal arms fused to form a slightly produced apical tergal bridge; median sternal plate seemingly comprised of 4 narrow longitudinal sclerites, rounded apically, flared and hoodlike. Proctiger (in lateral view) with broad basal sclerotization (tergum X); paraproct with flattened finlike process on sternal margin at base, apex slightly enlarged, bent tergad, bearing few poorly defined teeth and 2–5 small subapical cercal setae on lateral side.

Larva, 4th instar (Fig. 3). Character and positions of setae as figured; numbers of branches in Table 1. **Head:** Wider than long, distinctly widest in posterior 0.5; lightly tanned. Occipital foramen with long narrow slits extending to a distinctive triangular black spot with several small denticles near middle of lateralia; margins of slits not pigmented, ventrocaudal margin of foramen with moderately tanned collarlike edge. Labiogula elongate; hypostomal sutures complete, straight, continued caudal of posterior tentorial pit. Dorsomentum with 7, 8 (mode 7) teeth on either side of a broad median tooth. Mandible (Fig. 4) as figured. Maxilla (Fig. 4) highly modified for grasping, very long, slender, and curved mesally, projecting far beyond anterior margin of head capsule; seta 4-Mx stout, spinelike, inserted about 0.3 from base on ventromesal margin; other setae, maxillary brush, and laciniarastra absent; maxillary palpus highly reduced, borne (fused) dorsally at base of maxillary body. Seta 1-C close together (this character only shared with larvae of subgenus *Dendromyia*, except *Wyeomyia complosa* Dyar, and genus *Limatus* Theobald); 5-C inserted slightly anterior to 7-C very near 6-C; 9-C inserted slightly anterior to 10-C; 14-C long, inserted near anterior margin of head capsule well before both setae 12, 15-C. **Thorax:** Integument hyaline, smooth. Setae 4-P, 5, 6-M and 7, 13-T on individual basal plates; 5-7-P and 9-12-P, M, T on common basal plates. Seta 1-P single, inserted caudal and slightly lateral of 2, 3-P; 4-P short, about 0.5 length of 7-P, strongly aciculate; 11-P, M, T single, spinelike. Seta 8-M small, similar to 7-M. Seta 5-T single, simple; 13-T strongly developed, about as long as thorax. **Abdomen:** Integument hyaline, smooth. Seta 1-I, II short and multibranched,

1-III, IV short and single, 1-V, VI much longer and usually triple (2, 3), 1-VII similar to 1-V, VI but usually with 4 branches (3–5); 2-I–VII short, single, 2-I–III farther anterior than mesad of seta 1, 2-IV–VII far mesad and only slightly anterior to seta 1; 3-I short and multibranched, 3-II, IV with 3, 4 branches and longer than 3-I, 3-III, V usually single (1, 2) with 3-V much longer than segment, 3-VII single, aciculate, and about length of 2 segments; seta 5 similarly developed on segments I–VII but distinctly smaller on I and VII; 6-I–VI and 7-I, II on basal plates, aciculate; 6-I, II, IV–VI similarly developed but 6-I, II slightly longer and generally more branched, 6-III usually double (2, 3) with branches stronger and slightly longer than seta 6 on other segments; 7-I, II similarly developed with 7-II as long or longer than 7-I; 9-I–VI short, single; 13-I–IV single, 13-V usually double (1–3), 13-I, II far cephalad of seta 9, 13-II very small, similar to seta 9, 13-IV, V much longer than the others, 13-VI small with 7–12 branches, 13-VII similar to 13-V but shorter and more branched (3–5). **Segment VIII:** Comb with 12–27 ($\bar{x} = 20$) spinelike scales (no comb plate) in uneven single or partially double row, scales minutely spiculate in proximal portion, some pairs of scales (and occasionally 3 or 4 adjacent scales) fused basally to form a forked composite. **Siphon:** Short, length about 0.5 mm; widest at base, tapering distally; index 2.5–3.3 (width measured at base); lightly and evenly tanned. Pecten with 3–9 (mode 5) spines on either side of seta 1a-S in distal 0.5 of siphon; spines short, slender, equal in size, with ventral edge minutely spiculate. Seta 1-S inserted near base some distance from midventral margin; 2 seta 1a-S inserted distally on midventral line between the 2 pecten, 2a-S comprises 1, 2 proximal simple or frayed setae and 3, 4 more distal and highly branched setae in a more or less straight subdorsal row; 2-S laterally compressed and expanded distally, with hooked tip. **Segment X:** Saddle incomplete; lightly tanned; length about 0.25 mm, siphon/saddle index about 2.0. Setae 1–3-X very long, 1, 2-X about same length, 3-X longer, 1-X usually triple (2, 3), 2-X often with 5 branches (4–6), 3-X often with 4 branches (3–5); 4-X shorter, about 0.6 length of 1, 2-X but generally with more branches (5–7, often 7).

Pupa (Fig. 4). Character and positions of setae as figured; numbers of branches in Table 2. **Cephalothorax:** Lightly tanned. Seta 1-CT long, sigmoid, usually double (2, 3), with hooked tip; 5-CT nearly as long as 1-CT, with 4–8 (5) aciculate branches. **Trumpet:** Moderately and evenly tanned; brownish yellow; short, more or less cylindrical; index about 3.6 (2.5–4.1) (width measured at midlength). **Abdomen:** Lightly tanned, anterior margins of sterna II–VI noticeably darker; length about 3.9 mm. Seta 1-I well developed, with 4–10 primary branches and numerous distal branches; 2-II lateral to seta 1, 2-III–VII near posterior margin of tergum and mesad of seta 1; 3-I, II long, aciculate, 3-IV well for-

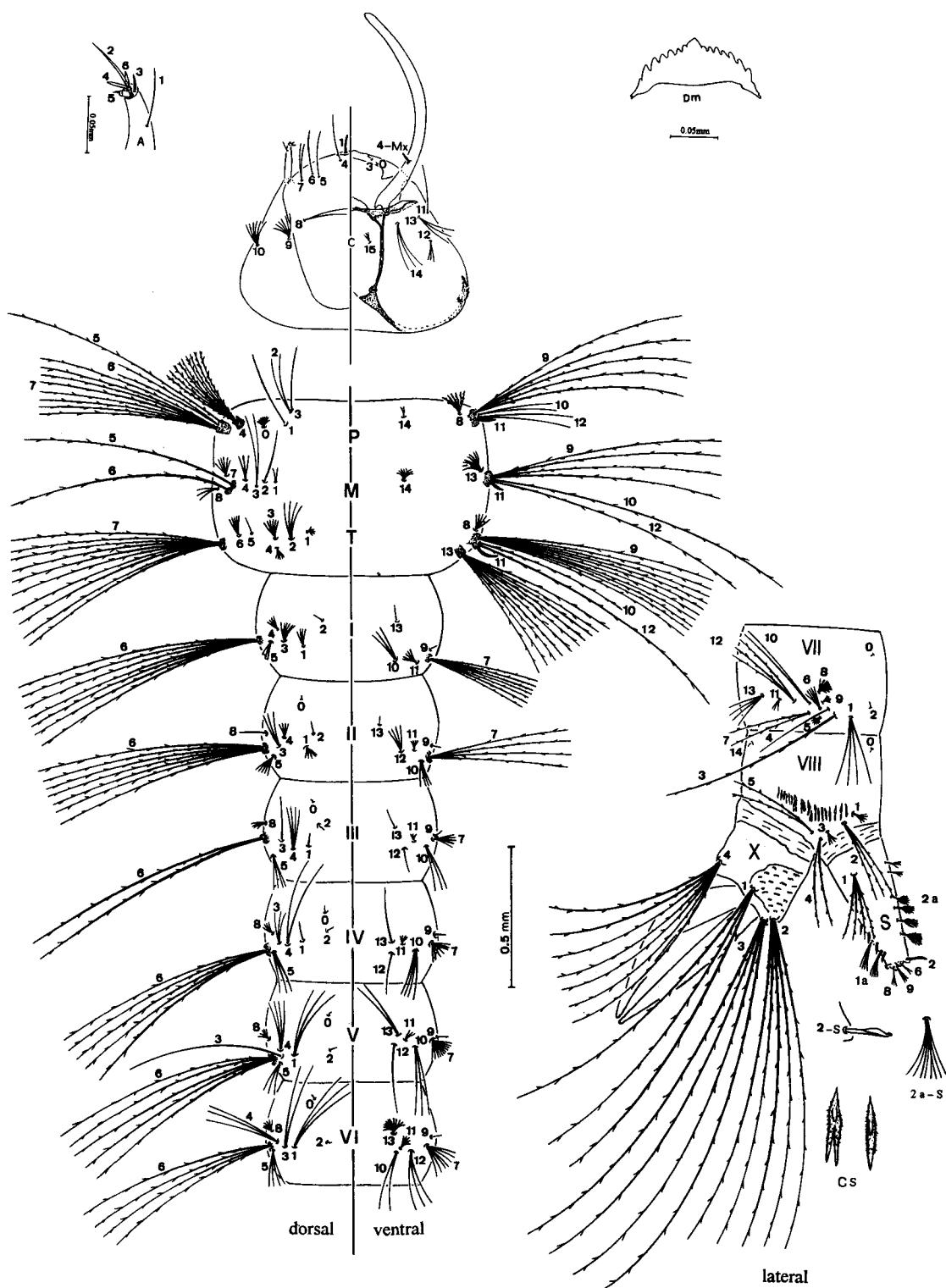


Fig. 3. *Wyeomyia confusa*, larva. A, antenna; C, cranium; Cs, comb scale; Dm, dorsumentum; M, mesothorax; P, prothorax; S, siphon; T, metathorax; I-X, abdominal segments; 0-14, setal numbers for specified areas, e.g. seta 10-C (4-Mx = seta 4 of maxilla).

Table 1. Range of numbers of branches for setae of 4th larval instar of *Wyeomyia (Prosopolepis) confusa* (mode in parentheses).

Setae no.	Head C	Thorax			Abdominal segments							
		P	M	T	I	II	III	IV	V	VI	VII	VIII
0	—	6-10 (8)	—	—	—	1	1	1	1	1	1	1
1	1	1	2-4 (2)	2-8 (5)	3-5 (4)	5, 6 (5)	1	1	2, 3 (3)	3-5 (4)	4-7 (5)	2, 3 (3)
2	—	2, 3 (2)	1	2-5 (4)	1	1	1-3 (1)	1	1	1	2-4 (3)	4-6 (5)
3	1	1, 2 (1)	1, 2 (2)	4-8 (6, 8)	6-8 (6)	3, 4 (3, 4)	1, 2 (1)	3, 4 (3, 4)	1, 2 (1)	1-3 (2, 3)	3-5 (4)	3-5 (4)
4	1	6-12 (9)	2-6 (3)	3-6 (5)	2-4 (4)	3, 4 (4)	3-5 (4)	2	3-5 (4)	2-5 (2, 3)	1, 2 (1)	2-4 (2)
5	1	1, 2 (1)	1	1	2-4 (3)	3-5 (4, 5)	2-7 (4)	2-4 (3)	2-4 (3)	3, 4 (4)	6-11 (6)	1-3 (2)
6	1, 2 (1)	1-3 (2)	1	4-7 (5)	5-8 (7, 8)	6-8 (7)	2, 3 (2)	4-6 (5)	4-6 (5)	4-5 (4)	5-9 (5)	—
7	1-3 (2)	6-12 (8)	5, 6 (6)	7-13 (10)	5-8 (7)	4-6 (4)	5, 6 (5)	6-9 (7)	7-11 (11)	6-10 (7)	2	—
8	2-4 (2)	3-7 (6)	2-5 (3)	4-6 (5)	—	1-3 (1)	2-4 (4)	4, 5 (4)	4-8 (5)	5-7 (6)	5-13 (12)	—
9	4-8 (6)	5-10 (7)	3-7 (4)	6-12 (10)	1	1	1	1	1	1	5	—
10	4-10 (6)	1-3 (2)	1	1, 2 (1)	3-6 (3)	2-4 (4)	3-5 (3)	4-6 (4)	3, 4 (3)	2	2	—
11	1-3 (1)	1	1	1	4-6 (5)	3-5 (4)	2-5 (3)	3-6 (4)	3-5 (3)	3-6 (3, 5)	1-4 (3)	—
12	3, 4 (3)	1-3 (2)	1	1	—	3, 4 (4)	1, 2 (1)	1	1, 2 (1)	2-4 (3)	1-3 (3)	—
13	3-5 (3)	—	7-12 (10)	8-12 (9)	1	1	1	1	1	1-3 (2)	7-12 (7, 12)	3-5 (4)
14	2-5 (3)	1, 2 (2)	9-14 (9)	—	—	—	—	—	—	—	—	—
15	2-5 (3)	—	—	—	—	—	—	—	—	—	—	—

ward of seta 1; 3-V, VI anterior to seta 1; 5-IV-VI long, usually single, about 1.5 length of following tergum, aciculate; 6-II usually single, aciculate, longer than following tergum, inserted on level mesad of seta 9, 6-III-VI inserted anterior to seta 9; 7-II ventral; 9-VII, VIII strongly developed, 9-VII with 17-39 (21) branches, longer than tergum VIII, 9-VIII with 17-32 (25) branches, considerably longer than paddle. *Genital lobe*: Moderately tanned; length about 0.25 mm in female, about 0.4 mm in male. *Paddle*: Lightly tanned; short, only slightly longer than segment VIII, evenly tapered from base, tip more or less pointed, inner and outer margins lined with small spicules that become longer and denser at tip, dorsal and ventral surfaces largely covered with minute spicules; index about 2.3 (2.0-2.4).

Bionomics. *Wyeomyia confusa* have been collected on human bait in forest, much more frequently on the ground than in the canopy of trees. Females may also bite humans and animals in cleared areas close to forest, but they rarely invade peridomestic environments (Forattini et al. 1968, 1993a, 1993b; Guimarães et al. 1987, 1989). The immature stages have been found only in the leaf axils of *Heliconia* sp. and plants of the family Marantaceae, such as *Calathea* sp. The single larva collected from a rain pool by Davis (1944b) was undoubtedly misidentified, and his report of finding larvae of this species (apparently identified by N. L. Cerqueira) in bamboo internodes and the leaf axils of a cultivated aroid (*Arum esculentum*, family Araceae) requires confirmation. The larvae exhibit aggressive and predacious behavior.

Distribution. Known only from Brazil. The species seems to be restricted to the Atlantic Rain Forest system, mainly in the coastal forests between latitudes of 8 and 30°S.

Systematics. *Prosopolepis* was considered a synonym of *Dendromyia* until Motta and Lourenço-de-Oliveira (1995) redefined the latter to include only 6 species. As a result, *Wy. confusa*, along with other species previously included in *Dendromyia*, were left without subgeneric placement. Motta and Lourenço-de-Oliveira (1995) also noted that species of *Dendromyia* seemed to share affinities with species of the Series *Prosopolepis* of Lane and Cerqueira (1942) and Lane (1953), in which *Wy. confusa* had been placed for decades (Heinemann and Belkin 1977, Harbach and Peyton 1993). This was based principally on similarities between *Wy. confusa* and some species of *Dendromyia*: the adults have scales on the clypeus, the immature stages are found in the leaf axils of *Callathea* and *Heliconia* plants, and the larvae exhibit predatory behavior. Additionally, *Wy. confusa* and *Dendromyia* are the only species of *Wyeomyia* that have larval maxillae with a long apical tooth, presumably an adaptation for grasping prey. However, the maxilla of *Wy. confusa* differs in having an exceptionally long apical tooth, the maxillary brush and laciniariastra are ab-

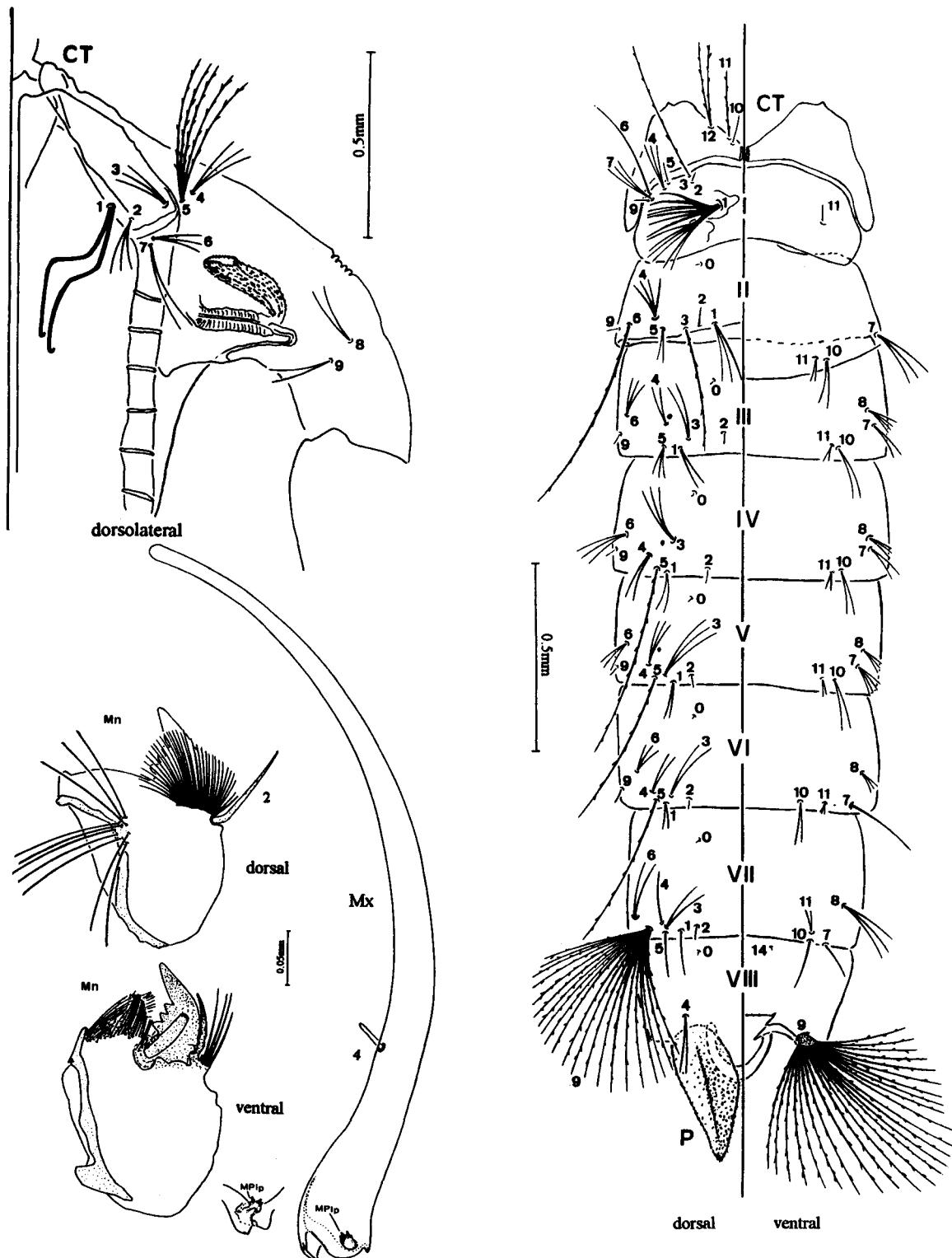


Fig. 4. *Wyeomyia confusa*, pupa and larval maxilla and mandible. CT, cephalothorax; Mn, mandible; MPip, maxillary palpus; Mx, maxilla; P, paddle; I-VIII, abdominal segments; 0-14, setal numbers for specified areas, e.g., seta 2-IV.

Table 2. Range of numbers of branches for pupal setae of *Wyeomyia (Prosopolepis) confusa* (mode in parentheses).

Setae no.	Cephalothorax CT	Abdominal segments						
		I	II	III	IV	V	VI	VII
0	—	—	1	1	1	1	1	1
1	2, 3 (2)	4-10 (5) ¹	3-6 (4)	1-3 (2)	1-4 (2)	1-4 (2)	1-3 (2)	1, 2 (1)
2	2, 3 (3)	1, 2 (1)	1, 2 (1)	1	1	1	1	—
3	2-4 (3)	1, 2 (1)	1, 2 (1)	2-4 (2)	2-4 (3)	2-4 (3)	1-4 (2)	1-3 (2)
4	2-4 (3)	2-5 (3)	3-5 (4)	2, 3 (2)	2-4 (2)	2-5 (3)	1-4 (2)	1, 2 (1)
5	4-8 (5)	1, 2 (1)	1-3 (2)	2-4 (3)	1, 2 (1)	1	1, 2 (1)	1, 2 (1)
6	2-5 (3)	1, 2 (1)	1-3 (1)	2-4 (3)	1-5 (3)	2-5 (3)	2-5 (3)	2-5 (2)
7	2-4 (2)	2-4 (3)	2-5 (3)	1-3 (2)	2, 3 (2)	3-5 (4)	1, 2 (1)	1-3 (1)
8	2-4 (2)	—	—	1-6 (4)	2-4 (3)	2-5 (3)	2-5 (3)	3-6 (3)
9	2-4 (2)	1	1	1, 2 (1)	1	1	1	17-39 (21)
10	1, 2 (1)	—	2, 3 (2)	2, 3 (2)	2-4 (2)	2, 3 (2)	1-3 (2)	1-3 (1)
2511	1, 2 (1)	1	2, 3 (2)	2-4 (2)	2-4 (2)	2-4 (2)	2-4 (3)	2-4 (2)
12	1-3 (2)	—	—	—	—	—	—	—
14	—	—	—	—	—	—	—	1

¹ Primary branches.

sent, and the maxillary palpus is highly reduced and fused with the maxillary body. In addition to morphologic evidence, the results of a recent electrophoretic study of gene-enzyme loci (Motta et al. 1998) give further support to the recognition of *Prosopolepis* and *Dendromyia* as distinct phyletic lines worthy of recognition as separate subgenera.

The most significant morphologic characters of *Prosopolepis* that contribute to its recognition as a separate subgenus are found in the immature stages, particularly the larva. In addition to the uniquely developed maxillae, the larva of *Wy. confusa* bears the following salient characters: denticles on lateralia near dorsolateral slit of occipital foramen; seta 1-C close together; seta 14-C developed and well forward of 15-C; seta 13-I single, inserted anteriorly at level of seta 2-I; comb of segment VIII with 12-27 free scales, with some fused basally in pairs to form a forked composite; 2a-S comprised of frayed and branched setae; seta 2-I-VII mesad of seta 1; pecten with about 5 spines on distal 0.5 of siphon. No characters exist that distinguish the pupa of *Prosopolepis* from those of other subgenera of *Wyeomyia*, but it is characterized by the following combination of features: abdomen unspotted; seta 1-CT sigmoid with hooked tip; seta 2-II-VII near posterior margin of tergum and mesad of seta 1; seta 6-VII dorsal; seta 9-VIII strongly developed and considerably longer than paddle; paddle short, only slightly longer than segment VIII, evenly tapered from base, tip more or less pointed, surface spiculose and margin lined with spicules. Apart from the distinctive features mentioned below, the adults of *Wy. confusa* are very similar to those of other species of *Wyeomyia* in overall ornamentation and structural detail, which is consistent with the relative homogeneity of this genus of mosquitoes. Distinctive features include clypeus largely covered with scales; translucent scales covering most of the proepisternum between forecoxae; an elongate

patch of scales extending from laterotergite along posterior edge of metapostnotum; and presence of a few large, scalelike setae on cerci of females.

For all intents and purposes, *Prosopolepis flui* Bonne-Wepster and Bonne, which undoubtedly represents a species of *Wyeomyia* as currently defined, has been considered to be conspecific with *Wy. confusa* since Edwards (1932) listed it as a questionable synonym of this species. This synonymy was firmly established by Lane (1951), apparently on the basis of historical precedence only. As pointed out by Bonne-Wepster and Bonne (1920), *Wy. flui* differs conspicuously from *Wy. confusa* in having a patch of appressed white scales on the mesopostnotum, a unique distinguishing feature that was obviously overlooked by later workers. On the basis of this character alone, *Wy. flui* should never have been considered a synonym with *Wy. confusa*. Despite this, we decided to examine the type series of *Wy. flui* (all females) in order to confirm the validity of this nominal species. As a result, we discovered the following features that distinguish *Wy. flui* from *Wy. confusa*: clypeus with laterally directed scales on outer margins only; proboscis pale beneath; lower proepisternal scales absent; mesopostnotum with a patch of decumbent pale scales below scutellum; 1-3 setae present on upper calpter of wing; ventral surfaces of midtarsomere 2 and hindtarsomere 3 pale-scaled; laterotergite and membrane behind metapostnotum without scales; females with a single spermathecal capsule, cerci without scales and postgenital lobe elongate and rounded apically. Based on these observations, *flui* is hereby restored to full species status.

During the course of these studies, it became apparent that the type specimens of *Wy. flui* were very similar to *Wy. kerri* del Ponte and Cerqueira. Further investigation revealed that the females of these nominal species are identical in all external anatomical features, including the genitalia. Conse-

quently, *Wy. kerri* del Ponte and Cerqueira is hereby formally recognized as a junior synonym of *Wy. flui* (Bonne-Wepster and Bonne). Until the affinities of this species are known, it cannot be placed in any currently recognized subgenus of *Wyeomyia*.

As a result of this synonymy, information about the adult male, larva, pupa, and bionomics formerly attributed to *Wy. kerri* now apply to *Wy. flui*. Although the taxonomy and biology of *Wy. flui* will be the subject of another paper, it is appropriate here to point out that *Wy. flui* and *Wy. confusa* also exhibit differences in larval habitats and distribution. As noted above, *Wy. confusa* appears to be confined to the Atlantic Rain Forest system where plants of the families Heliconiaceae and Marantaceae serve as habitats for the immature stages. *Wyeomyia flui* has never been found in the Atlantic Rain Forest and its immature stages have not been collected from plants of these families. It is interesting to note that the maxillae of *Wy. flui* larvae are not developed for predation, suggesting that an association may exist between the types of plants inhabited by *Wy. confusa* and the predatory nature of the larvae.

Lane and Cerqueira (1942) synonymized *Trichoprosopon pusillum* Lutz and Nuñez-Tovar with *Wy. confusa* without explanation. The original description of this nominal species (Lutz and Nuñez-Tovar 1928) is problematic because some descriptive elements were interchanged with those of another species, *Dendromyia bicompressa* Lutz and Nuñez-Tovar, described in the same paper. This is further complicated by the fact that the description of the pupal stage is clearly not that of a sabethine mosquito: "Tiene dos chapas anales, con una nervura mediana gruesa que termina un poco antes del borde posterior, en donde se observa una cerda muy fina." The presence of a paddle seta suggests that Lutz and Nuñez-Tovar had described a species of *Aedes*, *Culex*, or *Haemagogus* rather than a species of Sabethini. Because no type specimens of *Trichoprosopon pusillum* exist (Belkin et al. 1965, Knight and Stone 1977), it is not possible to determine the identity of this nominal species. Despite this, it is obviously not conspecific with *Wy. confusa*, and must be rejected as a synonym of this species. Because of the partially confused concepts of the 2 nominal species described by Lutz and Nuñez-Tovar (1928), *Trichoprosopon pusillum* is retained in *Wyeomyia* but its taxonomic status is hereby changed to nomen dubium.

Material examined. *Wyeomyia confusa*: Two hundred fifteen specimens (26♂, 12♂G, 75♀, 13♀G, 8L, 39Le, 42Pe), including 42 individual rearings. BRAZIL, Bahia, Uruçuca, 9 Jul. 1953, 5♀ (USNM); Espírito Santo, Nov. 1937, Serviço Febre Amarela, M. E. S. Bras. (R. C. Shannon collection), 1♂ (USNM); Rio de Janeiro, Guapimirim County, Parque Nacional da Serra dos Órgãos, Sep. 1992, R. Lourenço-de-Oliveira and M. A. Motta coll., larvae from *Heliconia* sp., 10LePe♂, 4♂G, 1Pe♂,

10LePe♀, 4♀G (IOC); same data except 23 Sep. 1992 and R. Lourenço-de-Oliveira coll., 2LePe♂, 1♂G, 1Pe♂, 1LePe♀, 1♀G, 5L (USNM); same data except Oct. 1994, M. A. Motta coll., 1LePe♀, 2L (IOC); same data except Mar. 1995, 1LePe♀, 1♀G, 1L (IOC), same data except L. Barros coll. and larvae from *Marantaceae* sp., 1LePe, 1♂ (BM); Jacarepaguá, Dec. 1937, Serviço Febre Amarela, M. E. S. Bras. (R. C. Shannon collection), 1♂, 1♂G (USNM); Trapicheiro, 12 Apr. 1946, 3♀ (USNM); Parque Gávea, 21 Jul. 1946, 3♀ (USNM); unknown localities, Dec. 1938, Serviço Febre Amarela, M. E. S. Bras. (R. C. Shannon collection), 3♀, Dec. 1937, 3♀, Nov. 1937, 1♂, (USNM); Mangaratiba, May 1938, Serviço Febre Amarela, M. E. S. Bras. (R. C. Shannon collection), 1♂, 1♀ (USNM); Petrópolis, May 1938, Serviço Febre Amarela, M. E. S. Bras. (R. C. Shannon collection), 1♂, 1♂G (USNM); same data except Apr. 1938, 5♀ (USNM); Lumiar County, Rio Bonito, Nova Friburgo, Feb. 1994, R. Lourenço-de-Oliveira and M. A. Motta coll., larvae from *Heliconia* sp., 2LePe♀, 2LePe♂, 1Pe♂, 3♂G, (IOC); Xerém, May 1997, M. A. Motta and L. Barros coll., larva from *Marantaceae* sp., 1LePe♀ (IOC); Santa Catarina, Quiriri, Joinville, Mar. 1996, Louzada coll., larvae from *Heliconia* sp. and Marantaceae, 3LePe♀, 1♀G, 3LePe♂, 2♂G (IOC); Minas Gerais, Juiz de Fora, 25 Jul. 1953, 7♂ (USNM); unknown locality, Jan. 1938, Serviço Febre Amarela, M. E. S. Bras. (R. C. Shannon collection), 1♀ (USNM); São Paulo, Cantareira, 1♀ (USNM); Juquiá, 2♀, 1♀G (BM), 1♀ (USNM); Parque Estadual da Serra do Mar, near Picinguaba, Jan. 1991, Marinelli coll., from human bait, 2♀ (IOC); Sta. Catarina, 26 Jun. 1953, 1♂, 19♀ (USNM); Reserva Florestal da Cantareira, 6 Oct 1993, M. A. Motta coll., neotype ♀LePe (IOC); state unknown, Blumenau, 23.iii.1932, F. Weber coll., 5♀, 3♀G (BM); no data, 5♀ (USNM).

Wyeomyia flui. Forty-two specimens (35♀, 7♀G). SURINAM, Albina (Marowijne) and Dam, Apr. 1917 and Jan. 1919, J. Bonne-Wepster and C. Bonne coll., lectotype ♀ (with dissected genitalia on slide), 6 paralectotype ♀ (one dissected genitalia on slide) (RMNH); Paramariho, 1 paralectotype ♀ (with dissected genitalia on slide) (USNM). Specimens originally identified as *Wy. confusa*: BRAZIL, Pará, Curralinho, H. W. Kumm coll., 3♀, 2♀G (BM); Rio Itaucú, 1935, H. W. Kumm coll., 1♀, 1♀G (BM). GUYANA (as British Guiana), Dr. Low, 1♀, 1♀G (BM). Specimens originally identified as *Wy. kerri*: BRAZIL, Mato Grosso, Cuiabá, 15 May 1935, G. Cesar coll., holotype ♀ (IOC, Costa Lima Collection), 5 paratype ♀ (2 coll. Feb. 1953, 3 coll. Mar. 1935) (BM), 4 paratype ♀ (coll. Jun. 1935, locality as "Cuyaba") and 1♀ (coll. 1935) (USNM); Acre, Juruá, 1937, 1♀ (USNM); Pará, Curralinho, 1930, 2♀ (USNM); Belém, Nov 1992, Motta coll. and det., from human bait, 7♀, 6LePe♀, 1LePeG♀ (IOC); Rondônia, Zoological Garden, Ariquemes, Jul 1987, Lourenço-de-Oliv-

eira coll. and det., larva from burutu palm 1♀ (IOC); same data except Jun. 1994, Motta det., 7♀, 6LePe♀, 1LePeG♀ (IOC). ECUADOR, Napo, Tena, 19 October 1968, 1♀ (USNM).

ACKNOWLEDGMENTS

We are grateful to Luciana R. Barros, Andréa L. Azevedo, and Orlando Vaz for their assistance in collecting and rearing mosquitoes, and to Fundação Nacional de Saúde for the support in the field.

REFERENCES CITED

Belkin, J. N., S. J. Heinemann and W. A. Page. 1970. Mosquito studies (Diptera, Culicidae). XXI. The Culicidae of Jamaica. Contrib. Am. Entomol. Inst. (Ann Arbor) 6(1):1-458.

Belkin, J. N., R. X. Schick and S. J. Heinemann. 1965. Mosquito studies (Diptera, Culicidae) V. Mosquitoes originally described from Middle America. Contrib. Am. Entomol. Inst. (Ann Arbor) 5(1):1-95.

Belkin, J. N., R. X. Schick and S. J. Heinemann. 1971. Mosquito studies (Diptera, Culicidae). XXV. Mosquitoes originally described from Brazil. Contrib. Am. Entomol. Inst. (Ann Arbor) 7(5):1-64.

Bonne, C. and J. Bonne-Wepster. 1925. Mosquitoes of Surinam, a study on Neotropical mosquitoes. Koninklijke Vereeniging het Koloniaal Instituut te Amsterdam Mededeeling 21, Afdeeling Tropische Hygiene 13. Druk De Bussy, Amsterdam, The Netherlands.

Bonne-Wepster, J. and C. Bonne. 1920. Diagnoses of new mosquitoes from Surinam, with a note on synonymy (Diptera, Culicidae). Insec. Inscit. Menst. (1919) 7:165-180.

Davis, D. E. 1944a. A comparison of mosquitoes captured with an avian bait at different vegetational levels. Rev. Entomol. (Rio de J.) 15:209-215.

Davis, D. E. 1944b. Larval habitats of some Brazilian mosquitoes. Rev. Entomol. (Rio de J.) 15:221-235.

Davis, D. E. 1945. A comparison of mosquitoes captured with avian bait and with human bait. Proc. Entomol. Soc. Wash. 47:252-256.

del Ponte, E. 1939. Identificación de "Sabethini" (Dipt. Culicidae) por medio de tarjetas perforadas. Physis (B. Aires) 17:535-541.

del Ponte, E. and N. Cerqueira. 1938. Alguns sabethineos do Brasil (Diptera, Culicidae). Rev. Entomol. (Rio de J.) 8:225-237.

Dyar, H. G. 1919. A revision of the American Sabethini of the *Sabates* group by the male genitalia. (Diptera, Culicidae). Insec. Inscit. Menst. 7:114-142.

Dyar, H. G. 1928. The Mosquitoes of the Americas. Part I. Carnegie Inst. Wash. Publ. 387:v + 1-616.

Dyar, H. G. and F. Knab. 1908. Descriptions of some new mosquitoes from tropical America. Proc. U.S. Natl. Mus. 35(1632):53-70.

Dyar, H. G. and F. Knab. 1919. New species of tropical American mosquitoes (Diptera, Culicidae). Insec. Inscit. Menst. 7:1-9.

Dyar, H. G. and R.C. Shannon. 1924. The subfamilies, tribes, and genera of American Culicidae. J. Wash. Acad. Sci. 14:472-486.

Edwards, F. W. 1932. Genera Insectorum. Diptera, fam. Culicidae, Fascicle 194. Desmet-Verteneul, Bruxelles, Belgium.

Forattini, O. P. 1965. *Entomologia médica*, Volume 3. Culicini: *Haemagogus*, *Mansonia*, *Culiseta*. Sabethini. Toxorhynchitini. Arboviruses. Filariose bancroftiana. Genética. Universidade de São Paulo, São Paulo, Brazil.

Forattini, O. P., O. S. Lopes and E. X. Rabello. 1968. Investigações sobre o comportamento de formas adultas de mosquitos silvestres do estado de São Paulo, Brasil. Rev. Saude Publica 2:111-173.

Forattini, O. P., E. X. Rabello and M. das Dores Cotrim. 1970. Catálogo das coleções entomológicas da Faculdade de Saúde Pública da Universidade de São Paulo (1.a Série) Culicidae [sic]. Rev. Saude Publica 4(no. especial):1-100.

Forattini, O. P., M. A. M. Sallum and I. Kakitani. 1988. Catálogo das coleções entomológicas da Faculdade de Saúde Pública da Universidade de São Paulo—(2.ª Série II)—Culicidae. Rev. Saude Publica 22:519-547.

Forattini, O. P., I. Kakitani, E. Massad and D. Marucci. 1993a. Studies on mosquitoes (Diptera: Culicidae) and anthropic environment. 3—survey of adults stages at the rice irrigation system and the emergence of *Anopheles albifasciatus* in south-eastern, Brazil. Rev. Saude Publica 27:313-325.

Forattini, O. P., I. Kakitani, E. Massad and D. Marucci. 1993b. Studies on mosquitoes (Diptera: Culicidae) and anthropic environment. 4—survey of resting adults and synanthropic behavior in south-eastern, Brazil. Rev. Saude Publica 27:398-411.

Guimarães, A. É. and M. Arlé. 1984. Mosquitos no Parque Nacional da Serra dos Órgãos, Estado do Rio de Janeiro, Brasil. I. Distribuição estacional. Mem. Inst. Oswaldo Cruz Rio de J. 79:309-323.

Guimarães, A. É. and V. M. N. Victório. 1986. Mosquitos no Parque Nacional da Serra dos Órgãos, Estado do Rio de Janeiro, Brasil. III. Preferência horária para hematofagia. Mem. Inst. Oswaldo Cruz Rio de J. 81:93-103.

Guimarães, A. É., M. Arlé and R. N. M. Machado. 1985. Mosquitos no Parque Nacional da Serra dos Órgãos, Estado do Rio de Janeiro, Brasil. II. Distribuição vertical. Mem. Inst. Oswaldo Cruz Rio de J. 80:171-185.

Guimarães, A. É., M. Arlé and R. N. M. Machado. 1987. Mosquitos do Parque Nacional da Serra dos Órgãos, Estado do Rio de Janeiro, Brasil. IV. Preferência alimentar. Mem. Inst. Oswaldo Cruz Rio de J. 82:277-285.

Guimarães, A. É., M. A. Motta, M. Arlé, R. M. Machado and L. D. Gonçalves. 1989. Bionomia de mosquitos (Diptera: Culicidae) em áreas da Mata Atlântica no Município de Itaguaí, Estado do Rio de Janeiro, Brasil. I. Frequência intra, peri e extradomiciliar. Mem. Inst. Oswaldo Cruz Rio de J. 84(Suppl. IV):243-254.

Harbach, R. E. and K. L. Knight. 1980. *Taxonomists' glossary of mosquito anatomy*. Plexus Publishing, Marlton, NJ.

Harbach, R. E. and K. L. Knight. 1982. Corrections and additions to *Taxonomists' glossary of mosquito anatomy*. Mosq. Syst. (1981) 13:201-217.

Harbach, R. E. and E. L. Peyton. 1991. Transfer of the subgenus *Davismyia* from *Wyeomyia* to *Sabates* and description of the type species, *Miamyia petrocchiae* (Diptera: Culicidae). Mosq. Syst. (1990) 22:149-159.

Harbach, R. E. and E. L. Peyton. 1993. Morphology and evolution of the larval maxilla and its importance in classification of the Sabethini (Diptera, Culicidae). Mosq. Syst. 25:1-16.

Heinemann, S. J. and J. N. Belkin. 1977. Collection re-

cords of the project "Mosquitoes of Middle America" 7. Costa Rica (CR). *Mosq. Syst.* 9:237-287.

Horsfall, W. R. 1955. Mosquitoes. Their bionomics and relation to disease. The Ronald Press Co., New York.

Howard, L. O., H. G. Dyar and F. Knab. 1915. The mosquitoes of North and Central America and the West Indies, Volume 3. Systematics description (in two parts). Part 1. *Carnegie Inst. Wash. Publ.* 159:vi + 1-523.

Knight, K. L. and A. Stone. 1977. A Catalog of the mosquitoes of the world (Diptera: Culicidae), 2nd ed. Thomas Say Found. 6:ix + 1-611.

Lane, J. 1936. Notas sobre culicídeos de Matto Grosso. *Rev. Mus. Paul. Univ. S. Paulo* 20:173-206.

Lane, J. 1939. Catálogo dos mosquitos neotrópicos. *Bol. Biol. Ser. Monogr.* 1:xi + 1-218.

Lane, J. 1951. Synonymy of Neotropical Culicidae (Diptera). *Proc. Entomol. Soc. Wash.* 53:333-336.

Lane, J. 1953. Neotropical Culicidae, Volume II. University of São Paulo, São Paulo, Brazil.

Lane, J. and N. L. Cerqueira. 1942. Os sabetíneos da América (Diptera, Culicidae). *Arch. Zool. S. Paulo* 3: 473-849.

Lutz, A. 1905. Novas espécies de mosquitos do Brasil. *Imprensa Med.* 13:347-350.

Lutz, A. and [M.] Nuñez-Tovar. 1928. Contribución para el estudio de los dipteros hematófagos de Venezuela, pp. 7-69, table + 11 pls. In: A. Lutz (ed.). *Estudios de zoología y parasitología Venezolanas*. Rio de Janeiro, Brazil.

Motta, M. A. and R. Lourenço-de-Oliveira. 1995. *Wyeomyia luteoventralis* Theobald, the type species of the subgenus *Dendromyia* Theobald (Diptera: Culicidae). *Mem. Inst. Oswaldo Cruz Rio de J.* 90:375-385.

Motta, M. A., R. Lourenço-de-Oliveira, F. A. Monteiro and L. R. Barros. 1998. Preliminary evaluation of genetic relatedness of three species of the subgenus *Dendromyia* Theobald and other species of the genus *Wyeomyia* Theobald (Diptera: Culicidae). *Mem. Inst. Oswaldo Cruz Rio de J.* 93:189-194.

Neves, D. P. and J. L. Pedersoli. 1976. Os Culicidae do Museu de História Natural de Universidade Federal de Minas Gerais, Belo Horizonte. I. A mata d espécies encontradas. *Rev. Bras. Biol.* 36:547-553.

Peryassú, A. G. 1908. Os culicídeos do Brasil. Instituto de Manguinhos, Rio de Janeiro, Brazil.

Peryassú, A. 1923. Os culicídeos do Brasil. Catalogo das subfamilias, generos, espécies e synonymias de mosquitos pernilongos encontrados no Brasil (Abril de 1923). a Folha Med. 4:85-87.

Stone, A., K. L. Knight and H. Starcke. 1959. A synoptic catalog of the mosquitoes of the world (Diptera: Culicidae). Thomas Say Found. 6:1-358.

Surcouf, J. M. R. and R. Gonzalez-Rincones. 1911. *Essai sur les Diptères vulnérants du Venezuela. Matériaux pour servir à l'étude des Diptères piqueurs et suceurs de sang de l'Amérique intertropicale, Première partie. Diptères Nématocères vulnérants*. A. Maloine, Paris.

Theobald, F. V. 1910. A Monograph of the Culicidae or Mosquitoes, Volume 5. British Museum (Natural History), London.