

Five new species of Neotropical *Drosophila* (Diptera, Drosophilidae)

Autor(en): **Vilela, Carlos R. / Bächli, Gerhard**

Objektyp: **Article**

Zeitschrift: **Mitteilungen der Schweizerischen Entomologischen Gesellschaft =
Bulletin de la Société Entomologique Suisse = Journal of the
Swiss Entomological Society**

Band (Jahr): **73 (2000)**

Heft 1-2

PDF erstellt am: **08.08.2024**

Persistenter Link: <https://doi.org/10.5169/seals-402771>

Nutzungsbedingungen

Die ETH-Bibliothek ist Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Inhalten der Zeitschriften. Die Rechte liegen in der Regel bei den Herausgebern.

Die auf der Plattform e-periodica veröffentlichten Dokumente stehen für nicht-kommerzielle Zwecke in Lehre und Forschung sowie für die private Nutzung frei zur Verfügung. Einzelne Dateien oder Ausdrucke aus diesem Angebot können zusammen mit diesen Nutzungsbedingungen und den korrekten Herkunftsbezeichnungen weitergegeben werden.

Das Veröffentlichen von Bildern in Print- und Online-Publikationen ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Die systematische Speicherung von Teilen des elektronischen Angebots auf anderen Servern bedarf ebenfalls des schriftlichen Einverständnisses der Rechteinhaber.

Haftungsausschluss

Alle Angaben erfolgen ohne Gewähr für Vollständigkeit oder Richtigkeit. Es wird keine Haftung übernommen für Schäden durch die Verwendung von Informationen aus diesem Online-Angebot oder durch das Fehlen von Informationen. Dies gilt auch für Inhalte Dritter, die über dieses Angebot zugänglich sind.

Five new species of Neotropical *Drosophila* (Diptera, Drosophilidae)

CARLOS R. VILELA¹ & GERHARD BÄCHLI²

The following species of *Drosophila* (subgenus *Drosophila*) are described from the Neotropics: *D. cundinamarca* sp. nov. (type locality: 32 km West of Bogotá, Cundinamarca, Colombia), *D. loewi* sp. nov. (type locality: Mérida, Yucatán, Mexico), *D. antioquia* sp. nov. (type locality: Medellín, Antioquia, Colombia) *D. caripe* sp. nov. (type locality: Caripe, Sucre, Venezuela), *D. freiremaiai* sp. nov. (type locality: Marko, Amazonas, Brazil). The first two species belong to the *D. tripunctata* species group and the remaining three are included in a new group hereby named the *Drosophila antioquia* species group, as they apparently form a monophyletic group and share the following common features: tips of longitudinal wing veins darkened and the area of the wing cells around them somewhat clouded; anterior and posterior crossveins straight, clouded; four strong prescutellar setae. Illustrations of terminalia and photomicrographs of wings are provided.

Keywords: Brazil, Colombia, Venezuela, Mexico, *Drosophila*, new species.

INTRODUCTION

While preparing two recent papers (VILELA & BÄCHLI, 2000, BÄCHLI *et al.*, 2000), we have studied series of specimens of *Drosophila* loaned from the American Museum of Natural History (AMNH, New York). Three undescribed species of the *D. tripunctata* group were included, of which two will be described in this paper. In addition, there were five males and one female which could at first sight be identified as *D. flexa*, but differed mainly in having the posterior crossvein (dM-Cu) of the wings straight rather than conspicuously sigmoid-shaped, as present in the species of the subgenus *Siphlodora*. Also remarkable was the presence in the wings of clouds or infuscations over both crossveins (R-M and dM-Cu) as well as around the tips of some longitudinal veins, especially a somewhat roundish darkened area in the cells r_{2+3} and m_1 , so far known to occur only in the Neotropical species *D. flexa*. Based on the external morphology as well as on the structure of the terminalia we believe that this remarkable similarity is due to convergence rather than to a close relationship. Similar wing spots, although much better defined, are also present in other drosophilid genera, for instance in the Palearctic *Gitona distigma* MEIGEN (SÉGUY, 1934: plate XII) and in the Neotropical *Cladochaeta abarista* GRIMALDI & NGUYEN (1999: 261).

MATERIAL AND METHODS

Label data attached to each type specimen are cited in full with a slash indicating a label change. Our own notes or interpretations are included in brackets (also in other items throughout the text).

¹ Departamento de Biologia, Instituto de Biociências, Universidade de São Paulo, Caixa Postal 11461, São Paulo - SP, 05422-970, Brazil. E-mail: crvilela@ib.usp.br

² Zoologisches Museum, Universität Zürich, Winterthurerstrasse 190, CH-8057, Zürich, Switzerland. E-mail: baechli@zoolmus.unizh.ch

Preparations of microscope slides were made following WHEELER & KAMBYSELLIS (1966) and KANESHIRO (1969). The abdominal structures, including the disarticulated terminalia, are preserved in microvials filled with glycerin and attached by the stopper to the pin of the respective specimen. For more details see VILELA & BÄCHLI (2000).

Illustrations were drawn using a microscope with an objective 20x and a camera lucida (1.8x). Whenever males and females were available, usually nine drawings of the terminalia were made for each species (8 for males, 1 for females) as follows: oblique posterior view of the epandrium and associated structures, posterior view of surstylus and decastrum, five views (clockwise from dorsal through ventral) of the aedeagus and associated structures, posterior view (also lateral view for *D. loewi*) of hypandrium and associated structures and a lateral view of the left oviscapt valve. Photomicrographs were taken of the following structures: right wing, aedeagus and associated structures in dorsal and left lateral views, right and left oviscapt plates and inner spermathecal capsules in lateral views. Whenever in the same plate, all figures were drawn to the same scale and all photomicrographs were taken and enlarged to the same magnification.

For measurements and indices see VILELA & BÄCHLI (1990), for morphological terminology see VILELA & BÄCHLI (2000).

All specimens are deposited in the American Museum of Natural History, New York (AMNH).

***Drosophila tripunctata* species group**

Species included: 64. See VILELA (1992), BÄCHLI *et al.* (2000) and the present paper.

Diagnosis. See FROTA-PESSOA, 1954:259.

***Drosophila (Drosophila) cundinamarca* sp. nov.**

(Figs 1A–H, 6A, 7A, 8)

Material examined. Holotype ♂ (dissected, right wing in microslide), labelled “Bogota 32 klm. w Colombia / WBHEED Nov. 1955 / 94.2 / *Drosophila cundinamarca* ♂ Vilela & Bächli det. 1999 / Holotype”; paratype ♀: same labels as holotype except sex, both deposited in AMNH. Type locality: 32 km West of Bogotá, Cundinamarca, Colombia.

Diagnosis. Aedeagus strongly flattened laterally, convex ventrally (Fig. 1D–H, 8A, B).

Description (n= 2). Head mainly brownish-yellow. Frontal length 0.32–0.34 mm, frontal index 0.71–0.79, top to bottom width ratio 1.18–1.25. Frontal triangle indistinct, microtrichose, apically pointed, about 0.90x frontal length; ocellar triangle darker, about 0.30x frontal length. Frontorbital plates narrow, apically diverging from eye margin, microtrichose, about 0.80x frontal length. Orbital setae equidistant, in a line, distance of posterior orbital seta to anterior one about equal to that to inner vertical seta. Postocellar setae convergent but not crossed. Carina longitudinally slightly grooved. Length ratio of anterior to posterior orbital 0.72–0.79, of mid to anterior orbital 0.27–0.38; poc 0.58x–0.65x, oc 0.79x frontal length; vt index 1.06–1.11; vibrissal index 0.85–0.90. Cheek index about 10. Eye darker (brownish) along frons and face (might be an artifact), index 1.17–1.19. First flagellomere brownish; length to width ratio 1.67–1.83. Arista with 5 upper and 2 lower long branches, plus terminal fork, inner branches relatively short. Proboscis and palpi yellow.

Drosophila cundinamarca

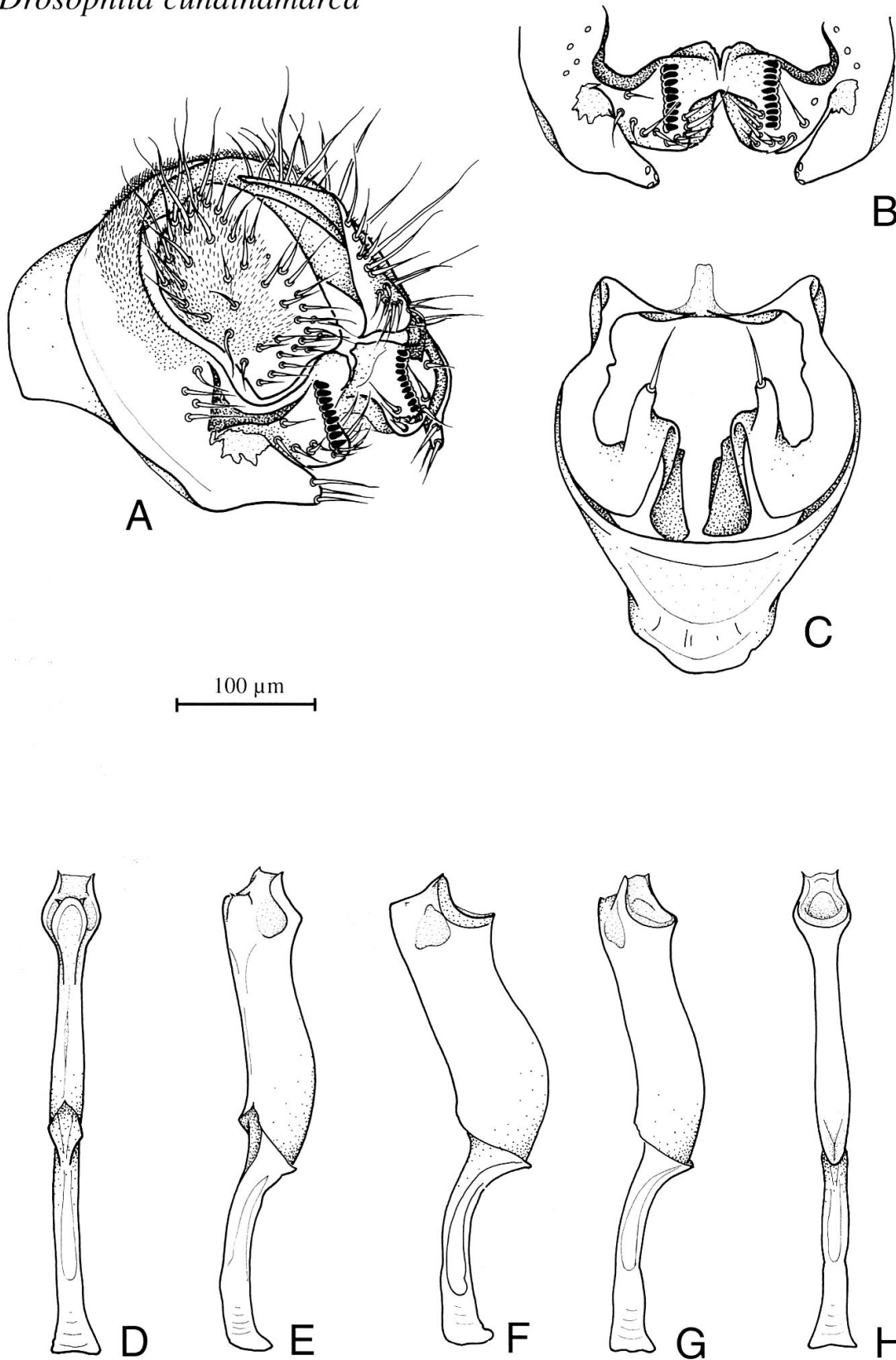


Fig. 1. *Drosophila (Drosophila) cundinamarca* sp. nov., holotype ♂. A, epandrium, cerci, surstyli and decasternum; oblique posterior view. B, surstyli, decasternum and ventral lobes of epandrium; posterior view. C, hypandrium, gonopods and paraphyses; posterior view. D-H, aedeagus and aedeagal apodeme; several views from dorsal through ventral.

Thorax brownish-yellow; length in ♂ 1.22 mm, in ♀ 1.45 mm; h index 0.93; six rows of acrostichal setulae. Scutum subshiny, without pattern. Transverse distance of dorsocentral setae about 2.3x longitudinal distance; dc index 0.59–0.68. Scutellum apically rounded, longish; basal scutellar setae slightly divergent, apical ones closer together; scut index 0.70–1.03; sterno index 0.68–0.70, mid katepisternal seta about 0.89x length of the anterior one. Halteres and legs yellow. Tarsomere 1 of hind leg with 2 yellow, basoventral setae. Preapical setae on all tibiae, apical setae on mid tibia.

Wing (Fig. 7A) hyaline, both crossveins slightly clouded; length in ♂ 3.10 mm, in ♀ 3.50 mm; length to width ratio 2.41–2.47. Indices: C, 3.38–3.56; ac, 2.00–2.10; hb, 0.22–0.24; 4c, 0.67–0.70; 4v, 1.41–1.53; 5x, 1.25–1.40; M, 0.37–0.47; prox. X, 0.48–0.50.

Abdomen shining yellowish-brown, tII–tIV with a diffuse, medially interrupted marginal band.

♂ *Terminalia* (Figs 1A–H, 8A, B). Epandrium with about 4 lower and no upper setae; ventral lobe with 3 setae at tip. Cerci linked to epandrium by membranous tissue. Surstylus not microtrichose, with 9–10 short, cone-shaped prenisetae, 5–6 long outer setae and 4–5 long inner setae. Decasternum as in Fig. 1B. Hypandrium as long as epandrium; bow membranous in the middle region, gonopod fused to paraphysis, bearing one seta. Aedeagus strongly flattened laterally, ventrally remarkably convex anteriorly and concave subapically, with two small pointed tips apically; subapically with two tiny spines at dorsal surface and laterally slightly membranous. Aedeagal apodeme shorter than aedeagus, laterally flattened. Ventral rod absent.

♀ *Terminalia*. Valves of oviscapt as in Figs 6A, 8C, D, with about 16 marginal and 8 discal peglike ovisensilla. Spermathecal capsule somewhat oval (Fig. 8E), sclerotized; introvert long.

Etymology. Named in allusion to the type locality.

Relationship. Although according to the external morphology and terminalia this species seems to be a member of the *D. tripunctata* group, its aedeagus has little similarity with any other of the species so far described in that group. For this reason, we are not ascribing it to any of the subgroups proposed by FROTA-PESSOA (1954).

***Drosophila (Drosophila) loewi* sp. nov.**

(Figs 2, 9A, B)

Material examined. Holotype ♂ (dissected, wings missing), labelled “MEXICO: Yucatan Merida H.69.33 IX/22–IX/23/55 W.B. HEED / *Drosophila loewi* ♂ Vilela & Bächli det. / Holotype”, deposited in AMNH.

Type locality: Mérida, Yucatán, Mexico.

Diagnosis. Aedeagus mostly similar to that of *D. tripunctata*, differing from it by having a pair of larger and more serrated ear-shaped laterodistal expansions (Figs 2E–I, 9A, B), medially incised gonopods (in lateral view, Fig. 2C) and a much more microtrichose cerci, mainly in their subventral area (Fig. 2A).

Description. Head mainly yellowish-brown. Frontal length 0.32 mm. Frontal triangle microtrichose, narrowly reaching anterior margin. Orbital setae subequidistant. Postocellar setae convergent, not crossed. Length ratio of anterior to posterior orbital seta 0.76, of mid to anterior orbital seta 0.38; vt index 1.00; vibrissal index 0.42. Cheek index about 14. First flagellomere yellowish-brown. Arista with 8 upper and 4 lower long branches, plus terminal fork, inner branches relatively long. Proboscis and palpi yellow.

Drosophila loewi

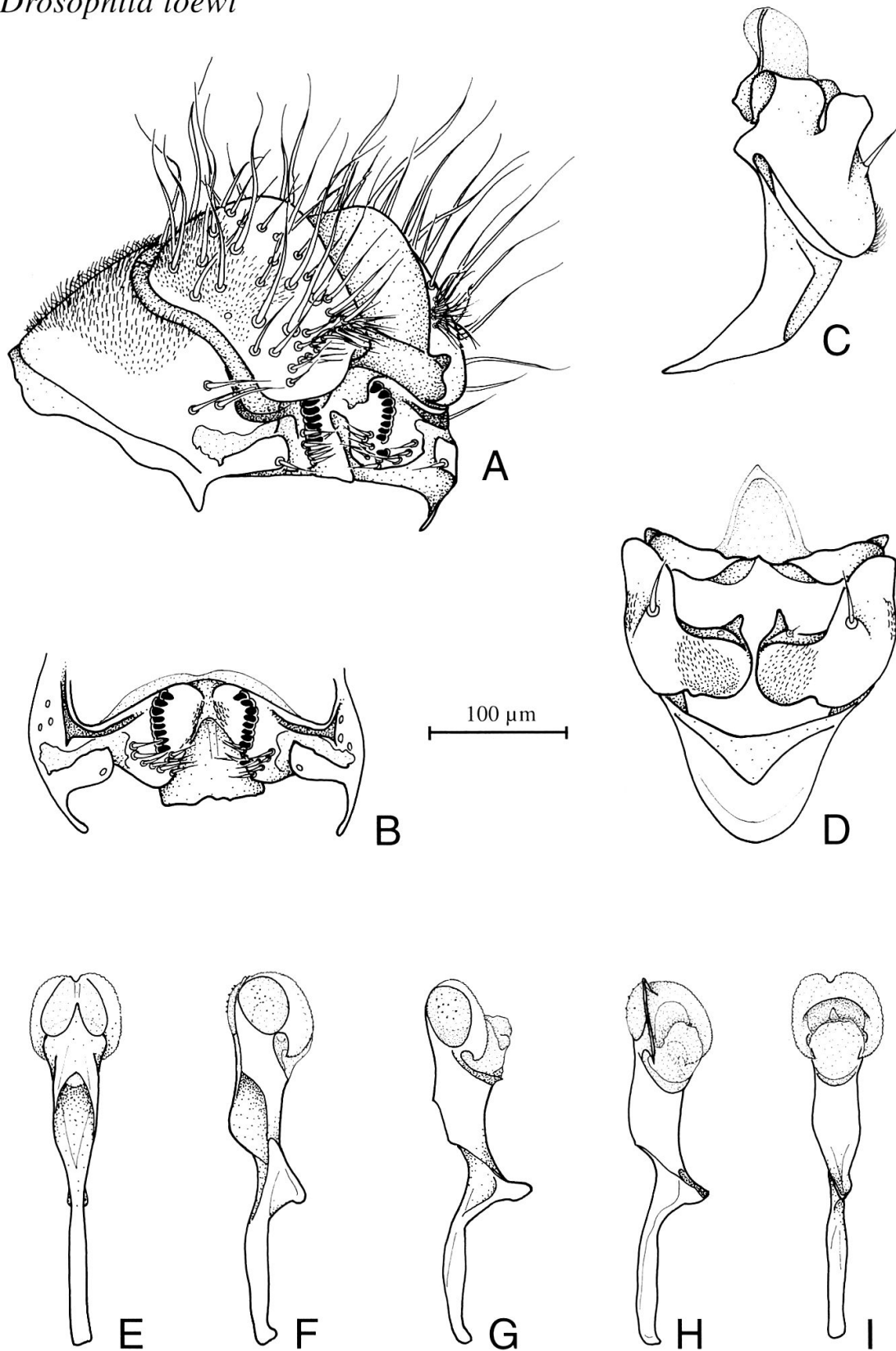


Fig. 2. *Drosophila (Drosophila) loewi* sp. nov., holotype ♂. A, epandrium, cerci, surstyli and decasternum; oblique posterior view. B, surstyli, decasternum and ventral lobes of epandrium; posterior view. C, hypandrium, paraphyses and gonopods; left lateral view. D, idem, posterior view. E–I, aedeagus and aedeagal apodeme; several views from dorsal through ventral.

Thorax brownish-yellow; length about 1.35 mm; h index 0.83; six rows of acrostichal setulae. Scutum subshiny brownish, without pattern. Transverse distance of dorsocentral setae about 2.20x longitudinal distance; dc index 0.64. Scutellum apically rounded; scutellar setae nearly equidistant; sterno index 0.50, mid katepisternal seta about 0.75x length of the anterior one. Halteres and legs yellow. Preapical setae on all tibiae; apical setae on mid tibia.

Wings missing.

Abdomen brownish-yellow, with diffuse marginal bands, medially slightly broadened on tIII + tV.

♂ *Terminalia* (Figs 2, 9A, B). Epandrium with 3 lower and no upper setae; ventral lobe somewhat square-shaped, with one ventroapical seta. Cerci with a conspicuous tuft of small setae in the subventral area, anteriorly linked to epandrium by membranous tissue. Surstylus anterodorsally strongly sclerotized, not microtrichose, with short, cone-shaped prenisetae, 5 long outer setae and 4 long inner setae. Decasternum as in Fig. 2B. Hypandrium shorter than epandrium; bow present, dorsomedially membranous, gonopod laterally incised at the middle of the posterior margin, fused to paraphysis, bearing one large outer seta and one inner setula; paraphysis microtrichose and gonopod laterally rugose on the outer submedial surface. Aedeagus straight, laterally expanded and slightly invaginated at tip, dorso-subapically membranous and covered with tiny spines, bearing a pair of latero-distal ear-shaped expansions, marginally serrated. Aedeagal apodeme as long as aedeagus, laterally flattened. Ventral rod triangle-shaped.

Etymology. Named in honor of one of the most prominent dipterists of the nineteenth century Hermann LOEW (1807–1879), who described *D. tripunctata*, later used to nominate the second largest group of *Drosophila* species of the New World.

Relationship. This species most closely resembles *D. tripunctata* LOEW, 1862, known from the Nearctic Region, especially by the presence of microtrichose paraphyses and the general appearance of the aedeagus. It seems that the two species are closely related; hence *D. loewi* is ascribed to the subgroup IV (FROTA-PESSOA, 1954) of the *tripunctata* group.

Note. Although the male holotype and only known specimen lacks both wings, its terminalia are very distinctive and easily separable from other known species belonging to the *tripunctata* group.

***Drosophila antioquia* species group, new group**

Species included: *Drosophila antioquia* sp. nov., *D. caripe* sp. nov. and *D. freiremaiai* sp. nov.

Diagnosis. Tips of longitudinal wing veins darkened and the area of the wing cells around them somewhat clouded; anterior (R-M) and posterior (dM-Cu) cross-veins straight, clouded; four strong prescutellar setae; prenisetae cone-shaped and sharply pointed, not well differentiated from the remaining surstylus setae, dorsal cleft of aedeagus at the very proximal end; ventral rod bifid; gonopod microtrichose.

***Drosophila (Drosophila) antioquia* sp. nov.**

(Figs 3, 7B, 9C, D)

Material examined. Holotype ♂ (dissected, right wing in microslide), labelled “Medellin COLOMBIA / WBHEED Nov. 1955 / 89.29 / *Drosophila antioquia* ♂ Vilela & Bächli det. 1999 / Holotype”, 2 ♂ ♂ paratypes: same labels as holotype, deposited in AMNH. Type locality: Medellín, Antioquia, Colombia.

Drosophila antioquia

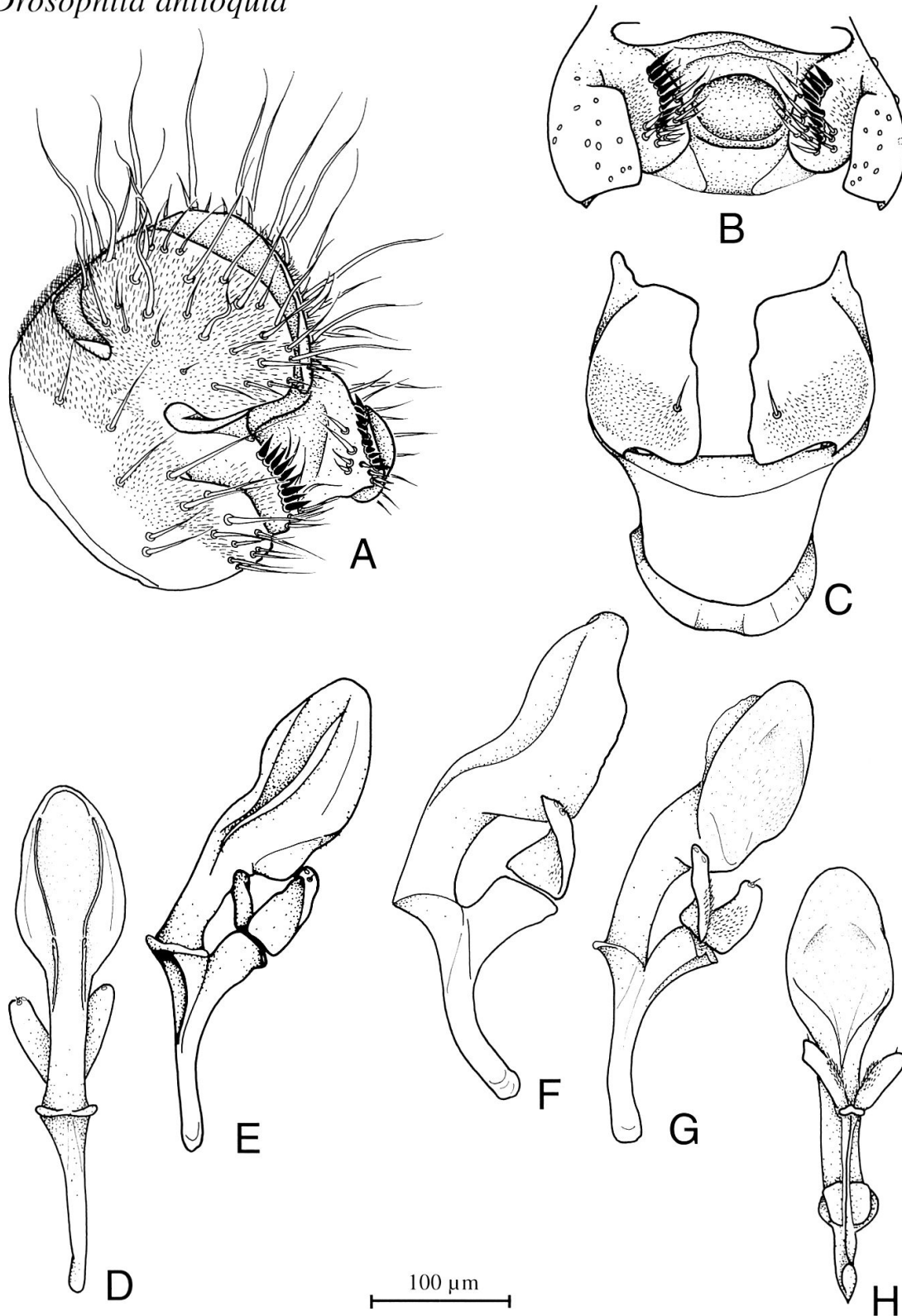


Fig. 3. *Drosophila (Drosophila) antioquia* sp. nov., holotype ♂. A, epandrium, cerci, surstyli and decasternum; oblique posterior view. B, surstyli, decasternum and ventral lobes of epandrium; posterior view. C, hypandrium and gonopods; posterior view. D-H, aedeagus, aedeagal apodeme and paraphyses; several views from dorsal through ventral.

Diagnosis. Prensisetae cone-shaped and sharply pointed, not well differentiated from the remaining surstylus setae; aedeagus with two dorsal keels; dorsal cleft of aedeagus positioned at the very proximal end, paraphyses widely microtrichose on the inner surface. Otherwise with group characters.

Description (n = 3). Head mainly yellowish. Frontal length 0.37–0.44 mm, frontal index 1.00–1.10, top to bottom width ratio 1.11–1.20. Frontal triangle microtrichose, apically narrowed, about 0.65x frontal length; ocellar triangle darker, about 0.35x frontal length. Frontorbital plates narrow, diverging from eye margin in apical third, microtrichose, about 0.85x frontal length. Orbital setae almost equidistant, in a line, distance of posterior orbital seta to anterior one about 0.70x that to inner vertical seta. Postocellar setae convergent but not crossed. Length ratio of anterior to posterior orbital seta 0.94–1.00, of mid to anterior orbital 0.62–0.67; poc 0.45x–0.55x, oc 0.73x–0.85x frontal length; vt index 0.88–1.06; vibrissal index 0.29–0.43. Cheek index 7–11. Eye index 1.30–1.34. First flagellomere yellowish; length to width ratio 1.50–1.83. Arista with 4 upper and 2–3 lower long branches, plus terminal fork, inner branches relatively short. Proboscis and palpi yellow.

Thorax yellowish-brown; length 1.09–1.52 mm; h index 0.81–0.88; six (8 in one specimen) rows of acrostichal setulae. Scutum subshiny, brownish, with 2 diffuse paramedian brown stripes, about 3/4 length of scutum and 2 similar lateral stripes, which are interrupted at the transverse suture. Transverse distance of dorsocentral setae about 3x longitudinal distance; dc index 0.58–0.65. Scutellum apically rounded, paler than scutum; scutellar setae nearly equidistant; basal ones diverging; scut index 0.94–0.97; sterno index 0.54–0.75, mid katapisternal seta 0.78x–1.11x length of the anterior one. Four prescutellar setae, the inner pair distinctly longer. Halteres and legs yellow. Preapical setae on all tibiae, apical setae on mid tibiae.

Wing (Fig. 7B) generally hyaline, tips of C-I, R₂₊₃, R₄₊₅ and M slightly clouded, both crossveins straight and distinctly clouded; the spot on R₂₊₃ roundish as in *D. flexa*; length 2.15–2.67 mm; length to width ratio 2.10–2.27. Indices: C, 2.87–3.93; ac, 1.67–2.00; hb, 0.56–0.61; 4c, 0.60–0.89; 4v, 1.48–1.67; 5x, 0.88–1.11; M, 0.39–0.50; prox. X, 0.60–0.75.

Abdomen subshiny, basally yellowish-brown, gradually becoming brown towards tip, no distinct pattern.

♂ *Terminalia* (Figs 3, 9C, D). Epandrium with about 5 lower and 1 upper setae; ventral lobe with about 9 long setae. Cerci anteriorly fused to epandrium at lower half. Surstylus microtrichose, with 9–10 long, cone-shaped, sharply pointed prensisetae, and 8 long inner setae. Decasternum heavily sclerotized, strongly concave. Hypandrium as long as epandrium; bow absent, gonopod linked to paraphyses by membranous tissue, bearing one seta, microtrichose on posterior half. Aedeagus tilde-shaped in profile, submedially concave dorsally and convex ventrally; dorsal surface bearing two submedian ridges on the posterior two thirds; ventrodistal half with a spinose membranous surface. Dorsal cleft at the very proximal end of aedeagus. Aedeagal apodeme shorter than aedeagus, bent and rod-shaped. Ventral rod distally bifid, laterally flattened, trapezoid-shaped, as long as paraphysis. Paraphysis triangle-shaped, bearing three subdistal setae, microtrichose on the inner surface, linked anteriorly to distal margin of ventral rod by membranous tissue.

Etymology. Named in allusion to the type locality.

Drosophila (Drosophila) caripe sp. nov.

(Figs 4, 7C, 9E, F)

Material examined. Holotype ♂ (dissected, right wing in microslide), labelled "Venezuela Caripe / M. WASSERMAN Oct-Nov 1956 / *Drosophila caripe* ♂ Vilela & Bächli det. 1999 / Holotype",

Drosophila caripe

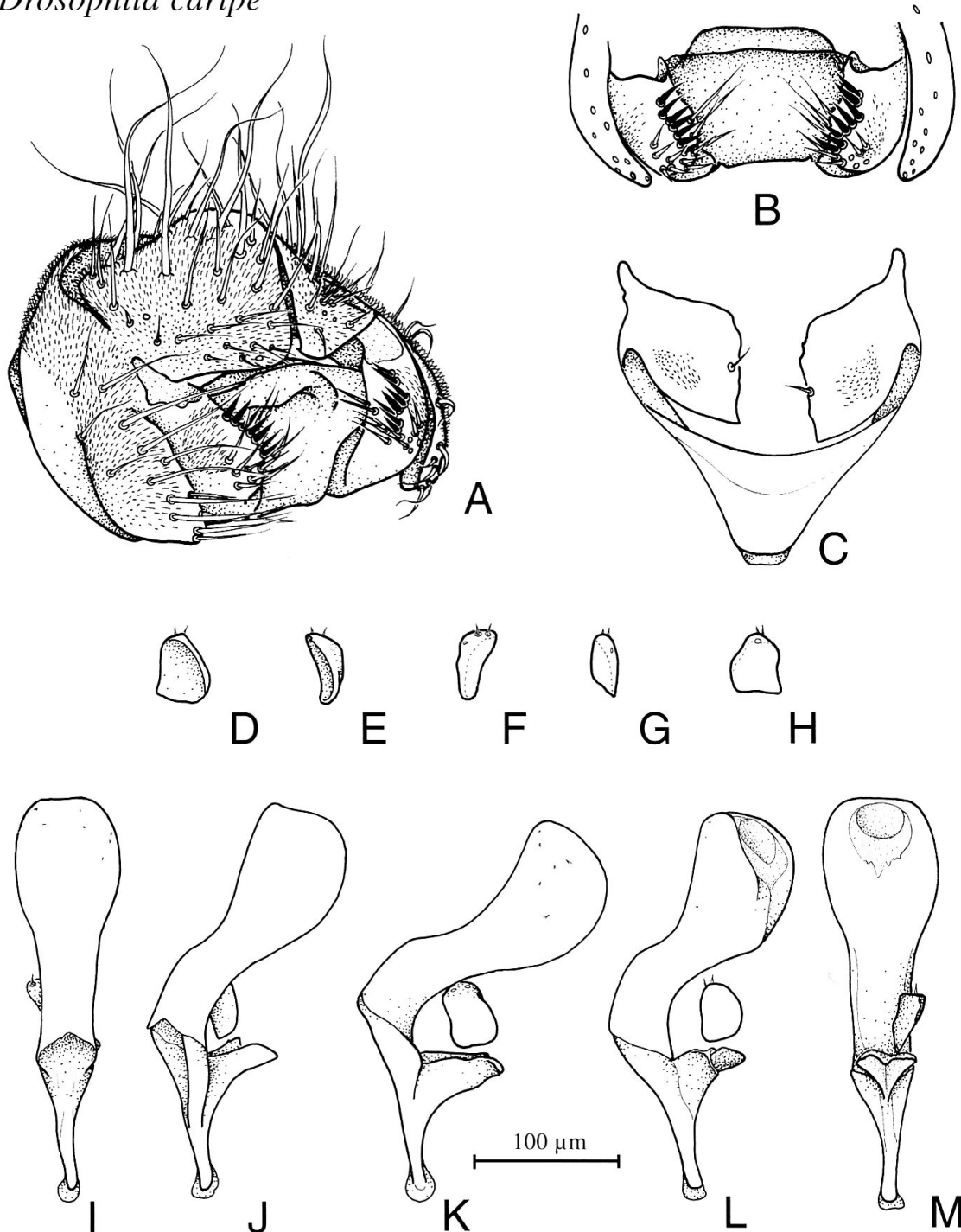


Fig. 4. *Drosophila (Drosophila) caripe* sp. nov., holotype ♂. A, epandrium, cerci, surstyli and decasternum; oblique posterior view. B, surstyli, decasternum and ventral lobes of epandrium; posterior view. C, hypandrium and gonopods; posterior view. D-H, left paraphysis; several views. I-M, aedeagus, aedeagal apodeme and right paraphysis; several views from dorsal through ventral.

deposited in AMNH. The specimen is badly damaged, having lost most of its setae and the distal region of the left wing.

Type locality: Caripe, Sucre, Venezuela.

Diagnosis. Prensisetae as in *D. antioquia* sp. nov.; dorsal cleft of aedeagus positioned at the very proximal end; aedeagus extremely similar to that of *D. freiremaiai* sp. nov. but differing from the latter by having much more microtrichose surstyli, a larger proximal half, a less dilatate distal end and smaller paraphyses. Otherwise with group characters.

Description. Head mainly brownish-yellow. Frontal length 0.39 mm, frontal index 1.21, top to bottom width ratio 1.05. Frontal triangle microtrichose, apically narrowed, about 0.75x frontal length; ocellar triangle darker, about 0.40x frontal length. Frontorbital plates apically diverging from eye margin, about 0.80x frontal length. Orbital setae subequidistant, in a line, distance of posterior orbital seta to anterior one about 0.85x that to inner vertical seta. Cheek index about 9. Eye index about 1.37. Proboscis and palpi yellow. Carina slightly broadened downwards, slightly grooved dorsally.

Thorax yellowish-brown; length about 1.12 mm. Scutum subshiny, without pattern. Transverse distance of dorsocentral setae about 2.5x longitudinal distance; dc index 0.54. Scutellum apically rounded; basal scutellar setae slightly divergent; scut index 0.96. Halteres and legs yellow. Four subequal prescutellar setae.

Wing (Fig. 7C) hyaline, slightly darker along costal margin, both crossveins and tips of C-I, R₂₊₃, R₄₊₅ and M clouded, the cloud infuscation of R₂₊₃ larger, roundish; length 2.00 mm; length to width ratio 2.20. Indices: C, 2.93; ac, 1.75; hb, 0.57; 4c, 0.78; 4v, 1.44; prox. X, 0.83.

Abdomen without pattern, brownish-yellow at base, becoming darker towards tip.

♂ *Terminalia* (Figs 4, 9E, F). Epandrium with about 2 lower and no upper setae, ventral lobe roundish, with about 12 long setae. Cerci anteriorly fused to epandrium at lower half. Surstylus microtrichose, with 7–8 long, cone-shaped, sharply pointed, not well defined prensisetae, 5–6 outer and 5 long inner setae. Decasternum heavily sclerotized, strongly concave. Hypandrium shorter than epandrium; bow absent, gonopod medially microtrichose, linked to paraphyses by membranous tissue, bearing one small seta. Aedeagus bent, dorsally concave, distally dilated. Aedeagal apodeme shorter than aedeagus, bent, rod-shaped. Ventral rod distally bifid, laterally flattened, as long as paraphyses. Paraphyses proximally angular, and bearing three subdistal setae; linked anteriorly to the dorsal margin of the ventral rod by membranous tissue.

Etymology. Named in allusion to the type locality.

***Drosophila (Drosophila) freiremaiai* sp. nov.**

(Figs 5, 7D, 9G, H)

Material examined. Holotype ♂ (dissected, right wing in microslide), labelled “Marko Brazil nr. Leticia / WBHEED HLCARSON Aug. 1960 / *Drosophila freiremaiai* ♂ Vilela & Bächli det. 1999 / Holotype”, deposited in AMNH.

Type locality: Marko, Amazonas, Brazil.

Diagnosis. Prensisetae as in *D. antioquia* sp. nov.; dorsal cleft of aedeagus positioned at the very proximal end; aedeagus extremely similar to that of *D. caripe* sp. nov., differing from the latter by having less microtrichose surstyli, a narrower proximal half, a conspicuously dilatate distal end and much larger paraphyses. Otherwise with group characters.

Drosophila freiremaiai

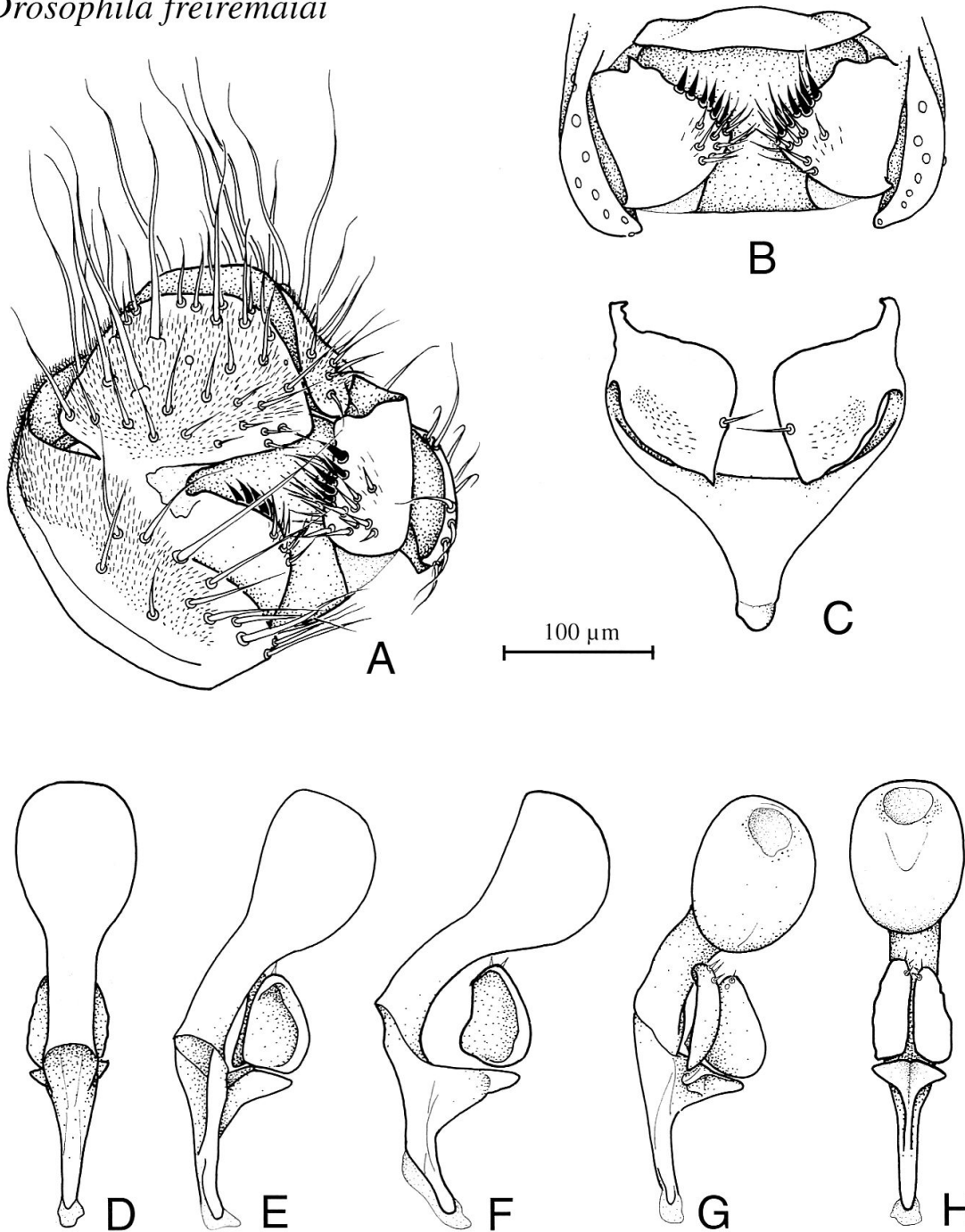


Fig. 5. *Drosophila (Drosophila) freiremaiai* sp. nov., holotype ♂. A, epandrium, cerci, surstyli and decasternum; oblique posterior view. B, surstyli, decasternum and ventral lobes of epandrium; posterior view. C, hypandrium and gonopods; posterior view. D-H, aedeagus, aedeagal apodeme and paraphyses; several views from dorsal through ventral.

Description. Head mainly yellowish brown. Frontal length 0.39 mm, frontal index 1.05, top to bottom width ratio 1.05. Frontal triangle microtrichose, apically narrowed, about 0.75x frontal length; ocellar triangle darker, about 0.35x frontal length. Frontorbital plates apically slightly diverging from eye margin, microtrichose, about 0.80x frontal length. Orbital setae equidistant, in a line, distance of posterior orbital to anterior one about 0.85x that to inner vertical setae. Postocellar

setae slightly converging. Length ratio of anterior to posterior orbital seta 1.00, of mid to anterior orbital seta 0.75; poc 0.52x, oc 0.83x frontal length; vt index 0.94; vibrissal index 0.36. Cheek index about 13. Eye index about 1.38. First flagellomere yellowish; length to width ratio 1.83. Arista with 4 upper and 2 lower long branches, plus terminal fork, inner branches relatively long. Proboscis and palpi yellow. Carina relatively narrow, longitudinally slightly grooved.

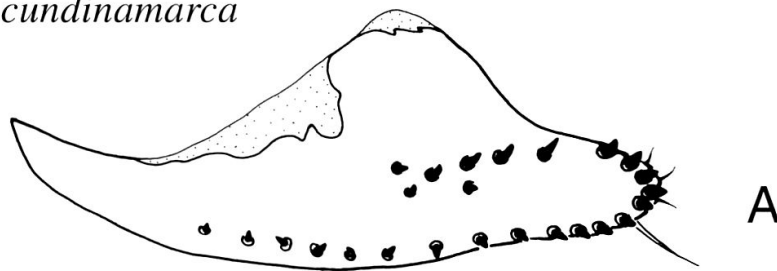
Thorax yellowish-brown; length 1.19 mm; h index 0.81; eight rows of acrostichal setulae. Scutum, subshiny, without pattern. Transverse distance of dorso-central setae about 3x longitudinal distance; dc index 0.67. Scutellum apically rounded, paler than scutum; scutellar setae nearly equidistant; scut index 1.04; sterno index 0.70, mid katepisternal seta about 0.80x length of the anterior one. Four pre-scutellar setae, subequal in length. Halteres and legs yellowish-brown.

Wing (Fig. 7D) generally hyaline, dark brown along both crossveins and tips of C-I, R₂₊₃, R₄₊₅ and M clouded, the marking on R₂₊₃ large, roundish; length 1.90 mm; length to width ratio 2.10. Indices: C, 3.33; ac, 2.00; hb, 0.50; 4c, 0.67; 4v 1.44; 5x, 1.30; M, 0.50; prox. X, 0.56.

Abdomen subshiny yellowish-brown, slightly darker towards tip, without pattern.

♂ *Terminalia* (Figs 5, 9G, H). Epandrium with about 3 lower and no upper setae, ventral lobe roundish, with about 9 long setae. Cerci anteriorly fused to epan-

Drosophila cundinamarca



Drosophila sp. 1

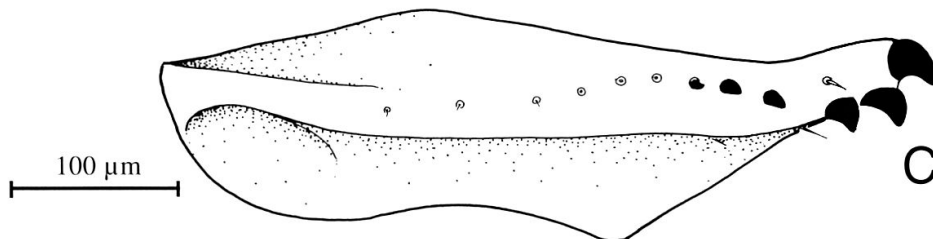
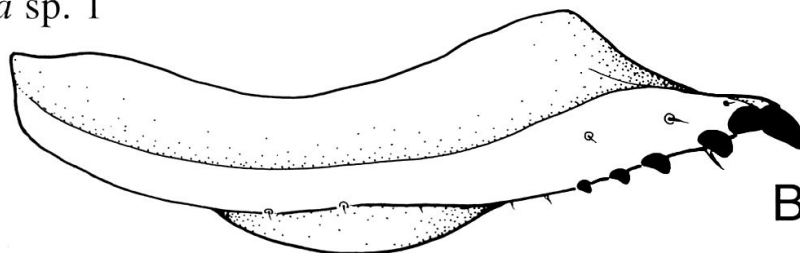
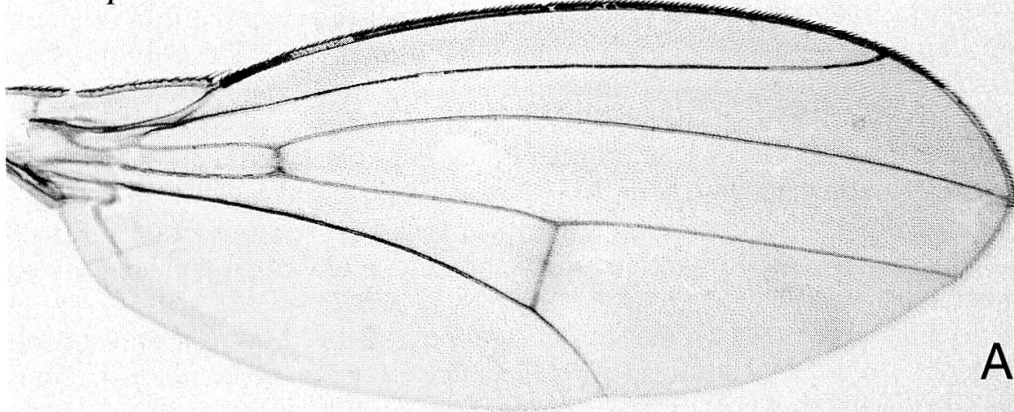
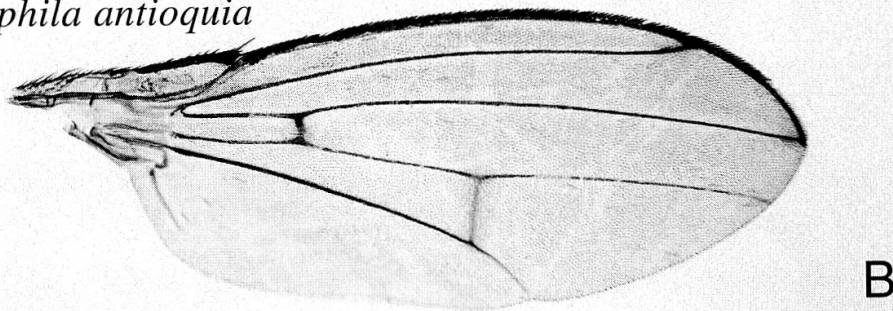


Fig. 6. Left oviscapt valves: A, *Drosophila (Drosophila) cundinamarca* sp. nov., paratype ♀, lateral view. B, *Drosophila* sp. 1 (*Drosophila antioquia* species group), ♀ from Volcan Santa Ana, El Salvador, Nov-1953, W.B. HEED coll., lateral view. C, same specimen, ventrolateral view.

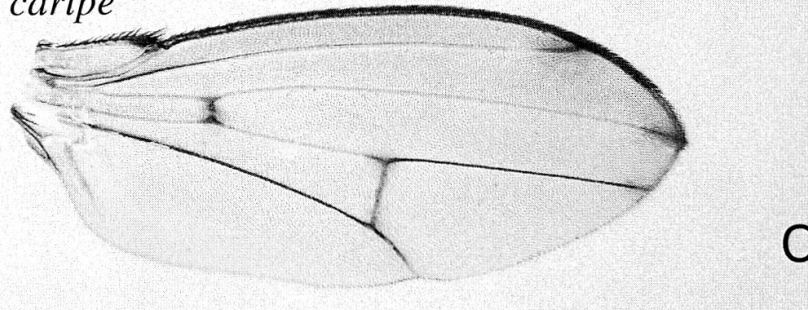
Drosophila cundimarca



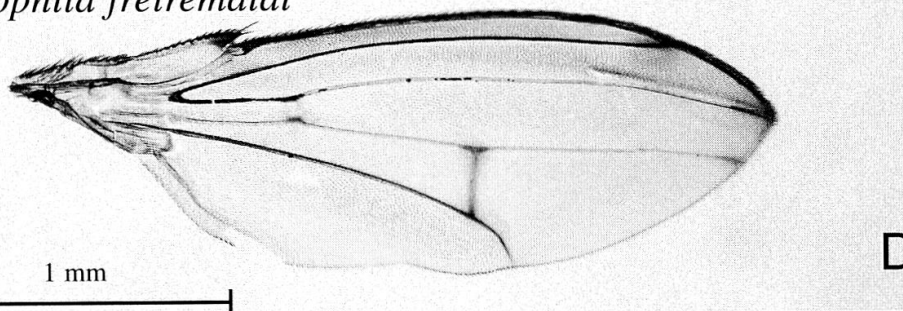
Drosophila antioquia



Drosophila caripe



Drosophila freiremaiai



1 mm

Fig. 7. Right wings (dorsal view) of: A, *Drosophila cundimarca* sp. nov. (holotype ♂); B, *Drosophila antioquia* sp. nov. (holotype ♂); C, *Drosophila caripe* sp. nov. (holotype ♂); D, *Drosophila freiremaiai* sp. nov. (holotype ♂).

drium at lower half. Surstylus anteriorly strongly sclerotized, slightly microtrichose, with 6–7 long, cone-shaped, sharply pointed prenisetae not well differentiated from the remaining surstylus setae, 6 outer and 8 long inner setae. Decasternum heavily sclerotized, strongly concave. Hypandrium shorter than epandrium; bow absent, gonopod submedially microtrichose, linked to paraphyses by membranous tissue, bearing one seta. Aedeagus bent, dorsally concave, distally dilated. Aedeagal apodeme shorter than aedeagus, bent, rod-shaped. Ventral rod laterally flattened, distally bifid, as long as paraphyses. Paraphysis proximally narrow, bearing three subdistal setae; linked anteriorly to the dorsal margin of aedeagal apodeme by membranous tissue.

Etymology. Named in honor of Dr. Newton FREIRE-MAIA, former drosophilist and founder of the Departamento de Genética of the Universidade Federal do Paraná, Curitiba, Paraná, Brazil.

Drosophila cundinamarca

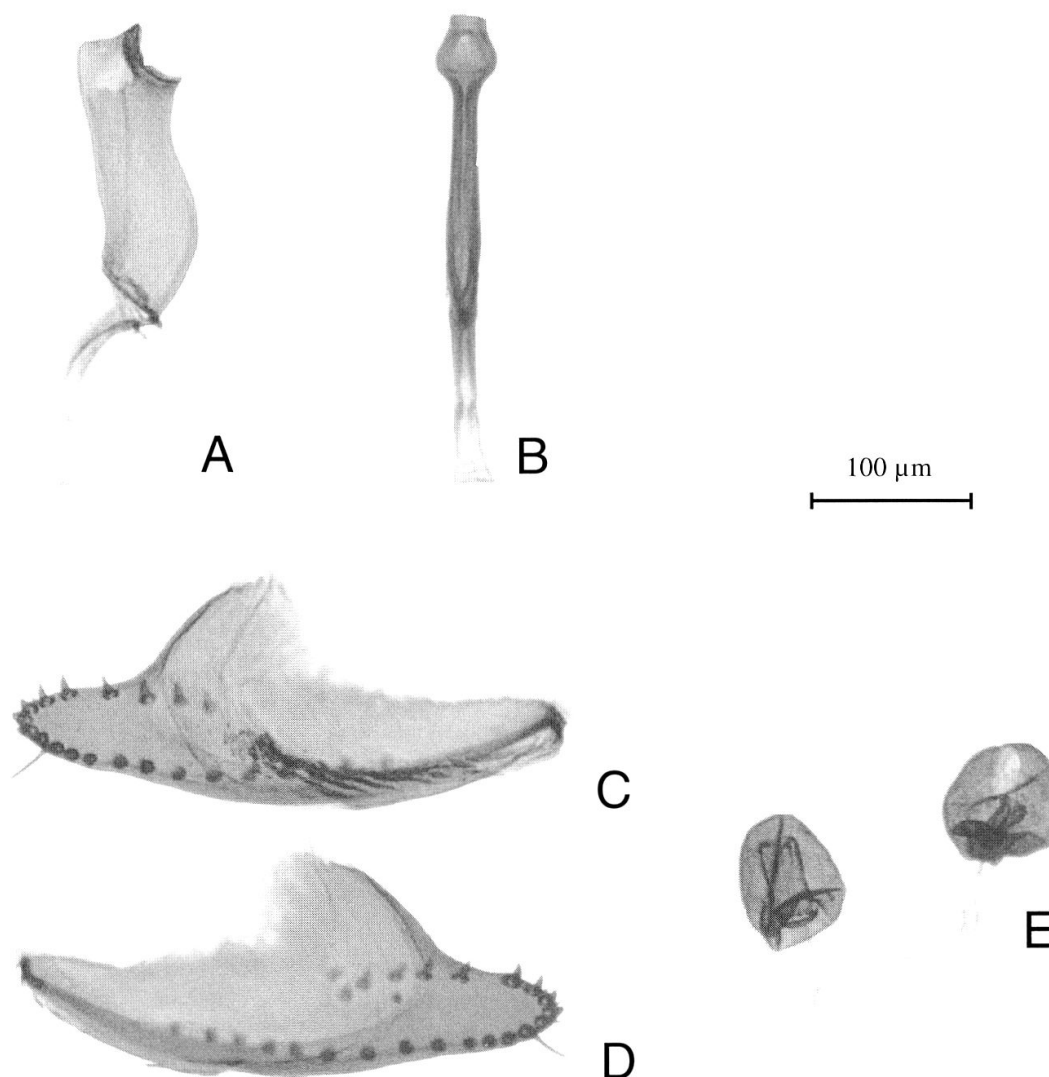


Fig. 8. *Drosophila (Drosophila) cundinamarca* sp. nov.: A, holotype ♂, aedeagus and aedeagal apodeme, left lateral view; B, idem, dorsal view. C, paratype ♀, right oviscapt valve; D, left oviscapt valve; E, inner spermathecal capsules, lateral view.

Drosophila sp. 1

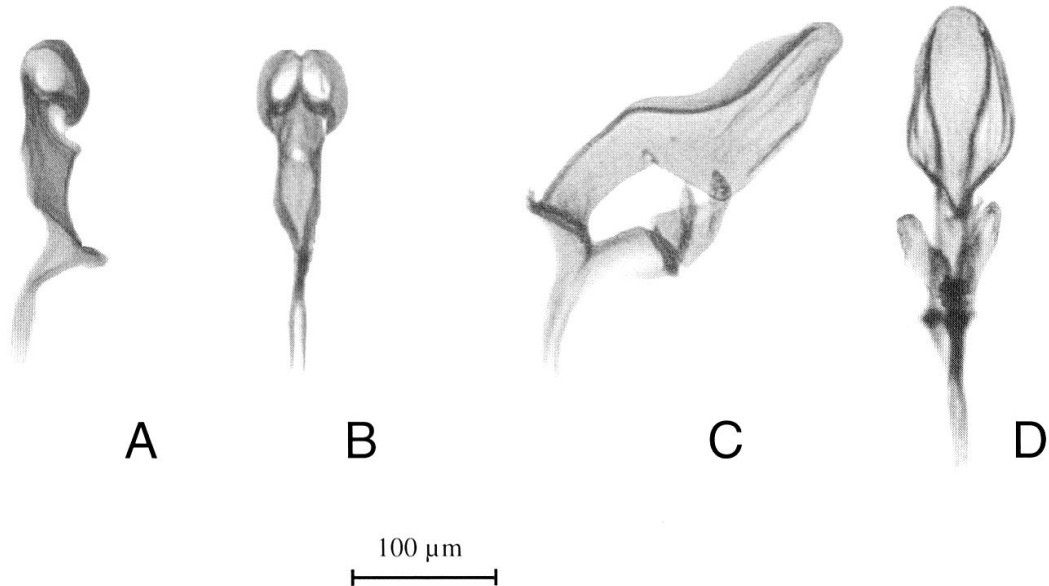
(Figs 6B, C, 10)

Material examined. One ♀ (AMNH) labelled: "Volcan Santa Ana 5670 ft 26.11 / Nov-1953 WBHEED / Rep de EL SALVADOR" / *Drosophila* sp. *antioquia* group Vilela & Bächli det. 1999.

This specimen is most similar to the three species of *Drosophila* known only from male specimens, included in the newly proposed *antioquia* species group, but we have so far been unable to associate it with certainty to any of them. We believe that this female could belong either to an undescribed species or to any of the three

Drosophila loewi

Drosophila antioquia



Drosophila caripe

Drosophila freiremaiai

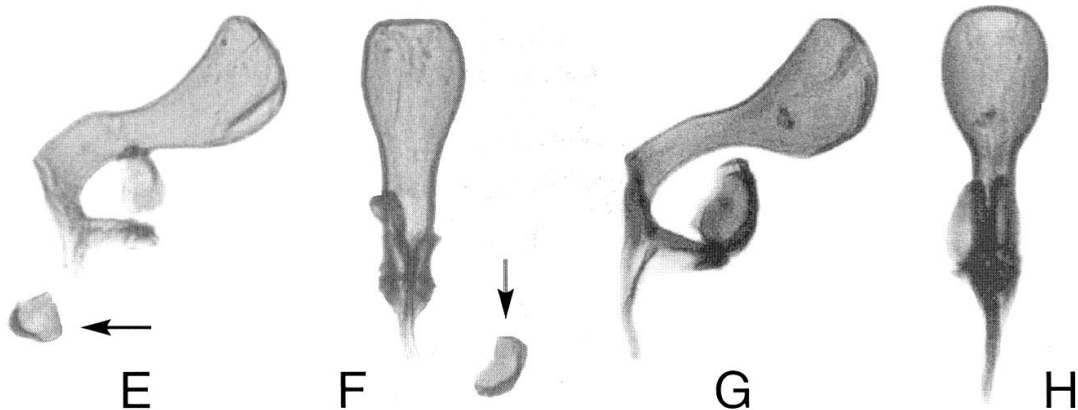


Fig. 9. Aedeagus, aedeagal apodeme and paraphyses (except for A and B): A, *Drosophila (Drosophila) loewi* sp. nov., holotype ♂, left lateral view; B, idem, dorsal view. C, *Drosophila (Drosophila) antioquia* sp. nov., holotype ♂, left lateral view; D, idem, dorsal view. E, *Drosophila (Drosophila) caripe* sp. nov., holotype ♂, left lateral view, the arrow points to the left paraphysis (accidentally disconnected from the aedeagus); F, idem, dorsal view. G, *Drosophila (Drosophila) freiremaiai* sp. nov., holotype ♂, left lateral view; H, idem, dorsal view.

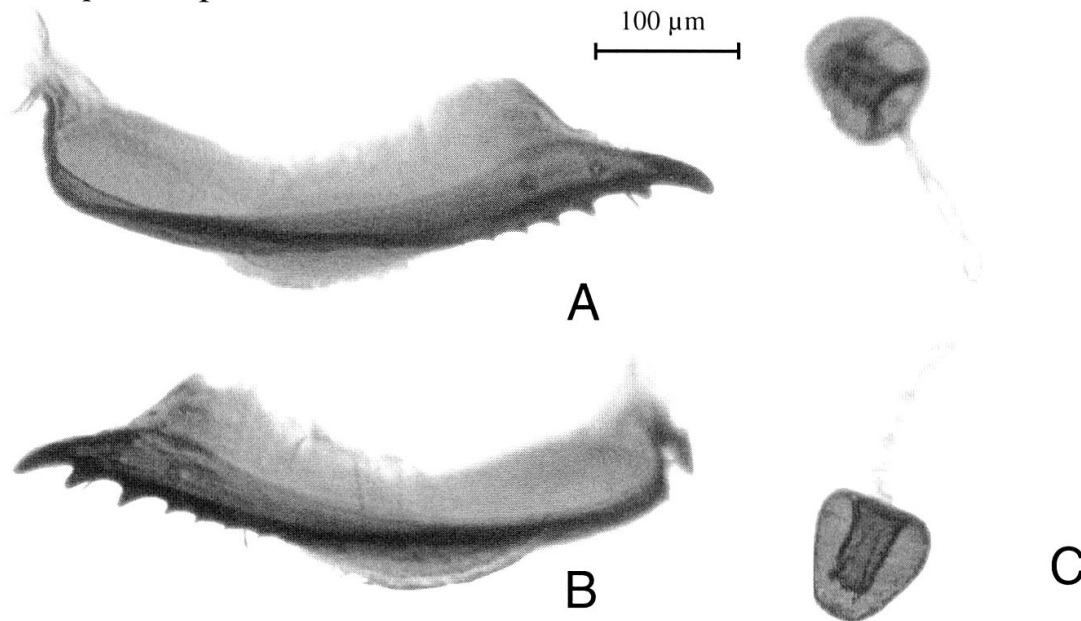
Drosophila sp. 1

Fig. 10. *Drosophila* sp. 1 (*Drosophila antioquia* species group), same specimen as in Fig. 6B, C: A, left oviscapt valve, lateral view; B, right oviscapt valve, lateral view; C, inner spermathecal capsules, lateral view.

species described above. However, it seems worthwhile to present some features of this female which could be useful for further analysis of these poorly known and apparently rare Neotropical flies.

Description. Head mainly yellowish. Frontal length 0.50 mm, frontal index 1.15, top to bottom width ratio 1.19. Frontal triangle microtrichose, apically narrowed, about 0.67x frontal length; ocellar triangle darker, about 0.37x frontal length. Frontorbital plates narrow, diverging from eye margin in apical third, microtrichose, about 0.80x frontal length. Orbital setae almost equidistant, in a line, distance of posterior orbital seta to anterior one about equal to that to inner vertical seta. Post-ocellar setae convergent but not crossed. Length ratio of anterior to posterior orbital seta 1.00; poc 0.43x frontal length; vt index 0.95. Cheek index 8. Eye index 1.35. First flagellomere yellowish; length to width ratio 1.71. Arista with 4 upper and 2 lower long branches, plus terminal fork, inner branches relatively short. Proboscis and palpi yellow. Carina slightly broadened downwards, dorsally grooved.

Thorax yellowish-brown; length 1.45 mm; h index 1.21; eight rows of acrostichal setulae. Scutum subshiny brownish, without pattern. Transverse distance of dorsocentral setae about 3x longitudinal distance; dc index 0.62. Scutellum apically rounded, paler than scutum; scutellar setae nearly equidistant; basal ones diverging; scut index 1.00; sterno index 0.64, mid katepisternal seta 0.89x length of the anterior one. Four prescutellar setae, the inner pair distinctly longer. Halteres and legs yellow. Preapical setae on all tibiae, apical setae on mid tibiae.

Wing generally hyaline, tips of C-I, R_{2+3} , R_{4+5} and M slightly clouded, the cloud infuscation of R_{2+3} roundish, both crossveins straight and distinctly clouded; length 2.67 mm; length to width ratio 2.31. Indices: C, 3.79; ac, 1.56; hb, 0.64; 4C, 0.64; 4v, 1.45; 5x, 1.00; M, 0.41; prox. X, 0.73.

Abdomen subshiny, basally yellowish-brown, gradually becoming brown towards tip, no distinct pattern.

♀ *Terminalia* (Figs 6B, C, 10). Valves of oviscapt strongly sclerotized, conspicuously keeled along the longitudinal submedian area, dorsoventrally flattened below the keel and laterally flattened above it, with about 12 marginal (6 peglike and 6 trichoidlike) and 2 (trichoidlike) discal ovisensilla. The structure of the six (especially the three distal ones) strong, spur-shaped ovisensilla somewhat recalls those found in most species of the *Drosophila flavopilosa* species group and may be related to oviposition in some unusual substrate. Inner spermathecal capsule (Fig. 10C) strongly sclerotized, somewhat cone-shaped, proximally ridged and distally spiny, recalling that found in the species of the *D. mesophragmatica* species group; introvert long.

ACKNOWLEDGMENTS

We are indebted to Pierre BRAUCHLI and Doro RÖTHLISBERGER for helping with digital image processing and to Dr. David A. GRIMALDI of the American Museum of Natural History for kindly loaning the specimens included in the present study.

REFERENCES

- BÄCHLI, G., VILELA, C.R., & RATCOV, V. 2000. Morphological differences among *Drosophila paraguayensis* DUDA, 1927 and its close relatives (Diptera, Drosophilidae). *Mitt. schweiz. ent. Ges.* 73(1–2): 67–92.
- FROTA-PESSOA, O. 1954. Revision of the *tripunctata* Group of *Drosophila* with Description of Fifteen New Species (Drosophilidae, Diptera). *Archos Mus. parana.* 1 (6): 253–304 + 23 plates.
- GRIMALDI, D.A. 1990. A Phylogenetic, Revised Classification of Genera in the Drosophilidae (Diptera). *Bull. Am. Mus. nat. Hist.* 197: 1–139.
- GRIMALDI, D. & NGUYEN, T. 1999. Monograph on the Spittlebug Flies, Genus *Cladochaeta* (Diptera: Drosophilidae: Cladochaetini). *Bull. Am. Mus. nat. Hist.* 241: 1–326.
- KANESHIRO, K.Y. 1969. A Study of the Relationships of Hawaiian *Drosophila* Species Based on External Male Genitalia. *Univ. Texas Publs* 6918: 55–70.
- SÉGUY, E. 1934. Diptères (Brachycères) (Muscidae Acalypterae et Scatophagidae). In: Faune de France, vol. 28, pp. 362–389. Paris, P. Lechevalier.
- VILELA, C.R. 1992. On the *Drosophila tripunctata* Species Group (Diptera, Drosophilidae). *Revta bras. Ent.* 36(1): 197–221.
- VILELA, C.R. & BÄCHLI, G. 1990. Taxonomic studies on Neotropical species of seven genera of Drosophilidae. *Mitt. schweiz. ent. Ges.* 63(Suppl.): 1–332.
- VILELA, C.R. & BÄCHLI, G. 2000. Morphological and ecological notes on the two species of *Drosophila* belonging to the subgenus *Siphlodora* PATTERSON & MAINLAND, 1944 (Diptera, Drosophilidae). *Mitt. schweiz. ent. Ges.* 73(1–2): 23–47.
- WHEELER, M.R. & KAMBYSELLIS, M.P. 1966. Notes on the Drosophilidae (Diptera) of Samoa. *Univ. Texas Publs* 6615: 533–565.

(received December 23, 1999; accepted January 27, 2000)