

Two new North American *Drosophila* species (Diptera: Drosophilidae)

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Drosophila (*Drosophila*) *luisserrai* sp. nov. (type locality: Bellingham, Washington, USA) and *Drosophila* (*Phloridosa*) *merzi* sp. nov. (type locality: Xalapa, Veracruz, Mexico) are described and *Drosophila* (*Sophophora*) *capnoptera* PATTERSON & MAINLAND, 1944 is redescribed, based on specimens from Mexico.

Keywords: Drosophilidae, *Drosophila luisserrai* sp. nov., *Drosophila merzi* sp. nov., *Drosophila capnoptera* PATTERSON & MAINLAND, 1944, descriptions, terminalia, Mexico, United States.

INTRODUCTION

Among flies collected by Bernhard MERZ in southern Mexico and by Luis SERRA in the northwestern United States, we found specimens of two *Drosophila* species new to science as well as specimens belonging to *Drosophila capnoptera* PATTERSON & MAINLAND, a species not described by modern standards.

MATERIAL AND METHODS

Label data attached to each specimen are cited in full with a slash indicating a label change. Our own notes or interpretations are included in brackets.

For morphological terminology, measurements, indices, preparations of microscope slides as well as illustrations see VILELA & BÄCHLI (2000). Whenever in the same plate, all figures were drawn to the same scale and all photomicrographs were taken and enlarged to the same magnification.

All specimens are deposited in the Zoological Museum, Universität Zürich Irchel, Zürich, Switzerland.

RESULTS

Genus *Drosophila* FALLÉN

Subgenus *Drosophila* FALLÉN

Drosophila luisserrai sp. nov.

(Figs 1, 5B, 6D, E)

Material examined. Holotype ♂ (dissected, right wing removed), labelled: "USA: Bellingham WA, IX.1995, L. SERRA leg. / ♂ / Holotype"; 1 ♂ paratype (dissected), same labels as holotype except of "Paratype".

Type locality. Bellingham, Washington, U.S.A.

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Drosophila luiserrai

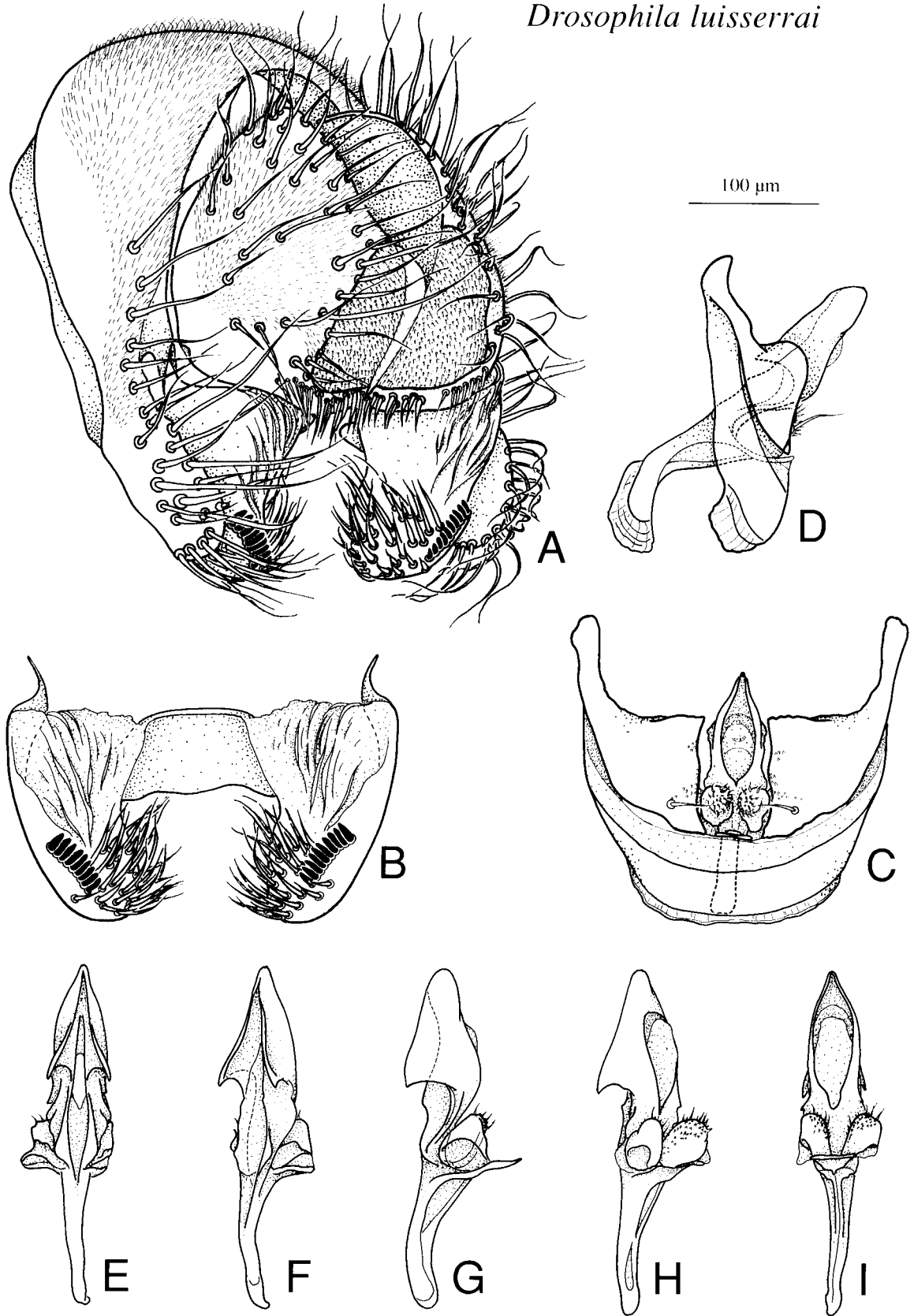


Fig. 1. *Drosophila (Drosophila) luiserrai* sp. nov., holotype ♂ (A, B, E–I) and paratype ♂ (C, D). A, epandrium, cerci, surstyli and decasternum, oblique posterior view. B, surstyli and decasternum posterior view. C, hypandrium, gonopods, paraphyse, aedeagal apodeme and aedeagus, posterior view. D, idem, left lateral view. E–I, aedeagus, aedeagal apodeme, and paraphyses, several views from dorsal through ventral.

Diagnosis. Generally yellowish flies; scutum with a faint median stripe; pleura brownish; tergites with narrow, medially interrupted brown marginal bands; wing with brown shadows along the crossveins and a faintly brownish costal margin; aedeagus as in Figs 1C–I, 6D, E.

Description. ♂. Head. Frons mainly dull yellowish-brown, yellowish above antennae, frontal length 0.37 (0.35–0.38) mm; frontal index = 1.00 (0.95–1.05), top to bottom width ratio = 1.49 (1.41–1.57). Frontal triangle greyish brown, about 64–71% of frontal length; ocellar triangle prominent, brown, blackish along inner margins of ocelli, about 43–45% of frontal length. Orbital plates greyish brown, about 82–86% of frontal length. Orbital setae black, or2 slightly more close to or1 than to or3 and more close to the eye margin than the other two, distance of or3 to or1 = 78–100% of or3 to vtm, or1 / or3 ratio = 0.83 (0.79–0.86), or2 / or1 ratio = 0.47 (0.45–0.50), postvertical setae = 63 (59–67) %, ocellar setae = 84 (81–86) % of frontal length; vibrissal index = 0.53. Face yellowish. Carina narrow between pedicels, somewhat broadened downwards, noselike, dorsally slightly sulcate. Cheek index about 4–6. Eye index = 1.18 (1.12–1.24). Occiput blackish. Pedicel yellowish. Flagellomere 1 brown, length to width ratio = 1.35. Arista with 3 dorsal, 1–2 ventral and about 5 short inner branches, plus terminal fork. Proboscis yellow. Clypeus brown. Palpi with 1–2 stronger setae.

Thorax length 1.30 (1.22–1.38) mm. Scutum yellow, subshiny, with a narrow, brownish median stripe which is broader in front of the scutellum. 6 rows of acrostichal setae. h index = 1.10. Transverse distance of dorsocentral setae 171–183% of longitudinal distance; dc index = 0.66 (0.64–0.69). Scutellum yellowish, apically pointed, distance between apical scutellar setae about 62–71% of that of the apical to the basal one; scut index = 1.65 (1.64–1.67). Pleura brownish, sterno index = 0.78 (0.67–0.89), mid katapisternal seta about 31–36% of the anterior one. Halteres yellow. Legs yellow, short preapical setae on all tibiae, ventral apical seta on mid tibia.

Wing (Fig. 5B) brownish along both crossveins and the costal border, more intensively so around the tips of veins R_{2+3} and R_{4+5} , veins yellow, crossveins brown; length 3.40 (3.29–3.50) mm, length to width ratio = 2.31 (2.27–2.35). Indices: C = 3.75 (3.74–3.76), ac = 1.57 (2.43–2.71), hb = 0.44 (0.42–0.47), 4C = 0.66 (0.63–0.70), 4v = 1.68 (1.59–1.78), 5x = 1.23 (1.10–1.36), M = 0.49 (0.41–0.56), prox. x = 0.52 (0.48–0.56).

Abdomen yellow, tergites 2–6 with broad, diffuse brownish marginal bands which are medially interrupted and laterally narrowed.

♂ *Terminalia* (Figs 1, 6D, E). Epandrium mostly microtrichose with about 27 lower setae, and no upper setae; ventral lobe, not microtrichose, narrow. Cerci mostly microtrichose, linked to hypandrium by membranous tissue, conspicuously membranous on the inner ventral region, except for the very ventral strip, which is sclerotized and bears a tuft of short setae. Surstylus dorsally membranous and pleated, not microtrichose, with 10 cone-shaped prenisetae, roundish at tip, about 2 outer setae and ca. 28 long inner setae. Decasternum as in Fig 1B. Hypandrium about half the length of epandrium, dorsal arch absent, gonopod linked to paraphysis by membranous tissue, bearing one thin seta on the anterior area. Aedeagus short, dorso-medially bearing a pair of short, projected frontwards expansions. Aedeagal apodeme as long as aedeagus, laterally flattened. Ventral rod longer than paraphysis, dorsoventrally flattened. Paraphysis microtrichose in the inner wall, linked to distal margin of aedeagal apodeme by membranous tissue, dorsally bearing some longer setulae among the shorter microtrichia.

Etymology. Named in honor of the collector, Luis SERRA, Barcelona.

Distribution. Northwestern United States: Washington.

Relationship. We were unable to identify the relationships between *D. luisserai* sp. nov. and any species of *Drosophila* described from North America.

Subgenus *Phloridosa* STURTEVANT

Drosophila merzi sp. nov.

(Figs 2, 6C)

Material examined. Holotype ♂ (dissected), labelled: "MEXICO Veracruz, Xalapa [=Jalapa], Muso [= Museo] Anthropol., 21.II.98 B. MERZ / Holotype"). For females see comments.
Type locality. Jalapa (Enriquez), Veracruz, Mexico.

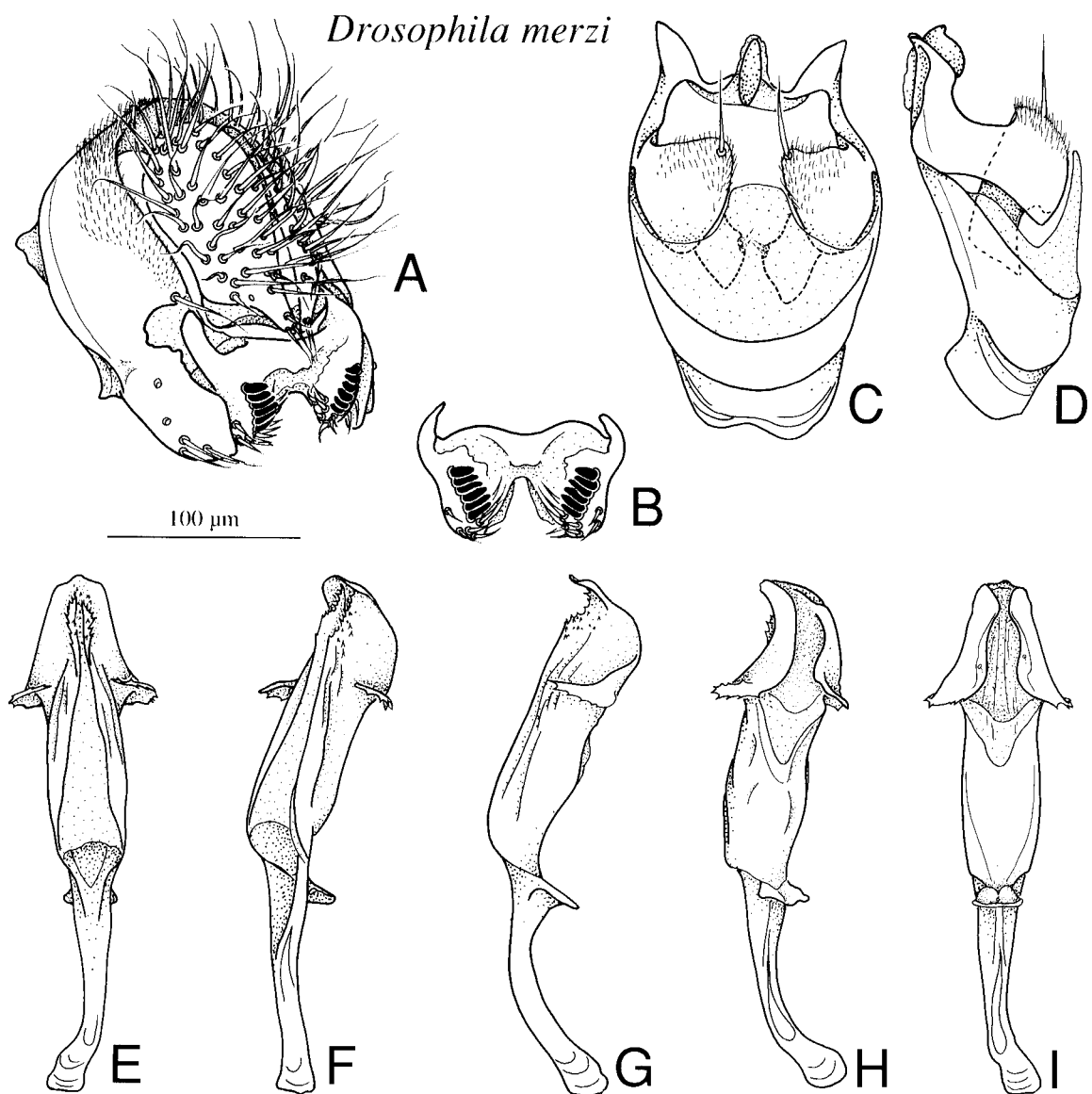


Fig. 2. *Drosophila (Phloridosa) merzi* sp. nov., holotype ♂. A, epandrium, cerci, surstyli and decasternum, oblique posterior view. B, surstyli and decasternum, posterior view. C, hypandrium, gonopods and paraphyses, posterior view. D, idem, left lateral view. E–I, aedeagus and aedeagal apodeme, several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

Diagnosis. Generally blackish fly; all setae distinctly short, black; wing hyaline; aedeagus as in Figs 2E–I, 6C.

Description. Head. Frons black, dull, frontal length 0.26 (0.25–0.27) mm; frontal index = 0.86 (0.84–0.88), top to bottom width ratio = 1.20 (1.16–1.24). Frontal triangle distinct, apically narrow, pointed, about 75–86% of frontal length; ocellar triangle prominent, subshiny, about 40–44% of frontal length. Orbital plates subshiny, apically broadened and slightly diverging from eye margin, about 87–93% of frontal length. Distance of or3 to or1 = 71–86% of or3 to vtm, or1 / or3 ratio = 0.75 (0.63–0.88), or2 / or1 ratio = 0.59 (0.57–0.60), postvertical setae = 48 (44–53) %, ocellar setae = 58 (56–60) % of frontal length; vibrissal index = 0.36 (0.33–0.38). Face blackish. Carina distinctly broadened downwards, dorsally flat, noselike. Cheek index about 6–7. Eye index = 1.27 (1.25–1.30). Occiput black. Length to width ratio of flagellomere 1 = 1.00. Arista with 3–4 short dorsal, 2 short ventral and about 4 very short inner branches, plus small terminal fork. Proboscis black. Palpi with about 2 short setae along the lower margin.

Thorax black, subshiny, length 1.05 (1.00–1.09) mm. 6 rows of acrostichal setae. h index = 0.96 (0.92–1.00). Transverse distance of dorsocentral setae 257–271% of longitudinal distance; dc index = 0.52 (0.50–0.55). Scutellum apically roundish, distance between apical scutellar setae about 100–125% of that of the apical to the basal one; basal ones divergent; scut index = 0.95. Sterno index = 0.25 (0.23–0.27), mid katapisternal seta missing. Halteres blackish. Legs basally brownish-black, tibiae and tarsi yellow.

Wing hyaline, veins yellow, length 2.10 (1.99–2.21) mm, length to width ratio = 2.36 (2.33–2.38). Indices: C = 2.59 (2.57–2.60), ac = 2.65 (2.50–2.80), hb = 0.65 (0.64–0.67), 4C = 0.94 (0.93–0.94), 4v = 1.88 (1.87–1.88), 5x = 1.25 (1.17–1.33), M = 0.49 (0.47–0.50), prox. x = 0.54 (0.53–0.56).

Abdomen generally blackish, apically paler brownish.

♂ *Terminalia* (Figs 2, 6C). Epandrium posterodorsally microtrichose with about 5 lower setae, one seta on the median region just above the connection with surstylus and no upper setae; ventral lobe not microtrichose, slightly pointed ventrad. Cerci linked to hypandrium by membranous tissue, not microtrichose; tip pointed ventrad. Surstylus not microtrichose, with 6 cone-shaped prenisetae, apically roundish, about 4 long outer setae and ca. 5 long inner setae. Decasternum as in Fig 2B. Hypandrium as long as epandrium, dorsal arch medially membranous, gonopod fused to paraphysis, dorsally microtrichose, bearing one seta on the posterior inner margin. Aedeagus subapically bearing 2 lateral serrated expansions, dorsoventrally flattened at tip, which is projected dorsad, subapically conspicuously serrated on the dorsal margin and covered with tiny spines. Aedeagal apodeme shorter than aedeagus, bent and rod-shaped. Ventral rod shorter than paraphysis, dorsoventrally flattened. Paraphysis linked to distal margin of aedeagal apodeme by membranous tissue, bearing two setulae at proximal inner corner.

Etymology. Named in honor of the collector, Bernhard MERZ, Geneve.

Distribution. Mexico.

Biology. Collected by net sweeping over flowers. It should be pointed out that the species belonging to the subgenus *Phloridosa* are known to breed in flowers.

Relationship. According to the male terminalia, this species differs from *Drosophila alfari* STURTEVANT, 1921 (VILELA 1984: 252, 255), *Drosophila lutzii* STURTEVANT, 1916 = *Drosophila floricola* STURTEVANT, 1942 (VILELA 1984: 254, 255; VILELA & BÄCHLI 1990: 279, CHASSAGNARD & TSACAS 1992: 99), *Drosophila*

denieri BLANCHARD, 1938 (VILELA 1986: 225), and *Drosophila alei* BRNCIC, 1962 (VILELA & BÄCHLI 2002: 203, 204, 213).

Comments. One male with the same label as the holotype has also been dissected. The aedeagus indicates that it belongs to *D. lutzii* STURTEVANT, the most widespread species of the subgenus *Phloridosa*. For comparison purposes with some aedeagi of the same species published by VILELA & BÄCHLI 1990: 319 (figs 162G–H) and CHASSAGNARD & TSACAS 1992: 99 (figs 3–4) it is also pictured in the present paper (Fig 6B). Four females with the same labels could be associated with *D. merzi*, but are not being considered paratypes; two of them have a fully black abdomen, the other two show a contrasting yellowish tergite 6.

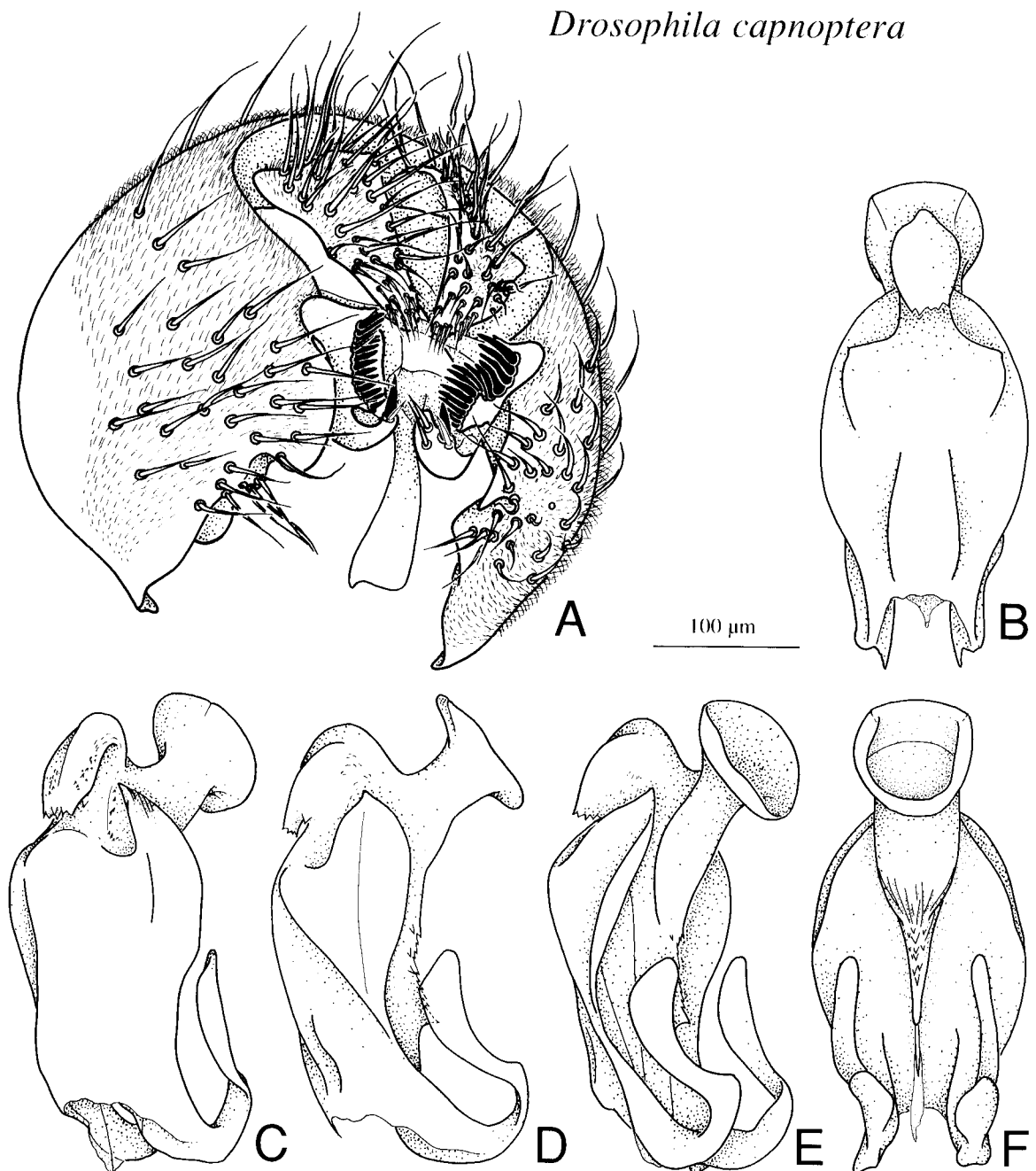


Fig. 3. *Drosophila (Sophophora) capnoptera* PATTERSON & MAINLAND, ♂ (Jalapa 20.II.98). A, epandrium, cerci, surstyli and decasternum, oblique posterior view. B–F, aedeagus, several views from dorsal through ventral.

As the holotype, and sole specimen, of *Drosophila tristani* STURTEVANT, 1921, from Costa Rica, is a female and the characters given in the description are ambiguous, we were unable to clearly establish its identity. We therefore decided to describe this species as new to science.

Subgenus *Sophophora* STURTEVANT

willistoni species group

***Drosophila capnoptera* PATTERSON & MAINLAND, 1944**

(Figs 3, 4, 5A, 6A)

Drosophila (Drosophila) capnoptera PATTERSON & MAINLAND, 1944: 47 (description, as member of the *alagitans* species group of the subgenus *Drosophila*, color plate);

Drosophila (Sophophora) capnoptera PATTERSON & MAINLAND, 1944: HSU 1949: 95, 130 (external male terminalia, *alagitans* species group transferred to subgenus *Sophophora*); PATTERSON & STONE 1952: 54, 75 (distribution); VARGAS 1954: 151 (distribution); HEED 1957: 70ff. (distribution); WHEELER & MAGALHÃES 1962: 155 ff. (redescription, transfer to the *alagitans-bocainensis* complex of the *willistoni* group, distribution); VAL *et al.* 1981: 154 (distribution).

Material examined. 2 ♂ (one dissected, right wing removed) and 1 ♀, labelled: "MEXICO Veracruz, Xalapa (=Jalapa), Bot. Garden, 20.II.98 B. MERZ".

Type locality. Perote, Veracruz, Mexico (PATTERSON & MAINLAND 1944: 48).

Diagnosis. Thorax brownish; pleura with a darker diagonal stripe and a contrasting black spot behind the fore coxae; tergites generally with broad, dark marginal bands which are medially and laterally extended to the tergite base; wing with brownish border along the costa and two dark brown spots, a basal triangular spot reaching to the crossvein R-M and a large dark area along the crossvein dM-Cu; aedeagus as in Figs 3B-F, 6A.

Redescription. ♂. Head. Frons pale golden yellow, pale yellow above antennae, frontal length 0.31 (0.28–0.32) mm; frontal index = 0.86, top to bottom width ratio = 1.34 (1.32–1.35). Frontal triangle brownish-yellow, about 76–79% of frontal length; ocellar triangle blackish, subshiny, about 41–47% of frontal length. Orbital plates narrow, apically slightly divergent from eye margin, brownish-yellow, subshiny, about 82–84% of frontal length. Orbital setae black, or2 more close to or1 than to or3 and close to the eye margin, distance of or3 to or1 = 50–60% of or3 to vtm, or1 / or3 ratio = 0.77 (0.75–0.80), or2 / or1 ratio = 0.43 (0.42–0.44), postvertical setae = 80 (76–84) %, ocellar setae = 102 (88–116) % of frontal length; vibrissal index = 1.00. Carina narrow, parallel-sided, convex but not nose-like. Cheek whitish, index about 11–13. Eye index = 1.17 (1.16–1.18). Occiput pale brown. Antennae greyish-silvery. Flagellomere 1 with prolonged marginal setae, about 1/4 width of flagellomere, length to width ratio = 1.8. Arista with 4–5 dorsal, 3 ventral and about 10 short inner branches, plus terminal fork. Proboscis brownish-yellow.

Thorax length 1.33 (1.24–1.41) mm. Scutum yellowish, slightly darker towards scutellum, subshiny, 6 rows of acrostichal setae. h index = 0.75 (0.67–0.82). Transverse distance of dorsocentral setae 164–169% of longitudinal distance; dc index = 0.67 (0.65–0.69). Scutellum brownish-yellow, distance between apical scutellar setae about 108–115% of that of the apical to the basal one; basal ones divergent; scut index = 1.18 (1.16–1.20). Pleura yellowish, with an oblique, blackish-brown stripe from behind the postpronotum to the hind margin of the katepisternum, a black anterior patch on the katepisternum and a more diffuse brown area around the base of the halteres, sterno index = 0.17 (0.15–0.16), mid katepisternal

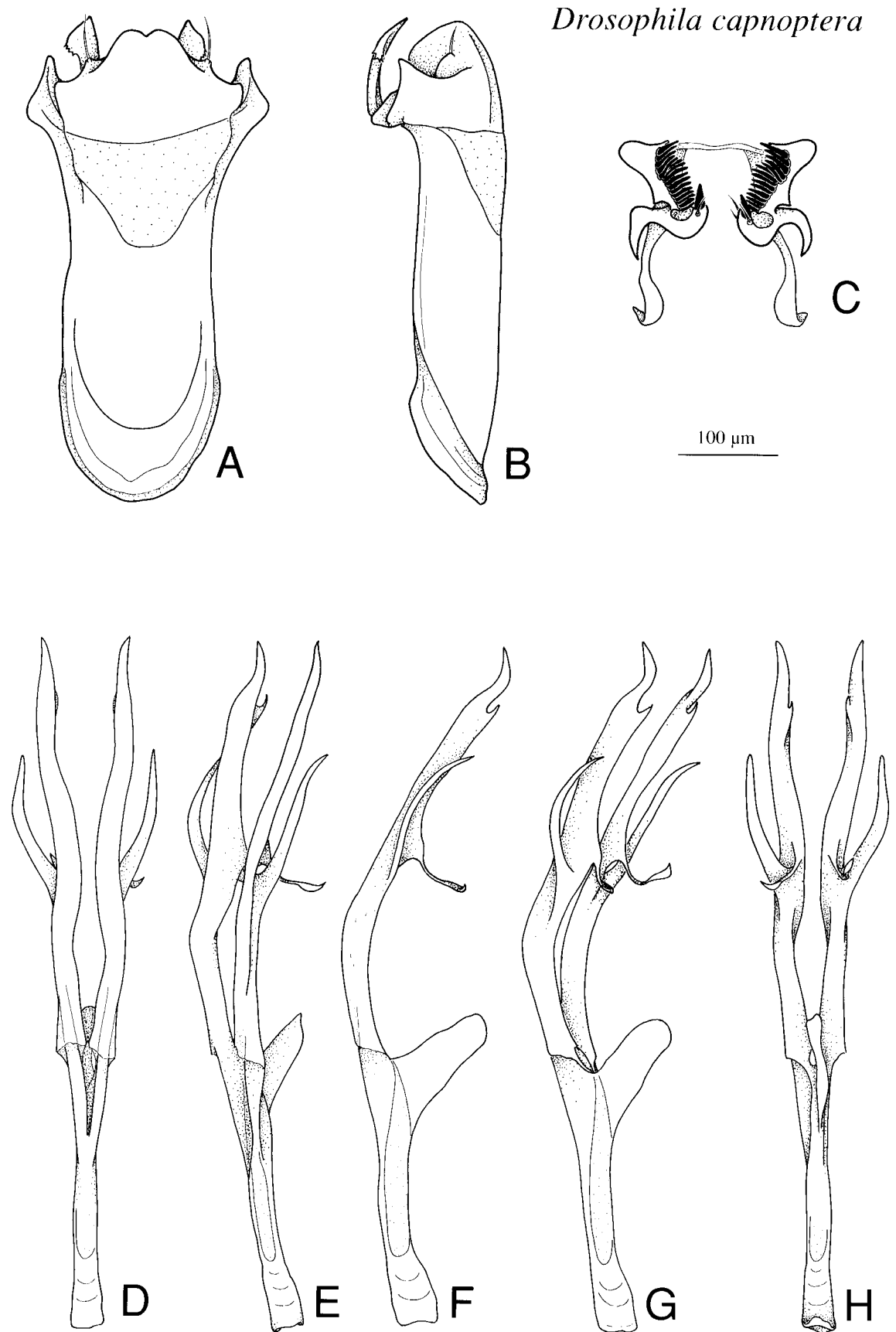
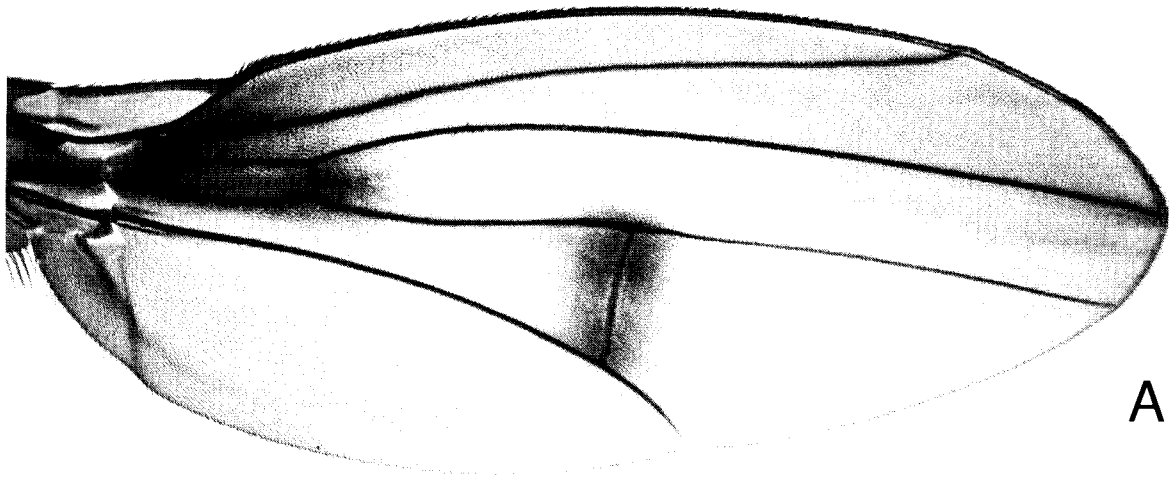


Fig. 4. *Drosophila (Sophophora) capnoptera* PATTERSON & MAINLAND, ♂ (Jalapa 20.II.98). A, hypandrium, posterior view. B, idem, left lateral view. C, surstyli and decasternum, posterior view. D–H, aedeagal apodeme and parameres, several views from dorsal through ventral.

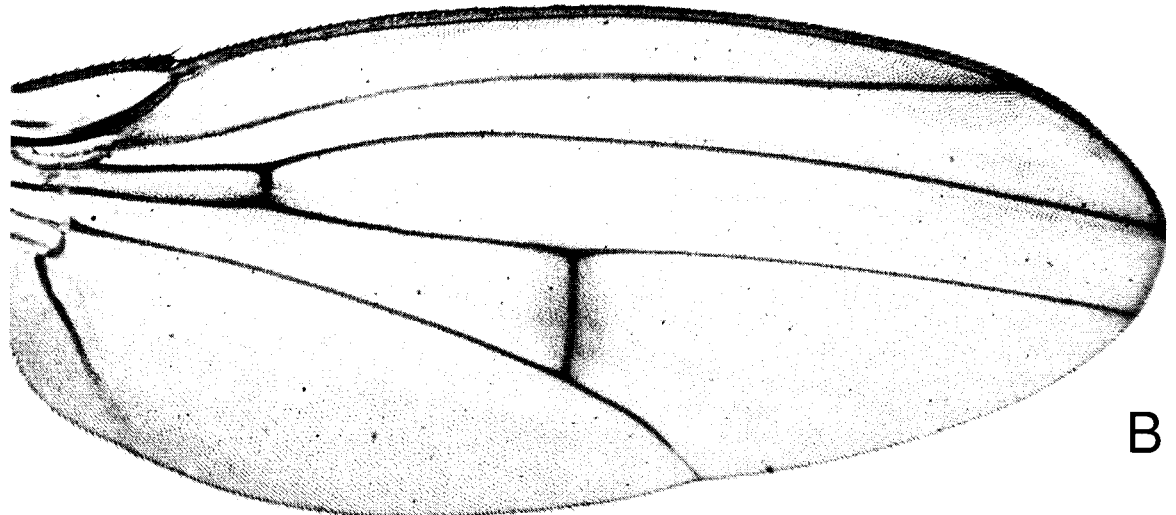
seta about 300–350% of the anterior one. Halteres pale yellow. Legs yellow, preapical setae on all tibiae, ventral apical seta on mid tibia.

Wing (Fig. 5A) narrow, apically pointed, with a pale brownish area in costal half, crossing the vein R_{4+5} in apical half, with a triangular, blackish area extending from the vein R_1 to the crossvein R-M, crossvein DM-Cu broadly blackish clouded, length 3.26 (3.11–3.40) mm, length to width ratio = 2.42 (2.41–2.43). Indices: C = 2.92 (2.74–3.11), ac = 2.63 (2.56–2.71), hb = 0.57 (0.57–0.58), 4C = 0.79 (0.73–0.85), 4v = 1.57 (1.54–1.59), 5x = 0.96 (0.91–1.00), M = 0.38 (0.37–0.38), prox. x = 0.54 (0.50–0.59).



Drosophila capnoptera

1 mm



Drosophila luisserrai

Fig. 5. Right wing, dorsal view, of: A, *Drosophila (Sophophora) capnoptera* PATTERSON & MAINLAND, ♂ (Jalapa 20.II.98); B, *Drosophila (Drosophila) luisserrai* sp. nov., holotype ♂.

Abdomen with yellow ground color, tergite 2 with lateral dark areas, tergites 3–6 each with a blackish marginal band which is medially triangularly extended to the base of the tergite and laterally extended, covering successively the whole ventral margin of the tergite, the dark band on tergite 6 almost covering the whole area, at most leaving two small, basal, paramedian, triangular yellowish spots.

♂ *Terminalia* (Figs 3, 4, 6A). Epandrium mostly microtrichose, with about 30 lower setae, and 5 upper setae. Cerci mostly microtrichose, linked to hypandrium by membranous tissue. Surstylus hook-shaped below, not microtrichose, with 15 cone-shaped, sharply pointed prenisetae positioned in a sinuate row, in addition to one very strong, directed inwards, preniseta on the tip of the lower expansion, 1 outer long seta and 2 inner setae. Decasternum as in Fig. 4C. Hypandrium longer than epandrium, dorsoventrally bearing two paramedian setae, projected posteriad, and dorsodistally bearing two appendages, subapically serrated at outer margin; dorsal arch absent; gonopod fused both to each other and to hypandrium, bearing two paramedian setae. Aedeagus flattened at tip, weakly linked both to aedeagal apodeme and to hypandrium by membranous tissue, with two long, laterodorsal expansions in addition to 1 dorsal, large, proximally serrated prominence and 1 laterally flat and narrow, slightly serrated ventral prominence on median line, lateral surfaces medially covered with tiny spines; anteroventral region anteriorly bearing 2 laterally flattened prolongations, projected posteriad. Aedeagal apodeme longer than aedeagus, rod-shaped. Ventral rod as in Figs 4D-H. Paraphysis fused to aedeagal apodeme, submedially bifid, distally sinuate, the inner main branch is apically bifid and bears a slender, curved expansion at medioventral surface.

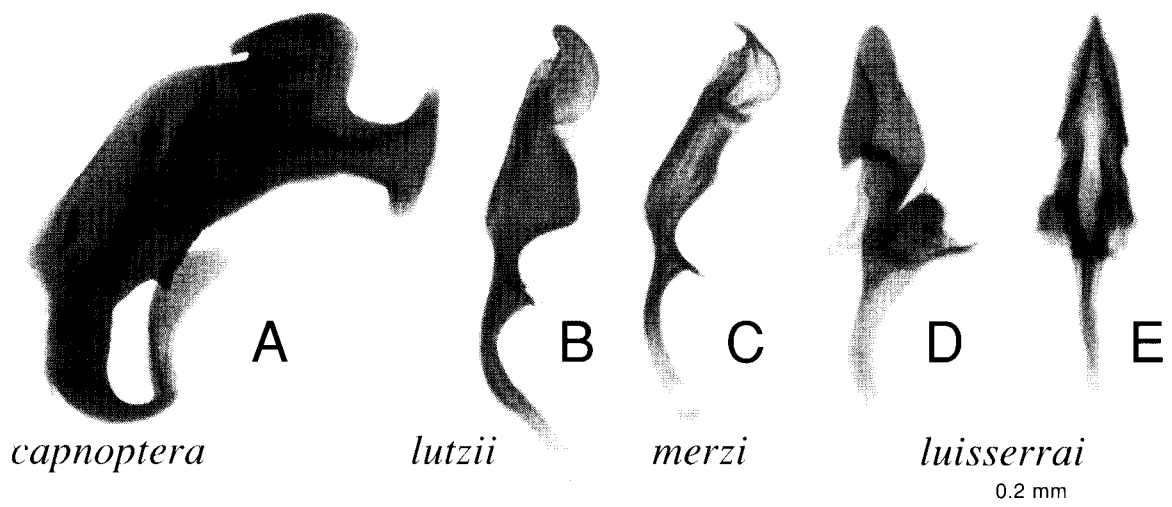


Fig. 6. A, *Drosophila (Sophophora) capnoptera* PATTERSON & MAINLAND, ♂ (Jalapa 20.II.98), left lateral view of aedeagus. B, *Drosophila (Phloridosa) lutzii* STURTEVANT, ♂ (Jalapa 21.II.98), left lateral view of aedeagus and aedeagal apodeme. C, *Drosophila (Phloridosa) merzi* sp. nov., ♂, holotype, left lateral view of aedeagus and aedeagal apodeme. D, *Drosophila (Drosophila) luisserrai* sp. nov., ♂, holotype, left lateral view of aedeagus, aedeagal apodeme and paraphyses. E, idem, dorsal view.

♀. *Measurements*: Frontal length 0.31 mm; frontal index = 0.75, top to bottom width ratio = 1.25. Frontal triangle about 67% of frontal length; ocellar triangle about 39% of frontal length. Orbital plates about 83% of frontal length. Distance of or3 to or1 = 56% of or3 to vtm, or1 / or3 ratio = 0.75, or2 / or1 ratio = 0.50, postvertical setae = 89%, ocellar setae = 100% of frontal length; vibrissal index = 0.75. Cheek index about 12. Eye index = 1.20. Thorax length 1.36 mm. h index = 0.79. Transverse distance of dorsocentral setae 160% of longitudinal distance; dc index = 0.74. Distance between apical scutellar setae about 123% of that of the apical to the basal one; scut index = 1.16, sterno index = 0.20, mid katepisternal seta about 250% of the anterior one. Wing length 3.08 mm, length to width ratio = 2.38.

Indices: C = 2.90, ac = 1.50, hb = 0.55, 4C = 0.80, 4v = 1.56, 5x = 0.82, M = 0.36, prox. x = 0.52.

Distribution. Mexico, El Salvador, Nicaragua, Costa Rica, Panama.

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REFERENCES

- CHASSAGNARD, M.T. & TSACAS, L. 1992. *Drosophila (Phloridosa) lutzii* STURTEVANT (Diptera: Drosophilidae), especie antofila de Mexico. *Folia Entomol. Mex.* 85: 95–105.
- HEED, W.B. 1957. Ecological and distributional notes on the Drosophilidae. *Univ. Texas Publs*, 5721: 62–78.
- HSU, T.C. 1949. The external genital apparatus of male Drosophilidae in relation to systematics. *Univ. Texas Publs* 4920: 80–142.
- PATTERSON, J.T. & MAINLAND, G.B. 1944. The Drosophilidae of Mexico. *Univ. Texas Publs* 4445: 9–101.
- PATTERSON, J.T. & STONE, W.S. 1952. *Evolution in the Genus Drosophila*. 610 pp. Macmillan.
- VAL, F.C., VILELA, C.R., & MARQUES, M.D. 1981. Drosophilidae of the Neotropical Region. In: ASHBURNER, M., CARSON, H.L., & THOMPSON, J.N., (eds.), *The Genetics and Biology of Drosophila*, vol. 3a, pp. 123–168. Academic Press
- VARGAS, L. 1954. Lista de las especies de Drosophilidae encontradas en Mexico (Diptera). *Revta Inst. Salubr. Enferm. trop., Mex.* 14: 149–153.
- VILELA, C.R. 1984. Notes on the holotypes of four Neotropical species of the genus *Drosophila* (Diptera, Drosophilidae) described by A.H. STURTEVANT. *Revta bras. Ent.* 28: 245–256.
- VILELA, C.R. 1986. The type-series of *Drosophila denieri* BLANCHARD (Diptera, Drosophilidae). *Revta bras. Ent.* 30 (2): 223–226.
- VILELA, C.R. & BÄCHLI, G. 1990. Taxonomic studies on Neotropical species of seven genera of Drosophilidae (Diptera). *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.
- VILELA, C.R. & BÄCHLI, G. 2002. On the identity of four poorly known species of Neotropical Drosophilidae (Diptera). *Mitt. Schweiz. Ent. Ges.* 75: 197–210.
- WHEELER, M.R. & DE MAGALHÃES, L.E. 1962. The *alagitans-bocainensis* complex of the *willistoni* group of *Drosophila*. *Univ. Texas Publs* 6205: 155–171.

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