



## A distinctive new species of biting midge in the subgenus *Euprojoannisia* Brèthes from Mexico with new records of Neotropical species of *Forcipomyia* Meigen (Diptera: Ceratopogonidae)

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### Abstract

A new species of biting midge, *Forcipomyia* (*Euprojoannisia*) *bibaana*, is described and illustrated from an adult male collected in the state Oaxaca, Mexico. The first records of *Forcipomyia* (*E.*) *mortuifolii* Saunders, *F. (Lasiohelea) cornuta* Saunders and *F. (L.) stylifer* (Lutz) are provided from Mexico as well as the first record of *F. (L.) anitae* Huerta & Ibáñez-Bernal from Guatemala.

**Key words:** Forcipomyiinae, biting flies, taxonomy, distribution

### Introduction

Biting midges of the genus *Forcipomyia* Meigen are very diverse and include 1154 extant and 32 extinct fossil species (Borkent 2016). The genus has considerable economic impact because many species are pollinators of cocoa and rubber trees (*Hevea*) (Bystrak & Wirth 1978). Species of *Forcipomyia* inhabit all zoogeographical regions except Antarctica, but many species still await formal description and names. This genus is currently divided into 36 subgenera (Borkent 2016). The current infrageneric classification is based mainly on adult morphology, however, nearly 12% of species are known from their immature stages (Borkent 2014).

Borkent & Spinelli (2007) listed 211 Neotropical species of *Forcipomyia* in 18 subgenera, and in Mexico at least 14 subgenera and 40 species are known. However, 17 species of different subgenera were subsequently described or recorded from this region (Marino & Spinelli 2008, Spinelli *et al* 2012, Marino *et al* 2013). Presently 17 species in the subgenus *Euprojoannisia* Brèthes are known from the Neotropical region (Borkent & Spinelli 2007), of which three have been recorded from Mexico, *Forcipomyia* (*E.*) *calcarata* (Coquillett) from Tabasco and Quintana Roo, *F. (E.) dowi* Bystrak & Wirth from Quintana Roo, and *F. (E.) navaiae* Bystrak & Wirth from Yucatan. The subgenus *Lasiohelea* Kieffer includes 11 species in the Neotropics (Borkent & Spinelli 2007), with only one species recorded from Mexico, *F. (L.) anitae* Huerta & Ibáñez-Bernal from Chiapas and San Luis Potosi. Herein, we describe a new species of *Forcipomyia* (*Euprojoannisia*) from Oaxaca, Mexico, and provide new records of four previously described species from the Neotropical region.

### Material and methods

Specimens were collected with Malaise traps and CDC light traps in different regions of Mexico (states of Guerrero, Oaxaca and Veracruz) and a locality of Guatemala (Livingston Island). Unless otherwise indicated, specimens were preserved in 70% ethanol and subsequently cleared, dissected and mounted on microscope slides

by the techniques described by Borkent & Spinelli (2007), except for a few specimens mounted in Euparal. Illustrations were prepared with the aid of a drawing tube attached to an Olympus BX50 compound microscope, and photographs were taken with a Lumenera Infinity Icamera mounted on the Olympus BX50.

Morphological terms follow those in the chapter on Ceratopogonidae in the recent Manual of Central American Diptera (Borkent *et al* 2009). Special terms for *Forcipomyia* (*Euprojoannisia*) are those provided by Bystrak & Wirth (1978). The holotype of the new species and other voucher specimens are deposited in the Collection of Arthropods of Medical Importance, Mexico City, Mexico (CAIM).

## Systematics

### Diptera: Ceratopogonidae

#### Subfamily Forcipomyiinae

#### Genus *Forcipomyia* Meigen

*Forcipomyia* Meigen, 1818: 73. Type species: *Tipula bipunctata* Linnaeus, designated by Westwood, 1840: 126. Generic name first published in synonymy with *Ceratopogon* but available under ICZN Code Article 11(e).

*Euforcipomyia* Malloch, 1915: 312. Type species: *Euforcipomyia hirtipennis* Malloch (= *Ceratopogon palustris* Meigen), by original designation.

*Cryptoscena* Enderlein, 1936: 51. Type species: *Ceratopogon palustris* Meigen, by monotypy.

*Proforcipomyia* Saunders, 1957: 662 (as subgenus of *Forcipomyia*). Type species: *Forcipomyia wirthi* Saunders, by original designation.

#### Subgenus *Euprojoannisia* Brèthes, 1914

*Euprojoannisia* Brèthes, 1914: 155. Type species: *Euprojoannisia platensis* Brèthes, by original designation.

*Euforcipomyia* Malloch, 1915: 312. Type species: *Euforcipomyia hirtipennis* Malloch (= *Ceratopogon palustris* Meigen), by original designation.

*Cryptoscena* Enderlein, 1936: 51. Type species: *Ceratopogon palustris* Meigen, by monotypy.

*Proforcipomyia* Saunders, 1957: 662 (as subgenus of *Forcipomyia*). Type species: *Forcipomyia wirthi* Saunders, by original designation.

#### *Forcipomyia* (*Euprojoannisia*) *bibaana*, new species

(Figs. 1–5)

**Type material.** Male. Holotype. MEXICO, *Oaxaca*, Municipio San Juan Guichicovi, Localidad El Zacatal, Malaise trap, 26–28-July-2009, Salceda, S.B., Rodríguez, A.A. & Ordóñez, A.J., Coll., 1 male (CAIM).

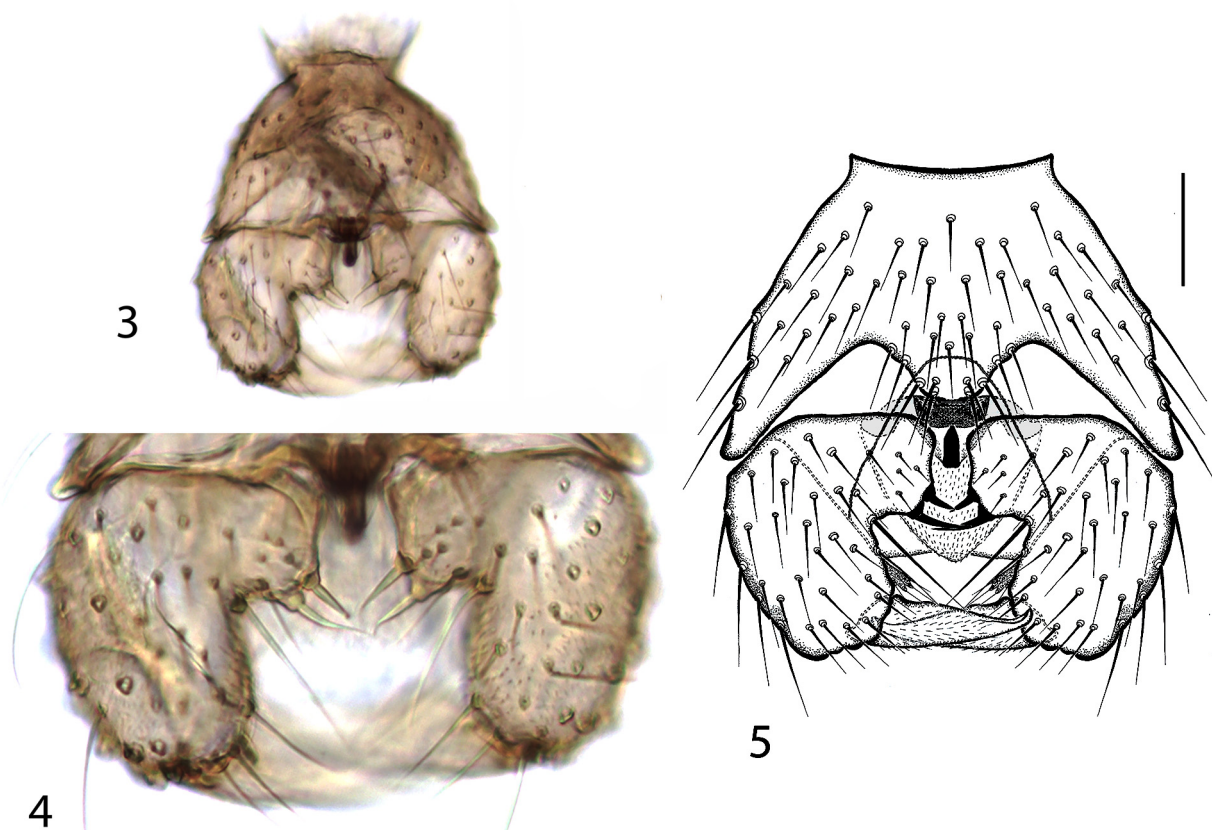
**Diagnosis.** Male: Only species of Neotropical *Forcipomyia* (*Euprojoannisia*) with posterior margin of sternite 9 with two distinctive lateral, triangular lobes and a posteromesal, rounded setose lobe; gonocoxite L-shaped with stout anteromesal projection bearing pair of short, very stout spines, aedeagus short, stout. Female unknown.

**Description. Head.** Brown. Eyes abutting medially for length of four ommatidia, without interommatidial spicules. Antenna (Fig. 1) with well developed plume, extending to base of flagellomere 13, flagellomeres 2–9 spherical, 5–9 fused, 10 1.6 x longer than 11, 10–13 elongate; flagellomere 13 with apical nipple, not constricted basally; antennal ratio 0.37. Palpus with third segment elongated, with rounded deep sensory pit; segments 4, 5 partly fused; palpal ratio 3.0.

**Thorax.** Pale yellowish; scutellum with 8 setae. Legs light brown; prothoracic tarsal ratio 2.2; mesothoracic tarsal ratio 1.7; metathoracic tarsal ratio 1.6. Wing (Fig. 2) pale, without pattern; base of  $M_2$  not visible; 1st radial cell obliterated, 2nd radial cell well developed; cubital fork distal to level of apex of costa; apices of  $CuA_1$ ,  $CuA_2$  obsolete; wing length 1.07 mm, breadth 0.35 mm; costal ratio 0.48. Halter whitish.



**FIGURES 1–2.** *Forcipomyia (Euprojoannisia) bibaana* n. sp. Male. 1. Antenna, lateral view. 2. Wing. Scale: 0.1 mm.



**FIGURES 3–5.** *Forcipomyia (Euprojoannisia) bibaana* n. sp. Male genitalia. 3-5. Ventral view. 4. Detail of the spines of gonocoxite. Scale: 0.1 mm.

**Abdomen.** Pale brown. Genitalia (Figs. 3–5) brown. Tergite 9 short, extending to 1/4 length of gonocoxite; posterior margin truncate, with elongate convergent apicolateral process bearing few apical setae; cercus lobe-like. Sternite 9 moderately narrow anteriorly, becoming increasing broader posteriorly; posterior margin with two deep

apicolateral excavations that produce two distinctive elongate apicolateral triangular lobes and a rounded posteromesal setose lobe. Gonocoxite L-shaped, 1.1x longer than greatest breadth, with stout anteromesal projection bearing pair of short, very stout spines; gonostylus 0.9 length of gonocoxite, slightly curved apically, tapering to pointed tip. Parameres absent; gonocoxal apodemes slender, V-shaped. Aedeagus very short, stout; basal arms broad, heavily sclerotized, apices recurved; basal arch very shallow, extending 1/20 of total aedeagal length; portion distal with short process hook-shaped, bent ventrocephalad.

**Female.** Unknown.

**Derivation of specific epithet.** The specific epithet is from the Zapotec language, *bibaana*=strange, in reference to the unusual shape of the male gonocoxite.

**Distribution.** This species is known only from the type locality, El Zacatal, in the state of Oaxaca, Mexico.

**Taxonomic discussion.** The peculiar L-shaped gonocoxite and the trilobed posterior margin of the sternite 9 clearly distinguish *F. bibaana* from all other Neotropical and Nearctic species of the subgenus in which the male sex is known. The anteromesal projection of gonocoxite bearing pair of short, very stout spines, is distinctive character of this new species.

## New records of other species

### *Forcipomyia (Euprojoannisia) mortuifolii* Saunders

*Forcipomyia (Proforcipomyia) mortuifolii* Saunders 1959: 35. Trinidad. (all stages; figs. female habitus, palpus, tibial comb, spermathecae, wing, antenna, male genitalia, pupa, larva); Chan & LeRoux 1971: 1329 (phylogenetic relationships).

*Forcipomyia (Euforcipomyia) mortuifolii*: Wirth 1974: 14 (in New World catalogue south of the USA).

*Forcipomyia (Euprojoannisia) mortuifolii*: Bystrak & Wirth 1978: 29 (all stages; distribution; figs. anterior veins of wings, palpus, frontal sclerite, flagellum, tibial comb of fore, mid and hind legs, male genitalia, detail of male sternite 9, spermathecae, female genitalia); Wilkening *et al* 1985: 515 (Florida records); Borkent & Wirth 1997: 31 (in World catalogue); Borkent & Spinelli 2000: 14 (in New World catalogue south of the USA); Borkent & Spinelli 2007: 49 (in Neotropical catalogue); Borkent & Grogan 2009: 7 (in Nearctic catalog); Grogan *et al* 2010: 10 (Florida record); Borkent 2016: 33 (in online World catalogue).

**Material examined.** MEXICO, *Oaxaca*, Municipio Santo Domingo Petapa, Localidad Río del Sol, Malaise trap, 29–30–June–2009, Salceda, S.B., Rodríguez, A.A. & Ordóñez, A.J., Coll., 1 male (slide). **New Mexico record.**

**Diagnosis.** Very small species, wing length 0.95 mm, male with ninth sternum with two mesal stout spines; gonostyle with mesal process. Female with palpus short and stout; mandible with fine teeth; oval basal flagellomeres; spermathecae slightly unequal, darkly sclerotized.

**Distribution.** *Forcipomyia (E.) mortuifolii* is widely distributed in the Caribbean region from extreme southern Florida, USA, Jamaica, Puerto Rico, Dominica, Santa Lucia and Trinidad. We provide the first record for Mexico.

### Subgenus *Lasiohelea* Kieffer, 1921

*Centrorhynchus* Lutz, 1913: 62 (preoccupied by *Centrorhynchus* Steven or Fisher Waldheim, 1829). Type species: *Centrorhynchus stylifer* Lutz, by original designation.

*Lasiohelea* Kieffer, 1921: 115. Type species: *Atrichopogon pilosipennis* Kieffer (= *Ceratopogon velox* Winnertz), by original designation.

*Parapterobosca* Harant *et al.*, 1951: 468. Type species: *Parapterobosca anthropophila* Harant, Huttel & Huttel, by original designation.

*Dacnoforcipomyia* Chan & Saunders, 1965: 527 (as subgenus of *Forcipomyia*). Type species: *Forcipomyia anabaenae* Chan & Saunders, by original designation.

### *Forcipomyia (Lasiohelea) anitae* Huerta & Ibáñez-Bernal

*Forcipomyia (Lasiohelea) anitae* Huerta & Ibáñez-Bernal, 1996: 350. Mexico. (male; figures of flagellomeres 10–13, palpus,

cibarial spines, male genitalia, Mexico); Ronderos & Spinelli 1999: 154 (Costa Rica and Brazil records); Borkent & Spinelli 2000: 16 (in New World catalogue south of the USA); Marino & Spinelli 2005: 165 (female; figures flagellum, palpus, cibarial spines, scutellum, wing, genital sclerotization, spermatheca; Argentina record); Borkent & Spinelli 2007: 52 (in Neotropical catalogue); Borkent 2016: 43 (in online World catalog).

*Lasiohelea stylifer*: Macfie 1953: 7 (male; figure genitalia; Costa Rica).

*Lasiohelea anitae*: Huerta & Ibáñez-Bernal 1999: 497 (female; figures flagellomeres, palpus, head, mandible, cibarial armature, anterior veins of wings, spermatheca; abdomen, distal segments; distribution).

*Forcipomyia (Lasiohelea)* sp.: Spinelli *et al* 2002: 527 (biting frogs; Argentina).

**Material examined.** MEXICO, *Guerrero*, Ayutla de los Libres, Locality La Unión, Malaise trap, 7-April–16-May-2009, Marín, B.W., Coll., 1 male (slide). *Oaxaca*, Municipio San Juan Guichicovi, Locality El Zarzal, Malaise trap, 24–25–July–2009, Salceda, S.B., Rodríguez, A.A. & Ordoñez, A.J., Coll., 1 male (slide). *Veracruz*, Municipio Actopan, Locality Soyacuautla, Malaise trap, 5–February–2009, Brigada entomológica, JSV., Coll., 3 males, 2 females (slides). GUATEMALA, Izabal, Isla Livingston, Locality Creek Chino, 12–16–July–1999, Malaise trap, Huerta, H., Coll., 1 male (slide). **New Guatemala record.**

**Diagnosis.** Male: Aedeagus divided in two sclerites, joined basally, straight inner side to subapical apex, external side expanded at the base, tapering to apex, portion distal abruptly bend to a sharp, ventrally direct point. Female: cibarial armature with 15 a 16 teeth in single row; mandible with 30-32 teeth, scutellum with 8 setae in a row.

**Distribution.** *Forcipomyia (L.) anitae* is widely distributed in the Neotropical region from Mexico, Costa Rica, Brazil (Bahia, Itabuna), to northeastern Argentina. We provide additional new Mexican records from the states of Oaxaca and Guerrero, and the first record from Guatemala.

### ***Forcipomyia (Lasiohelea) cornuta* Saunders**

*Forcipomyia (Lasiohelea) cornuta* Saunders, 1964: 464. Costa Rica, Trinidad, Brazil. (all stages; figures larva, larval head, posterior aspect of larval body, prothoracic pseudopod, pupa, pupal respiratory organ, antenna, palpus, spermatheca, wing, male genitalia); Wirth 1974: 7 (in New World catalogue south of the USA); Aitken *et al* 1975: 108 (Trinidad records); Borkent & Wirth 1997: 39 (in World catalogue); Borkent & Spinelli 2000: 16 (in New World catalogue south of the USA); Borkent & Spinelli 2007: 52 (in Neotropical catalogue; Borkent 2016: 44 (in online World catalogue).

**Material examined.** MEXICO, *Veracruz*, Municipio Emiliano Carranza, Locality Vega de Alatorre, CDC light trap, 15–May–2010, Brigada Entomológica, Coll., 1 male (slide). **New Mexico record.**

**Diagnosis.** Male: gonocoxite basally bearing small, sinuous, foliaceous process; aedeagus with four anterolateral process strong, horns-shaped. Female with third palpal segment short and swollen; spermatheca subspherical; other characteristic undiagnosable.

**Distribution.** *Forcipomyia (L.) cornuta* is distributed in Costa Rica, Trinidad and Brazil (São Paulo). We provide the first record from Mexico.

### ***Forcipomyia (Lasiohelea) stylifer* (Lutz)**

*Centrorhynchus stylifer* Lutz, 1913: 63. Brazil. (female; figs. wing, palpus; habits).

*Lasiohelea stylifer*: Edwards 1922: 166 (combination; notes; Brazil); Macfie 1939: 171 (Brazil records); Macfie 1940: 181 (Guyana record); Macfie 1944: 298 (Trinidad, ex cacao); Lane 1945: 362 (female redescription; lectotype designation; figure antenna); Lane 1947: 161 (larva, pupa; figure larva; Brazil); Ortiz 1952: 241 (female redescription; figures wing, head, palpus, spermatheca; Venezuela); Wirth 1956: 246 (female redescription; Costa Rica); Cavalieri 1962: 363 (synopsis of Neotropical species).

*Forcipomyia (Lasiohelea) stylifera*: Wirth 1974: 7 (in New World catalogue south of the USA); Aitken *et al* 1975: 108 (Trinidad records; figure female wing); Huerta & Ibáñez-Bernal 1996: 353 (in key to American species); Ronderos & Spinelli 1999: 154 (redescription; figures female head, palpus, cibarial spines, scutellum, hind tibial comb, tarsal claws, wing, genital sclerotization, spermatheca, male genitalia; distribution).

*Forcipomyia (Lasiohelea) stylifer*: Borkent & Wirth 1997: 43 (in World catalogue); Borkent & Spinelli 2000: 17 (in New World catalogue south of the USA); Felipe-Bauer & Oliveira 2001: 1116 (in list of type specimens of the Instituto Oswaldo Cruz); Spinelli *et al* 2005: 138 (in key Argentinean bloodsucking species); Borkent & Spinelli 2007: 52 (in Neotropical catalogue); Borkent 2016: 46 (in online World catalogue).

**Material examined.** MEXICO, *Oaxaca*, Municipio San Juan Guichicovi, Locality El Zacatal, potrero, CDC light trap, 27–28-July-2009, Salceda, S.B., Rodríguez, A.A. & Ordóñez, A.J., Coll., 1 male (slide). **New Mexico record.**

**Diagnosis.** Male. Aedeagus divided in two sclerites, lightly joined basally, 2/3 of total length, distal portion slender, externally directed. Female with third palpal segment fusiform, with a distinct extension beyond the pit, fifth segment as long as fourth; 9-10 cibarial spines in one row; scutellum with 7 strong setae in a row, large circular aperture of spermathecal.

**Distribution.** This very common species is widely distributed in the Neotropical region from Mexico to Ecuador, Trinidad, Venezuela and northeastern Argentina. We provide the first record from Mexico.

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