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Four new Neotropical species of *Trigonometopus* Macquart, 1835 (Diptera, Lauxaniidae)

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ABSTRACT

The genus Trigonometopus *Macquart (1835) currently includes 13 species, found in most biogeographic regions, being absent from the Afrotropical and Australian Regions. The genus included six known Neotropical species and four new species are herein added to the genus:* T. assisensis *sp. nov.,* T. boraceiensis *sp. nov.,* T. lourdesae *sp. nov., and* T. mariae *sp. nov., the first two from the State of São Paulo, the other two respectively from the states of Mato Grosso do Sul and Santa Catarina. A key for the exclusively Neotropical species of the genus is provided.*

Key-Words: Description; New taxa; Neotropical region; Systematics.

INTRODUCTION

The genus *Trigonometopus* was described by Macquart (1835) to include *Tetanocera frontalis* Meigen, 1830, at that time known from France. The genus now includes 13 species found in the Palearctic, Nearctic, Oriental and Neotropical regions-the genus is noticeably absent in the Afrotropical and Australian regions. There are six species known from the Neotropical region: *T. albifrons* Knab, 1914a; *T. albocostatus* Hendel, 1912; *T. angustipennis* Knab, 1914a; *T. immaculipennis* Malloch, 1923; *T. punctipennis* Coquillett, 1898, and *T. rotundicornis* Williston, 1896. *T. punctipennis* was originally described from the Nearctic region, but was registered for Mexico and Costa Rica (Gaimari & Silva, 2010b). The valid non-Neotropical species, according to Pape & Thompson (2013), are: *T. eborifacies* Shatalkin, 1997 (from Russia); *T. frontalis* Meigen, 1830 (from a French locality not stated by Meigen, maybe Bordeaux according to Papp, 1984); *T. vittatus* Loew, 1869 (from Georgia, USA); *T. canus* Meijere, 1916 (from Indonesia, Java, considered a questionable species by Papp, 2007); *T. fuscipennis* Hendel, 1912 (from Samoa); *T. ishidae* Matsumura, 1918 (from Japan; S.D. Gaimari, *person. comm.*); and *T. semibrunneus* Malloch, 1929 (from Niue, American Samoa).

Knab (1914a) reviewed the species from the New World, described two new species and presented a key. His characterization of the genus, however-a long head with a triangular profile, its horizontal frons, face strongly receding, and antenna inserted at frontal apex-is broad and vague, as pointed by Stuckenberg (1971). Malloch (1923) described one new

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species from Cuba and presented a key for the identification of the species he had seen-the key most used for the genus in the region so far.

The taxon as a family group based on *Trigonometopus* has been studied mainly by Knab (1914b), Malloch (1929), Wheeler (1956), Stuckenberg (1971), Shatalkin (1997, 2000), Sasakawa (1998, 2002, 2005) and Papp (2007), besides many others who have just described new species. A suprageneric taxon has been proposed to gather *Trigonometopus* and some other genera, ranked as subfamily by Becker (1905), but considered as tribe by Papp (2007). It would include, according to Papp (2007), the following Old World genera: *Diplochasma* Knab; *Kerteszomyia* Malloch; *Luzonomyza* Malloch; *Maquilingia* Malloch; *Neotrigonometopus* Malloch; *Protrigonometopus* Hendel; *Shatalkinella* Papp; *Trigonometopsis* Malloch; *Trigonometopus* Macquart; and *Tetroxyrhina* Hendel.

Papp (2007) reviewed the Trigonometopini providing a better characterisation of its Old World genera. The tribe can be characterized by a number of features: an elongated head, in most genera longer than high; a broad, setose fronto-orbital plate (an obvious synapomorphy of the clade); the thorax more or less elongated; abdomen never strongly flattened; tergite 7 fused to the epandrium, at least medially (another synapomorphy of the tribe); male genitalia with no surstylus nor surstylar lobe on epandrium; phallus wholly membranous; and three spermathecae.

Shatalkin (1997) considered *Tetroxyrhina* a subgenus of *Trigonometopus,* but pointed many differences between the two taxa. He indicated as Palaearctic species of *Trigonometopus s. str.* just *T. frontalis* (Meigen, 1830) and *T. eborifacies* Shatalkin, 1997, refering as diagnostic features for this taxon the first flagellomere pointed apically, fore fronto-orbital setae situated on level of anterior margin of eye, two sternopleural setae, yellow halteres, epandrium forming a ring structure as a result of the ventral expansion of its lateral sectors. Papp (2007) elevated *Tetroxyrhina* to the generic level, and it seems to be the most speciose genus of the tribe.

Gaimari & Silva (2010b) presented a key to the Neotropical Lauxaniidae genera that includes *Trigonometopus.* Diagnostic features for the genus in the Neotropical region would be the head sharply pointed anteriorly; fronto-facial angle less than 90°; eye at least slightly longer than high; postsutural intra-alar seta absent; wing hyaline or marked; crossvein dm-cu beyond middle of wing; cell dm with rounded apex.

This paper is a contribution to the knowledge of the Neotropical Lauxaniidae, a large acalyptrate family still poorly known in the Neotropics, with the description and illustration of four new species of *Trigonometopus* from Brazil. The paper discusses interesting genitalic features of males and females that may be particularly useful in a worldwide revision of the genus.

MATERIALS AND METHODS

This study utilized material collected by the authors and specimens borrowed from the "Coleção Padre Jesus Santiago Moure", Universidade Federal do Paraná, Curitiba, Brazil (DZUP), and from the Museu de Zoologia da Universidade de São Paulo, São Paulo, Brazil (MZUSP).

Specimens of one of the new species were collected by the first author in Assis in the State of São Paulo. The type specimens were deposited at the collections of DZUP and MZUSP. The study also includes material collected in the "SISBIOTA Diptera CNPq/FAPESP" project in the State of Mato Grosso do Sul, housed at the MZUSP.

For the study of the morphology of male and female terminalia, the post-abdomen was removed from a dry specimen and placed in a cold 10% KOH solution for 24-48 hours to soften the tissues, and then rinsed in distilled water and dehydrated in an increasing ethanol series (30%, 50%, 70% and 95%). It was then bleached with lactophenol and stored in a vial with glycerin, which was fixed to the insect pin. Illustrations were made using a Leica DM 2500 microscope and Leica MZ 12,5 stereomicroscope, both equipped with a camera lucida.

The morphological terminology follows Gaimari & Silva (2010b) and Cumming & Wood (2009).

RESULTS

Taxonomy

Trigonometopus Macquart, 1835

Trigonometopus Macquart, 1835: 419. Type species, *Tetanocera frontalis* Meigen, 1830: 45. Ref.: Hendel, 1908: 60; Melander, 1913: 77; Knab, 1914a: 123, 1914b: 132; Malloch, 1923: 48, 1929: 33; Wheeler, 1956: 313; Stuckenberg, 1971: 515; Shatalkin, 1997: 163, 2000: 39; Papp, 2007: 166; Gaimari & Silva, 2010b: 993.

Diagnosis: head triangular in profile (Fig. 1A); antenna inserted at frontal apex; face strongly protrud-

ing; eye longer than high; fronto-facial angle slightly higher than 45°; fronto-orbital setae situated on level of anterior margin of eye; proclinate setulae on the anterior part of frons; anepimeron bare; postsutural intra-alar seta absent; ctenidium absent; wing sapromyziform; wing hyaline or marked; crossvein dm-cu beyond middle of wing; base of R_{4+5} bare; cell dm with rounded apex.

Key for the Neotropical species of *Trigonometopus*

1. Body grey; wing with brown bands (Fig. 1D); ocellar setae longer than posterior fronto-orbital seta (Fig. 1A) ..... *T. assisensis* Lima & Silva, sp. nov.
— Body brownish or yellowish; wing unspotted or with stripes; ocellar setae no longer than posterior fronto-orbital seta or absent 2
2. Wing membrane with milky costal margin extending to apex of vein R_{4+5} ..... *T. albocostatus* Hendel
— Wing membrane without milky costal margin 3
3. Presutural dorsocentral seta present 4
— Presutural dorsocentral seta absent 7
4. Wing hyaline; pleural region dark; prescutellar acrostichal setae tiny; dorsocentral setae 1+2 ..... *T. immaculipennis* Malloch
— Wing infuscated, sometimes spotted; pleural region pale; prescutellar acrostichal setae well developed; dorsocentral setae variable 5
5. Wing membrane with two dark spots along the apical section of vein R_{4+5}; dark spots at both ends of dm-cu crossvein (Fig. 4D) 6
— Wing without spots ..... *T. rotundicornis* Williston
6. Wing infuscated at costal and anterior margins ..... *T. mariae* Lima & Silva, sp. nov.
— Anterior margin of wing not infuscated ..... *T. punctipennis* Coquillett
7. Ocellar seta present 8
— Ocellar seta absent 9
8. Wing hyaline; pleura yellow; apical scutellar setae with setigerous spot ..... *T. albifrons* Knab
— Wing infuscated (Fig. 3D); pleura brownish; apical scutellar setae without setigerous spot ..... *T. lourdesae* Lima & Silva, sp. nov.
9. Genal margin with dark stripe; postocellar setae convergent; apex of first flagellomere almost triangular ..... *T. angustipennis* Knab
— Genal margin not darkened (Fig. 2A); postocellar setae cruciate (Figs. 2B–C); apex of first flagellomere rounded ..... *T. boraceiensis* Lima & Silva, sp. nov.

Trigonometopus assisensis sp. nov. (Figs. 1A-I)

Diagnosis: Grey integument. Ocellar setae long, longer than posterior fronto-orbital seta; proclinate setulae covering anterior third of frons to base of anterior fronto-orbital seta; scape shorter than pedicel; first flagellomere long, oval, with recurved apex. Scutum, abdomen and femora covered by setigerous spots; dorsocentral setae arranged 0+2; proepisternal and anepisternal setae absent. Anterior two third of the wing totally covered by brown bands. Female terminalia telescopic, hypoproct and epiproct present, well developed; sternite 8 narrow; 4 spermathecae. Male terminalia: sternite 6 reduced; sternites 7 and 8 almost fused; hypandrium reduced to a stripe; phallus pear-shaped.

Description: **Male:** *Head (Figs. 1A, 1B, 1C):* Rounded vertex, grey; posterior edge of vertex slightly concave from dorsal view; ocellar triangle placed slightly anterior of vertex, slightly raised. Frons rectangular, short, longer than wide; flat in profile, a shallow dark grey groove running longitudinally from base of ocellar triangle through middle of frons to anterior margin; proclinate setulae from anterior margin to almost half way to vertex, including base of anterior fronto-orbital seta; anterior margin, in dorsal view, concave; lunule exposed. Face grey, almost flat; lower facial margin narrow. Parafacial grey, narrow. Gena grey with setigerous spots. Eye oval, longer than high, brownish red. Antenna brown, inserted in a facial depression: scape shorter than pedicel; first flagellomere long, oval, with recurved apex, pruinose; arista pubescent. Chaetotaxy: outer vertical seta divergent, ⅔ length of

inner vertical seta, convergent; ocellar seta ⅔ lenght of postocellar setae, proclinate, divergent; postocellar setae strong, cruciate; anterior fronto-orbital seta and posterior fronto-orbital seta both reclinate, anterior seta ⅔ length of posterior seta; 2 genal setae. *Thorax:* Scutum flat; grey, with setigerous spots; pleural region grey; scutellum triangular, grey. Chaetotaxy: dorsocentral setae 0+2 (anterior seta away from suture); 1 postpronotal seta; 2 notopleural setae; 1 prescutellar acrostichal seta; 4 rows of acrostichal hairs; intra-alar seta absent; 1 pre- and 1 postsutural supra-alar setae; 2 postalar setae; 1 katepisternal seta; many katepisternal hairs; anepisternal seta absent; proepisternal seta absent; 2 pairs scutellar setae, apical pair parallel. *Legs:* Coxae and femora brown with grey pruinosity; apex of femora dark yellow; tibiae and tarsi brownish

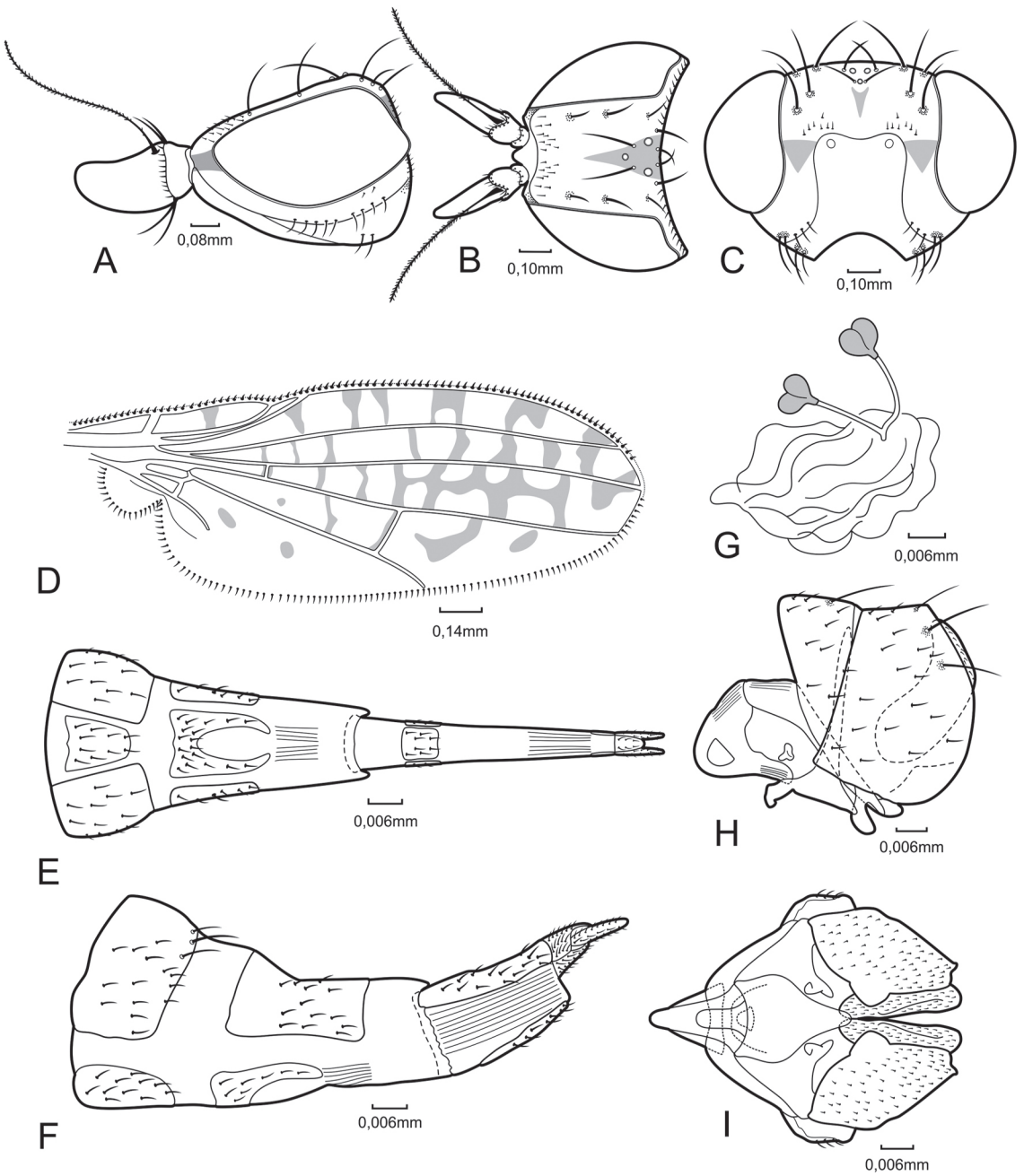

FIGURE 1: *Trigonometopus assisensis* sp. nov. **(A)** Head, lateral view. **(B)** Head, dorsal view. **(C)** Head, frontal view. **(D)** Wing. **(E)** Female abdomen, ventral view. **(F)** Female abdomen, lateral view. **(G)** Spermathecae and genital chamber. **(H)** Male terminalia, lateral view. **(J)** Male terminalia, ventral view.

yellow; apical segments of tarsi dark brown. Chaetotaxy: fore coxa with preapical seta; fore femur with posterodorsal and posteroventral rows of setae; mid coxa with 2 basal setae; mid femur with 2 strong apical setae; mid tibia with 1 strong apical anterior seta; hind coxa with 1 apical seta; hind femur with anterior and anteroventral rows of setae; hind tibia with strong 1 posteroventral and 1 anteroventral setae. *Wing (Fig. 1D):* Hyaline; anterior two thirds with brown bands, spotted at crossveins; costa sapromyziform; R bare; crossvein r-m located before midpoint of discal medial cell; crossvein dm-cu before midpoint of cell r_{4+5}; longitudinal veins parallel; vein A_1 short. Halter whitish yellow. *Abdomen:* Grey, with setigerous spots; dorsally with black spots; in males, sternite 6 reduced to a small plate, tergites 7 and 8 almost fused. *Terminalia (Figs. 1H, 1I):* Epandrium almost rectangular. Surstylus not well developed, fused to epandrium. Hypandrium as an almost complete ring around phallus base, narrow; with median projection, forked. Phallus pear-shaped; phallapodeme U-shaped laterally and forked in ventral view, strongly sclerotized; ejaculatory apodeme small and bell-shaped, in ventral view. **Female:** As male, except for abdominal apical segments, telescopic, membranous areas widely folded; sternite 8 narrow (Figs. 1E, 1F). *Terminalia:* With hypoproct and epiproct present. Cercus long. Spermathecae with configuration 2+2; pair of spermathecae united with no differenciation of a commom duct; very short duct linking paired spermathecae (Fig. 1G).

Etymology: The specific epithet *assisensis* was used as a homage to the type-locality, the city of Assis, where a large number of the type specimens were collected. To be treated as a noun in apposition.

Type material: Holotype: male; Brazil: São Paulo. Assis, 06.iv.2001, A.M.A. Lima col. (DZUP). *Paratypes:* Brazil: São Paulo. Assis, Horto Florestal, 05.ix.1992, S.M.D. Mello col., 1 male (MZUSP); Assis, 10.v.1995, V.C. Silva col., 2 males, 1 female (MZUSP); Assis, 27.iv.1999, A.M.A. Lima col., 3 males, 2 females (MZUSP); Assis, 06.iv.2001, A.M.A. Lima col., 2 males, 9 females (DZUP); Santa Catarina. [Seara], Nova Teutônia, ix.1967, F. Plaumann col., 1 male (MZUSP).

Comments: Some specimens of this new species were collected on grass fields. It should be noted that, besides the adaptation to life to an open vegetation- as noticed by Collin (1948: 227) and Stuckenberg (1971: 516) but queried by Shewell (1977) and Davies *et al.* (2012) the specimens were collected close to water source, preferably just before sunset.

Trigonometopus boraceiensis sp. nov. (Figs. 2A-I)

Diagnosis: Brownish yellow integument. Ocellar seta absent; postocellar setae cruciate. Antennal scape as long as pedicel. Thorax dark brown, with yellow stripes. Wing infuscated slightly brownish with dark brown median stripe. Female abdomen without modified sternites; 3 rounded spermathecae; epiproct present as a slender belt. Male terminalia: epandrium rectangular; surstylus rounded, articulated with epandrium.

Description: **Male:** *Head (Figs. 2A, 2B, 2C):* Rounded vertex, yellow; posterior edge of vertex distinctly concave from dorsal view; ocellar triangle placed slightly anterior of vertex, strongly raised, dark brown. Frons rectangular, two times longer than wide; yellow; flat in profile; proclinate setulae in anterior margin densely present to half way to vertex, including base of anterior fronto-orbital seta; anterior margin, in dorsal view, straight; lunule exposed. Face yellow, bare; lower facial margin wide; facial length almost four times its upper width. Eye oval, longer than high, brownish. Parafacial brownish yellow, and yellow between eye and face; narrow. Gena brown, with short setulae. Occiput yellowish brown. Antenna yellowish brown, inserted in a facial depression: scape as long as pedicel; first flagellomere rounded; arista pubescent, inserted submedially at first flagellomere. Chaetotaxy: outer vertical seta divergent, ½ length of inner vertical seta, reclined; ocellar seta absent; postocellar setae cruciate; both anterior fronto-orbital seta and posterior fronto-orbital seta reclinate, anterior seta ¾ length posterior seta; 3 genal setae; supravibrissal setae reaching base of face; occipital setae in two rows. *Thorax:* Scutum flat; dark brown, with one wider medial and two narrow yellow stripes; pleural region light brown, postpronotal lobe with a yellow spot, katepisternum dark brown; scutellum triangular, rounded apex, flat, brownish with yellow central stripe; anepisternum haired, brownish spotted; katepisternum haired. Chaetotaxy: dorsocentral setae 0+3 (anterior seta close to suture); 1 postpronotal seta; 2 notopleural setae; prescutellar acrostichal seta absent; 2 rows of acrostichal hairs; intra-alar seta absent; 1 presutural supra-alar seta; 1 postalar seta; 1 anepisternal seta; 1 katepisternal seta; 2 scutellar setae, apical pair divergent. *Legs:* Brownish yellow. Chaetotaxy: fore coxa with 2 apical setae; fore femur with one posterodorsal, one posteroventral and one posterior rows of setae; fore tibia with 2 apical setae: 1 anterior and 1 posterodorsal; mid coxa with 2 strong basal setae and 1 row of apical setae;

mid femur with 1 short and strong posterior seta; mid tibia with 2 apical setae: 1 anterodorsal and 1 ventral; hind coxa with 1 apical seta; hind femur with 1 anterodorsal seta; hind tibia with 1 apical anteroventral spine. *Wing (Fig. 2D):* Infuscated slightly brownish with dark brown median stripe; anterior margin withish till apex of R_{2+3} and with brown stripe from R_{4+5} till CuA_2+A_1; Sc and R1 paler than the other veins; costa sapromyziform; crossvein r-m located before midpoint of discal medial cell; crossvein dm-cu located at midpoint of cell r_{4+5}; longitudinal veins parallel; vein A_1 short, ending halfway to wing margin. Halter brownish yellow. *Abdomen:* Dark brown, lateral and central regions yellowish. *Terminalia:* Epandrium (Figs. 2H, 2I) rectangular. Surstylus articulated with epandrium; rounded. Hypandrium as an almost complete ring around phallus base; with long medial projection; phallapodeme as a long tube; phallus not seen. **Female** (Figs. 2E, 2F): As males, except for the following features: sternites not modified. Epiproct present as a slender belt. Cercus long. *Terminalia:* With 1+2 spermathecae configuration, rounded, with short ducts (Fig. 2G).

Etymology: The specific epithet *boraceiensis* is a homage to the type-locality, "Estação Biológica de Boracéia", where the holotype was collected. To be treated as a noun in apposition.

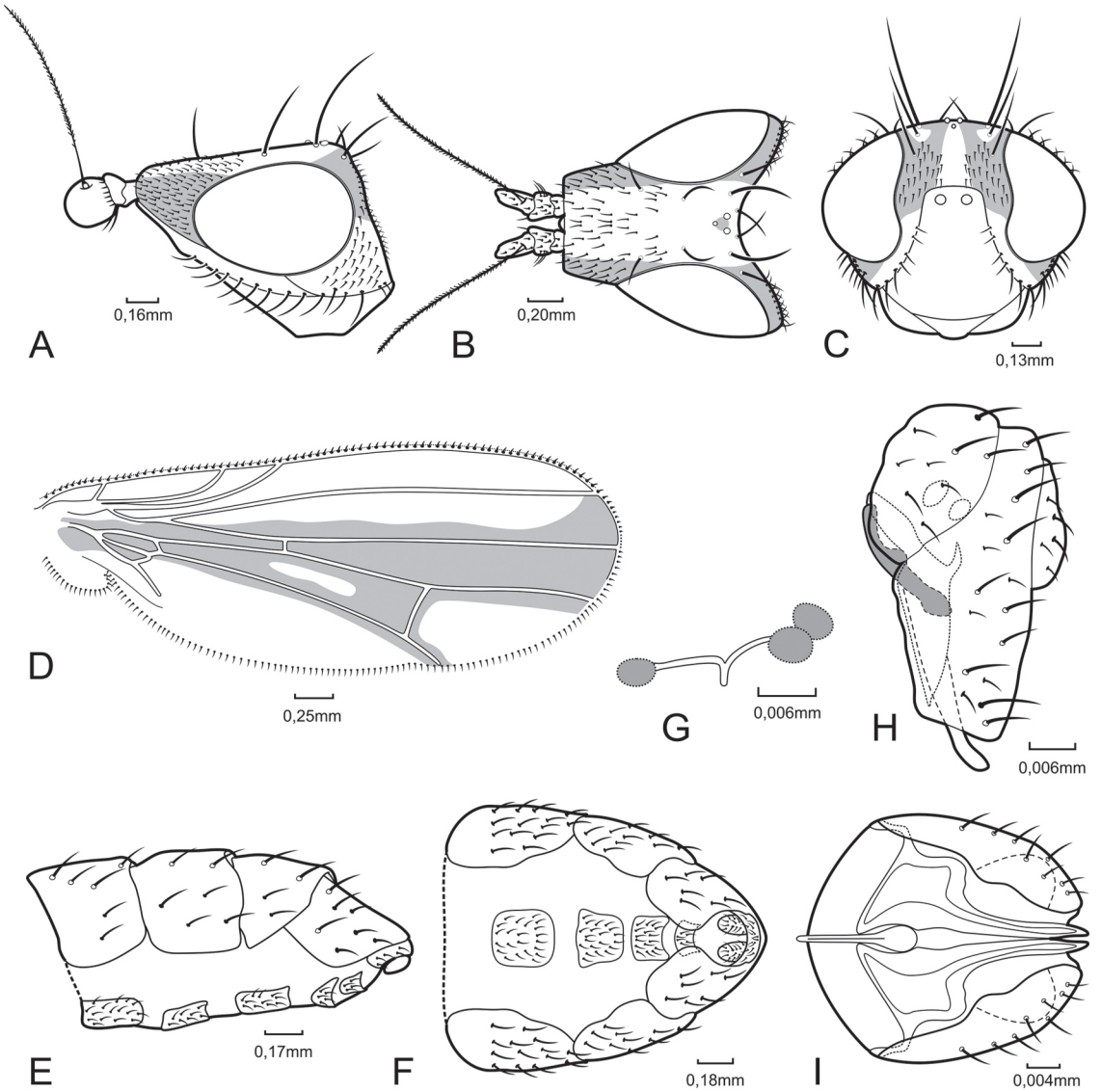

FIGURE 2: *Trigonometopus boraceiensis* sp. nov. **(A)** Head, lateral view. **(B)** Head, dorsal view. **(C)** Head, frontal view. **(D)** Wing. **(E)** Female abdomen, lateral view. **(F)** Female abdomen, ventral view. **(G)** Spermathecae. **(H)** Male terminalia, lateral view. **(I)** Male terminalia, ventral view.

Type material: Holotype: male; Brazil: São Paulo. Salesópolis, 14.viii.1947, E. Rabello & Trav. F. & J. Lane col. (MZUSP). *Paratype:* 1 female, Brazil: Santa Catarina. Seara, Nova Teutônia, ix.1967, F. Plaumann col. (MZUSP).

Comments: The abdomen of both types was dissected and stored in vials in glycerin, pinned with the specimens.

Trigonometopus lourdesae sp. nov. (Fig. 3)

Diagnosis: Brownish yellow body. Postocellar setae cruciate; 1 genal seta; arista inserted pre-basally; antennal scape longer than pedicel. Dorsocentral setae arranjed 0+3. Wing infuscated, with paler anterior margin. Female sternite 8 reduced; hypoproct and epiproct present; 3 spermathecae; cercus well developed.

Description: **Male:** *Head (Figs. 3A, 3B, 3C):* Rounded vertex, brown; posterior edge of vertex distinctly concave from dorsal view; ocellar triangle placed slightly anterior of vertex, well raised, brown. Frons rectangular, longer than wide; brown, with an anterior median yellow stripe; flat in profile; proclinate setulae from anterior margin to mid way between anterior and posterior fronto-orbital setae; anterior margin, in dorsal view, straight. Face yellow, with brown, median, narrow, stripe, and a thin brown ocular margin till the lower supravibrissal setae (more evident in female paratype); in profile, almost flat; bare; lower facial margin wider; facial length approximately 3 times its upper width. Eye oval, longer than wide, brown. Parafacial yellow, narrow. Gena brownish. Occiput brownish. Antenna yellowish brown, inserted in a facial depression: scape longer than pedicel; first flagellomere triangular to oval, with rounded apex; arista pubescent, inserted submedially. Chaetotaxy: outer vertical seta divergent, ½ length of inner vertical seta, reclined; ocellar setae proclinate, ⅓ length of postocellar setae; postocellar setae cruciate; both anterior fronto-orbital seta and posterior fronto-orbital seta reclinate, anterior seta ¾ length posterior seta; 1 genal seta; supravibrissal setae long, reaching base of face; occipital setae in two rows. *Thorax:* Scutum flat; brown, with paler longitudinal stripes; pleural region brown, postponotal lobe yellowish and continuing to wing base; scutellum triangular, flat, brown. Chaetotaxy: dorsocentral setae 0+3 (anterior seta close to suture); 1 postpronotal seta; 2 notopleural setae; prescutellar acrostichal seta absent; 2 rows of acrostichal hairs; intra-alar seta absent; presutural supra-alar setae absent; 1 postsutural supra-alar setae; 1 postalar seta; 1 anepisternal seta; 1 katepisternal seta; 1 proepisternal seta; 2 scutellar setae, apical pair paralel. *Legs:* Yellowish brown. Chaetotaxy: fore coxa with 2 anterior apical setae; fore femur with one posterodorsal, one posteroventral and one posterior rows of setae; fore tibia with 2 apical setae: 1 dorsal and 1 ventral; mid coxa with 1 row of apical setae; mid tibia with 2 apical setae: 1 dorsal and 1 ventral; hind coxa with 1 apical seta; hind femur with 1 strong anterodorsal seta; hind tibia with 2 small apical ventral spine. *Wing (Fig. 3D):* Infuscated, with paler anterior margin; Sc, R_1 and R_{2+3} light brown; costa sapromyziform; crossvein r-m located before midpoint of discal medial cell; crossvein dm-cu located in midpoint of cell r_{4+5}; longitudinal veins parallel; vein A_1 short, ending halfway to wing margin. Halter yellow. *Abdomen:* Brown. *Terminalia:* Epandrium (Fig. 3H) almost oval. Surstylus fused to epandrium. Hypandrium (Fig. 3I) as an almost complete ring around phallus base; well sclerotized; with median projections with lateral expansions, arrow shaped. Phallus (Fig. 3I) reduced, pear shaped; phallapodeme hourglass shaped. Cercus wide, rounded. **Female** (Figs. 3E, 3F): As males, except for terminalia not telescoped; sternite 8 reduced. Hypoproct and epiproct present. Cercus long. *Terminalia:* Spermathecae with configuration 1+2, tubular, common duct very short (Fig. 3G).

Etymology: This species is named after Maria de Lourdes Alves de Lima, sister of the first author, who has greatly incentived her to complete her scientific research training.

Type material: Holotype: male; Brazil: Mato Grosso [do Sul]. Nioaque, ii.1937 (MZUSP). *Paratype:* Brazil: Mato Grosso [do Sul]. Nioaque, ii.1937, 1 female (MZUSP). Corumbá, BEP [Base de Estudos do Pantanal, Universidade Federal do Mato Grosso do Sul] – transição Ciliar/Paratudal, 19°34'20,09"S, 57°00'57,09"W, Malaise 2, 14-29.ix.2012, Lamas, Nihei & eq. col., 1 male (MZUSP).

Comments: Abdomens of holotype and the paratype from Nioaque were dissected and stored in vials with glycerin and pinned with the specimens. It was very interesting to find in Corumbá, in the State of Mato Grosso do Sul, additional specimens of this species more than 70 years after the first specimens were collected at a locality to the southeast in the same state.

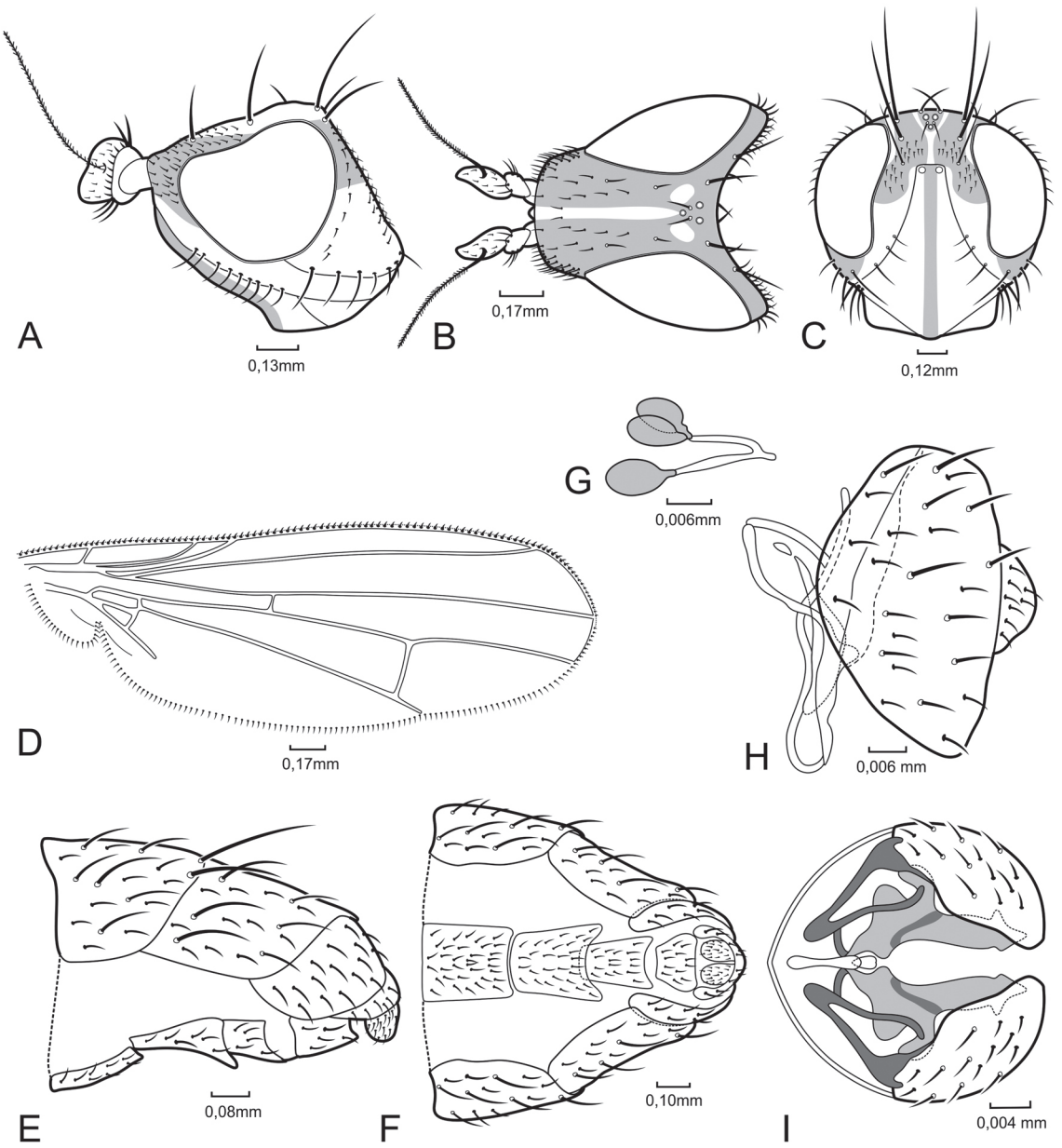

FIGURE 3: *Trigonometopus lourdesae* sp. nov. **(A)** Head, lateral view. **(B)** Head, dorsal view. **(C)** Head, frontal view. **(D)** Wing. **(E)** Female abdomen, lateral view. **(F)** Female abdomen, ventral view. **(G)** Spermathecae. **(H)** Male terminalia, lateral view. **(I)** Male terminalia, ventral view.

Trigonometopus mariae **sp. nov.**
(Fig. 4)

Diagnosis: Yellowish brown species, darker at the dorsal side. Anterior margin of frons almost straight, in dorsal view. Postocellar setae cruciate. Antennal scape as long as pedicel. Dorsocentral setae arranged 1+3; presutural supra-alar seta present. Wing hyaline, infuscated at costal margin, spotted at both end of crossvein dm-cu, two spots along R_{4+5} near its apex. Female sternite 8 reduced to a small plate; epiproct present; 3 spermathecae; cercus papilate.

Description: **Male:** *Head (Figs. 4A, 4B, 4C):* Rounded vertex, brownish yellow; ocellar triangle placed slightly anterior of vertex, slightly raised, brown. Frons rectangular, narrow, at least three times longer than wide; brown; flat in profile; anterior margin strongly covered with proclinate setulae to half way to vertex, and sparsely covered with proclinate setulae until base

of posterior fronto-orbital seta; anterior margin, in dorsal view, almost straight. Face yellowish brown, bare; in profile, straight; lower facial margin narrow. Lunule exposed. Eye oval, longer than high, brownish. Parafacial brownish yellow, narrow. Gena brownish yellow, with short setulae. Occiput brown. Antenna brownish yellow, inserted in a facial depression: scape as long as pedicel; first flagellomere oval; arista pubescent, inserted dorsomedially. Chaetotaxy: outer vertical seta divergent, ⅔ length of inner vertical seta, reclined; ocellar seta proclinate; postocellar setae cruciate, ocellar setae ⅔ lengh postocellar setae; anterior and posterior fronto-orbital setae reclinate, anterior seta ⅔ length posterior seta; no genal seta; supravibrissal setae very long, reaching base of face; occipital setae in two rows. *Thorax:* Scutum flat; brownish yellow, and darker at lateral margins; pleural region brownish yellow; scutellum triangular, rounded apex, flat, brown with yellow central stripe. Chaetotaxy: dorsocentral setae 1+3 (anterior seta close to suture); 1 postpronotal seta; 2 notopleural setae; 2 prescutellar acrostichal setae; 4 rows of acrostichal hairs; intra-alar seta absent; 1 presutural and 1 postsutural supra-alar setae; 1 postalar seta; 1 anepisternal seta; 1 proepisternal seta; 2 katepisternal setae; 2 scutellar setae. *Legs:* yellow, fore apical tarsomeres darker. Chaetotaxy: fore coxa with 3 apical setae; fore femur with one posterodorsal, one posteroventral and one dorsal rows of setae; fore tibia with 2 apical setae: 1 anterodorsal and 1 ventral; mid coxa with 2 basal setae and 1 apical

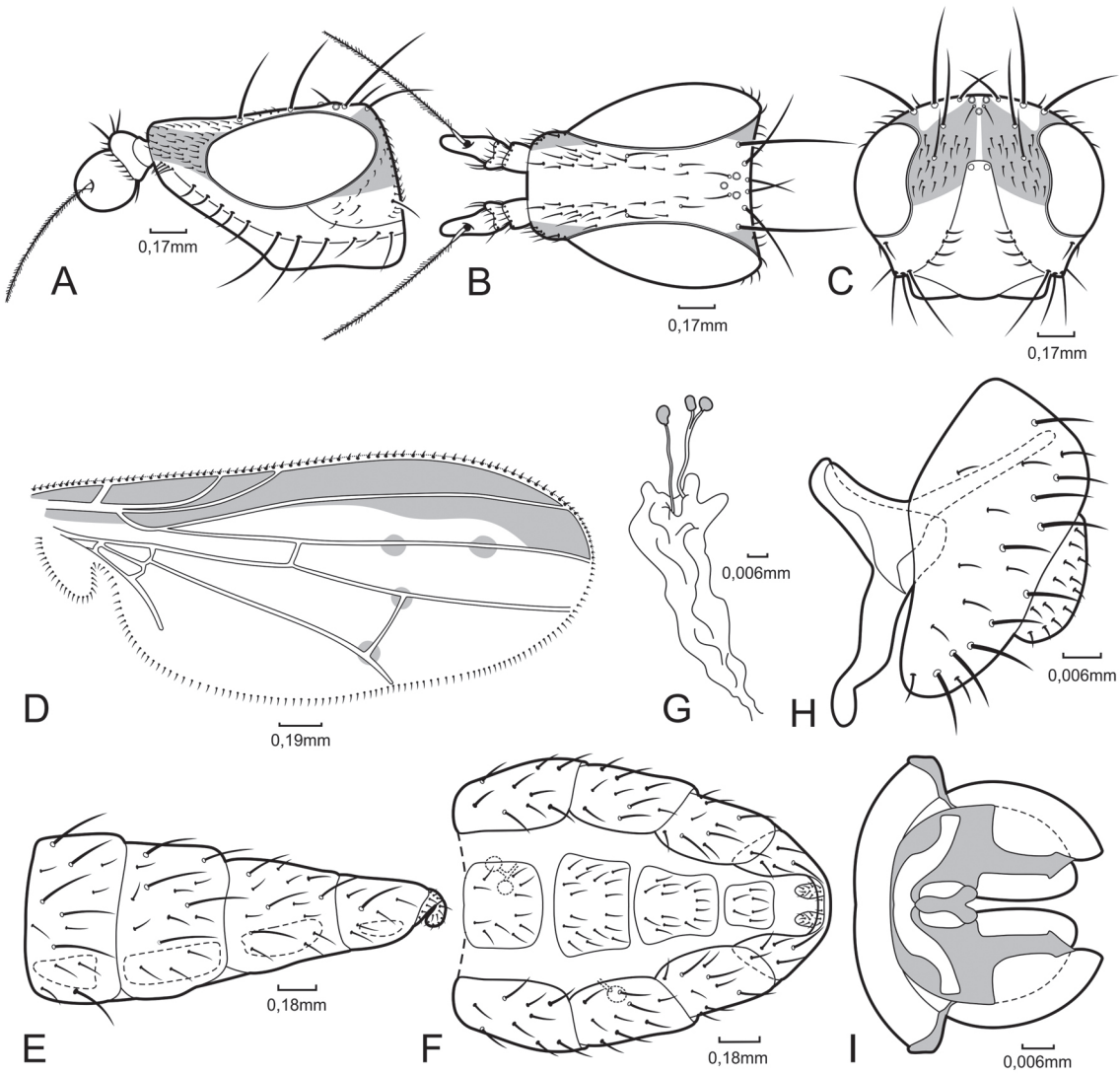

FIGURE 4: *Trigonometopus mariae* sp. nov. **(A)** Head, lateral view. **(B)** Head, dorsal view. **(C)** Head, frontal view. **(D)** Wing. **(E)** Female abdomen, lateral view. **(F)** Female abdomen, ventral view. **(G)** Spermathecae and genital chamber. **(H)** Male terminalia, lateral view. **(I)** Male terminalia, ventral view.

setae; mid femur with 1 anterior row of setae, 1 apical posterodorsal seta, 1 apical posterior seta; mid tibia with 2 apical setae: 1 anterodorsal and 1 anteroventral; hind coxa with 2 apical setae: 1 anterior and 1 lateral; hind femur thickened, with 1 strong anterodorsal seta; hind tibia with 1 apical anterodorsal spine, 1 ventral spine. *Wing (Fig. 4D):* Hyaline, infuscated at costal margin, spotted at both end of crossvein dm-cu, two spots along R_{4+5} near its apex; costa sapromyziform; crossvein r-m located in the midpoint of discal medial cell; crossvein dm-cu located before midpoint of cell r_{4+5}; longitudinal veins parallel; vein A_1 short, not reaching wing margin. Halter brownish yellow. *Abdomen:* Brown, with yellow stripes at the anterior margin of the tergites that become paler in each segment toward abdominal apex, which is yellow. *Terminalia (Figs. 4H, 4I):* Epandrium trapezoid, with rounded margins; surstylus rounded, fused to epandrium; hypandrium as an almost complete ring, strongly sclerotized, with paired median sharp projections; phallapodeme Y-shaped, strongly sclerotized; phallus not seen; cercus big, papilate. **Female:** As males, except for sternite 8 reduced to a small plate. *Terminalia not telescopic (Figs. 4E, 4F, 4G):* Hypoproct and epiproct present; genital chamber as a long tube, posterior apex forming a large bag; dorsal wall with the opening of the spermathecal ducts. Spermathecae with configuration 1+2; ducts of paired spermathecae short until commom duct (Fig. 4G). Cercus small, papilate.

Distribution: Brazil.

Etymology: This species is named after Maria Alves de Lima, mother of the first author, for her continuous support to AMAL.

Type material: Holotype: female: Brazil: Santa Catarina. Seara, Nova Teutônia, ix.1962, F. Plaumann col. (MZUSP). *Paratype:* Brazil: Pará. Belém, 25.iv.1965, F. Pirelli & H.S. Lopes col., 1 male (MZUSP).

Comments: Abdomens dissected and stored in vials with glycerin and pinned with the specimens. This species is similar to *T. punctipennis,* differing by the frons being longer (1,5 times longer than wide in *T. punctipennis*), brown (brown with yellow central stripe in *T. punctipennis*), first flagellomere oval (pointed apically in *T. punctipennis*), scutum brownish yellow, darker at lateral margins (brownish yellow with central gray dorsocentral vittae through entire length and dark brown laterally in *T. punctipennis*), wing infuscated at costal margin (infuscated at cell bm and base of basal radial cell and r-m spotted in *T. punctipennis*).

DISCUSSION

This genus has considerably wide distribution in the world, but it is still poorly known in the Neotropical region. This paper almost doubles the number of previously known species for the Neotropics, suggesting that there is the need for collecting effort in more diverse habitats in different parts of the region. The actual number of Neotropical species of *Trigonometopus* is likely much higher.

Among the new species, only *T. assisensis* sp. nov. has four spermathecae, a feature considered by Gaimari & Silva (2010a) to be an apomorphy for the Eurychoromiinae and as well a feature sporadically found in other lauxaniid genera. It has been also observed in the Neotropical lauxaniine genera *Cephalella* Malloch (Silva, 1999) and *Neogriphoneura* Malloch (Mello & Silva, 2008), and in the Australian species *Australinina geniseta* (Malloch), *Homoneura* (*Homoneura*) *angustigena* Kim and *H.* (*H.*) *eurymelon* Kim (Kim, 1994). This feature is still insufficiently known in many species and genera of the family and a more extensive comparative analysis would better show the evolution of the number of spermathecae in the Lauxaniidae.

Shatalkin (1997) and Papp (2007) considered that the following features define *Trigonometopus:* first flagellomere pointed apically, anterior fronto-orbital seta situated on level of anterior margin of eye and structure of the epandrium forming a ring as a result of the ventral expansion of its lateral sectors. These features are quite variable, however, among the Neotropical species or are even absent in some species (or the information is not available). The apex of the flagellomere is pointed only in *T. assisensis* and *T. punctipennis,* although not forming a small beak, as in *T. frontalis.* The position of the anterior fronto-orbital setae is more variable among the Neotropical species, but five of the species share the state in *T. frontalis,* while there is no information about *T. albocostatus* for this character. The shape of the epandrium is not known in six of the Neotropical species, but in five of the species the abdomen certainly does not form a ring.

Other characters always mentioned for the genus are the number and position of dorsocentral setae and the number of katepisternal setae: the dorsocentral setae are variable, but in the Nearctic species *T. vittatus* (no available information for *T. albocostatus*) and in all Neotropical species there is only one katepisternal seta, while *T. punctipennis* shares with *T. frontalis* a pair of katepisternal setae. This shows that part of the features formerly taken as diagnostic for the genus ac-

tually apply to only part of *Trigonometopus,* not being shared by part or all of the Neotropical diversity of the genus. The set of Neotropical species diverge from the rest of the genus to a certain degree. A detailed study of the relationships within *Trigonometopus* is necessary to put the Neotropical species into proper context within the genus.

RESUMO

O gênero Trigonometopus *Macquart (1835) atualmente inclui 13 espécies e é encontrado em quase todas as regiões biogeográficas, estando ausente nas Regiões Afrotropical e Australiana. Na Região Neotropical, está composto por seis espécies. Neste trabalho, são descritas quatro novas espécies de* Trigonometopus *da região Neotropical:* T. assisensis *sp. nov.,* T. boraceiensis *sp. nov.,* T. lourdesae *sp. nov.; e* T. mariae *sp. nov., as duas primeiras do Estado de São Paulo e as outras duas respectivamente dos Estados do Mato Grosso do Sul e de Santa Catarina. Uma chave para as espécies exclusivamente neotropicais do gênero é fornecida.*

Palavras-Chave: Descrição; Novos táxons; Região Neotropical; Sistemática.

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