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Four new species of *Paratrizygia* Tonnoir from the Brazilian Atlantic Forest (Diptera, Mycetophilidae, Sciophilinae)

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Abstract

Paratrizygia Tonnoir was originally described for *P. conformis*, from Australia, and since then only four species have been added to the genus, from Chile and Southern Argentina. We add four new species to the genus *Paratrizygia*—*P. balbii* **sp. nov.**, *P. alvesi* **sp. nov.**, *P. camargoi* **sp. nov.**, and *P. albidens* **sp.nov.—**from the southern part of the Brazilian Atlantic Forest. Comments are made about the possible relationships of the Brazilian and other Neotropical species of the genus. An identification key to the Neotropical species of the genus is provided.

Key words: *Paratrizygia*, Sciophilinae, Mycetophilidae, Neotropics, Atlantic Forest, Taxonomy

Introduction

Mycetophilidae (Diptera) is the largest and most diversified Bibionomorpha family, with more than 4,100 described species (Evenhuis *et al*. 2007), placed in 135 extant genera. Approximately 1,000 species are known from the Neotropics (Papavero 1978, Amorim *et al*. 2002).

The monophyly of Mycetophilidae has been supported in the literature repeatedly. Phylogenies for the family based both on morphological (Søli 1997, Tozoni 1998) and molecular data (Rindal *et al*. 2009) have demonstrated that the Sciophilinae *s.l.* are paraphyletic in relation to the Mycetophilinae. Hence, taxa earlier accepted as tribes of Sciophilinae have been proposed to be ranked as subfamilies, *i.e.*, Gnoristinae, Mycomyiinae, Leiinae, Manotinae, and Sciophilinae *s.s.* (Tuomikoski 1966, Hennig 1973, Väisänen 1984, Tozoni 1998, Rindal *et al.* 2009).

The Sciophilinae *s.s.* include genera with medial and cubital forks complete, as well as a group of genera with M_2 and/or M_4 weak or missing, sometimes with an unattached vein between the medial and cubital veins. This group includes *Acnemia* Winnertz, *Afrocnemia* Matile, *Azana* Walker, *Cluzobra* Edwards, *Megalopelma* Enderlein, *Monoclona* Mik, *Morganiella* Tonnoir & Edwards, *Neoaphelomera* Miller, *Neotrizygia* Tonnoir & Edwards, *Paramorganiella* Tonnoir, *Paratryzigia* Tonnoir , *Parvicellula* Marshall, *Sciophila* Meigen, and *Trizygia* Skuse (Amorim & Oliveira 2008; Oliveira & Amorim 2010). A part of this group of genera was referred to by Matile (1998) as the *Azana* group, and was thought to be monophyletic.

Paratrizyigia Tonnoir has M_{1+2} as well as CuA unforked, with an additional vein, possibly M_4 unattached either to M_{1+2} or to CuA. As noted by Matile (1998), the original description of *Paratrizygia* has a discrepancy between the text describing the wing features of the type-species (Tonnoir 1929: 605) and the photograph referred to as belonging to that species (Tonnoir 1929, Fig. 14). Actually, the wing of *Paratrizygia conformis* Tonnoir must be that of Plate XXIII Figure 15, while that of Figure 14 must be that of *Paramorganiella adventurosa* Tonnoir, mistakenly indicated as Plate XXIII Figure 15. The type of *P. conformis*, however, has unfortunately not been localized (Bugledich 1999).

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Freeman (1951) described the first known Neotropical species of *Paratrizygia*– *P. setifera*, from Chile and Argentina, *P. spinulosa* and *P. infuscata*, from Chile– indicating that the only relevant difference between the Australian and the South American species is the presence of R_4 in the type-species, which is absent in the Neotropical species. An additional species was erected by Duret (1984), *P. lanfrancoae*, from Argentina and Chile, who indicated a possible relationship of his species with *P. infuscata*. The fact that the holotype of *P. conformis* is not available prevents a check on whether the type species actually constitutes a monophyletic group with the Neotropical species assigned to the genus. Hence we assume a conservative position by retaining both the Australian and the South America species in the same genus.

In this paper, we describe four new species from the southern Atlantic Forest of Brazil, all without R_4, which form a clade with the previously described Chilean and Argentinian species. A key for the Neotropical species of the genus is provided.

Material and methods

All specimens examined in this paper belong to Diptera collection of the Museu de Zoologia da Universidade de São Paulo (MZUSP), Brazil. Holotypes and paratypes of the new species are deposited in the MZUSP collection. The wings and terminalia were detached from the dissected specimens; the male and female terminalia were heated in KOH solution, neutralized, dehydrated, and permanently slide mounted in Canada balsam preparations. Photographs were taken using a Leica DC camera attached to a Leica MZ16 stereomicroscope and a DM2500 transmission microscope. Photographs were prepared using AutoMontage software and Photoshop CS. Drawings were made using a *camera lucida* and redrawn using Adobe Illustrator 11.0. Morphological terminology follows Søli (1997), except for wing venation which follows Amorim & Rindal (2007).

Abbreviations used are: ae, aedeagus; anp, anepisternum; ce, cercus; ce1, first cercomere of female terminalia; ce2, second cercomere of female terminalia; cxI, fore coxa; cxII, mid coxa; cxIII, hind coxa; gcap, gonocoxal apodeme; gcx, gonocoxite; gd, gonoduct; gs, gonostyle; ktp, katepisternum; ltg; laterotergite; mes, metepisternum; mep, mesepimeron; mtd, mediotergite; par, parameres; pem, proepimeron; pes, proepisternum; pnt, pronotum; S, sternite; sc, scutum; sctl, scutellum; T, tergite.

Paratrizygia Tonnoir 1929

Paratrizygia Tonnoir 1929: 605. Type-species, *P. conformis* Tonnoir (orig. des.).

Diagnosis. Three ocelli, lateral ocelli touching or almost touching eye margin. Mediotergite, laterotergite, and anepisternum setose. Wing membrane covered with micro- and macrotrichia. Sc ending just beyond origin of Rs, sc-r faint, connecting to R in the basal region of wing; M_{1+2} unforked, an unattached vein present between M_{1+2} and unforked cubital vein (possibly M_4, Amorim & Oliveira 2008). Tarsal claws toothed.

Comments. The holotype of *Paratrizygia conformis* Tonnoir is missing from the Australian Museum, Sydney (Bugledich 1999: 269), which prevents us from a wider discussion of the relationships within the genus. Even though the original description of the type-species of the genus is detailed, the fact that the holotype cannot be examined constrains the preparation of a well established diagnosis.

Paratrizygia balbii, sp. nov.

(Figs. 1, 3, 7)

Diagnosis. Gonostyle directed laterally on basal thirds and then strongly curved apically, bifid at apex, main apical branch with four elongated spines. Aedeagus trifid at base.

FIGURE 1. *Paratrizygia balbii*, **sp. nov.** Habitus, lateral view. Holotype. Scale 1 mm.

Material examined. Holotype ♂, BRAZIL, State of São Paulo, Salesópolis, Estação Ecológica de Boracéia, Malaise trap open vegetation, 23°39'05" S, 45°53'51" W, 01–04.xii.2008, Amorim, Falaschi & Miranda cols. (BIOTA-FAPESP).

Description. **Male** (Fig. 1). Wing length, 2.3 mm, wing width, 0.6 mm. **Head.** Vertex brown, with scattered setae. Three ocelli, mid ocellus smaller and slightly more ventral in position than lateral ones, lateral ocelli separated from mid ocellus by about 1.5 times its width. Occiput brown. Eyes setose. Scape yellowish brown, pedicel light yellow, with longer setae dorsally along apical margin; 14 brownish flagellomeres, almost twice as long as wide, with scattered setae and a short apical neck. Frons brown, clypeus light brown, covered with short setae; labella yellowish; maxillary palpus light yellow, lighter towards the apex, five palpomeres, basal palpomere very small, apical ones increasingly longer, last palpomere almost twice length of penultimate. **Thorax.** Scutum brown, lighter laterally, scutellum brown. Pleural sclerites brown, katepisternum and anepisternum light brown, metepisternum yellowish brown. Pleural membrane yellowish. Scutum moderately arched, covered with scattered small setae and stronger supra-alar, dorsocentral and acrostical setae. Scutellum with six scutellar bristles of slightly different sizes and many setulae. Pronotum densely setose, with some stronger setae. Anepisternum with some stronger setae and many setulae; katepisternum more or less squared ventrally. Mesepimeron reaching ventral margin of thorax, bare. Laterotergite projecting slightly, with 6–9 setae of different sizes, suture with mediotergite incomplete dorsally. Mediotergite slightly curved in profile, ventral half with a pair of patches of longer setae and some setulae. Haltere whitish yellow, with some few setae on pedicel and more densely setose on knob. Coxae whitish yellow, femora, tibiae and tarsi light yellowish brown, darker towards the apex. Mid- and hind first tarsomere more than twice the length of second tarsomere; mid- and hind tibiae and tarsi with erect darker short bristles along almost entirely length, those on hind tibia more or less aligned dorsally and laterally. Tibial spurs 1:2:2, about twice the length of tibial width at apex, internal spurs shorter. Tarsal claws with a large apical tooth and a smaller, more basal one. **Wing** (Fig. 3). Membrane homogenously light brown, no maculation; membrane densely covered with microtrichia in all cells, macrotrichia densely distributed, but sparser in basal cells. Sc complete, reaching C just beyond base of Rs, setose, well sclerotized. C ending before wing apex, extending about a third the distance between R_5 and M_1. First sector of Rs almost transverse, devoid of setae, about as long as r-m. R_1 relatively long, reaching C on apical third of wing; R_5 reaching C just before wing apex, well sclerotized; r-m almost longitudinal, well sclerotized, setose. M_{1+2} unforked; an unattached vein between M_{1+2} and unforked CuA (possibly M_4); CuA complete, well sclerotized. A_1 incomplete, not present on the apical half. All apical veins with dorsal macrotrichia. **Abdomen**. Abdomen light brown, setose, slender. T8 short and wide, S8 slender, longer than wide, rounded apically. Terminalia light brown, conspicuous, quite elongate. **Terminalia** (Fig. 7). Gonocoxites setose, elongate, fused to each other only at ventral margin, with a pair of distinctive apical medial extensions, pointed outwards at apex, which on untreated specimens fold, covering inner structures of the terminalia; gonostyle very long, with a strong curve on basal third, bifid apically, the main branch with four apical spines; aedeagus slightly sclerotized, pointed at apex, with a pair of lateral extensions at base and a medial short projection directed anteriorly; gonocoxal apodeme complete; T9 long, setose, with four characteristic regular rows of spines on a apical fold facing ventrally; cerci medially fused, weakly sclerotized, covered with setulae.

Female. Unknown.

Etymology. The species name is feminine, named after Maria Isabel Protti de Andrade Balbi, of the Faculdade de Filosofia, Ciências e Letras de Ribeirão Preto, Universidade de São Paulo, who has been a constant support to the Diptera systematic research in our lab.

Comments. This is the only species of the genus with the gonostyle bifid apically. The four spines at the apex of one of the branches of the gonostyle are quite similar to those of *P. camargoi*, **sp. nov.**, but in the latter species the gonostyle is not bifid and is strongly curved on its basal third. Also, the apical medial projections of the gonocoxites are more rounded in *P. balbii*, **sp. nov.**, while they are more pointed in *P. camargoi*, **sp. nov.**

Paratrizygia alvesi, sp. nov.

(Figs. 2, 4, 8, 9)

Diagnosis. Projections of gonocoxite rounded apically, with regular rows of microtrichia in grooves (Fig. 8). Gonostyle hook-shaped, with a rounded inner projection before apex, four dark spines apically. Aedeagus without a medial projection directed ventrally at base.

Material examined. Holotype ♂, BRAZIL, State of Rio de Janeiro, Rio de Janeiro, Parque Estadual do Desengano, Malaise trap, 21°50' S, 41°40' W, 20–23.iv.2002 (BIOTA-FAPESP). Paratypes, 2 ♂, 1 ♀ same data as holotype; 2 ♂, 2 ♀, same data as holotype, except 17–20.iv.2002; 5 ♂, 5 ♀, State of Minas Gerais, Presidente Olegário, Fazenda Gigante, 1,000 m, Malaise trap, 18°31' S, 46°18' W, 02–09.i.2010, Ribeiro, Amorim, Silva & Berbert cols. (BIOTA-FAPESP); 2 ♂, 2 ♀, Botelhos, Córrego da Onça, 21°40'90" S, 46°22'05" W, Malaise trap, 09.vii.2008, João Basso col. (BIOTA-FAPESP); 2 ♂, 3 ♀, same data, but 07.xii.2008–06.i.2009; 1 ♀, same data, but 19.xi.2008 (BIOTA-FAPESP); 1 ♀, State of São Paulo, Jundiaí, Serra do Japi, 23º11'11" S, 46º53'03" W, 22.x.1197–12.iv.1998, Amorim, Martins & Urso-Guimarães cols. 1 ♂, State of Santa Catarina, São Bento do Sul, Cepa Rugendal, 26°15'01,0" S, 49°22'43,0" W, 13–19.x.2001, A.P. Dias *et al.* col. (BIOTA-FAPESP).

Description. Male. Head (Fig. 2)**.** Vertex light-brown, with scattered setae. Three ocelli, mid ocellus smaller and slightly more ventral in position than lateral ones. Occiput brown. Eyes setose. Scape and pedicel yellow, with longer setae dorsally along apical margin; 14 brownish flagellomeres, almost twice longer than wide, with scattered setae and a short apical neck. Front and clypeus light-brown, covered with short setae;

labella yellow; maxillary palpus yellow, five palpomeres, basal palpomere very small, apical ones increasingly longer, last palpomere almost twice penultimate. **Thorax** (Fig. 2)**.** Scutum and scutellum brownish. Pleural sclerites brownish. Pleural membrane yellowish. Scutum moderately arched, covered with scattered small setae and stronger supra-alar, dorsocentral and acrostical. Scutellum with four scutellar bristles of slightly different sizes and many setulae. Pronotum densely setose, with some stronger setae. Anepisternum with some stronger setae and many setulae; katepisternum more or less squared ventrally. Mesepimeron reaching ventral margin of thorax, devoid of setae. Laterotergite only slightly projected, with 6–9 setae of different sizes, suture separating from mediotergite incomplete dorsally. Mediotergite slightly curved on profile, ventral half with a pair of patches with some longer setae and some setulae. Haltere whitish yellow, with some few setae on pedicel and more densely setose on knob. Coxae whitish yellow, femora, tibiae and tarsi yellow, darker to the apex. Mid and hind first tarsomere more than twice the length of second tarsomere; mid and hind tibiae and tarsi with erect darker short bristles along almost entirely length, those on hind tibia more or less aligned dorsally and laterally. Tibial spurs 1:2:2, about twice the length of tibial width at apex, internal spurs shorter. Tarsal claws with a larger apical tooth and a smaller, more basal one. **Wing** (Fig. 4). Length, 1.9 mm, width 0.8 mm. Membrane homogenously hyaline, no maculation; membrane densely covered with microtrichia on all cells, macrotrichia densely distributed, less so in the basal cells. Sc complete, ending in C just beyond base of Rs, setose, well sclerotized. C ending before wing apex, extending about a third the distance between R_5 and M_1. First sector of Rs almost transverse, devoid of setae, about as long as r-m. R_1 relatively long, reaching C on apical third of wing; R_5 reaching C quite before wing margin, well sclerotized; r-m almost longitudinal, well sclerotized, setose. M_{1+2} unforked; a loose vein between medial and cubital inforked veins (possibly M_4); CuA complete, well sclerotized. A_1 incomplete, not produce on the apical half. All apical veins with dorsal macrotrichia. **Abdomen**. Abdomen brownish, setose. T8 short and wide, S8 slender, longer than wide, rounded apically. Terminalia brownish, conspicuous, quite elongate. **Terminalia** (Fig. 8). Gonocoxite setose, elongate, fused to each other only at ventral margin, with a pair of distinctive apical medial extensions, pointed outwards at apex, which on untreated specimens fold covering inner structures of the terminalia, projections of gonocoxite rounded apically, with regular rows of microtrichia on grooves; gonostyle hook shaped, with a rounded inner projection before apex, four dark spines apically; aedeagus slightly sclerotized, pointed at apex, with a pair of lateral extensions at base; parameres not strongly sclerotized, just lateral of aedeagus, with small macrotrichia apically; T9 long, setose, with four characteristic regular rows of spines at a apical fold facing ventrally; cerci medially fused, weakly sclerotized, covered with setulae.

Female. As male, except for the following features. Wing length 2.1 mm, width 0.8 mm. Antennal flagellomeres not as elongate as the male, near each other. **Terminalia** (Fig. 9)**.** Terminalia yellowish. A pair of weakly sclerotized spermathecae on segment 7. Sternite 8 elongated, a pair of gonapophyses apically separated by a short medial incision, covered with fine, elongated setae on apical margin; T8 wide, twice length of T9, with setae only at lateral margins; S9 (genital fork) without an anterior medial extension, a gonopore shortly connected anteriorly to a pair of ducts; T9 wide and short, setae emerging from digitiform projections along margin; S10 membranous, with microtrichia; T10 not visible, maybe fused to T9; Ce1 more than three times Ce2 length, covered with microtrichia and few scattered setae; Ce2 ovoid, covered with microtrichia and few setulae.

Etymology. The species is named after the collector, Mr. João Batista Alves, an exemplary gentleman, who has been extremely helpful with our Malaise trap collections.

Comments. There is some color variations between examined specimens. The antennal flagellomeres and thorax vary between brownish or light-brown. The specimens from Descalvado, in the state of Rio de Janeiro, are yellowish, differing from those of the state of Minas Gerais, which are much darker. Nevertheless, male and female terminalia from both localities are nearly identical, so with the data at hand we prefer to consider them a single species.

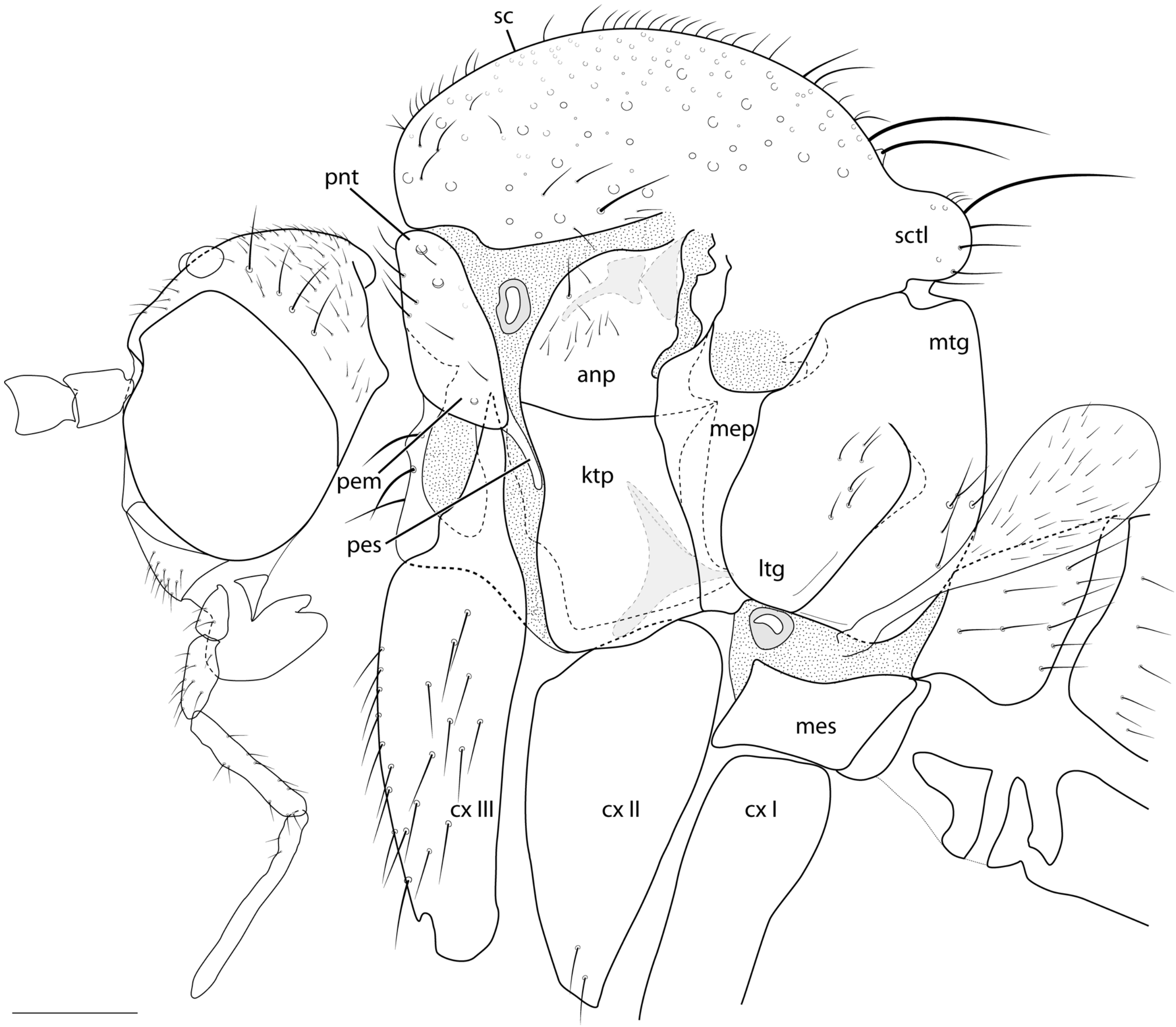


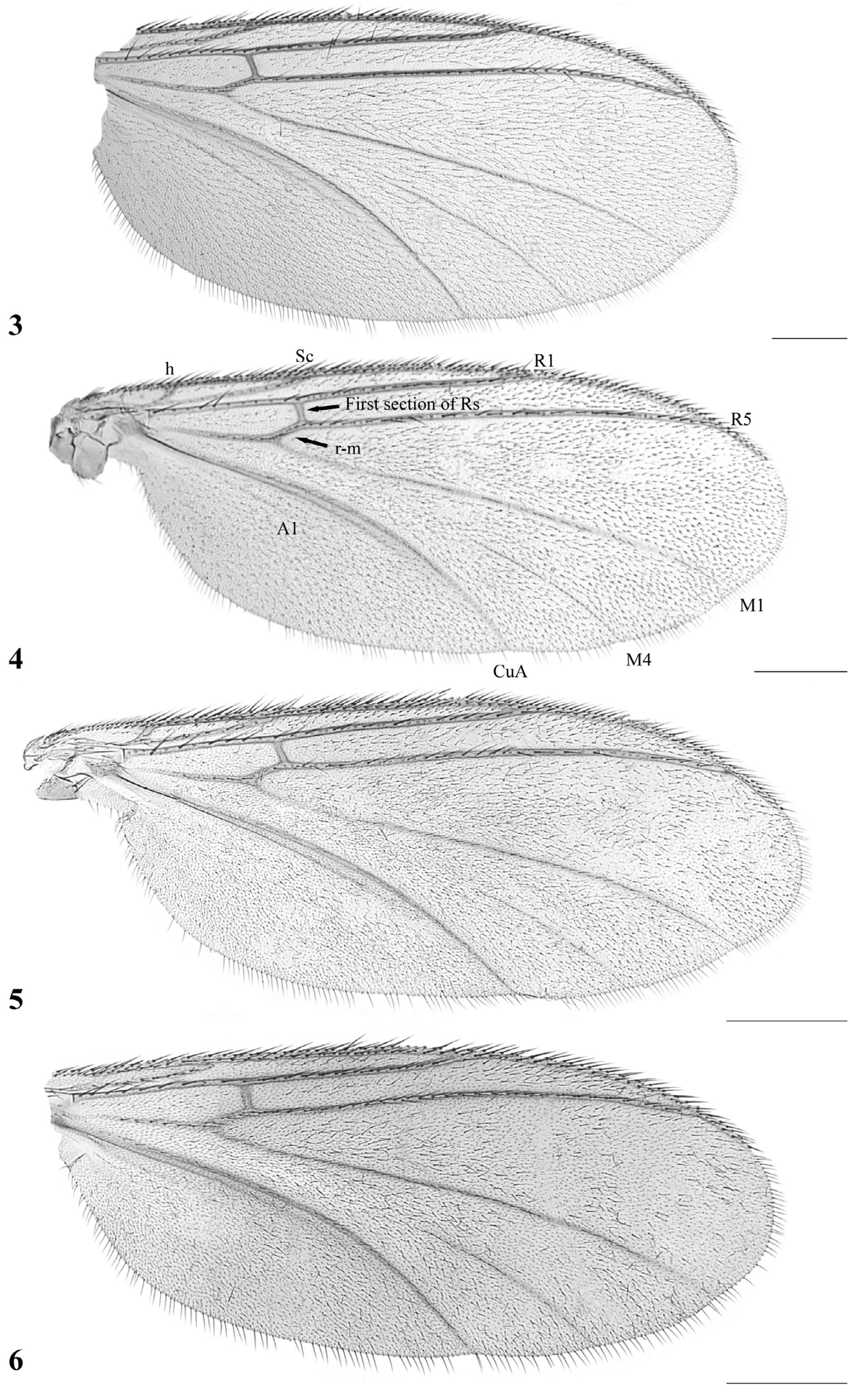
FIGURE 2. *Paratrizygia alvesi*, **sp. nov.** Thorax, lateral view. Paratype. Scale 0.1 mm.

***Paratrizygia camargoi*, sp. nov.**
(Figs. 5, 10, 11)

Diagnosis. Apical projections of gonocoxite tapering to the apex. Gonostyle wide at base, with a strong medial sinuosity, thin at the apex, with four apical elongated spines. Aedeagus with a medial incision at base. Female S8 with a pair of long, digitiform gonapophyses.

Material examined. Holotype ♂, BRAZIL, State of Bahia, Ilhéus, Mata Esperança, Malaise trap, 14°46' S, 39°04' W, 15–18.v.2002, C.O. Azevedo *et al*. cols. (BIOTA-FAPESP). Paratypes 1 ♂, same data as holotype; 1 ♀, same data as holotype, except 18–21.v.2002.

Description. **Male. Head.** Vertex brown, with scattered setae. Three ocelli, mid ocellus smaller and slightly more ventral in position than lateral ones. Occiput brown. Eyes setose. Scape and pedicel rounded, yellow, with longer setae dorsally along apical margin; 14 brownish flagellomeres, almost twice longer than wide, with scattered setae and a short apical neck. Front and clypeus brownish, covered with short setae; labella yellow; maxillary palpus yellow, five palpomeres, basal palpomere very small, apical ones increasingly longer, last palpomere more than twice penultimate. **Thorax.** Scutum and scutellum brownish. Pleural sclerites brownish, pleural membrane yellow. Scutum moderately arched, covered with scattered small



FIGURES 3–6. Wings of *Paratrizygia*. **3.** *P. balbii*, **sp. nov.** Holotype. **4.** *P. alvesi*, **sp. nov.** Holotype. **5.** *P. camargoi*, **sp. nov.** Holotype. **6.** *P. albidens*, **sp. nov.** Holotype. Scale 0.25 mm.

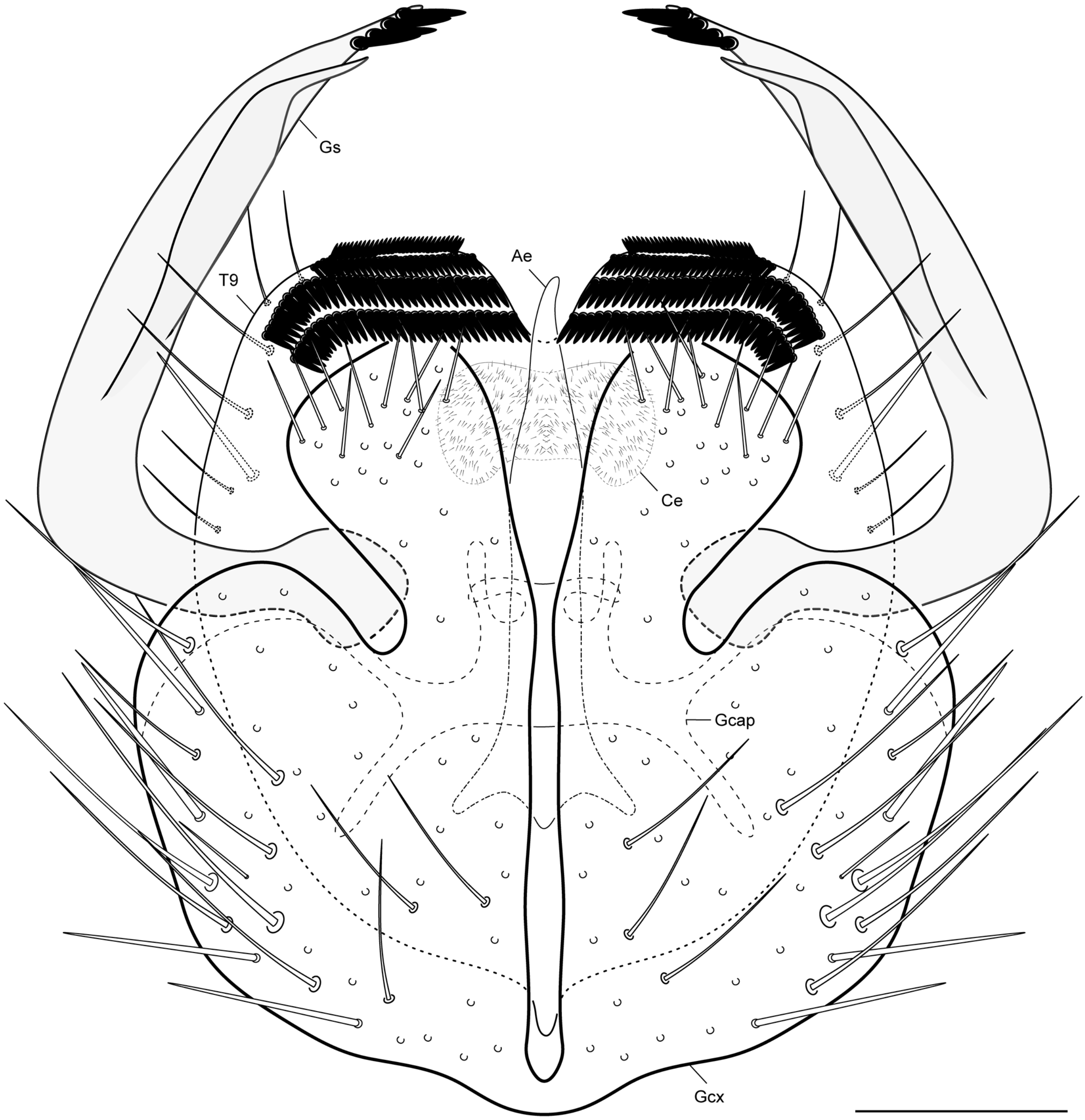


FIGURE 7. *Paratrizygia balbii*, **sp. nov.** Male terminalia, ventral view. Holotype. Scale 0.1 mm.

setae and stronger supra-alar, dorsocentral and acrostical. Scutellum with four scutellar bristles of slightly different sizes and many setulae. Pronotum densely setose, with some stronger setae. Anepisternum with some stronger setae and many setulae; katepisternum more or less squared ventrally. Mesepimeron reaching ventral margin of thorax, devoid of setae. Laterotergite only slightly projected, with setae of different sizes, suture separating from mediotergite incomplete dorsally. Mediotergite slightly curved on profile, ventral half with a pair of patches of longer setae and some setulae. Haltere whitish yellow, with some few setae on pedicel and more densely setose on knob. Coxae whitish yellow, femora, tibiae and tarsi yellow. Mid and hind first tarsomere more than twice the length of second tarsomere; mid and hind tibiae and tarsi with erect darker short bristles along almost entirely length, those on hind tibia more or less aligned dorsally and laterally. Tibial spurs 1:2:2, about twice the length of tibial width at apex, internal spurs shorter. Tarsal claws with a

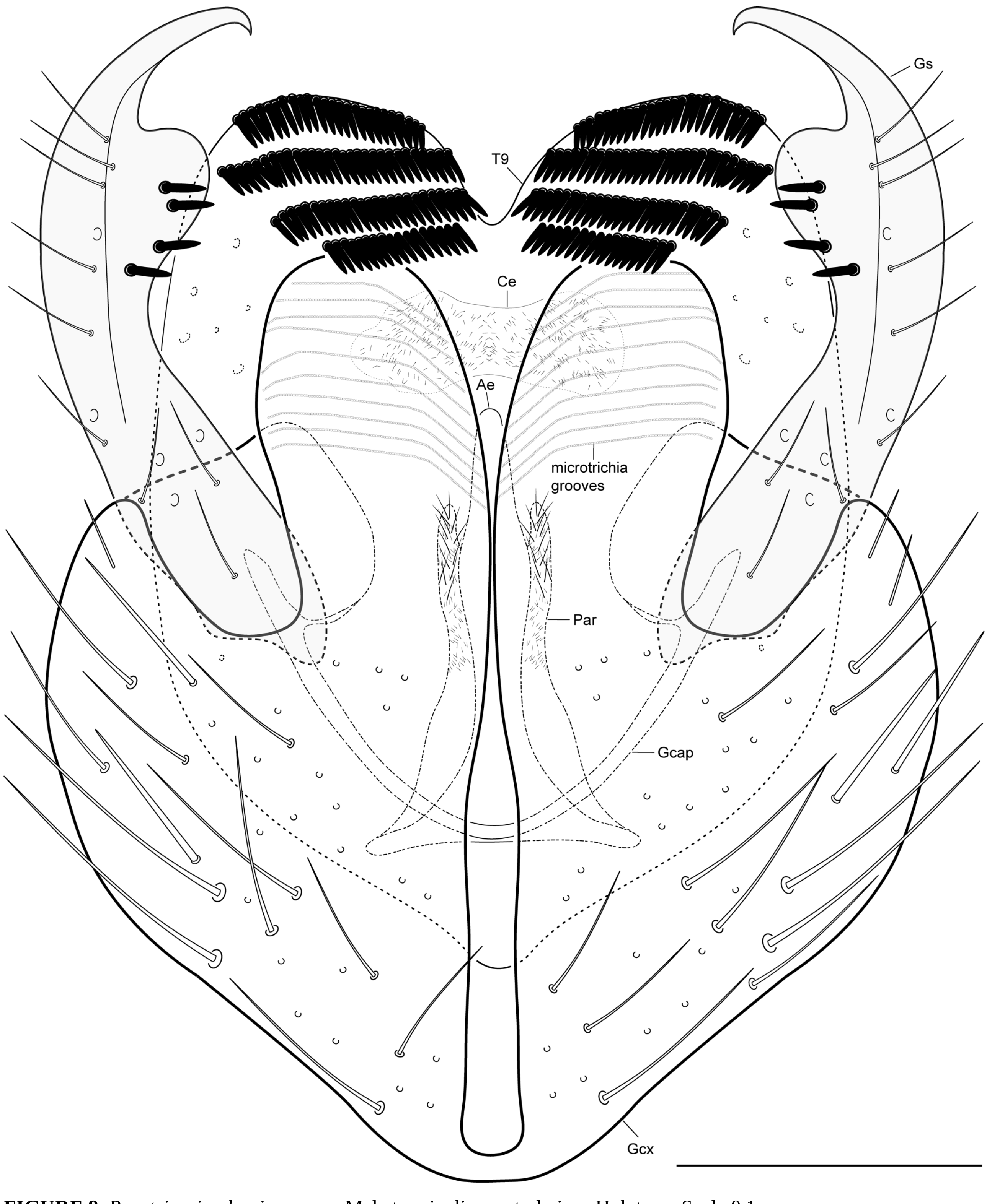


FIGURE 8. *Paratrizygia alvesi*, **sp. nov.** Male terminalia, ventral view. Holotype. Scale 0.1 mm.

larger apical tooth and a smaller, more basal one. **Wing** (Fig. 5). Length, 1.7 mm, width 0.6 mm. Membrane homogenously light brownish, no maculation; membrane densely covered with microtrichia on all cells, macrotrichia densely distributed, less so in the basal cells. Sc complete, ending in C just on base of Rs, setose, well sclerotized. C ending before wing apex, extending about a third the distance between R_5 and M_1. First sector of Rs almost transverse, devoid of setae, about as long as r-m. R_1 relatively long, reaching C on apical third of wing; R_5 reaching C quite before wing margin, well sclerotized; r-m almost longitudinal, well sclerotized, setose. M_{1+2} unforked; a loose vein between medial and cubital inforked veins (possibly M_4); CuA complete, well sclerotized. A_1 incomplete, not produce on the apical half. All apical veins with dorsal macrotrichia. **Abdomen**. Segments light brown, setose. T8 short and wide, S8 slender, longer than wide, rounded apically. Terminalia light brown, conspicuous. **Terminalia** (Fig. 10). Gonocoxite setose, elongate, fused to each other only at ventral margin, with a pair of apical medial projections slendering to the apex, which on untreated specimens fold covering inner structures of the terminalia; gonostyle wide at base, with a strong medial sinuosity, thin at the apex, with four apical elongate spines; aedeagus slightly sclerotized, pointed at apex, with a medial incision at base; T9 long, setose, with four characteristic regular rows of spines at a apical fold facing ventrally; cerci not medially fused, weakly sclerotized, covered with setulae.

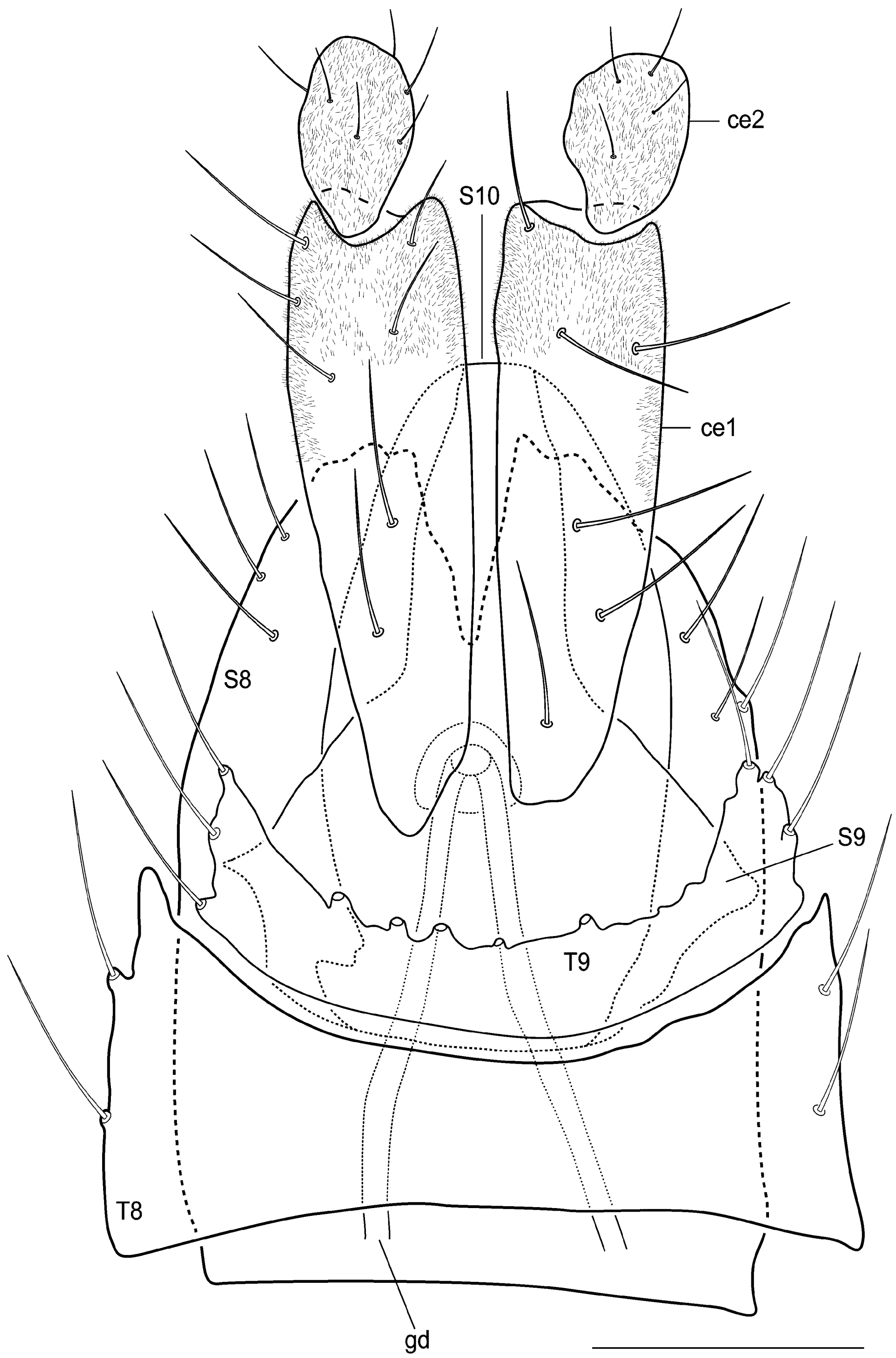


FIGURE 9. *Paratrizygia alvesi*, **sp. nov.** Female terminalia, dorsal view. Paratype. Scale 0.1 mm.

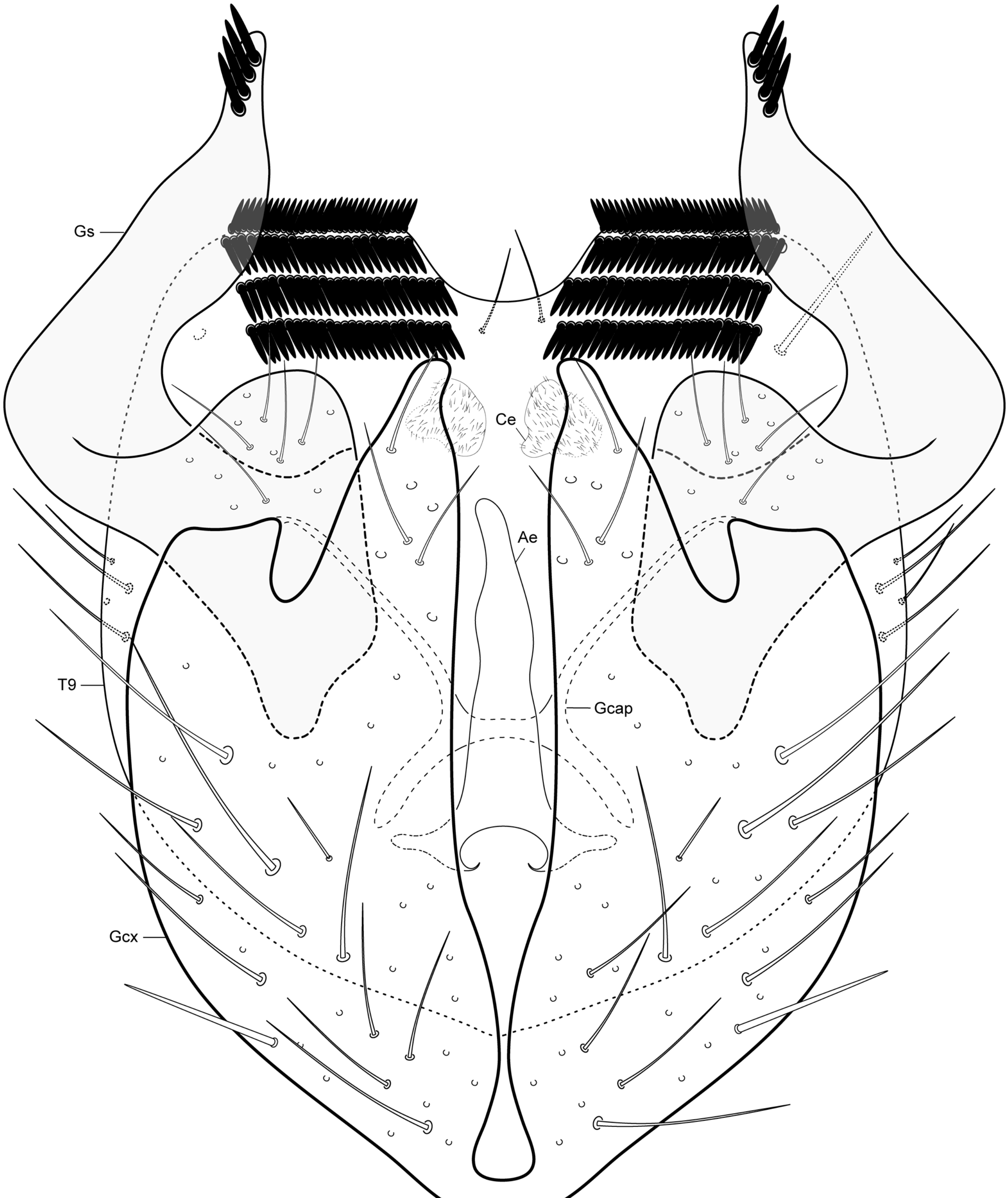


FIGURE 10. *Paratrizygia camargoi*, **sp. nov.** Male terminalia, ventral view. Holotype. Scale 0.1 mm.

Female. As the male, except for the following features. Wing length, 1.7 mm, wing width, 0.7 mm. Antennal flagellomeres smaller, not so elongate as the male, near each other. **Terminalia** (Fig. 11)**.** Terminalia light brownish yellowish. Spermathecae not visible (but maybe present). S8 with a pair of long, digitiform gonapophyses, some longer setae laterally and some shorter at apex of gonapophyses; T8 wide, with setae only at lateral margins; S9 (genital fork) without an anterior medial extension; T9 wide and short, setae emerging from digitiform projections along apical margin; S10 membranous, with microtrichia; T10 not visible, maybe fused to T9; Ce1 slightly more than twice times Ce2 length, covered with microtrichia and few scattered setae; Ce2 ovoid, covered with microtrichia and some longer setulae.

Etymology. This species is named after Brazilian entomologist Dr. João Maria Franco de Camargo (1941–2009), an excellent teacher and a great naturalist, who devoted his professional career to the study Meliponinae bee biology and systematics. Dr. Camargo produced beautiful ink drawings of meliponines.

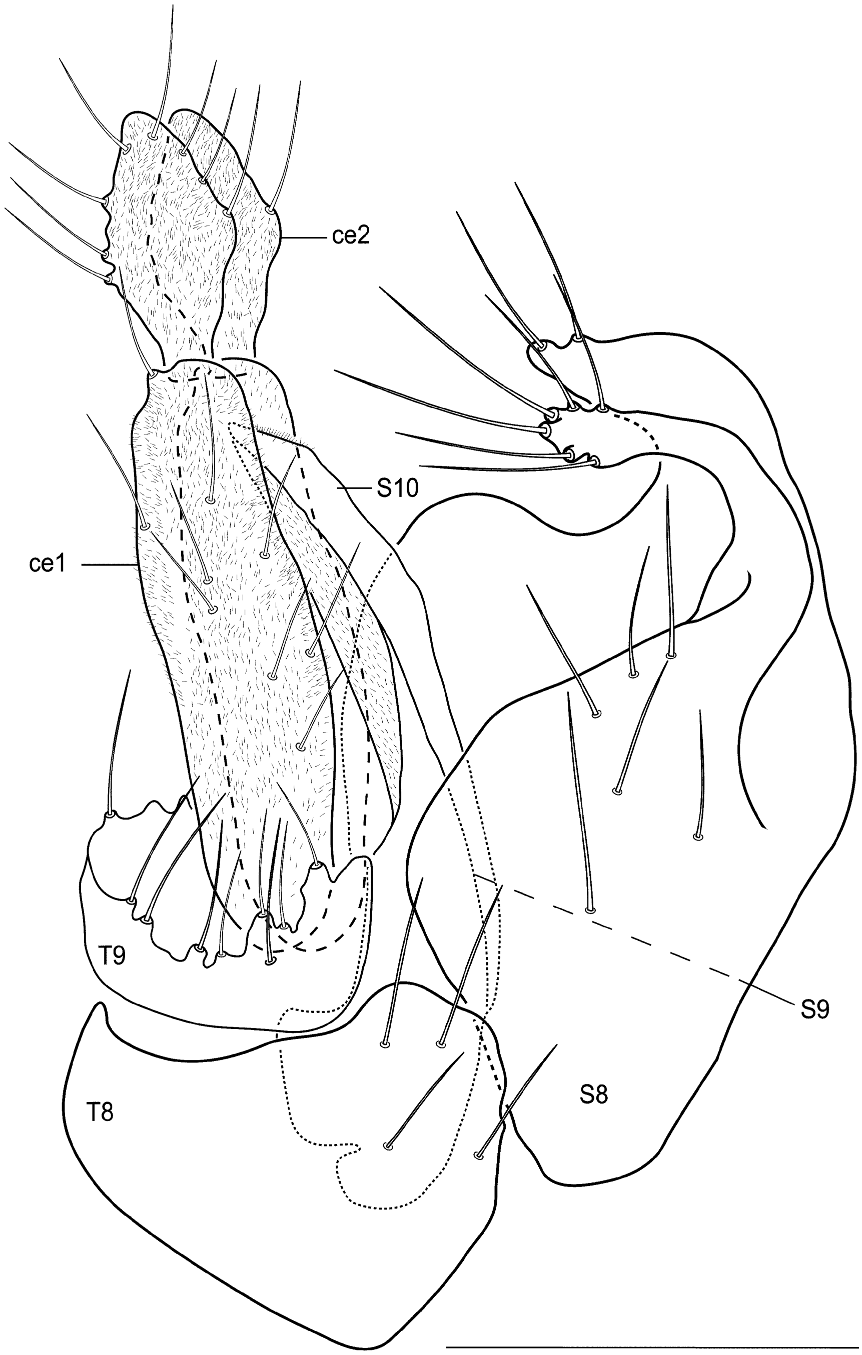


FIGURE 11. *Paratrizygia camargoi,* **sp. nov.** Female terminalia, lateral view. Paratype. Scale 0.1 mm.

***Paratrizygia albidens*, sp. nov.**
(Figs. 6, 12, 13)

Diagnosis. Apical projections of gonocoxite thin, hook-shaped at apex. Gonostyle weakly sclerotized, elongated, not strongly curved, with a single apical spine. Aedeagus with a medial projection at base directed ventrally.

Material examined. Holotype ♂, BRAZIL, State of São Paulo, Sertãozinho, Estação Ecológica Augusto Ruschi, Malaise trap, 21°08' S, 47°59' W, 30.xii.2009–19.i.2010, V.C. Silva & D.S. Amorim cols. (BIOTA-FAPESP). Paratypes 1 ♀, same data as holotype, 1 ♂, same data as holotype, but 15.xi–01.xii.2009; 1♂, State of São Paulo, Matão, 28.vi.2007, Malaise trap, F.B. Noll col. (BIOTA-FAPESP); 1 ♂, State of Paraná, Ponta Grossa, Parque Estadual de Vila Velha, Res. IAPAR, Malaise trap, 25°14'09" S, 50°00'17" W, 08.xii.1986, PROFAUPAR.

Description. Male. Head. Vertex brown, with scattered setae. Three ocelli, mid ocellus slightly more ventral in position than lateral ones. Occiput brown. Eyes setose. Scape and pedicel yellow, with longer setae apically along apical margin; 14 brownish flagellomeres, almost twice longer than wide, with scattered setae and a short apical neck. Front and clypeus brown, covered with short setae; labella yellow; maxillary palpus yellow, five palpomeres, basal palpomere very small, apical ones increasingly longer, last palpomere more than twice penultimate. **Thorax.** Scutum and scutellum brown. Pleural sclerites brown. Pleural membrane yellow. Scutum moderately arched, covered with scattered small setae and stronger supra-alar, dorsocentral and acrostical. Scutellum with four scutellar bristles of slightly different sizes and many setulae. Pronotum densely setose, with some stronger setae. Anepisternum with some stronger setae and many setulae; katepisternum more or less squared ventrally. Mesepimeron reaching ventral margin of thorax, devoid of setae. Laterotergite only slightly projected, with 6–9 setae of different sizes, suture separating from mediotergite incomplete dorsally. Mediotergite slightly curved on profile, ventral half with a pair of patches with some longer setae and some setulae. Haltere whitish yellow, with a few setae on pedicel and more densely setose on knob. Coxae whitish yellow, femora, tibiae and tarsi yellow. Mid and hind first tarsomere more than twice the length of second tarsomere; mid and hind tibiae and tarsi with erect darker short bristles along almost entirely length, those on hind tibia more or less aligned dorsally and laterally. Tibial spurs 1:2:2, about twice the length of tibial width at apex, internal spurs shorter. Tarsal claws with a larger apical tooth and a smaller, more basal one. **Wing** (Fig. 6). Length, 1.6 mm, width 0.6 mm. Membrane homogenously light brown, no maculation; membrane densely covered with microtrichia on all cells, macrotrichia densely distributed, less so in the basal cells. Sc complete, ending in C just before base of Rs, setose, well sclerotized. C ending before wing apex, extending about a third the distance between R_5 and M_1. First sector of Rs almost transverse, devoid of setae, about as long as r-m. R_1 relatively long, reaching C on apical third of wing; R_5 reaching C quite before wing margin, well sclerotized; r-m almost longitudinal, well sclerotized, setose. M_{1+2} unforked; a loose vein between medial and cubital inforked veins (possibly M_4); CuA complete, well sclerotized. A_1 incomplete, not produce on the apical half. All apical veins with dorsal macrotrichia. **Abdomen**. Abdomen brown, setose, slender. T8 short and wide, S8 slender, longer than wide, rounded apically. Terminalia brown, conspicuous, quite elongate. **Terminalia** (Fig. 12). Gonocoxite setose, elongate, fused to each other only at ventral margin, with apical extensions tapering towards apex, apically curved inwards; gonostyle elongated, thin at base, wider mid way to apex, more or less gently curved, acute apically, with a single apical spine, weakly sclerotized; aedeagus slightly sclerotized, pointed at apex, with a medial projection at base directed ventrally; T9 long, setose, with four characteristic regular rows of spines at a apical fold facing ventrally; cerci not medially fused, weakly sclerotized, covered with setulae.

Female. As the male, except. Wing length 1.6 mm, width 0.6 mm. R_1 eleven times the r-m length. Antennal flagellomeres not as elongate as the male, near each other. **Terminalia** (Fig. 13)**.** Terminalia yellow. Spermathecae not visible (but maybe present). S8 separated from S7 by a large membranous area, a pair of apical gonapophyses separated by a apical medial suture; T8 wide, twice length of T9, with setae only laterally; S9 (genital fork) without an anterior medial extension; T9 wide and short, setae emerging from digitiform projections along apical margin; S10 membranous, with microtrichia; T10 not visible, maybe fused to T9; Ce1 slightly more than 2.5 times Ce2 length, covered with microtrichia and few scattered setae; Ce2 ovoid, covered with microtrichia and few setulae.

Etymology. The species name is feminine, derived from the Latin words *albus*, for white, and *dens*, for tooth, referring to the single apical whitish tooth of the gonostyle.

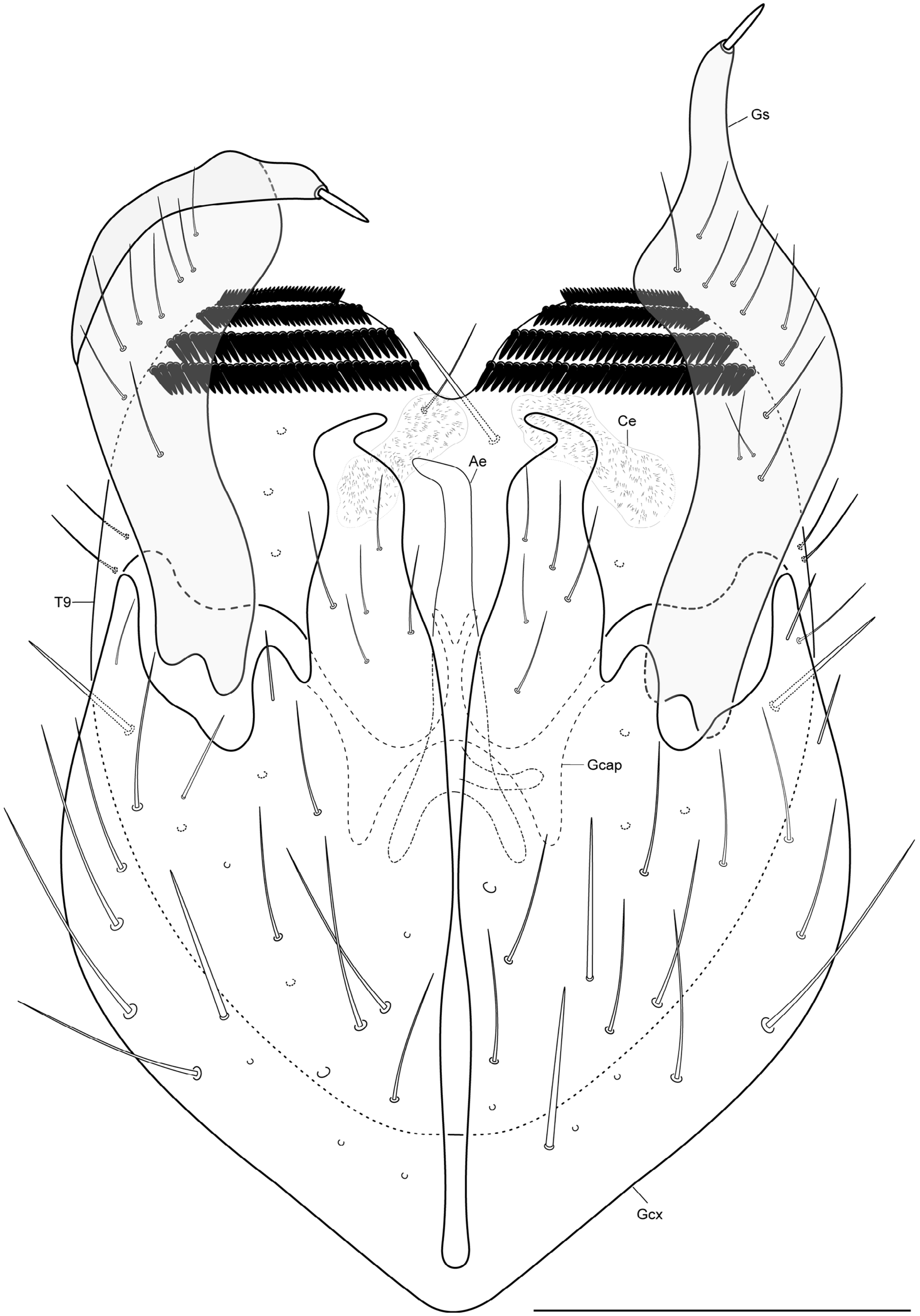


FIGURE 12. *Paratrizygia albidens*, **sp. nov.** Male terminalia, ventral view. Holotype. Scale 0.1 mm.

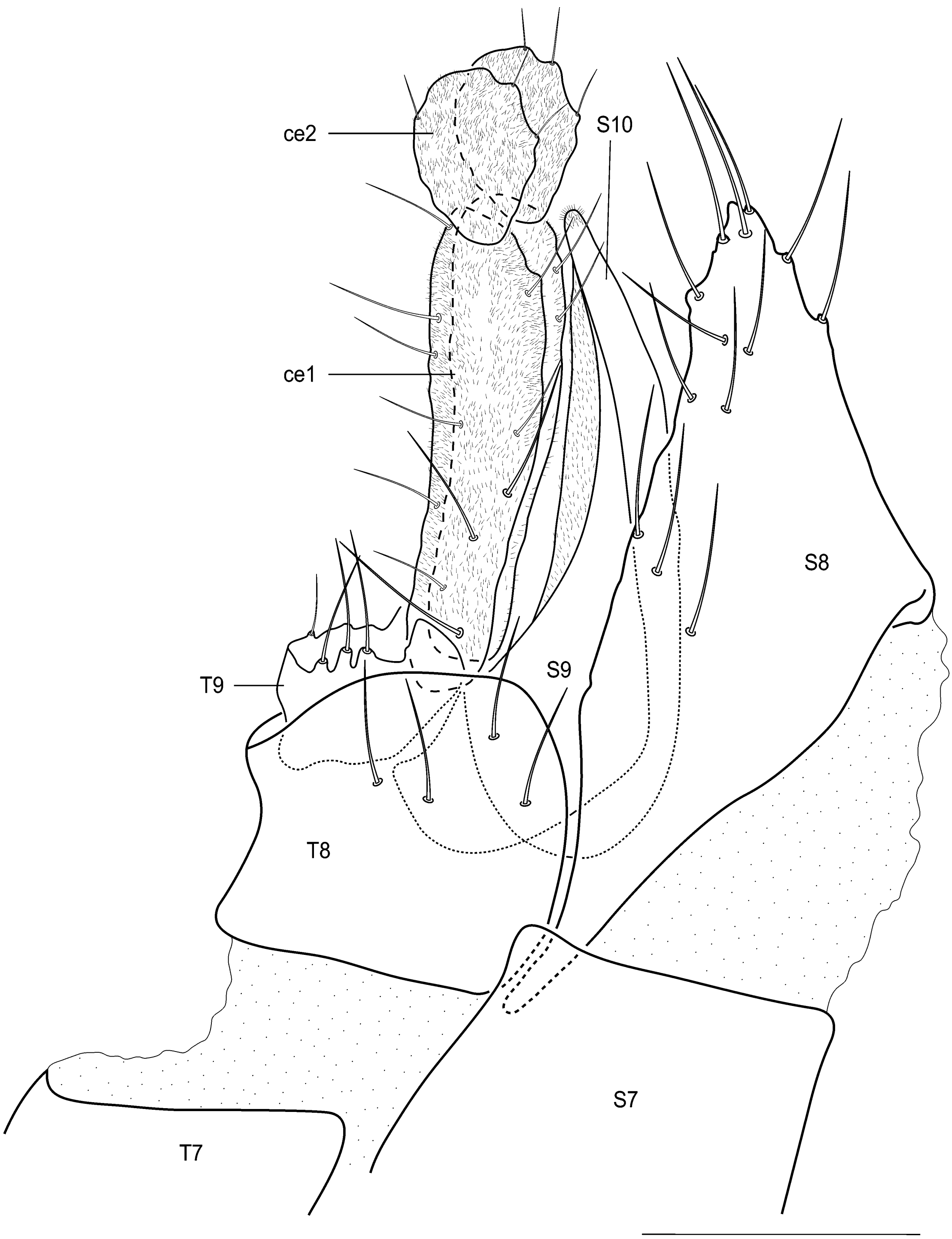


FIGURE 13. *Paratrizygia albidens*, **sp. nov.** Female terminalia, lateral view. Paratype. Scale 0.1 mm.

Comments. In alcohol specimens, the gonocoxites are sometimes further apart from each other, so the medial incision is wider, differing from the slide mounted specimen drawn, where the apical extensions of the gonocoxite are nearly parallel. This may also apply to the other species.

Key to males of the Neotropical species of *Paratrizygia* (modified from Freeman 1951)

1. Wings infuscated..2
- Wings clear, without patterns...3

2(1). Wings with dark medial band and wingtip, especially on anterior margin .... *P. infuscata* Freeman
- Wings with dark band from costal until posterior margin, covering anal region; central and basal areas clear ....*P. lanfrancoae* Duret

3(1). Knob of halteres blackish 4
Knob of halteres whitish..5

4(3). Tergite 9 with five strong setae on the apex of both apicolateral projections .... *P. setifera* Freeman
- Tergite 9 with an apical band of black spinules .... *P. spinulosa* Freeman

5(3). Apical medial extension of the gonocoxite curved apically; a single light coloured apical spine on the gonostyle (Fig. 12) .... *P. albidens*, **sp. nov.**
- Apical medial extension of the gonocoxite not curved apically; two or more dark spines apically on the gonostyle (Figs. 7, 8, 10) 6

6(5). Apical projections of gonocoxite with grooves with microtrichia (Fig. 8) ....*P. alvesi*, **sp. nov.**
- No grooves with microtrichia on apical projections of gonocoxite 7

7(6). Gonostyle bifid at apex, one of the branches with four spines (Fig. 7).. *P. balbii*, **sp. nov.**
- Gonostyle unforked, four spines at apex (Fig. 10) .... *P. camargoi*, **sp. nov.**

Discussion

The type species of *Paratrizygia* is the only species in the genus that is plesiomorphic concerning the presence of R_4. Hence, if it was lost once along the evolution of the genus, the Neotropical species would compose a clade within *Paratrizygia*. Tonnoir (1929) referred to the absence of setae on the anepisternum of *P. conformis*. Anepisternal setae are present in the Neotropical species of *Paratrizygia*, but the evolution of this character is not easy to interpret. *Phthinia* Winnertz and *Neaphelomera*, for example, have anepisternum devoid of setae, while *Azana*, *Cluzobra* and *Trizygia* have anepisternal setae. It seems possible that anepisternal setae are plesiomorphic in this level of the evolution of the Sciophilinae, in such a way that it would be more parsimonious to accept its absence as an apomorphy of *P. conformis* and its presence in the Neotropical species of the genus would be plesiomorphic. The Neotropical species of the genus with patterned wings, on the other hand, are *P. infuscata* and *P. lanfrancoae*. Based on features of the male terminalia, it seems unlikely that *P. infuscata*, *P. lanfrancoae*, and *P. conformis*, would compose a clade, so patterned wings may be a plesiomorphy shared with the Australian species or a homoplasy between these species.

We examined the Chilean and Argentinian species assigned to the genus and there is no doubt that they compose a group with the Brazilian species. The presence of rows of spines on the apical extension of the male tergite 9, folded ventrally in the terminalia, is an apomorphy shared by the Neotropical species, as is clear from the illustrations of Freeman (1951) and Duret (1984). Tonnoir (1929: 605, fig. 4) illustrated the male terminalia of *P. conformis* in lateral view, but did not describe it in the text, and Matile (1998) illustrated only the gonocoxite but not the tergite 9, so it is not possible to be sure about this feature without examination of the Australian species. *Trizygia* may also have these spines (Chris Borkent, personal communication), what raises questions about the inclusion of this clade of Neotropical species in the genus *Paratrizygia*. A solution for this problem, however, depends on a phylogenetic analysis of the genera of the higher Sciophilinae and of the holotype of *P. conformis* Tonnoir. The apical medial projections of the gonocoxites, on the other hand, are very evident in the Brazilian species and also appear to be present in the Chilean and southern Argentinean species (Freeman 1951, Duret 1984, Matile 1998). The shape of these projections apically, however, is different in the Brazilian species.

There are important differences in the morphology of the female terminalia between the species of *Paratrizygia* described here. Wider comparisons among Mycetophilidae genera will probably reveal important features of female genitalia for the understanding of the phylogeny of the family. A short T9 with setae arising from digitiform projections is shared by all three species with known females. Also, the genital furca in all three species lack an anterior, medial extension. A third condition shared by these species concerns the elongated first cercomere, but this may have a wider distribution in the Sciophilinae (Amorim & Rindal, 2007). On the other hand, there are differences that allow recognition at the species level. The membranous area basal to sternite 8 is typical of *P. albidens*, **sp. nov.**, while the digitiform gonapophyses are exclusive to *P. camargoi*, **sp. nov.** *Paratrizygia alvesi*, **sp. nov.** has relatively typical female genitalia, and can therefore be distinguished from the remaining Brazilian species.

The geographic distribution of the Atlantic Forest species is worth some discussion. There is not a single case of sympatry between the species studied here, as seen in other genera of Mycetophilidae in the Atlantic Forest (Oliveira & Amorim 2010). *Paratrizygia alvesi*, **sp. nov.** is known from the state of Santa Catarina to higher altitudes in the states of São Paulo, Rio de Janeiro, and Minas Gerais. *Paratrizygia camargoi*, **sp. nov.** is known only from state of Bahia, northeastern Brazil. This is the northern most known distribution in the Atlantic Forest of a genus with austral connections. Oliveira & Amorim (2010) described a species of *Phthinia* from the state of Espírito Santo, but this record for *Paratrizygia* is even more to the north in Neotropics. *Paratrizygia balbii*, **sp. nov.** is known only from the state of São Paulo and its present distribution is limited to the ombrophilous forest, while *P. albidens*, **sp. nov.** occurs in semideciduous forests.

The restriction of species of different mycetophilid genera to semideciduous or ombrophilous forests was also seen in *Cluzobra* (Amorim & Oliveira 2008). For mycetophilid genera present in both areas, there are no species shared between the semideciduous forest of western Brazil, and the ombrophilous forest along the coast. The semideciduous forest should therefore be considered one of the most endangered areas on a world scale, once it corresponds to the area in which sugar cane and soy harvesting is expanding rapidly and removing the few remaining areas of forest. Most of the large and well preserved biological reserves in the Atlantic Forest are concentrated in the ombrophilous forests and furnish no protection for the semideciduous forest faunal and floral diversity. This requires an urgent public and private effort to establish stable biological reserves within this domain.

It is also relevant to note that all specimens used in this paper were collected quite recently. Most of the examined specimens were collected by the Atlantic Forest Diptera project (see Acknowledgements) and none of the type specimens were collected by Fritz Plaumann or John Lane. It is quite surprising, in this context, that still only a single male of *P. balbii*, **sp. nov.** is known from the Boracéia Biological Station, belonging to the Museu de Zoologia, in Salesópolis, State of São Paulo, an area of Atlantic Forest that received a close attention from many dipterists. Boracéia is also the type-locality of the first known Neotropical species of the genus *Azana* collected only recently with Malaise traps (Amorim *et al.* 2008a, 2008b). This is a strong indication that there is still a huge hidden diversity in the Atlantic Forest, justifying the need of additional collection effort in its entire range.

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