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Azana atlantica, n.sp., with reduced mouthparts and two ocelli: first record of *Azana* for the Neotropical region (Diptera: Mycetophilidae: Sciophilinae)

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Abstract

A new Sciophilinae—*Azana atlantica*, **sp.n.**—is described from the Atlantic Forest in southeastern Brazil. The species has a number of distinctive apomorphic features, including loss of the mid ocellus, reduced mouthparts, Sc short and incomplete, first section of Rs missing, r-m elongated, longitudinal in position, aligned with the second section of Rs (R_5), unforked medial and cubital veins, R_4 missing, M_4 entirely absent, gonostyle triangular, with an inner row of elongated spines and a basal, digitiform inner projection. Some of these features are shared with other genera of the *Azana*-group of Sciophilinae. The shape of the scutum and the strong spines on the gonostyle make it clear that the species belongs in *Azana*, despite the features that are distinctive from the remaining species in the genus. There are ten species described in *Azana* to date, from United States, Europe, Sri Lanka, Canary Islands, tropical Africa and Baltic amber. This is the first Neotropical species belonging to the genus. The complete loss of M_4 and the separated gonocoxites suggest that *Azana atlantica*, **sp.n.** forms a monophyletic group with the Afrotropical species of the genus. *Azana*, *Morganiella*, *Neoaphelomera*, *Neotrizygia*, and *Trizygia* are shown to compose a small clade within the *Azana*-group of genera. The division of the genus into two subgenera—*A.* (*Azana*) and *A.* (*Jugazana*)—most probably renders *A.* (*Azana*) paraphyletic and it is suggested that this should be for the time being abandoned.

Key words: Diptera, Mycetophilidae, Sciophilinae, *Azana*, biodiversity, taxonomy, Neotropical region, Atlantic forest

Introduction

The family Mycetophilidae (*s.s.*) has 135 genera and about 4,000 species described worldwide, of which about 50 genera and more than 900 species are known from the Neotropical region. Until recently the Ditomyiidae, Bolitophilidae, Diadocidiidae, Keroplatidae, and Lygistorrhinidae were included in this family as subfamilies. Amorim & Rindal (2007) proposed a phylogeny for the higher Bibionomorpha in which the Cecidomyiidae is the sister of the rest of the clade, and within this group the Sciaridae is the sister of the remaining Mycetophiliformia. The Mycetophilidae, in accordance with Hennig (1973) and Matile (1990), appears as the sister group of the Lygistorrhinidae.

The study of the phylogenetic relationships within the Mycetophilidae is still wanting. Söli's (1997) excellent study is a major contribution towards the understanding of the phylogeny of the family, but the sampling of genera was limited, in such a way that the incongruences in relation to the phylogenetic study of Tozoni (1998), for example, show the need for additional studies on specific parts of the family. Some important conclusions, however, are fairly well supported in view of the phylogeny of the family generated by the studies of Söli (1997) and Tozoni (1998): (1) the Sciophilinae *sensu* Vockeroth (1981) is paraphyletic in rela-

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tion to the Mycetophilinae; (2) the Sciophilinae *s.s.* may still be paraphyletic, but a large group of genera certainly composes a clade which seems to be sister to the remaining members of the family; (3) the Cycloneurinae seems to be nested within the Leiinae; and (4) the Manotinae seems to be the sister group of the Mycetophilinae.

The Sciophilinae *s.s.* currently includes 36 genera (Table 1), most occuring in only a few biogeographic regions. There are several genera with an exclusively austral distribution, including *Aneura*, *Austrosciophila*, *Morganiella*, *Neoallocotocera*, *Neoaphelomera*, *Neotrizygia*, *Paramorganiella*, *Paratrizygia*, *Parvicellula*, *Stenophragma*, *Tasmanina*, *Taxicnemis*, and *Trizygia*, while others, such as *Baeopterogyna*, *Drepanocercus*, *Impleta*, *Paratinia*, and *Speolepta* are exclusively Holarctic. However, the speciose genera *Acnemia*, *Leptomorphus, Monoclona*, *Neuratelia*, *Phthinia*, and *Sciophila*, are found in both hemispheres.

TABLE 1. Genera of Sciophilinae *s.s.* of the world.

Acnemia Winnertz
Afrocnemia Matile
Allocotocera Mik
Anaclileia Meunier
Aneura Marshall
Austrosciophila Tonnoir
Azana Walker
Baeopterogyna Vockeroth
Cluzobra Edwards
Coelophthinia Edwards
Drepanocercus Vockeroth
Eudicrana Loew
Impleta Plassmann
Leptomorphus Curtis
Loicia Vockeroth
Megalopelma Enderlein
Monoclona Mik
Morganiella Tonnoir & Edwards
Neoallocotocera Tonnoir
Neoaphelomera Miller
Neoneurotelia Shinji
Neoparatinia Shinji
Neotrizygia Tonnoir & Edwards
Neuratelia Rondani
Paramorganiella Tonnoir
Paratinia Mik
Paratrizygia Tonnoir
Parvicellula Marshall
Phthinia Winnertz
Polylepta Winnertz
Sciophila Meigen
Speolepta Edwards
Stenophragma Skuse
Tasmanina Tonnoir
Taxicnemis Tonnoir & Edwards
Trizygia Skuse

The genus *Azana* was revised by Coher (1995), who formally described species previously referred to in the literature, and later on Matile (1999) considered this set of southern hemisphere genera with unforked veins to be the *Azana*-group (though he did not include *Paramorganiella*). In a large survey of dipterans of the Atlantic forest of Brazil, we came across an undescribed species of Sciophilinae with unforked M and CuA, reduced mouthparts and some other distinctive features.

Azana Walker

Azana Walker, 1856: 26.

Type–species. *Azana scatopsoides* Walker, 1856: 26 (monotypy) (= *Azana anomala* Staeger, 1840).

Diagnosis. Flagellomeres cylindrical, 2-3 ocelli. Thorax strongly arched, laterotergite and mediotergite setose, anepisternum variable. Sc short, incomplete; r-m long and perfectly longitudinal; M unforked, CuA unforked, in most species an isolated vein (M_4) reaching margin; C extending considerably beyond the apex of R_5.

Azana atlantica Oliveira & Balbi, n.sp.
(Figs. 1–6)

Diagnosis. Two ocelli, mouthparts reduced, maxillary palpus 1-segmented. Wing fumose brown, slightly darker across the mid of the wing and close to the apex; first section of Rs not sclerotized; M_4 entirely absent; A_1 scarcely visible. Gonostyle triangular, with a row of spines along the entire inner margin; parameres absent.

Material examined. Holotype, ♂, BRAZIL, State of São Paulo, Salesópolis, Estação Biológica de Boracéia, Trilha dos Pilões, 23º 39' 05.8" S, 45º 53' 44.6" W, Malaise Trap ("trilha Ponto 4"), 30.iii–02.iv.2001, STP Amarante & eq. cols. Paratypes: 1 ♂, same data as holotype; 1 ♂, same data as holotype, except 23º 39' 06.3" S, 45º 53' 48.9" W; 1 ♂, *idem*, except 23º 39' 05.1" S, 45º 53' 51.8" W, 26.ii.2005.

Description. Male. Head (Figs. 1–2)**.** Vertex light brown, two ocelli, apart from the eye margin, ocellar area darker. Frons light yellowish brown, setose. Clypeus brown, setose. Mouthparts reduced, a single light brown palpomere, labella and palpi setose. Scape and pedicel light brown, scape trapezoidal, enlarging to the apex, elongated, pedicel more rounded, shorter; flagellum whitish yellow, with 14 flagellomeres; flagellomeres cylindrical, short, wider than long, with scattered setae. Lateral and ventral occiput setae separated from the larger, dorsal setae. **Thorax** (Fig. 3). Mesonotum strongly arched, setose, light brown, with a pair of yellowish brown longitudinal bands connected anteriorly in each half of the scutum. Scutellum brown, setose. Pleural sclerites light brown, mesepimeron lighter dorsally. Pronotum with about 7 large setae. Primary anapleural suture complete, no secondary anapleural suture. Anepisternum with about 25 setae on dorsal half, divided dorsoventrally by an unsclerotized slender band. Laterotergite not specially protruded, with about 20 setae concentrated on posterior half; mediotergite with more than 20 setae distributed longitudinally along the entire midline. Mesepimeron produced on the ventral half, slender. Pedicel of halter whitish, knob brown, small setae on the entire pedicel. **Wing** (Fig. 4)**.** Length, 4.0 mm. Membrane densely covered with macrotrichia and microtricha. Membrane slightly fumose, with a brown, rounded macula from C to slightly posterior of M at the mid of the wing, and darker at the wing apex; cubital fold conspicuously brown. C ending almost halfway between R_5 and M. Sc incomplete. R_1 short, reaching C slightly beyond middle of the wing. R_5 reaching C well before wing apex, base of Rs indistinct, r-m perfectly longitudinal, indistinct from Rs. Medial fork absent, insertion of M on r-m very basal in the wing, close to origin of CuA. CuA unforked. A_1 weak but

present, ending half way to wing margin. **Legs.** Anterior coxa yellowish, basal and distal ends brown, mid and hind coxae brown, setae on distal half; trochanters brown; anterior femur yellowish, mid and hind femora brown; all tibiae and tarsi yellowish, first tarsomere about three times the sum of the length of the remaining tarsomeres. Tibial spurs 1:2:2, brown, mid and hind legs with longer spur about twice the length of the smaller one. **Abdomen.** Tergites 1–2 yellowish, brownish laterally, tergites 3–7 light brown; tergite 7 arched on posterior margin. Sternites 1–3 yellowish, sternites 4–7 light brown, with a pair of longitudinal, weakly sclerotized bands. T8 and S8 brown, short. **Terminalia** (Figs. 5–6)**.** Terminalia brown. Gonocoxites not fused mesally, well separated from each other, with no projections on distal margin; gonostyle subtriangular, with a digitiform basal projection and a row of 21–24 elongated spines along inner margin. Tegmen relatively unmodified, rounded distally, with a pair of apodemes directed anteriorly; gonocoxal apodemes very long, projected anteriorly beyond the margin of the terminalia. No evidence of parameres (referred to as "inner styles" by Coher 1995). T9 well developed, almost rectangular. T10 not produced, cerci produced as a pair of lobes more or less fused to each other distally to T9, rather membranous, covered with dense microtricha.

Female. Unknown.

Etymology. The species name is feminine and comes from "Atlantic", as a reference to the fact that the species is known from the Atlantic Forest of southeastern Brazil.

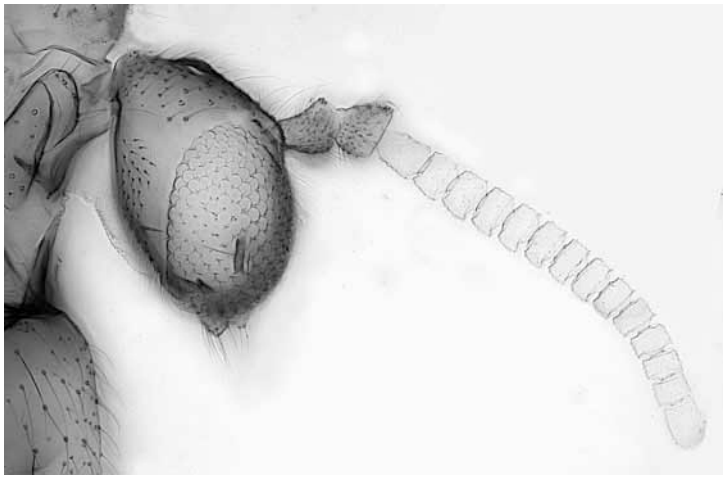


FIGURE 1. *Azana atlantica*, **sp.n.** Holotype. Head, lateral view.

Discussion

The genus *Azana* has ten species formally described. These species are *A. sinusa* Coher, from the United States; *A. bulgarense* Coher and *A. corsicana* Coher, from Europe; *A. asiatica* Senior-White, from Sri Lanka, *A. nigricoxa* Strobl, also from Europe, and *Azana palmensis* Santos-Abreu and *Azana rarissima* Meunier, from the Canary Islands and Baltic amber respectively. The position of this latter species in *Azana* requires confirmation. Matile (1998) described two species of *Azana* from tropical Africa, *A. minuta* and *A. pusilla*, that share some of the apomorphies shown by the species described here.

Coher (1995) proposed a subgenus *A.* (*Jugazana*) for *A. nigricoxa*. The diagnostic features of the subgenus – gonostyle simple and tapering, inner styles absent, aedeagus pear-shaped, T9 greatly enlarged, subtriangular (Coher, 1995) – appear to be secondary features of a small clade within *Azana*, in such a way that the set of species gathered within *A.* (*Azana*) would compose a paraphyletic group. Interestingly the mouthparts of *A.* (*Jugazana*) *nigricoxa* are referred to by Coher (1995) as short, but the differences between *A. atlantica*, **sp.n.** and *A.* (*Jugazana*) *nigricoxa* indicate that these would be independent acquisitions. We suggest that the subdivision of the genus into two subgenera should be abandoned until an analysis of the phylogenetic relationships between the species of *Azana* can be performed and a division of the genus can result in monophyletic groupings.

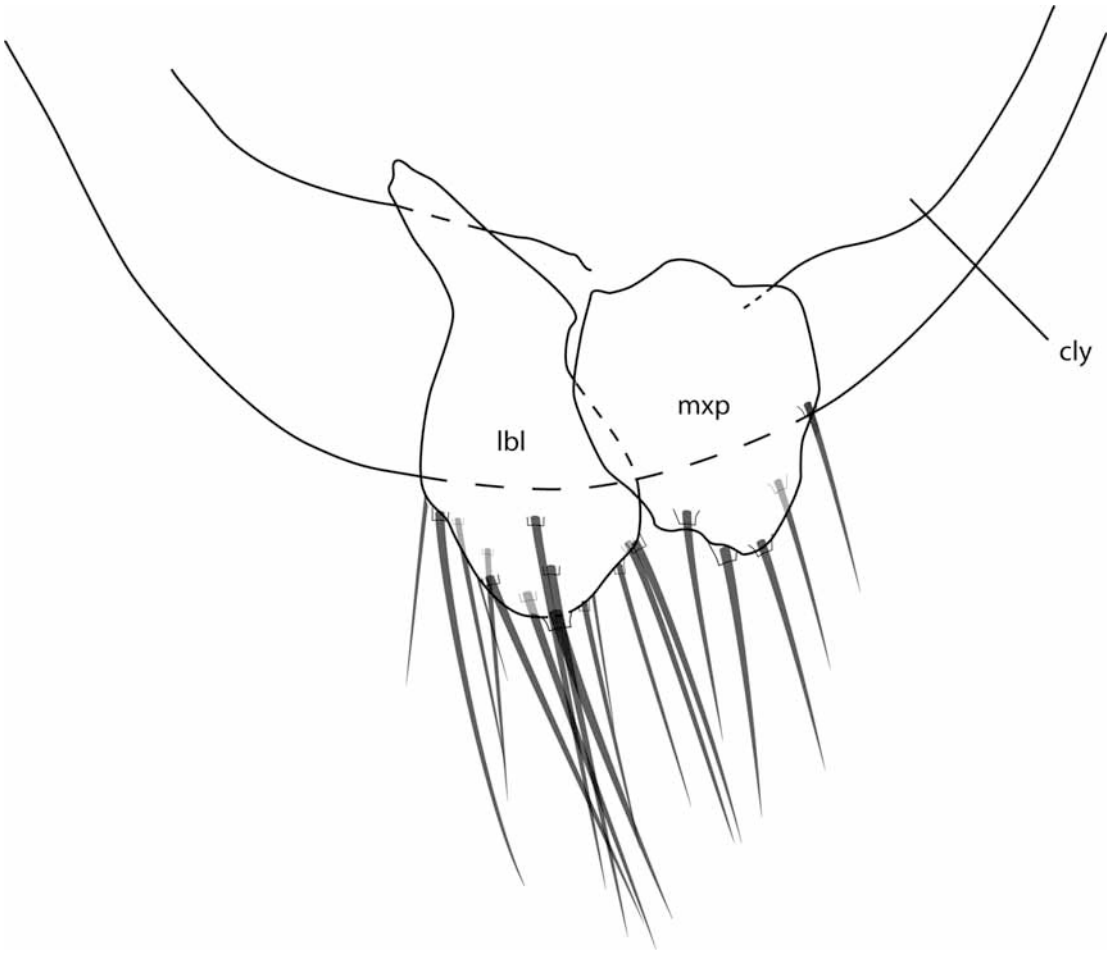


FIGURE 2. *Azana atlantica*, **sp.n.** Holotype. Detail of mouthparts, lateral view

The species described here has a quite unique combination of features in the Mycetophilidae. Reduced mouthparts in the family are relatively rare, known in some species of *Dziedzickia* Johannsen, *Metanepsia* Edwards and *Chalastonepsia* Söli. Reduction of the distal veins is seen in the Manotinae and in different sciophiline genera, as commented above, but *Azana atlantica*, **sp.n.**, *A. minuta* Matile, 1998, and *A. pusilla* Matile, 1998, the later two from Africa, are possibly the only mycetophilid species with only two posterior veins in the wing.

Some of the Sciophilinae genera have both the cubital and the medial forks complete, including *Allocotocera*, *Aneura*, *Baeopterogyna*, *Eudicrana*, *Leptomorphus*, *Neuratelia*, *Paratinia*, *Phthinia*, *Speolepta*, *Stenophragma*, and *Tasmanina*. The remaining genera of the subfamily have either the medial and/or the cubital fork veins interrupted basally or missing. *Acnemia*, *Afrocnemia*, *Cluzobra*, *Monoclona*, and *Parvicellula* have an unforked CuA (i.e., M_4 absent) and a complete medial fork. *Megalopelma*, *Morganiella*, and *Sciophila* have M_4 interrupted basally and the medial fork complete. *Paratrizygia* has the cubital fork complete, but M_2 interrupted basally. *Azana*, *Neoaphelomera*, *Neotrizygia*, *Paramorganiella*, and *Trizygia* have both the medial and cubital fork incomplete, with an isolated vein in between that could be either M_2 or M_4, but is most probably M_4. Matile (1999) presented notes on the genera *Trizygia*, *Parvicellula*, *Neotrizygia*, *Paratrizygia*, and *Neoaphelomera*, and described the genus *Afrocnemia*, assumed to be the sister genus of *Cluzobra* (for an interpretation of wing vein homology in Mycetophilidae, see Amorim & Rindal, 2007).

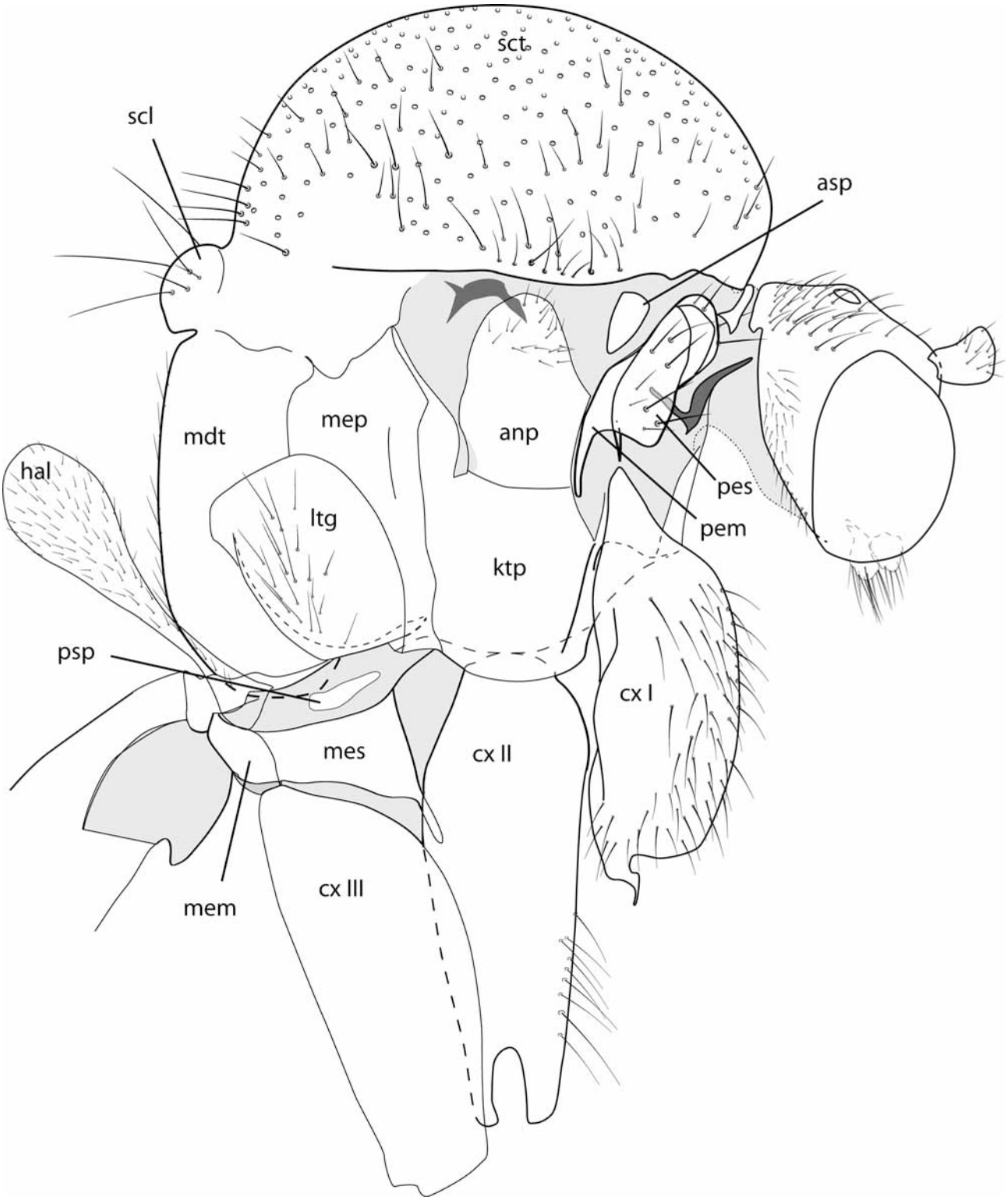


FIGURE 3. *Azana atlantica*, **sp.n.** Holotype. Thorax, lateral view.

An additional feature may help to better understand the relationship between these genera. The originally transverse vein r-m is short and oblique in position in most sciophiline genera. This is actually the plesiomorphic condition in the family, also found in other subfamilies and outside the Mycetophilidae (Amorim & Rindal, 2007). A long and completely longitudinal r-m, however, is seen in the genera *Azana*, *Morganiella*,

Neoaphelomera, *Neotrizygia*, and *Trizygia*, perfectly aligned with the distal section of Rs. These genera also present a short, strictly transverse basal section of Rs. In *Neotrizygia*, *Neoaphelomera* and *Azana*, r-m is quite long, with the origin of M_{1+2} displaced to a very basal position in the wing. This seems to be a small monophyletic group within the Sciophilinae to which the new species described here certainly agrees. *Morganiella* is apomorphic for different other features within this clade, but Sc is long and complete, with a very evident sc-r placed distally to the origin of Rs. *Neotrizygia* also has a fairly long Sc. *Azana*, *Neotrizygia*, and *Trizygia* have short Sc, but only *Azana* has an incomplete Sc.

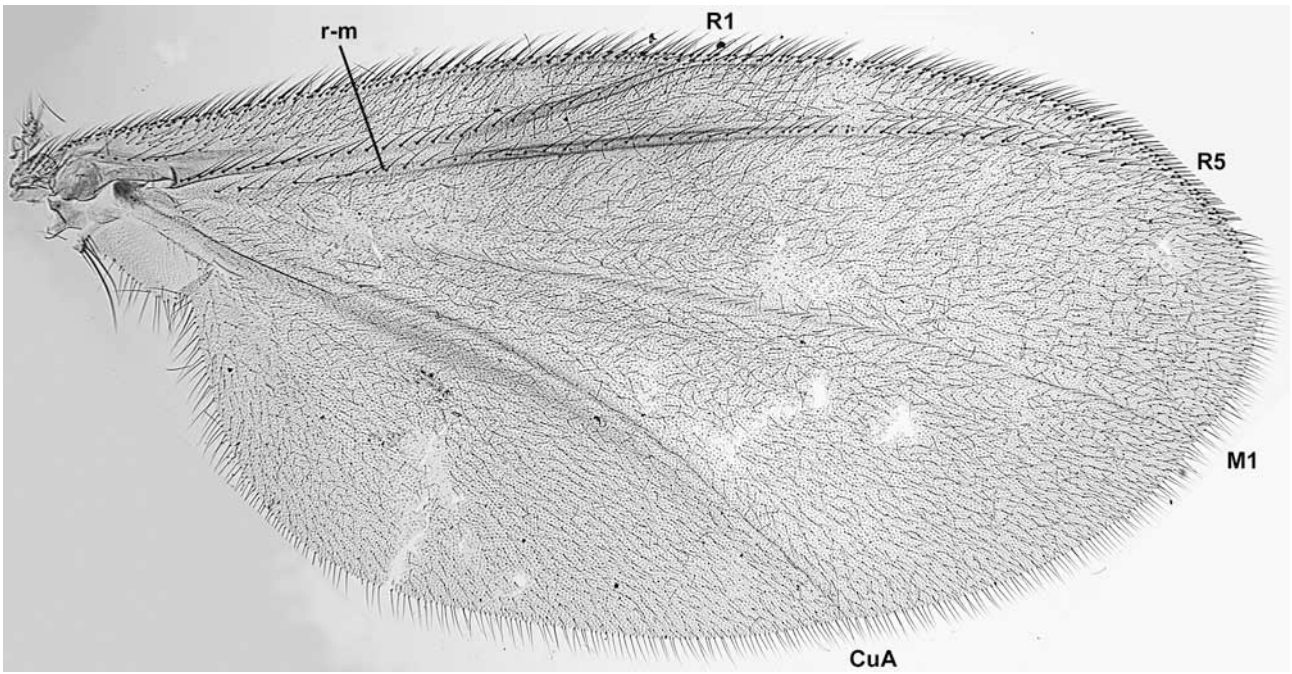
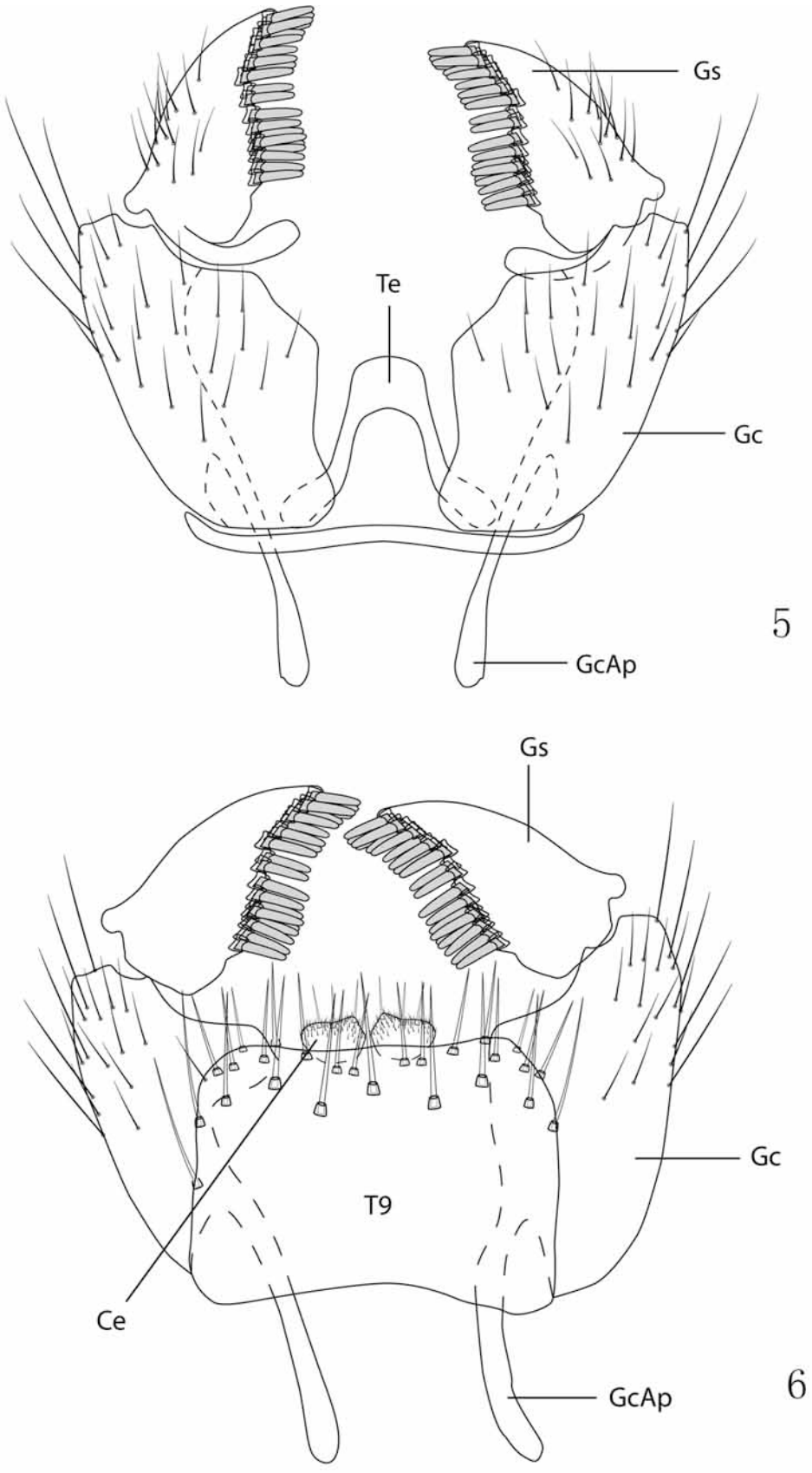


FIGURE 4. *Azana atlantica*, **sp.n.** Holotype. Wing.

Azana atlantica, **sp.n.** shares the features listed above for the *Azana*-group of genera, but it is even more autapomorphic. M_4 is entirely lost, the base of Rs is not produced, there is only a pair of ocelli (which is homoplastically shared with, e.g., part of the genus *Cluzobra*), and there is the distinctive reduction in the mouthparts. In the Central American key of the family Mycetophilidae (Vockeroth, in press) *Azana atlantica*, **sp.n.** runs into "Undescribed genus A", mainly because of the complete absence of M_4, but there is no reference to reduced mouthparts or to the ocelli in that work. Chris Borkent (pers. comm.) examined specimens from western Ecuador and southern Mexico used by J.R. Vockeroth to refer to the "Undescribed genus A" and confirmed that they belong to *Azana* and agree in the general morphology with *Azana atlantica*, **sp.n.**, though they differ in some finer aspects.

The Afrotropical species of *Azana* described by Matile (1998) share with *A. atlantica*, **sp.n.** the complete loss of M_4. Also, the male terminalia of both Afrotropical species described by Matile (1998) and the species described in this paper have the gonocoxites largely separated from each other and an inner digitiform projection of the gonostyle. There is no reference to the loss of the mid ocellus or to the reduction of the mouthparts in the Afrotopical species. The very distinctive spines on the gonostyle seen in *A. atlantica*, **sp.n.** are also present in *A. sinusa* and *A. corsicana*, but not in the Afrotropical species of the genus. A formal phylogenetic analysis would more properly establish the relationships between the species of the genus and solve these problems.



FIGURES 5–6. *Azana atlantica*, **sp.n.** Holotype. Male terminalia. 5. Ventral view. 6. Dorsal view. Abbreviations: Ce, cercus; Gc, gonocoxite; GcAp, gonocoxal apodeme; Gs, gonostyle; T9, tergite 9; Te, tegmen.

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