Two New Species of the Tribe Alycaulini (Diptera: Cecidomyiidae) from Brazil

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Two new species of the tribe Alycaulini (Diptera: Cecidomyiidae) from Brazil

Maria Virginia Urso-Guimarães[1,2,*]

Abstract

Two new species of the tribe Alycaulini, *Alycaulus hexadentatus* **sp. nov.** and *Meunieriella spinosa* **sp. nov.** (Diptera: Cecidomyiidae), are described from Brazil, using morphological characters from the adult and immature stages. Their biology and associations with the host-plant species are discussed.

Key Words: *Alycaulus*; gall maker; inquiline; *Meunieriella*; Neotropical region; taxonomy

Resumo

Duas espécies novas da tribo Alycaulini, *Alycaulus hexadentatus* **sp. nov.** e *Meunieriella spinosa* **sp. nov.** (Diptera: Cecidomyiidae), são descritas para o Brasil. A biologia e associação com as espécies de plantas hospedeiras são discutidas.

Palavras Chave: *Alycaulus*; galhador; inquilino; *Meunieriella*; região Neotropical; taxonomia

Alycaulus hexadentatus **sp. nov.** and *Meunieriella spinosa* **sp. nov.** are previously undescribed taxa assigned to the tribe Alycaulini. The diagnostic characters of the species are the enlarged dorsal-longitudinal ridges on the basal half of the ovipositor, and the setose sclerotized posterior margin of the male seventh tergite. Setae are occasionally present on the eighth tergite (Gagné & Etienne 1996).

The tribe Alycaulini includes 212 described species in 20 genera, all restricted to the Americas (Gagné & Jaschhof 2017). The biology and habitats of alycauline species are diverse. They may cause simple galls on the stems, tendrils, or petioles of various plants. They live in flowers or achenes, as inquilines in abandoned galls of other cecidomyiids, or in association with fungi (Gagné 1994; Gagné & Jaschhof 2017).

Alycaulus was described by Rübsaamen (1915) for the species *Alycaulus mikaniae* Rubsaamen (Diptera: Cecidomyiidae) from Auristella on Rio Acre, Amazonas State, Brazil. A second species, *Alycaulus trilobatus* Möhn (Diptera: Cecidomyiidae) was described from El Salvador (Möhn 1964) and also occurs in Colombia (Wünsche 1979). The third species is *Alycaulus globulus* Gagné (Diptera: Cecidomyiidae) from Poço das Antas, Rio de Janeiro State, Brazil (Gagné et al. 2001). All previously known species of *Alycaulus* are associated with galls on *Mikania* spp. (Asteraceae) (Gagné 1994; Gagné & Jaschhof 2017). *Alycaulus hexadentatus* **sp. nov.** is the first species of the genus found associated with a host plant of the family Smilacaceae.

Meunieria (Diptera: Cecidomyiidae) was described by Rübsaamen (1905) for the species *M. dalechampiae* from Palmeira, Rio de Janeiro State, Brazil. Later, Kieffer (1909) renamed *Meunieria* (preocc. Kieffer, 1904) to *Meunieriella*. Currently, *Meunieriella* has 21 species, most of which are in the Neotropical region, with only 1 species in the Nearctic region. All species are inquilines of abandoned galls of other cecidomyiids, except for 2 gall-maker species, *M. avicenniae* (Cook) and *M. aquilonia* Gagné (Gagné & Jaschhof 2017). In Brazil, 3 species of *Meunieriella* are known: *M. insignis* (Tavares), associated with abandoned galls of *Protium heptaphyllum* (Aubl.) Marchand (Burseraceae); *M. dalechampiae* (Rübsaamen), found in ex-galls of *Dalechampia filicifolia* Lam. (Euphorbiaceae); and *M. lantanae* (Tavares) in abandoned galls of *Lantana* sp. (Verbenaceae) (Gagné & Jaschhof 2017). Herein, *Meunieriella spinosa* **sp. nov.** is described from abandoned galls on leaves of *Inga edulis* Mart. (Fabaceae). The other species of *Meunieriella* occupying abandoned galls on *Inga* host-plant species was described by Möhn (1975). The specimens of *M. ingae* Möhn were reared from abandoned galls of *Inga leptoloba* Schltdl. (Fabaceae) in El Salvador. The distribution of *I. leptoloba* is restricted to Central America, from Mexico to Panama, including some Caribbean islands. This is the first record of a *Meunieriella* species associated with abandoned galls on species of *Inga* in Brazil.

Material and Methods

Branches of *Smilax oblongifolia* Pohl ex Grisebach (Smilacaceae) with leaf galls induced by *Alycaulus hexadentatus* **sp. nov.** were collected in seasonal semideciduous forest vegetation around Itambé Cave in Altinópolis, São Paulo State, Brazil (21.068781°S, 47.438968°W; about 900 masl), on 28-V-2001. Branches of *I. edulis* with hairy leaf galls induced by an unidentified cecidomyiid, from which *Meunieriella spinosa* **sp. nov.** emerged, were collected in Delfinópolis, Minas Gerais State, Brazil (20.343960°S, 46.804585°W; about 700 masl) on 29-VI-2000.

The branches with galls were collected and transferred to individual plastic bags to rear the adults. Some of the galls were dissected under a stereomicroscope to obtain immature stages. All material was

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conserved in 80% ethanol. The specimens were mounted following the technique of Gagné (1994), and the morphological terminology and identification key used were provided by the same source. The material was illustrated under an optical microscope and stereomicroscope. The plant species were identified by the specialists mentioned in the "Acknowledgments" section. All types are deposited in the Museu de Zoologia of the Universidade de São Paulo, São Paulo, Brazil.

TAXONOMY

Cecidomyiidae Macquart, 1838

Cecidomyiinae Rondani, 1840

Alycaulus Rubsaamen, 1915

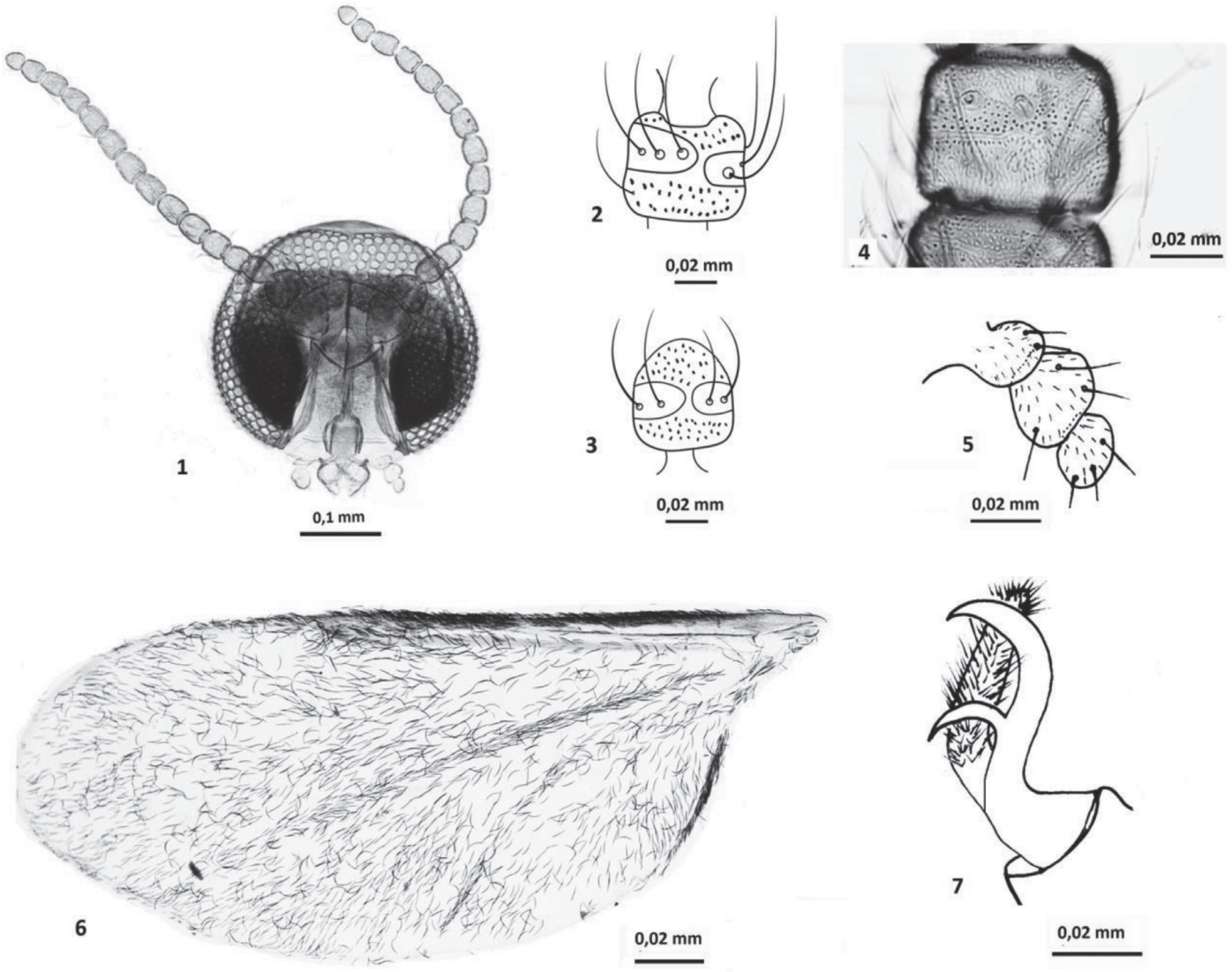
DIAGNOSIS

Larva with robust, wide spatula with 3 to several points, and 8 short terminal papillae; antennal horns of pupa strong, broad, and serrate; female cerci of most species fused; gonostylus attenuate in male, R5 about 3/4 of the length of wing (Möhn 1964; Gagné et al. 2001).

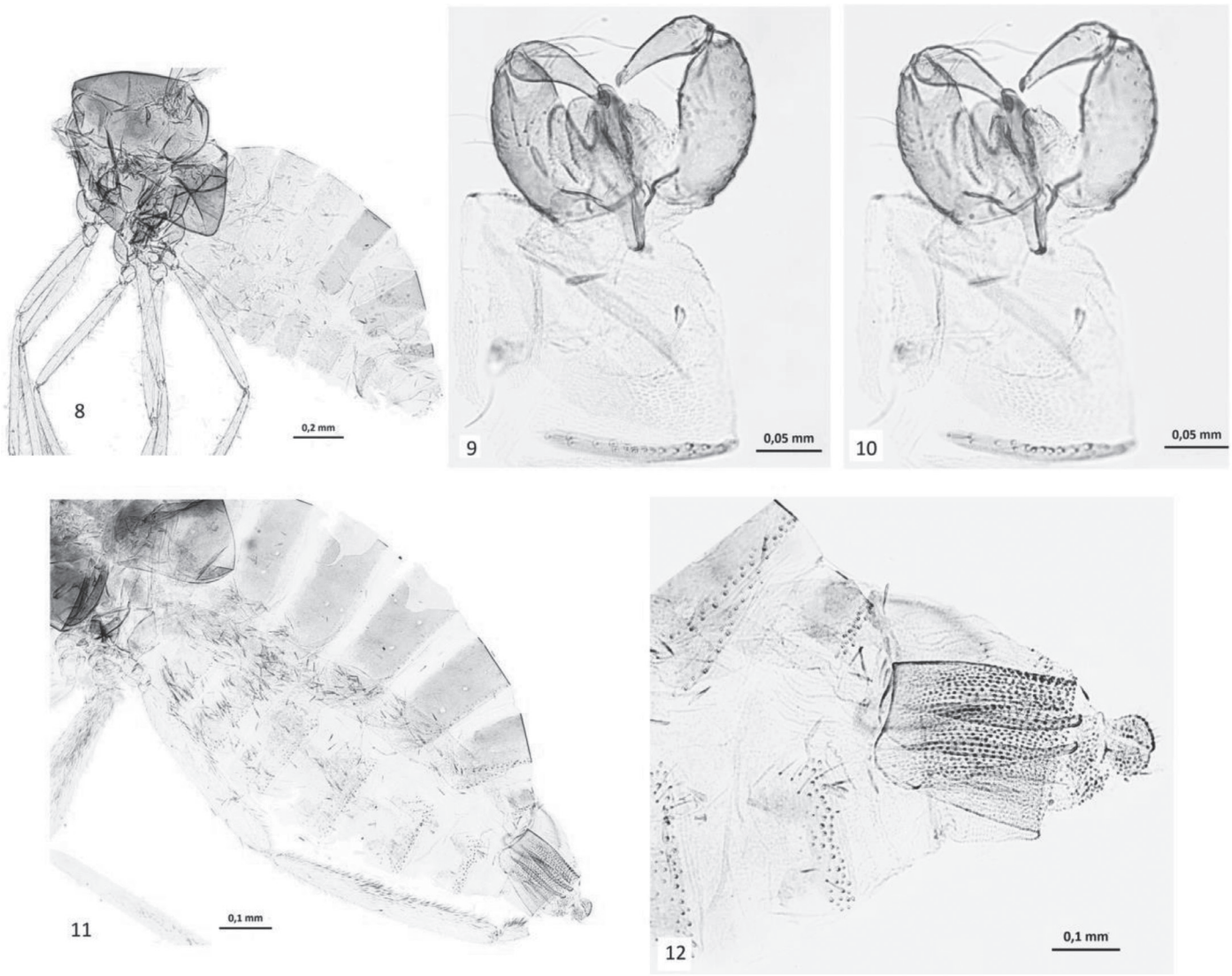
Alycaulus hexadentatus **sp. nov.** Urso-Guimarães (Figs. 1–17)

DESCRIPTION

Adult. Male. Light brown. Body length: male 1.6 mm (n = 1), female 3.7 mm (n = 1). Head: eyes black, holoptic, facets hexagonal, closely adjacent (Fig. 1). Antenna with 13 flagellomeres in male, 18 in female. Male and female flagellomeres barrel-shaped, with row of strong setae and circumfila appressed to flagellomeres (Figs. 2–4). Mouthparts: labellum triangular in frontal view, with microsetae; palpus 3-segmented (Fig. 5), first segment as wide as long, second longer and wider than first; third, when present, narrower, shorter than second, and all approximately globoid. Thorax: wing (Fig. 6) length, male: 1.0 mm, female: 2.2 mm; R5 about 0.7 length of wing. Tarsal claws with tooth; empodia as long as claws (Fig. 7). Scutum with dorsocentral rows of setae and lateral setae present, anepistemum bare; katepistemum with 17 setae; anepimeron with 18 setae. Male abdomen (Figs. 8–10): Tergites 1 to 4 weakly sclerotized, tergites 6 and 7 completely sclerotized, tergite 8 as narrow sclerotized band, all tergites with single row of setae along posterior margin, trichoid sensilla absent. Sternites 2 to 6 rectangular, sternites 7 and 8 membranous, all sternites covered with setae and scales, trichoid sensilla absent. Female abdomen (Figs. 11, 12): Tergites 2 to 6 rectangular,



Figs. 1–7. *Alycaulus hexadentatus* **sp. nov.**: (1) Male head (frontal view); (2) Fifth flagellomere of female; (3) Last flagellomere of male; (4) Fifth flagellomere of female; (5) Palpus (frontal view); (6) Wing; (7) Male tarsal claw and empodium.



Figs. 8–12. *Alycaulus hexadentatus* **sp. nov.**: (8) Male thorax and abdominal segments (lateral view); (9) Male terminalia (dorsal view); (10) Male terminalia (ventral view); (11) Female thorax and abdominal segments (lateral view); (12) Ovipositor (ventro-lateral view).

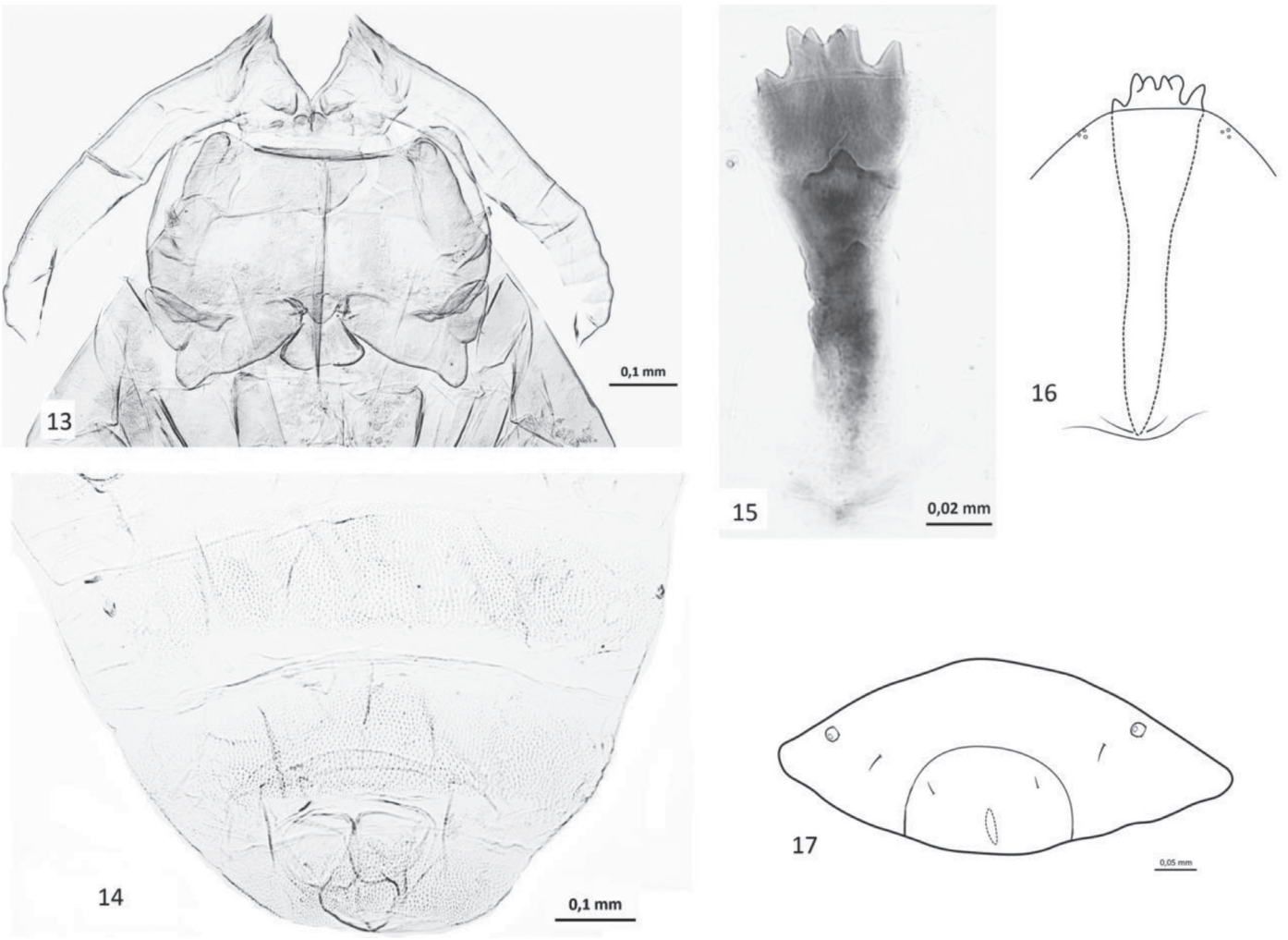
about twice as wide as long, with setae as in male; tergite 7 slightly wider than long, with 2 rows of posterior setae, tergite 8 as a narrow band with a strong row of setae, trichoid sensilla absent. Sternites 2 to 7 weakly sclerotized, sternite 8 membranous, all covered with setae and scales, trichoid sensilla absent. Male terminalia: Hypoproct slightly bilobed, wider than cercus, with pair of posterior setae; aedeagus longer than hypoproct and parameres; parameres apically with 2 to 3 short setae; gonocoxite cylindrical; gonostylus attenuate, widest at base, tapering to narrow apex, setulose basally, carinate beyond; apical tooth present. Ovipositor: protractible portion of ovipositor about 2.5 times length of tergite 7, covered with rows of spicules and with 2 sclerotized bridges on dorsal region; cerci fused, spheroid, with longitudinal fold, completely covered with setae; hypoproct slightly less than half the length of cerci, slightly longer than wide, narrowed and curved apically, with 2 apical setae.

Pupa. (Figs. 13, 14): Light brown. Body length, 2.9 mm, 1.6 mm max width (n = 10). Head. Antennal horns well developed, triangular, anterior margin finely serrate, triangular region sclerotized on base of antennal sheath; cervical sclerite with 2 short setae; face without ventral projections, without papillae. Thorax: prothoracic spiracle short, cylindrical. Wing reaching third abdominal segment; all pairs of legs reaching sixth abdominal segment. Abdominal tergites 2 to 8 uniformly spiculose, dorsal spines absent. Terminal segment 0.1 mm long; 0.3 mm wide. Integument smooth.

Larval third instar. (Figs. 15–17): Yellowish. Body: 1 mm long (n = 1). Integument densely spiculose dorsally and laterally on all thoracic and abdominal segments. Prothoracic spatula: length, 0.3 mm, 6 teeth anteriorly, middle tooth larger than lateral teeth; group of 3 lateral papillae on each side of spatula, 1 papilla with setae, 2 bare. Terminal segment with 4 setose papillae, the setae of equal length; ventral anus in cleft.

Type Material. HOLOTYPE male, Itambé Complex, Altinópolis, São Paulo State, Brazil (21.068781°S, 47.438968°W; about 900 m asl), reared from leaf galls of *S. oblongifolia* (Smilacaceae), collected 28-V-2001 Urso-Guimarães MV collector; emerged 6-VII-2001, deposited in Museu de Zoologia da Universidade de São Paulo. PARATYPES, 10 pupal exuviae, 1 larva, 1 female, collected and reared with holotype, female emerged 18-VI-2001 (deposited in Museu de Zoologia da Universidade de São Paulo).

Etymology. The specific name "*hexadentatus*" means 6 teeth, referring to the number of teeth on the larval prothoracic spatula of the new species.



Figs. 13–17. *Alycaulus hexadentatus* **sp. nov.**: (13) Cephalic region of pupa (ventral view); (14) Abdominal segments of pupa (dorsal view); (15) Prothoracic spatula of larva (ventral view); (16) Prothoracic spatula and lateral papillae of larva (ventral view); (17) Terminal segment and terminal papillae (dorsal view).

Gall and biology. Globoid leaf galls of *S. oblongifolia* (Smilacaceae), immature galls are cream-colored transitioning to light green with red dot at the apex when mature. They are bare, monothalamous, and occur only on the upper leaf surface. The larva pupates in the gall, and adults emerged through an escape hole dug by the pupa with its antennal horns. One pupa was found outside the gall, among mycelia of fungi, from which an adult emerged. Galls were also recorded by Delfinópolis in Urso-Guimarães et al. (2003, Fig. 22) on a plant, then identified as *Smilax coriifolia* A.DC, a name currently synonymized under *Smilax oblongifolia*.

Remarks. *Alycaulus hexadentatus* **sp. nov.** is recognized as a member of Alycaulini in possessing the enlarged dorsal-longitudinal ridges on the basal half of the ovipositor and the sclerotized and setose posterior margin of the male seventh tergite, diagnostic characters of the tribe. The specimens of *A. hexadentatus* **sp. nov.** share their diagnostic features with previously known *Alycaulus* species. *Alycaulus hexadentatus* **sp. nov.** shares with *A. globulus* (Gagné et al. 2001) the clavate gonostylus and the triangular pupal antennal horns, slightly serrate on the internal edge. *Alycaulus hexadentatus* **sp. nov.** shares with *A. globulus* and *A. tetralobus* (Wünsch 1979) the fused cercal lobe of the female. *Alycaulus mikaniae* was described as having separate cerci by Rübsaamen (1915), but Gagné et al. (2001) argued that this is an artifact resulting from the preparation of the material, and all females of the genus have fused cerci. *Alycaulus hexadentatus* **sp. nov.** differs from the previously known species in the larval spatula, narrower and with 6 anterior teeth, in contrast to the condition of spatula broad with 5 teeth in *A. mikaniae*, and broad and tridentate in *A. globulus* and *A. trilobatus*; reduced set of lateral papillae (1 group of 3 lateral papillae on each side of spatula in the new species, in contrast to the complete set with 4 lateral papillae on each side in previously known species); and only 2 pairs of setose papillae on each side on the terminal segment (instead of the 4 pairs of terminal papillae in previously known species). The reduction of papillae is common in most alycauline larvae that live in woody-stem galls (Gagné & Jachhof 2017). *Alycaulus hexadentatus* **sp. nov.** is the first species of the genus reared from galls on *Smilax oblongifolia*. All previously known species of *Alycaulus* have been reared from *Mikania* galls.

Cecidomyiidae Macquart, 1838

Cecidomyiinae Rondani, 1840

Meunieriella Kieffer, 1909

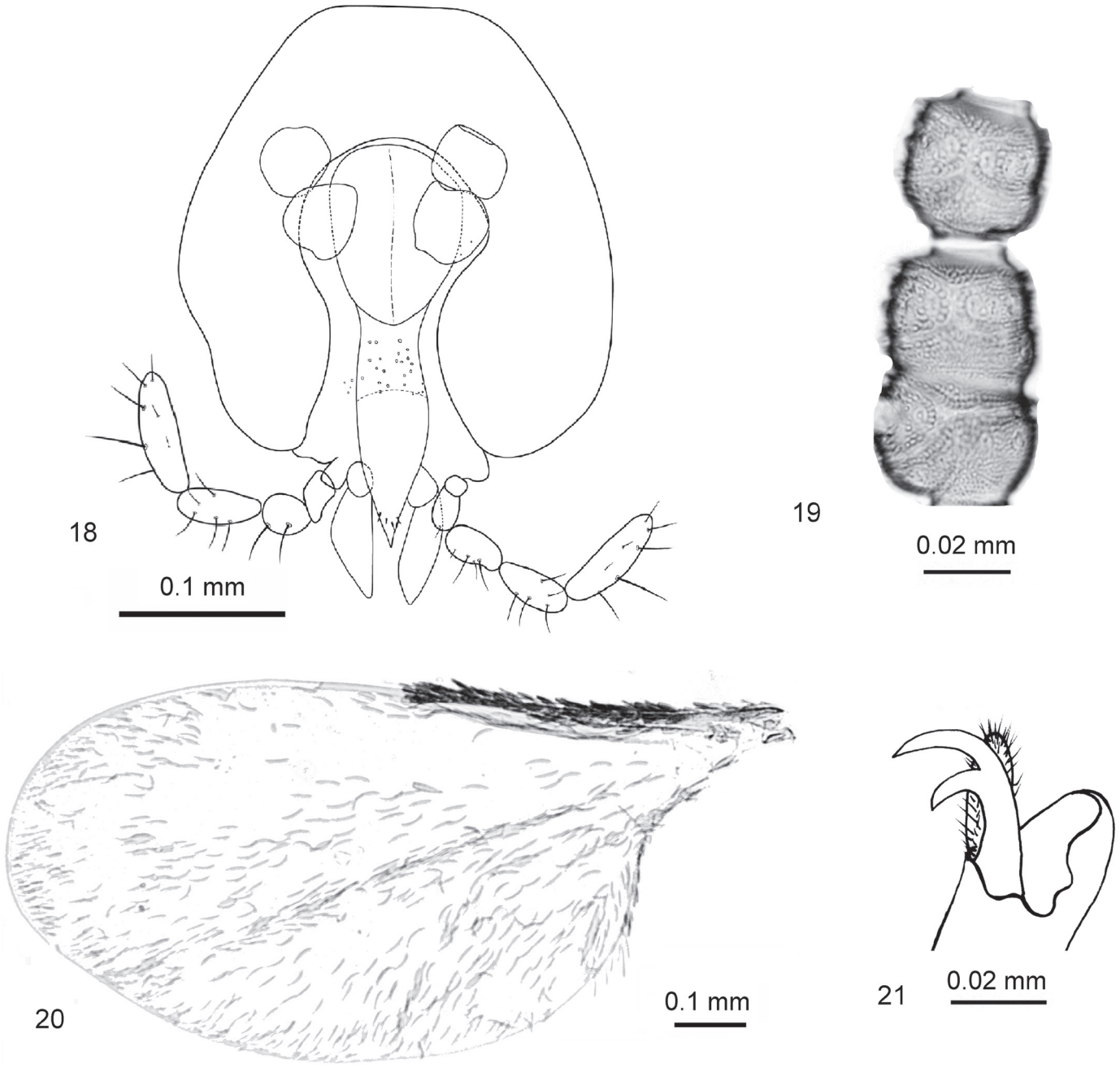
Diagnosis. Adults: palpus 4-segmented; claws toothed; wings: R_1 and R_5 short, almost parallel, R_5 straight, M_4 and Cu_2 present. Male sixth through eighth abdominal segments completely retractable within the anterior part of the abdomen, gonocoxite and gonostylus of male terminalia extremely prolonged and thin; ovipositor elongated and protractible, cercus with simple setae. Pupa: antennal horn with upper

and lower spines, upper and lower frontal horn absent, upper cephalic margin thickened laterally; prothoracic spiracle and cephalic papillae long; abdominal dorsal segments with rows of small spicules, without spines. Larva: prothoracic spatula 2-toothed; 1 pair of inner lateral papillae bare and 3 pairs of outer lateral papillae, 8 terminal papillae, 6 with long to very long setae, lower inner setae always severely shortened (Möhn 1975; Gagné & Etienne 1996).

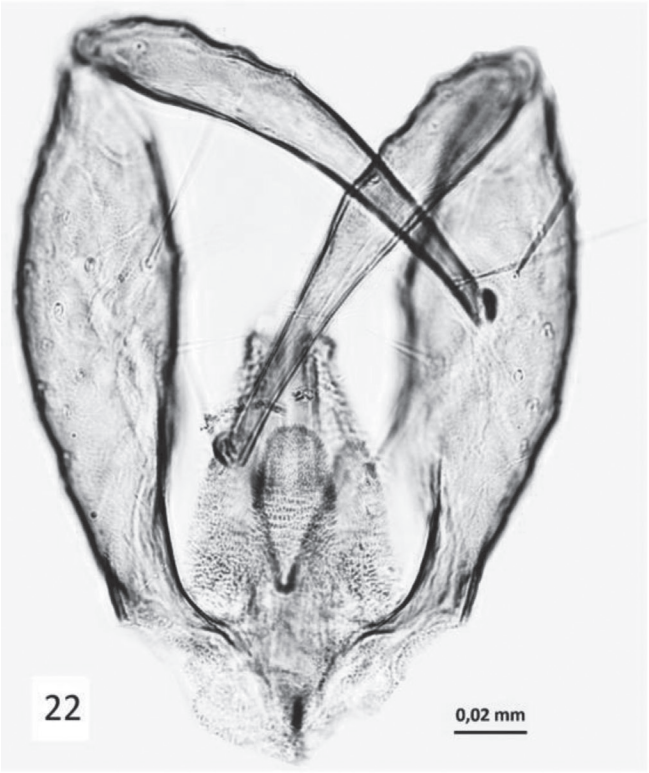
Meunieriella spinosa **sp. nov.** Urso-Guimarães (Figs. 18–29)

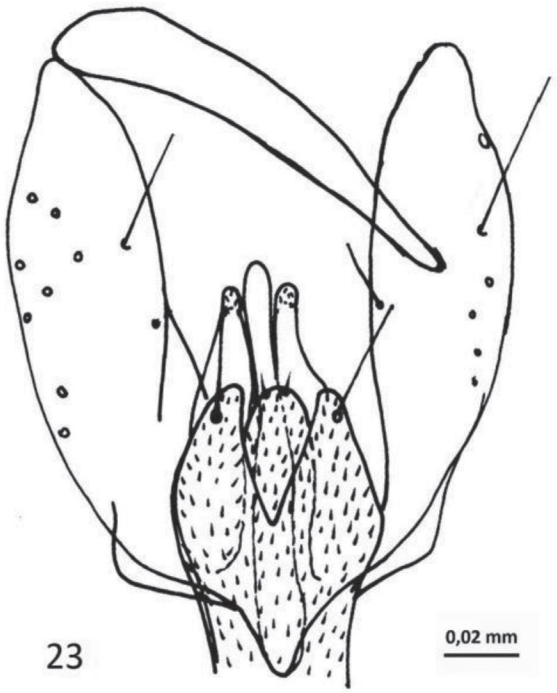
DESCRIPTION

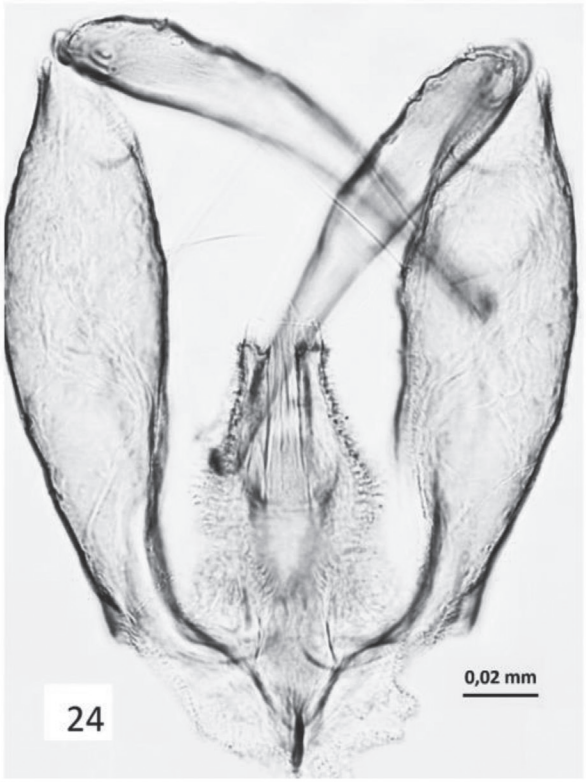
Adult. Male. Body length: male 1.2 mm (n = 3), female 1.4 mm (n = 2). Head: eyes black, holoptic, facets hexagonal, closely adjacent (Fig. 18); Antenna with 17 to 18 flagellomeres in male, 1 of the females with antennae broken at 15th flagellomere. Male and female flagellomeres barrel-shaped, with row of stout setae and circumfila appressed to flagellomeres as in Figure 19. Mouthparts: labellum triangular in frontal view; palpus 4-segmented, first segment as wide as long, second and third longer and wider than first, fourth equal in width and twice as long as third (Fig. 18). Thorax: wing (Fig. 20) length, male: 0.9 mm, female: 1.0 mm; maximum width, male and female: 0.5 mm; R_5 half the length of wing. Legs completely covered with scales, tarsal claws toothed; empodia as long as claws (Fig. 21). Scutum with dorsocentral rows of setae and lateral setae present, anepistemum and katepistemum bare; anepimeron with 9 setae. Male abdomen: tergites 1 to 5 sclerotized, tergites 6 to 8 weakly sclerotized and retractable, all tergites with single row of setae along posterior margin, trichoid sensilla

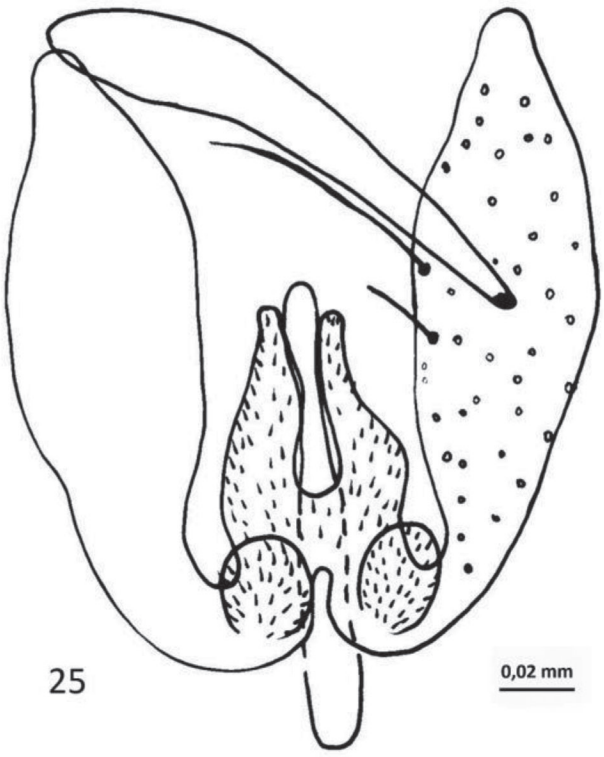


Figs. 18–21. *Meunieriella spinosa* **sp. nov.**: (18) Male head (frontal view); (19) Female flagellomeres 1 to 3; (20) Wing; (21) Male tarsal claw and empodium.



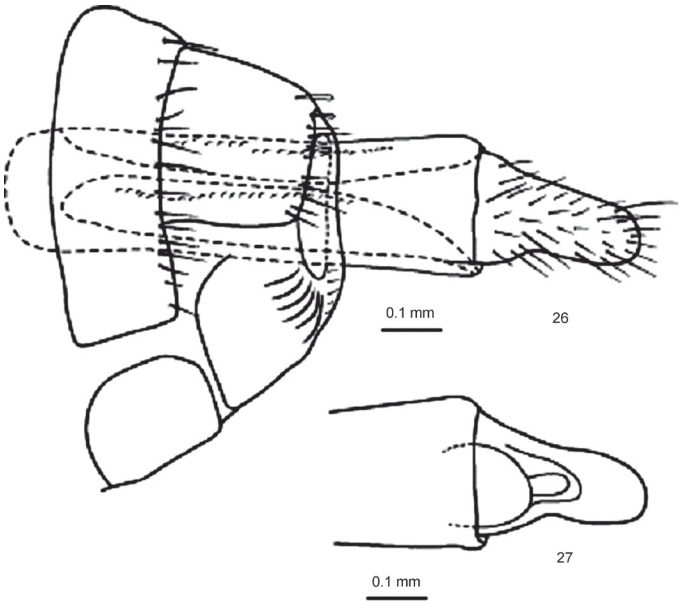






Figs. 22–25. *Meunieriella spinosa* **sp. nov.**: (22) Male terminalia (dorsal view); (23) Male terminalia (schematic drawing, dorsal view); (24) Male terminalia (ventral view); (25) Male terminalia (schematic drawing, ventral view).

not visible. All sternites membranous, with single row of setae along posterior margin, trichoid sensilla not visible on shrunken abdomen. Female abdomen: Tergites 2 to 6 rectangular, weakly sclerotized, all tergites with single row of setae and scales along posterior margin, seventh tergite with pair of trichoid sensilla. Sternites 2 to 7 weakly sclerotized, sternite 8 membranous, all covered with setae and scales, seventh sternite with 2 pairs of trichoid sensilla. Male terminalia (Figs. 22–25): gonocoxite and gonostylus cylindrical and very long, the former



Figs. 26–27. *Meunieriella spinosa* **sp. nov.**: (26) Last segments of female abdomen and ovipositor (dorso-lateral view); (27) Ovipositor (ventral view).

completely covered with setae, and the latter setulose basally, carinate beyond; with small tooth apically; hypoproct unilobed, longer and narrower than cercus, with pair of setae at apex; parameres bilobed, longer than hypoproct, covered with microsetae at apex of each lobe and with basal lobe on each side, aedeagus cylindrical, longer than parameres and narrower than cercus. Ovipositor (Figs. 26–27): protractible portion of ovipositor about 7.5 times length of seventh tergite, pair of longitudinal rows of spines on dorsal part of protractible region; fused cerci completely covered with macrosetae; hypoproct 1/3 the length of cerci, longer than wide, narrowed, with apical macrosetae.

Pupa (Figs. 28–29). Body length: 1.3 mm, maximum width: 0.5 mm (n = 3). Head: antennal horns short, rounded and smooth with upper and lower spines; cephalic setae very long (0.2 mm); upper and lower frontal horn absent, lower and lateral papillae absent, upper cephalic margin thickened laterally; prothoracic spiracle long (0.1 mm); abdominal segments with dorsal rows of small spicules in discal area.

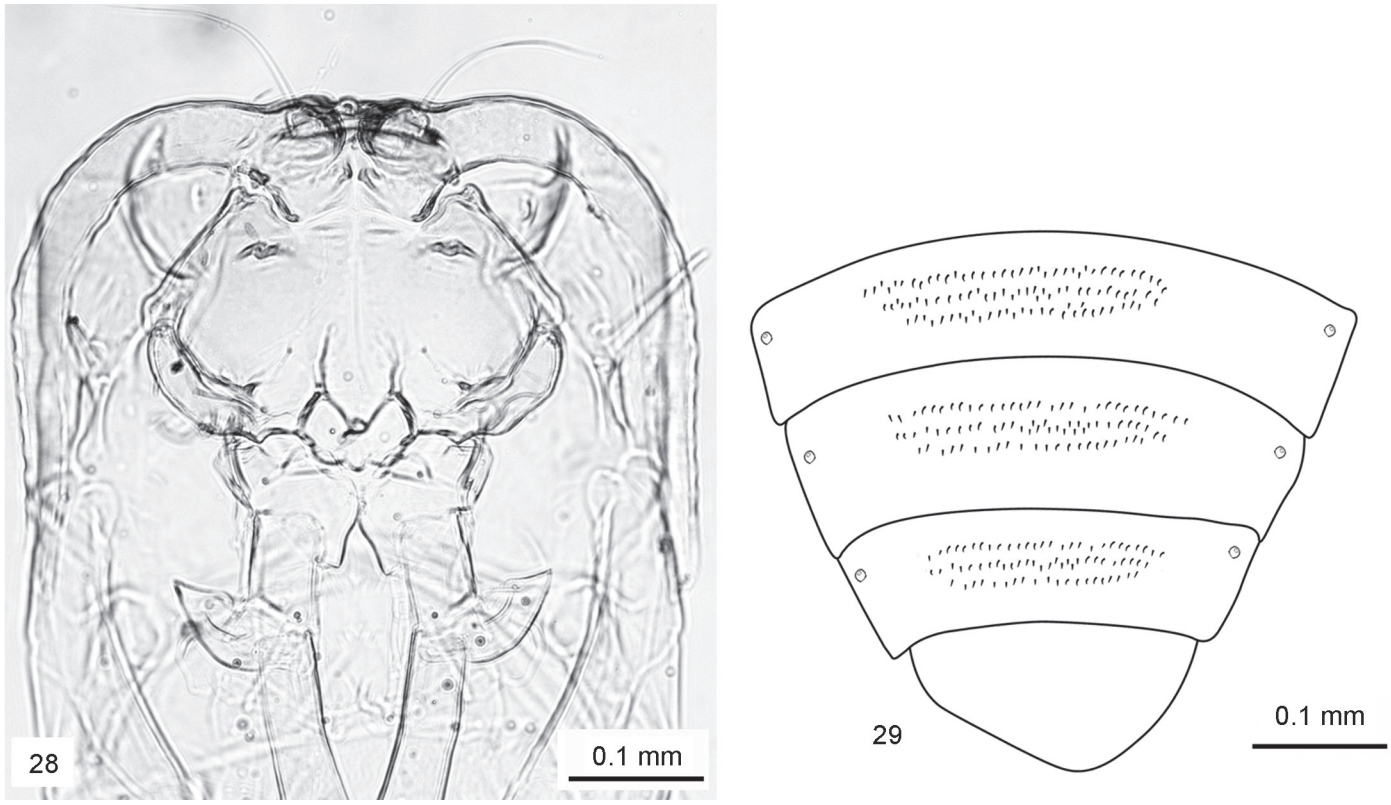
Larva. Unknown.

Type Material. HOLOTYPE male, Delfinópolis, Minas Gerais State, Brazil (20.343960°S, 46.804585°W; about 700 masl), reared from abandoned hairy leaf galls of an unidentified cecidomyiid on *Inga edulis*, collected 29-VI-2000, Urso-Guimarães MV collector; emerged 12-VII-2000, deposited in Museu de Zoologia da Universidade de São Paulo. PARATYPES: 2 males, 2 females, 3 exuviae collected and reared with holotype (Museu de Zoologia da Universidade de São Paulo).

Etymology. The specific name "*spinosa*" means "with spines" and refers to the diagnostic characteristic of this species, the longitudinal row of spines in the dorsal area of the protractible region of the ovipositor.

Gall and biology. Globoid hairy galls on leaves of *I. edulis*, short brown to red trichomes, monothalamous, occurring on upper leaf surface. The single larva pupates in the gall. Galls found in Delfinópolis (Urso-Guimarães et al. 2003, Fig. 17).

Remarks. The new species belongs to the genus *Meunieriella* in possessing most of the diagnostic characters, especially the male sixth through eighth abdominal segments completely retractable within anterior part of abdomen, gonocoxite, and gonostylus of male terminalia extremely prolonged and narrow; elongated and protractible ovipositor, cercus with simple setae; pupal antennal horn with upper and lower spines, upper and lower frontal horn absent, upper cephalic margin thickened laterally; prothoracic spiracle and cephalic papillae long.



Figs. 28–29. *Meunieriella spinosa* **sp. nov.**: (28) Cephalic region of pupa (ventral view); (29) Terminal segment of pupa (dorsal view).

Some characters can approximate *Meunieriella spinosa* **sp. nov.** from the Neotropical congeners: R_5 wing vein is 5/10 as long as wing, the male sixth to eighth abdominal tergites are reduced, and the gonocoxites and gonostyli are very narrow and long, as in all Neotropical species of *Meunieriella* except for *M. avicenniae*, which has the R_5 7/10 longer than the wing, the male sixth to eighth abdominal tergites less reduced, and the gonocoxites and gonostyli are wider and shorter than in Neotropical species. *Meunieriella spinosa* **sp. nov.** may be differentiated from the Neotropical congeners by all of the following adult and pupal unique characters: the presence of the basal lobe on each side of parameres, a pair of longitudinal rows of spines in the dorsal area of the internal protractible region of the ovipositor, and the pupation occurring inside the gall. *Meunieriella spinosa* **sp. nov.** is inquiline in galls of an unidentified cecidomyiid, as are the majority of the Neotropical species.

Acknowledgments

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