

Two new species of *Asphondylia* Loew, 1850 (Diptera, Cecidomyiidae) on Asteraceae from Brazil

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Abstract. Two new species of *Asphondylia* inducing galls on Asteraceae are described, *A. gaucha* from the state of Rio Grande do Sul and *A. mineira* from the state of Minas Gerais. Their host plants are *Vernonanthura discolor* (Sprengel) H. Rob., and *V. polyanthes* (Sprengel) Vega & Dematteis, respectively, both native to Brazil. Illustrations of relevant morphological characters are provided. The new species are compared with congeneric Neotropical species. The types are deposited in the Entomological Collection of the Museu Nacional/Universidade Federal do Rio de Janeiro.

Keywords. Gall midges; Host plant; Morphology; Taxonomy.

INTRODUCTION

Asphondylia Loew, 1850 (Diptera, Cecidomyiidae) is one of the most diverse and widespread genera of the Cecidomyiidae, with about 300 species, all gall-inducers (Gagné & Jaschhof, 2021). The genus is recognizable by its needlelike ovipositor, two-toothed gonostylus, three-segmented palpi and the presence of upper and lower horns on the pupal frons (Gagné, 1994).

Approximately 50 species of *Asphondylia* induce galls on Asteraceae, 19 of them in the Neotropical Region and seven in Brazil (Table 1). In the world, there is only one described species of *Asphondylia* associated with the genus *Vernonanthura*, *Asphondylia ajallai* Möhn, 1959 from El Salvador.

In this paper, two new species of *Asphondylia* which induce stem galls on Asteraceae are described: *A. gaucha* and *A. mineira*, the former induces complex galls on *Vernonanthura discolor* (Sprengel) H. Rob. and the latter simple galls on *Vernonanthura polyanthes* (Sprengel) Vega & Dematteis, both host plants are native to Brazil. The complex galls on *Vernonanthura discolor* were previously reported by Mendonça *et al.*, 2014, but the gall-inducing species was not identified in that publication.

MATERIAL AND METHODS

Galls on *Vernonanthura discolor*, and *V. polyanthes* were collected in different localities of Brazil: the former in Floresta Nacional de São Francisco de Paula (29°25'22"S; 50°23'11"W) in the municipality of São Francisco de Paula, state of Rio Grande do Sul, by M. Mendonça and the latter in Serra Negra do Funil, municipality of Rio Preto (22°05'S, 43°49'W), state of Minas Gerais by B. Mascarenhas.

Field work was performed on different dates (see "Material Examined"). Specimens were reared in the laboratory and sent in micro vials with 70% ethanol to VCM for identification. All material was prepared and mounted on microscope slides following the methods outlined in Gagné (1994). The genus was identified using the key of Gagné (1994), and the new species were proposed after comparison with literature data (host plants, gall morphology and cecidomyiid descriptions). All specimens were deposited in the Entomological Collection of the Museu Nacional/Universidade Federal do Rio de Janeiro (MNRJ).

Morphological studies and drawings were made with the aid of an optical microscope coupled with a photographic camera and drawing tube. Measurements were made according to Maia & Oliveira, 2021. All drawings were edited

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Table 1. Species of *Asphondylia* Loew, 1850 (Diptera, Cecidomyiidae) on Asteraceae in Brazil.

Species	Host Plant	References
<i>Asphondylia cipo</i> Urso-Guimarães, 2018	<i>Lessingianthus warmingianus</i> (Baker) H. Rob.	Urso-Guimarães, 2018
<i>Asphondylia glomeratae</i> Gagné, 2001	<i>Mikania glomerata</i> Spreng.	Gagné et al., 2001
<i>Asphondylia gochnatiae</i> Maia, 2008	<i>Moquiniastrium polymorphum</i> (Less.) G. Sancho (as <i>Gochnatia polymorpha</i> (Less.) Cabrera)	Maia et al., 2008
<i>Asphondylia ingaiensis</i> Maia, 2021	<i>Moquiniastrium barrosoae</i> (Cabrera) G. Sancho	Maia & Oliveira, 2021
<i>Asphondylia moehni</i> Skuhravá 1989	<i>Mikania glomerata</i> Spreng., <i>M. guaco</i> Kunth.	Möhn, 1973; Skuhravá, 1989
<i>Asphondylia serrata</i> Maia, 2004	<i>Eremanthus erythropappus</i> (DC) MacLeish (as <i>Vanillosmopsis erythropappa</i> (DC.) Sch. Bip.)	Maia, 2004
<i>Asphondylia ulei</i> Rübsaamen, 1908	<i>Mikania</i> sp.	Rübsaamen, 1908

using Corel DRAW®. Adult morphological terminology follows Cumming & Wood (2009) and larval and pupal stages follows Gagné (1989).

The new species are compared to each other and to *Asphondylia ajallai*, the only known congeneric species that induces galls on the same host genus.

Description

Asphondylia gaucha Maia, sp. nov. (Figs. 1-4)

Diagnosis: Male hypoproct deeply bilobed; ovipositor with needle part 2.0-2.2 X length 7th sternite; pupa: antennal horn with apical part 1.5 X length of basal part, upper frontal horn simple, 0.2 X length of antennal horn, lower frontal horn tridentate, 0.1 X length of antennal horn, teeth not aligned, lateral teeth conspicuously above mesal tooth, 8th abdominal segment with 8-9 dorsal spines in the posterior row.

Male: Body: 3.20-4.60 mm long (n = 5). **Head** (Fig. 1A): globoid, 0.55-0.65 mm long 0.55-0.65 mm wide (n = 5), eye facets hexagonal, closely appressed; antennae: flagellomeres 1 and 2 not fused, scape truncated conical, setose, 0.14 mm long, 0.07 mm wide (n = 3), pedicel globose, setose, 0.07-0.075 mm long, 0.06-0.065 mm wide (n = 3), 1st-11th flagellomeres cylindrical, 12th conical (Fig. 1B), circumfila longitudinally wavy (Fig. 1C), proportion flagellomere neck-node: 1:10.5; frons with 26-32 (N = 5); mouth parts: labrum long-attenuate, 0.06-0.08 mm long, 0.05-0.06 mm wide (N = 5); hypopharynx of the same shape of labrum, with long lateral setulae, anteriorly directed, 0.22 mm long, 0.05-0.06 mm wide; labella elongate and convex, 0.08-0.10 mm long, 0.03-0.05 mm wide (N = 1), with lateral and mesal setae; palpus 0.21-0.25 mm long (N = 5): 1st segment globoid, 2nd and 3rd segments cylindrical, all segments with setae. **Thorax:** scutum with two dorsocentral rows of setae, setae more abundant anteriorly, and irregular group of lateral row of setae on each side, scales intermixed; scutellum with scattered setae; anepimeron setose and anepisternum setose; remaining pleural sclerites bare. Legs: first tarsomere of each leg with an apical hook-like projection 0.03 mm long (N = 14) (Fig. 1D), tarsal claws curved beyond midlength, isomorphic, empodium shorter than claws (Fig. 1E); wing: length 2.90-3.20 mm (N = 5) (Fig. 1F). **Abdomen** (Fig. 2A): 1st-7th tergites sclerotized,

rectangular with a posterior row of setae, few lateral setae, mostly covered elsewhere with scales, and basal pair of trichoid sensillae; 8th tergite band-like with basal pair of trichoid sensillae as vestiture; 2nd-8th sternites sclerotized, rectangular, 2nd-7th sternites with a posterior row of setae, several setae at midlength and laterally, mostly covered elsewhere with scales, and basal pair of trichoid sensillae; 8th sternite entirely covered with setae, more abundant posteriorly, mostly covered elsewhere with scales and basal pair of trichoid sensillae. Terminalia (Figs. 2B): gonocoxite short and stout, 0.15-0.18 mm long, 0.10 mm wide (N = 4), gonostylus spherical, 0.06-0.07 mm long, 0.06-0.07 mm wide (N = 4), teeth 0.01 mm long, 0.03 mm wide (N = 2), hypoproct deeply bilobed, lobes conical; cercus rounded at apex; aedeagus conical.

Female: Body length: 4.10-4.50 mm (n = 4). **Head:** 0.60 mm long, 0.60-0.70 mm wide (n = 4), eye facets hexagonal, closely appressed; antennae: scape 0.14-0.16 mm long, 0.07 mm wide (n = 3), pedicel 0.06-0.08 mm long, 0.07-0.08 mm wide (n = 3), 1st-11th flagellomeres cylindrical, 12th spheroid (Fig. 3A), circumfila comprising two longitudinal bands connected sub basally and apically by two transverse bands (Fig. 3B); 27-30 frontal setae; mouthparts: labrum 0.10-0.11 mm long, 0.06 mm wide (n = 2), hypopharynx 0.16-0.18 mm long, 0.06 mm wide (n = 2), labellum 0.09-0.10 mm long, 0.04 mm wide at midlength (n = 2), palpus 0.27-0.29 mm long (n = 2): 1st segment globose, 2nd segment cylindrical, 3rd segment claviform. **Thorax:** apical projection of first tarsomere with 0.04 mm long (N = 4) (Fig. 3C); tarsal claws more robust than in male (Fig. 3D); wing length: 4.00-4.10 mm (N = 3) (Fig. 3E). **Abdomen** (Fig. 3F): 1st-8th tergites sclerotized, 1st-7th tergites rectangular with a posterior row of setae, few lateral setae, basal pair of trichoid sensillae and mostly covered elsewhere with scales, 8th tergite with distal margin with lobes 0.16-0.17 mm long (N = 3), 2nd-6th sternites as in male; 7th sternite 0.57-0.67 mm long, 1.75-1.9 X length sternite 6 (N = 2), setose (except basally), setae more abundant distally, and mostly covered elsewhere with scales; sternite 8 not sclerotized; ovipositor: needle part 1.25-1.35 mm long, 2.0-2.2 X length sternite 7 (n = 2). Other characters as in male.

Pupa (Fig. 4A): Color: brownish. Body length: 3.95-4.70 mm (N = 2). **Head** (Fig. 4B): dorsal plate 0.65 mm long, 0.15 mm wide (n = 1); face with lateral projection; antennal horn triangular, 0.37-0.38 mm long (N = 3), apical part 1.5 X length of basal part, inner

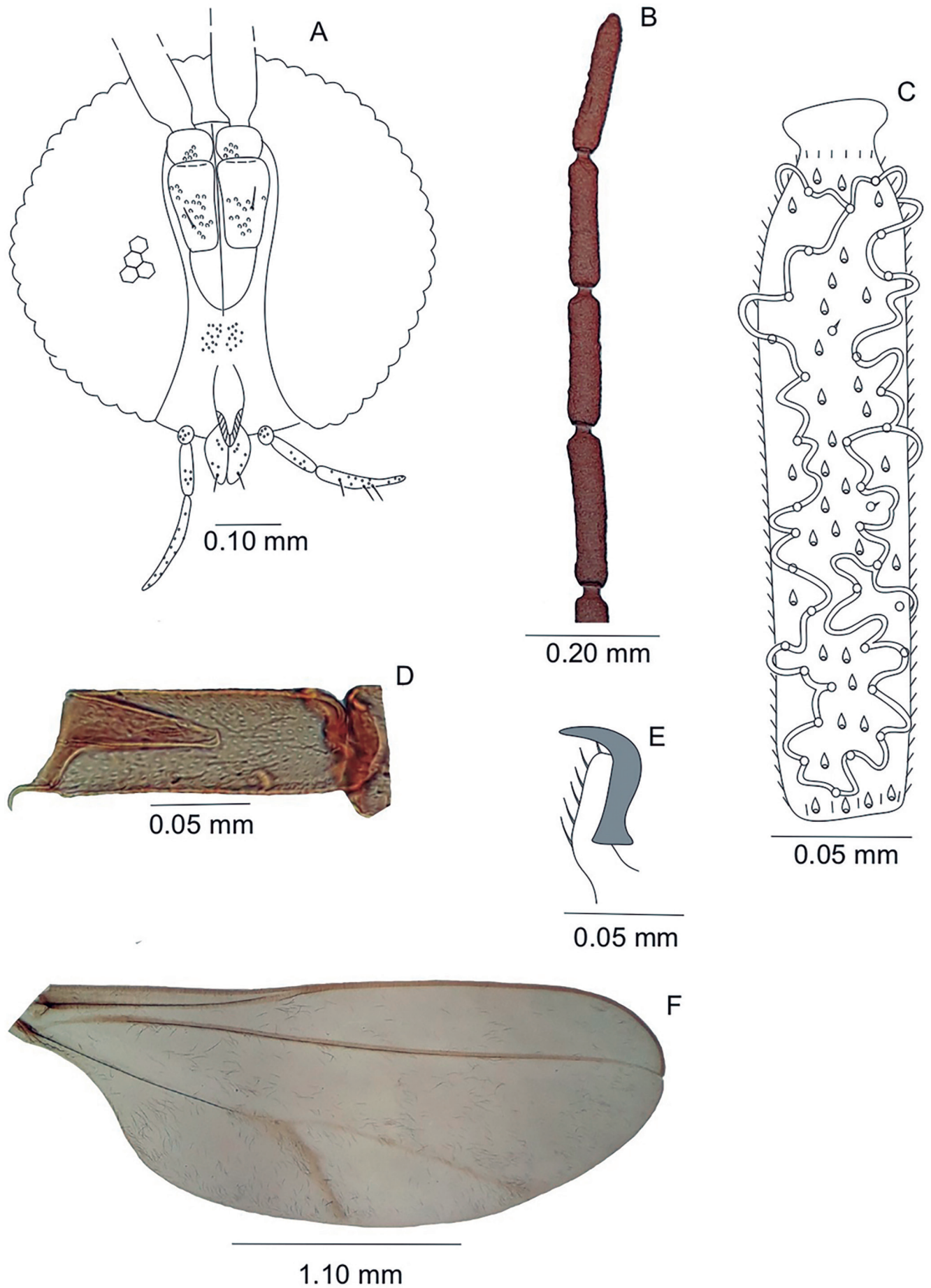


Figure 1. *Asphondylia gaucha*, **sp. nov.**, male: (A) Head, frontal view, (B) 9th-12th flagellomeres, (C) 5th flagellomere, (D) Hindleg, 1st tarsomere, lateral view, (E) Foreleg, tarsal claw and empodium, lateral view, (F) Wing.

margin serrated; apical seta 0.06 mm long, 0.66 X wide of antennal flagellomere (N = 1); upper facial horn simple, triangular, 0.07 mm long (N = 3), as long as width of basal flagellomere; lower facial horn tridentate, 0.03 mm long (N = 3), 0.1 X length of antennal horn, teeth triangular, not aligned, lateral teeth conspicuously above mesal tooth; two pairs of lower facial papillae: one pair setose, the other bare; three pairs of lateral facial papillae: one pair setose, two bare; upper cephalic margin thickened laterally. **Thorax:** integument wrinkly (Fig. 4C), prothoracic spiracle short, 0.08 mm long, setiform, curved (N = 3). **Abdomen** (Fig. 4D): segments 2-8 with transverse rows of crescent dorsal spines; posterior row with 16-25 spines in the 2nd segment, 21-26 in the 3rd, 21-26 in the 4th, 21-25 in the 5th, 20-25 in the 6th, 14-19 in the 7th and 8-9 in the 8th (N = 4).

Larva: Unknown.

Gall (Fig. 4E): Complex, on stem, spherical, brown, and one-chambered on *Vernonanthura discolor*.

Material examined: Holotype male, BRAZIL, Rio Grande do Sul, São Francisco de Paula, Floresta Nacional de São Francisco de Paula, XI.2007, M. Mendonça col. (MNRJ-ENT1-69141). Paratypes: same data as holotype, 9 males (MNRJ-ENT1-69137, MNRJ-ENT1-69138, MNRJ-ENT1-69143, MNRJ-ENT1-69140, MNRJ-ENT1-69142, MNRJ-ENT1-69143, MNRJ-ENT1-69144, MNRJ-ENT1-69145, MNRJ-ENT1-69146), 4 females (MNRJ-ENT1-69133, MNRJ-ENT1-69134, MNRJ-ENT1-69135, MNRJ-ENT1-69136), and 4 pupal exuviae (MNRJ-ENT1-69129, MNRJ-ENT1-69130, MNRJ-ENT1-69131, MNRJ-ENT1-69132).

Etymology: The name "*gaucha*" means native of Rio Grande do Sul.

***Asphondylia mineira* Maia, sp. nov.**
(Figs. 5-8)

Diagnosis: Male hypoproct deeply bilobed; ovipositor with needle part 1.7-1.9 X length 7th sternite; pupa:

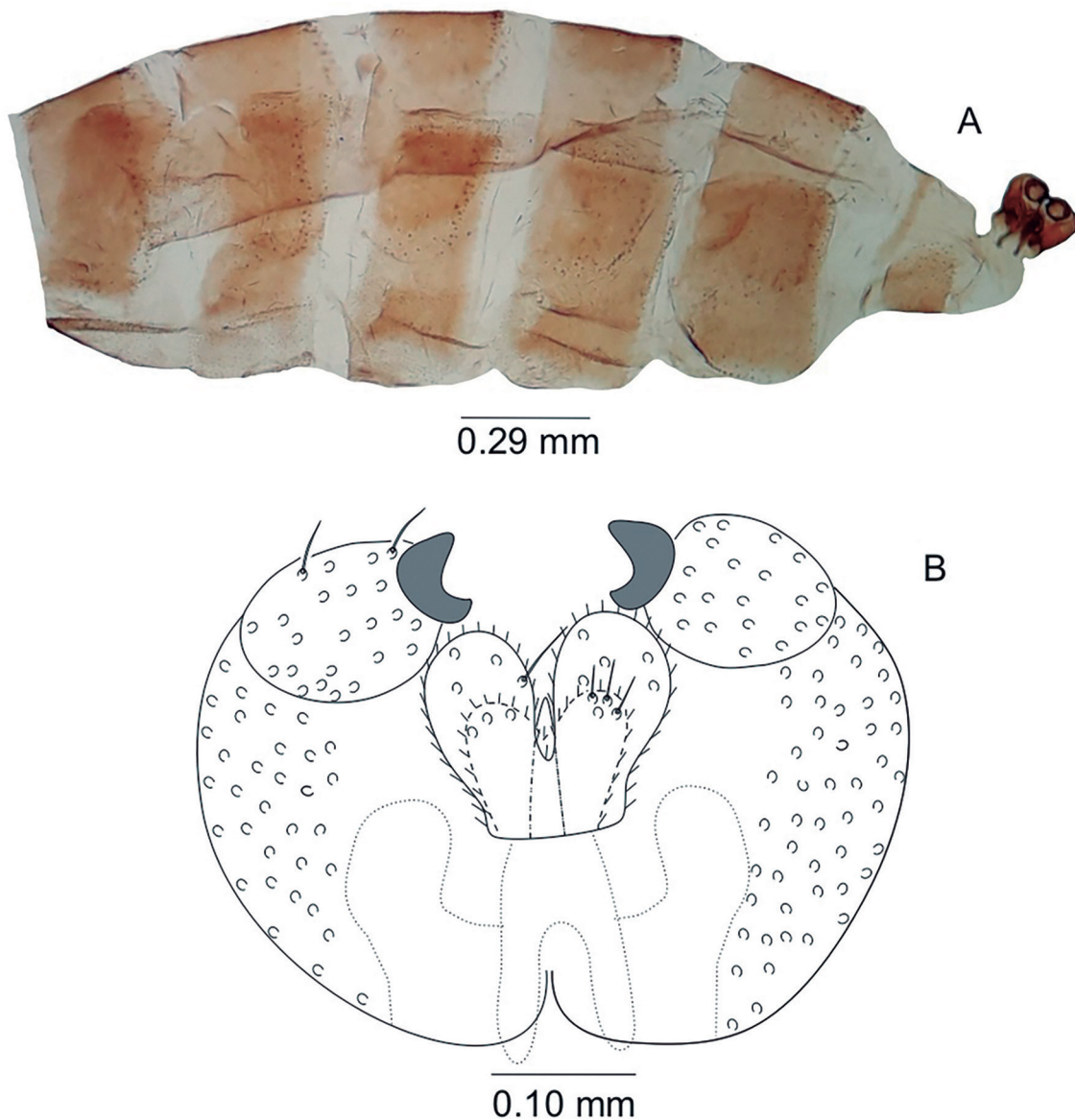


Figure 2. *Asphondylia gaucha*, sp. nov., male: (A) 3rd abdominal segments to terminalia, lateral view, (B) Terminalia, dorsal view.

antennal horn with apical part 1.3 X length of basal part, upper frontal horn simple, 0.08 X length of antennal horn, lower frontal horn tridentate, 0.02 X length of antennal horn, teeth not aligned, lateral teeth conspicuously above mesal tooth, 8th abdominal segment with 8-9 dorsal spines in the posterior row.

Male: Body: 3.90 mm long (N = 1). **Head** (Fig. 5A): 0.55 mm long, 0.55 mm wide (N = 1), eye facets hexagonal, closely appressed; antennae: flagellomeres 1 and 2 not fused, scape truncated conical, setose, 0.14 mm long, 0.08 mm wide (N = 1), pedicel globose, setose, 0.08 mm long, 0.07 mm wide (N = 1), 1st-3rd flagellomeres

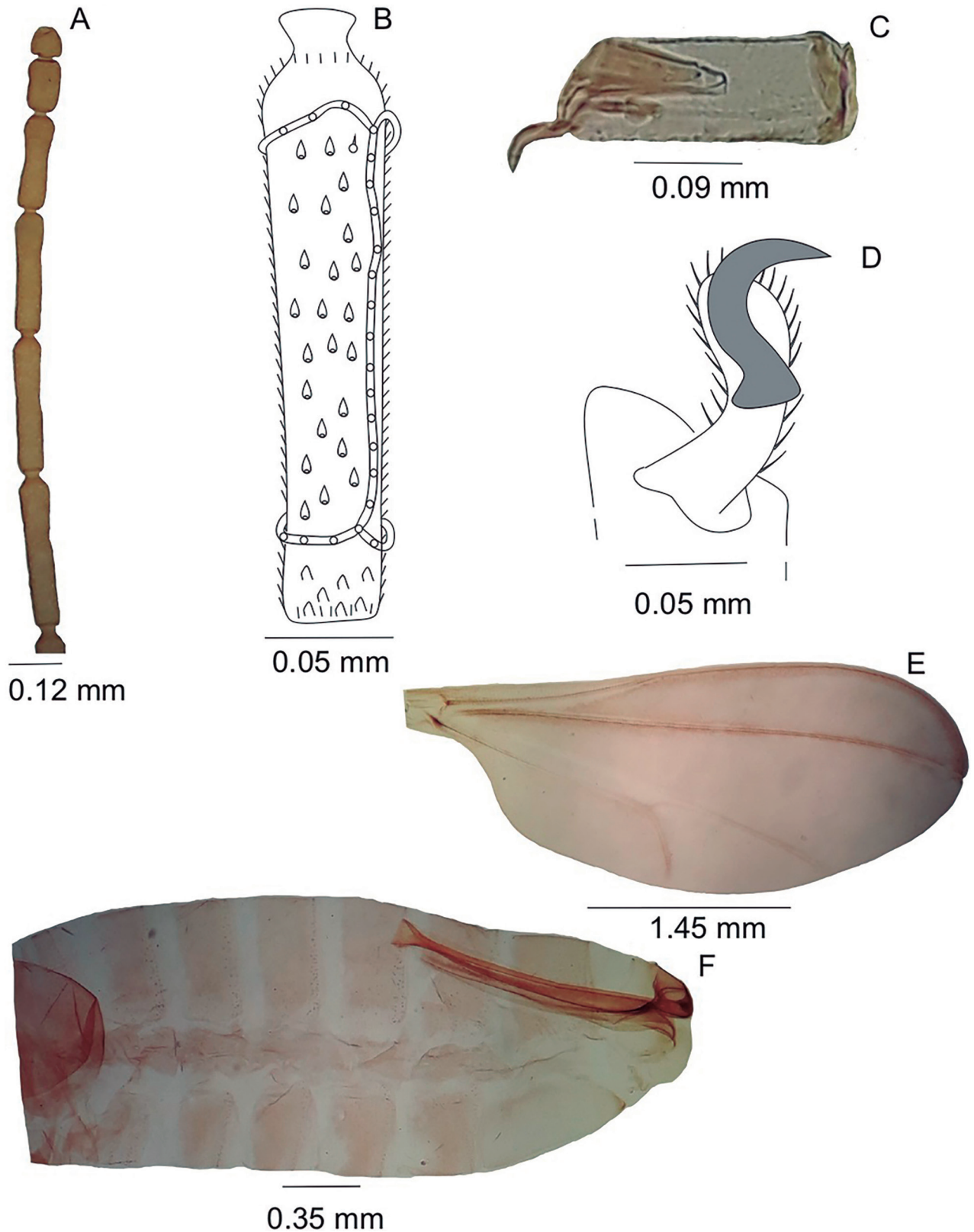


Figure 3. *Asphondylia gaucha*, **sp. nov.**, female: (A) 7th-12th flagellomeres, (B) 5th flagellomere, (C) Hindleg, 1st tarsomere, lateral view, (D) Midleg, tarsal claw and empodium, lateral view, (E) Wing, (F) Abdomen, lateral view.

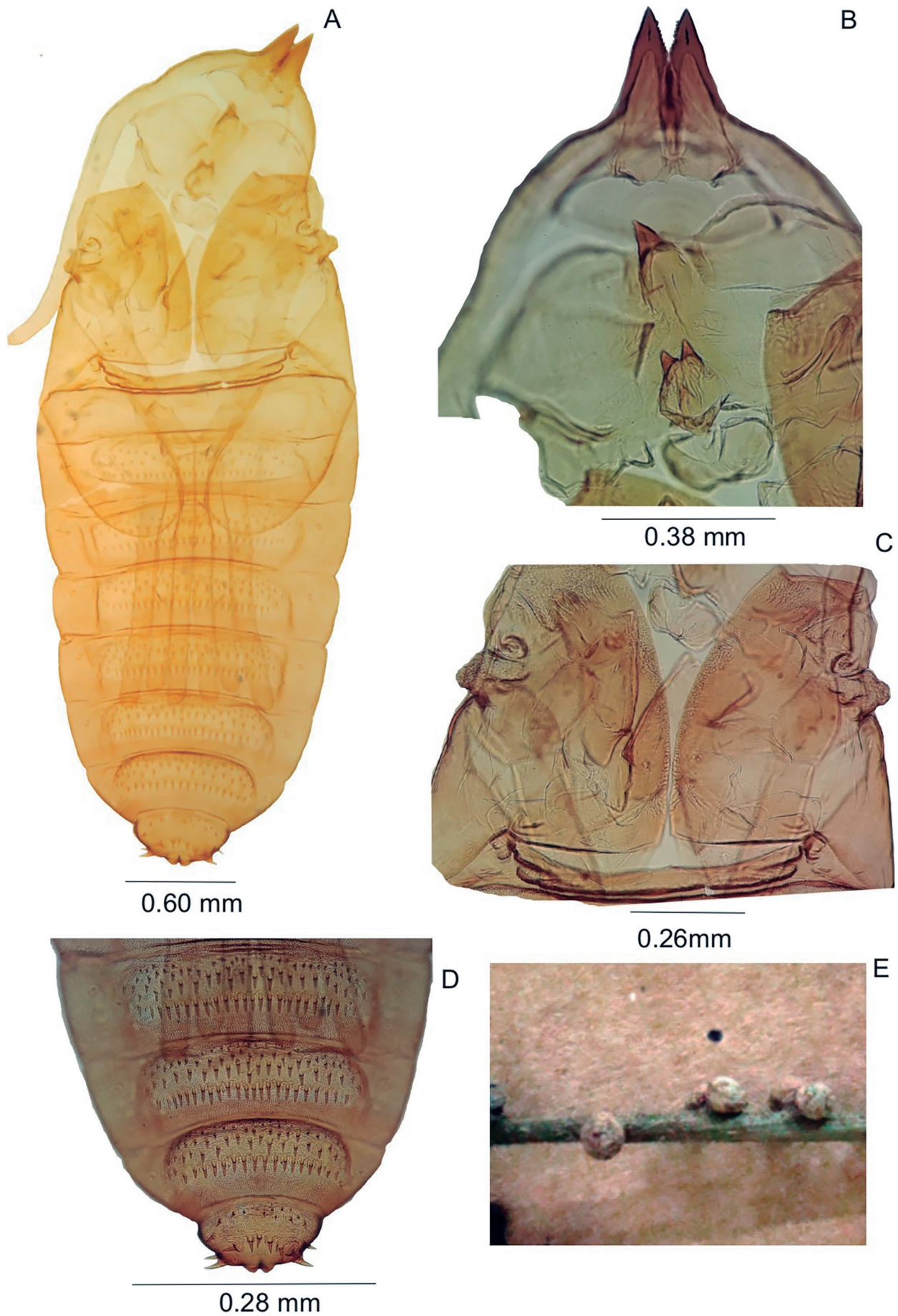


Figure 4. *Asphondylia gaucha*, **sp. nov.**, pupa: (A) General aspect, (B) Head, ventral view, (C) Thorax, dorsal view, (D) 5th-8th abdominal segments, dorsal view, (E) Gall, general aspect.

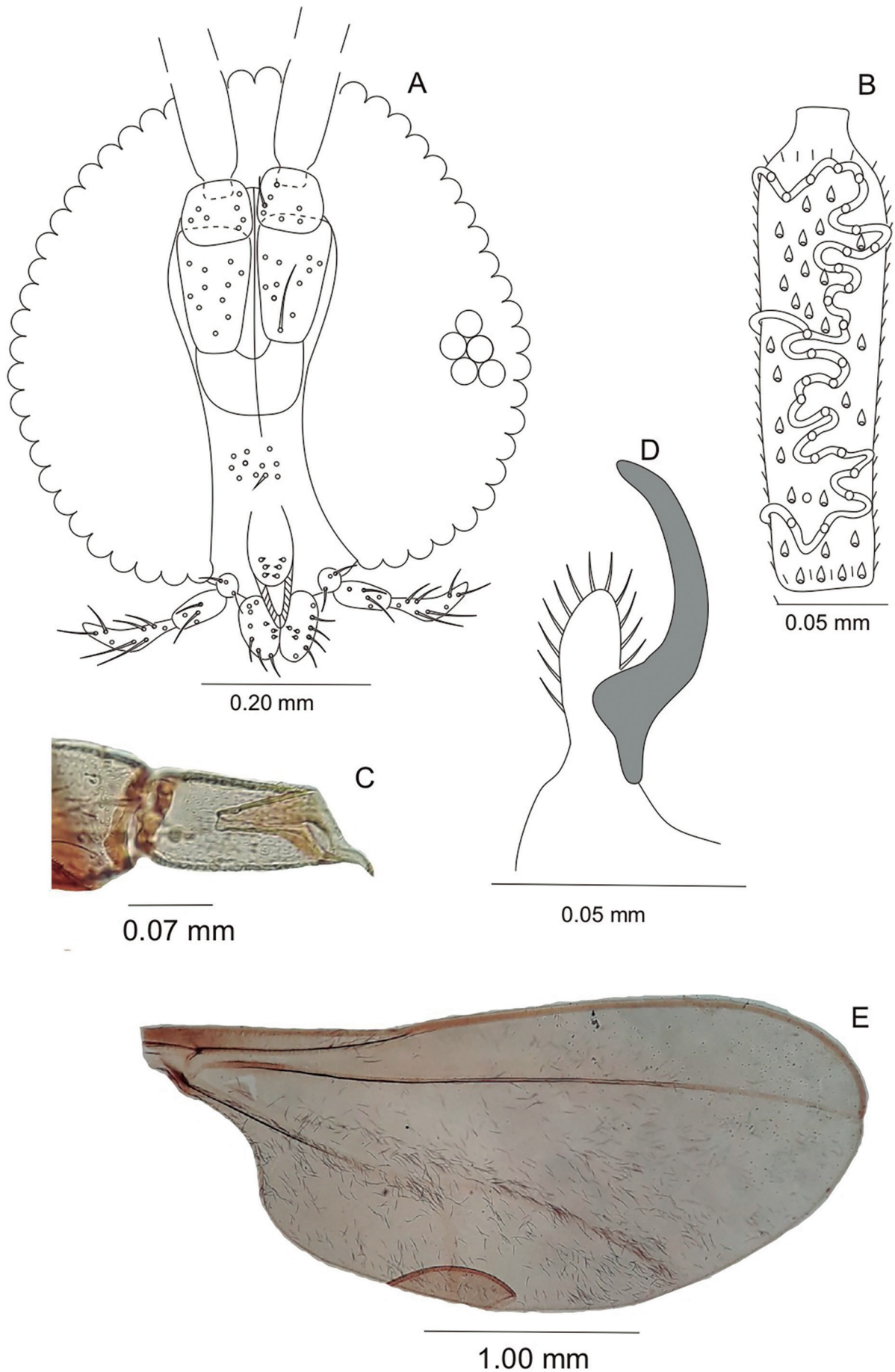


Figure 5. *Asphondylia mineira*, **sp. nov.**, male: (A) Head, frontal view, (B) 3rd flagellomere, (C) Midleg, 1st tarsomere, lateral view, (D) Hindleg, tarsal claw and empodium, lateral view, (E) Wing.

cylindrical (other flagellomeres missing), 0.05 mm wide, circumfila longitudinally wavy (Fig. 5B), proportion flagellomere neck-node: 1:10.5; frons with 10 setae (N = 1); mouth parts: labrum long-attenuate, 0.08 mm long, 0.05 mm wide; hypopharynx of the same shape of labrum, with long lateral setulae anteriorly directed, 0.13 mm long, 0.05 mm wide; labella elongate and convex, 0.07 mm long, 0.04 mm wide (N = 1), with lateral and mesal setae; palpus about 0.22 mm long (N = 1), all segments with setae. **Thorax:** scutum with two dorso-central rows of setae, setae more abundant anteriorly and posteriorly, one lateral row of setae on each side of scutum, extending from base to distal margin, scales intermixed; scutellum with scattered setae; anepimeron setose, anepisternum setose; remaining pleural sclerites bare; legs: first tarsomere of each leg with an apical hook-like projection 0.045 mm long (N = 2) (Fig. 5C), legs: tarsal claws curved beyond midlength, isomorphic, empodium shorter than claws (Fig. 5D); wing: length 2.45 mm (N = 1) (Fig. 5E). **Abdomen** (Fig. 6A): trichoid sensilla not visible; 1st-7th tergites sclerotized, rectangular with a posterior row of setae, few lateral setae and mostly covered elsewhere with scales, 8th tergite narrow, mesally constricted bare; 2nd-8th sternites more sclerotized than tergites; 2nd-7th sternites rectangular with a posterior row of setae, several setae at midlength, few lateral setae, mostly covered elsewhere with scales, 8th sternite rectangular, entirely covered with setae, more abundant posteriorly, and mostly covered elsewhere with scales. Terminalia (Fig. 6B): gonocoxite short and stout, 0.18 mm long, 0.11 mm wide (N = 1), gonostylus spherical 0.7 mm long, 0.075 mm wide (N = 1), teeth 0.02 mm long, 0.04 mm wide (N = 1), hypoproct weakly bilobed, rounded apically.

Female: Body length: 3.80-5.50 mm (N = 6). **Head** (Fig. 7A): 0.55-0.65 mm long, 0.60-0.70 mm wide (N = 4), antennae: scape 0.15-0.18 mm long, 0.07-0.09 mm wide (N = 4), pedicel 0.07-0.08 mm long, 0.08-0.09 mm wide (N = 5), 1st-11th flagellomeres cylindrical, circumfila comprising two longitudinal bands connected sub basally and apically by two transverse bands (Fig. 7B); 15-32 frontal setae; mouthparts: labrum 0.11-0.13 mm long, 0.05-0.06 mm wide (N = 4), hypopharynx 0.18-0.20 mm long, 0.05-0.06 mm wide (N = 4), labellum 0.08-0.09 mm long, 0.05-0.06 mm long (N = 4), palpus 0.18-0.28 mm long (N = 4); 1st segment globose, 2nd and 3rd segments cylindrical. **Thorax:** anepimeron setose. Legs: tarsal claws curved beyond midlength, anisomorphic, less robust on foreleg than on mid and hindlegs, apical hook-like projection of first tarsomere with 0.05-0.08 mm long (N = 4) (Fig. 7C), empodium shorter than claws (Fig. 7D); wing: length 3.75-4.00 mm (N = 5) (Fig. 7E). **Abdomen** (Fig. 7F): 1st-7th tergites, rectangular with a posterior row of setae, few lateral and mesal setae, mostly covered elsewhere with scales, basal pair of trichoid sensillae, 8th tergite with posterior margin with lobes 0.17-0.21 mm long (N = 4), 2nd-6th sternites rectangular with a posterior row of setae, few lateral setae, group of mesal setae, mostly covered elsewhere with scales, basal pair of trichoid sensillae, 7th

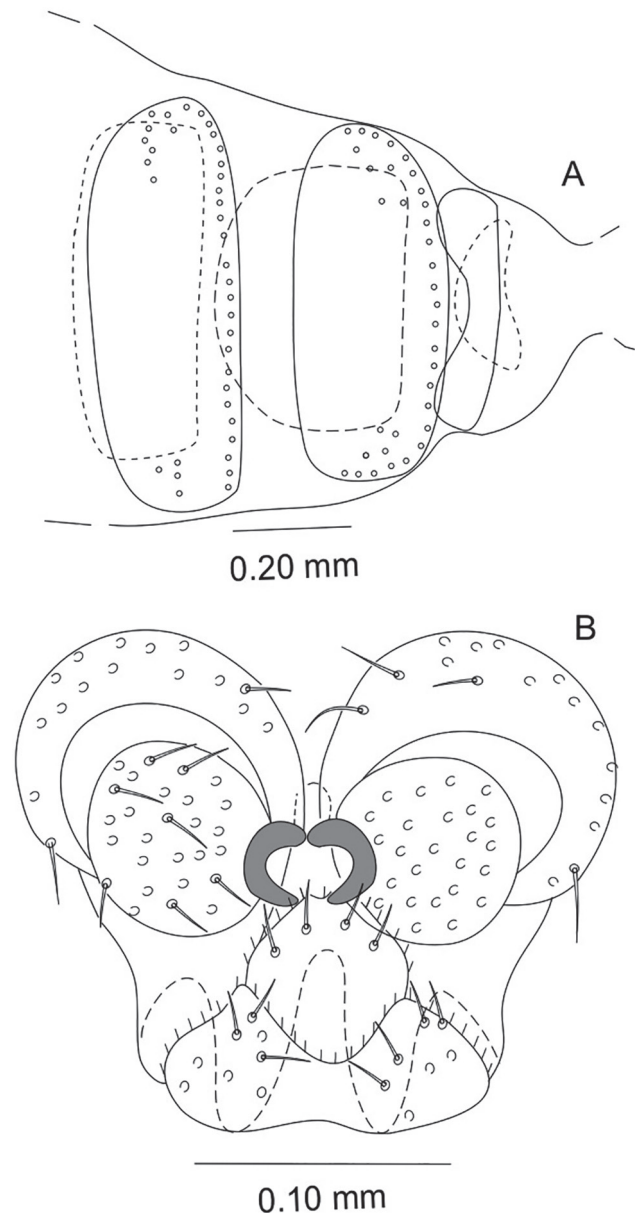


Figure 6. *Asphondylia mineira*, sp. nov., male: (A) 7th and 8th abdominal segments, dorsal view, (B) Terminalia, dorsal view.

sternite 0.68-0.85 mm long (N = 6), 2.1-2.5 X length sternite 6 (N = 6), with posterior margin more sclerotized mesally, rectangular with distal and mesal group of setae, lateral setae, mostly covered elsewhere with scales, basal pair of trichoid sensillae; sternite 8 not sclerotized; ovipositor: needle part 1.31-1.45 mm long (N = 6), 1.7-1.9 X length sternite 7 (n = 6). Other characters as in male.

Pupa (Fig. 8A): Color: brownish. Body length: 4.50-4.90 mm (N = 2). **Head** (Fig. 8B): dorsal plate 0.06 mm long, 0.09 mm wide (n = 1); face with lateral projection; antennal horn triangular, 0.38 mm long (N = 2), apical part 1.37 X length of basal part, inner margin serrated; apical seta 0.05 mm long (N = 2), 0.5 X wide of antennal flagellomere; upper facial horn simple, 0.03 mm long (N = 2), triangular, as long a width of basal flagellomeres; lower facial horn tridentate, 0.01 mm long (N = 2), 0.2 X length of antennal horn, teeth triangular, not aligned, lateral teeth conspicuously above mesal tooth triangular;

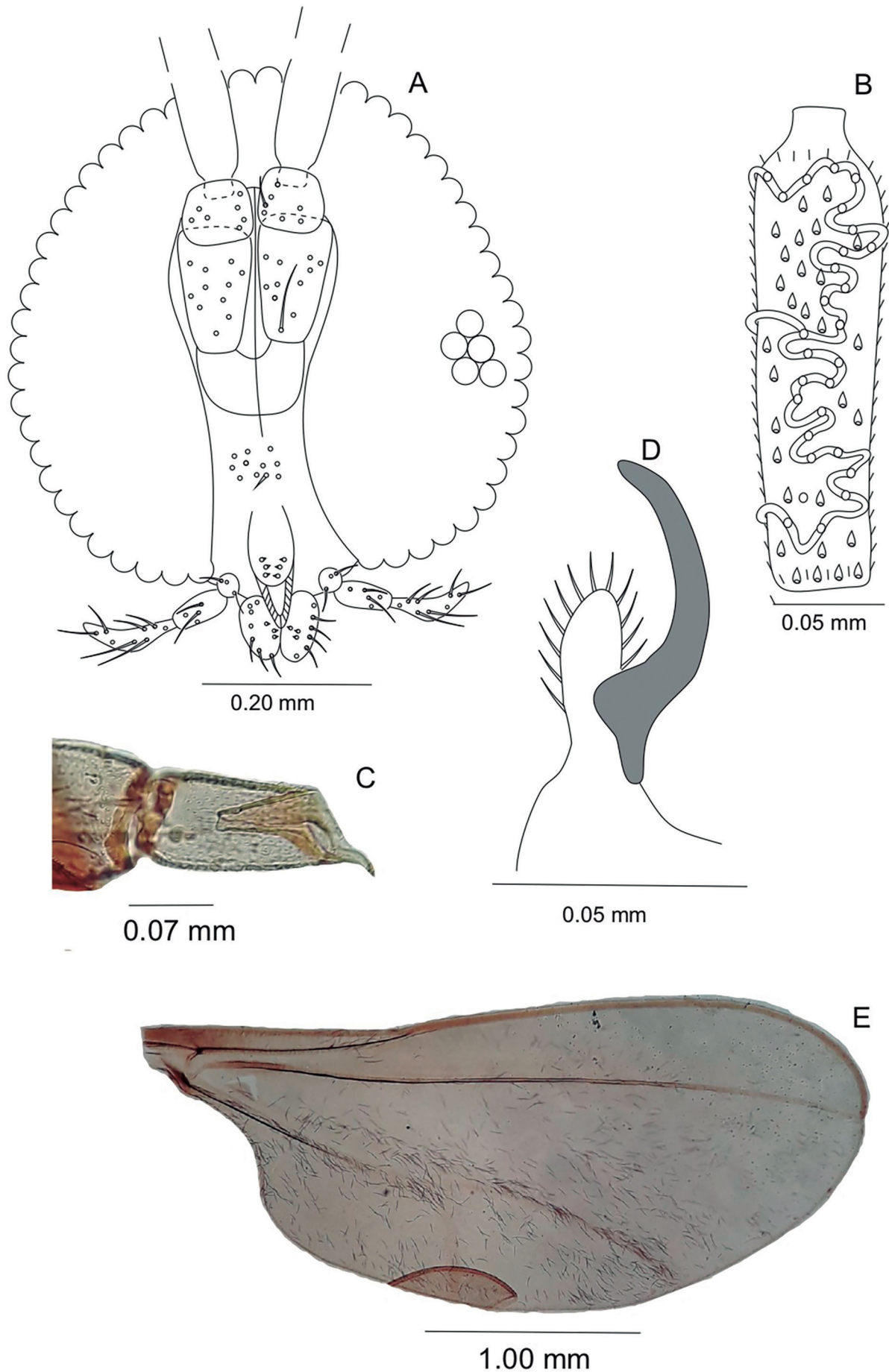


Figure 7. *Asphondylia mineira*, **sp. nov.**, female: (A) Head, frontal view, (B) 3rd flagellomere, (C) Foreleg, tarsomere, lateral view, (D) Midleg, tarsal claw and empodium, lateral view, (E) Wing, (F) abdomen, lateral view.

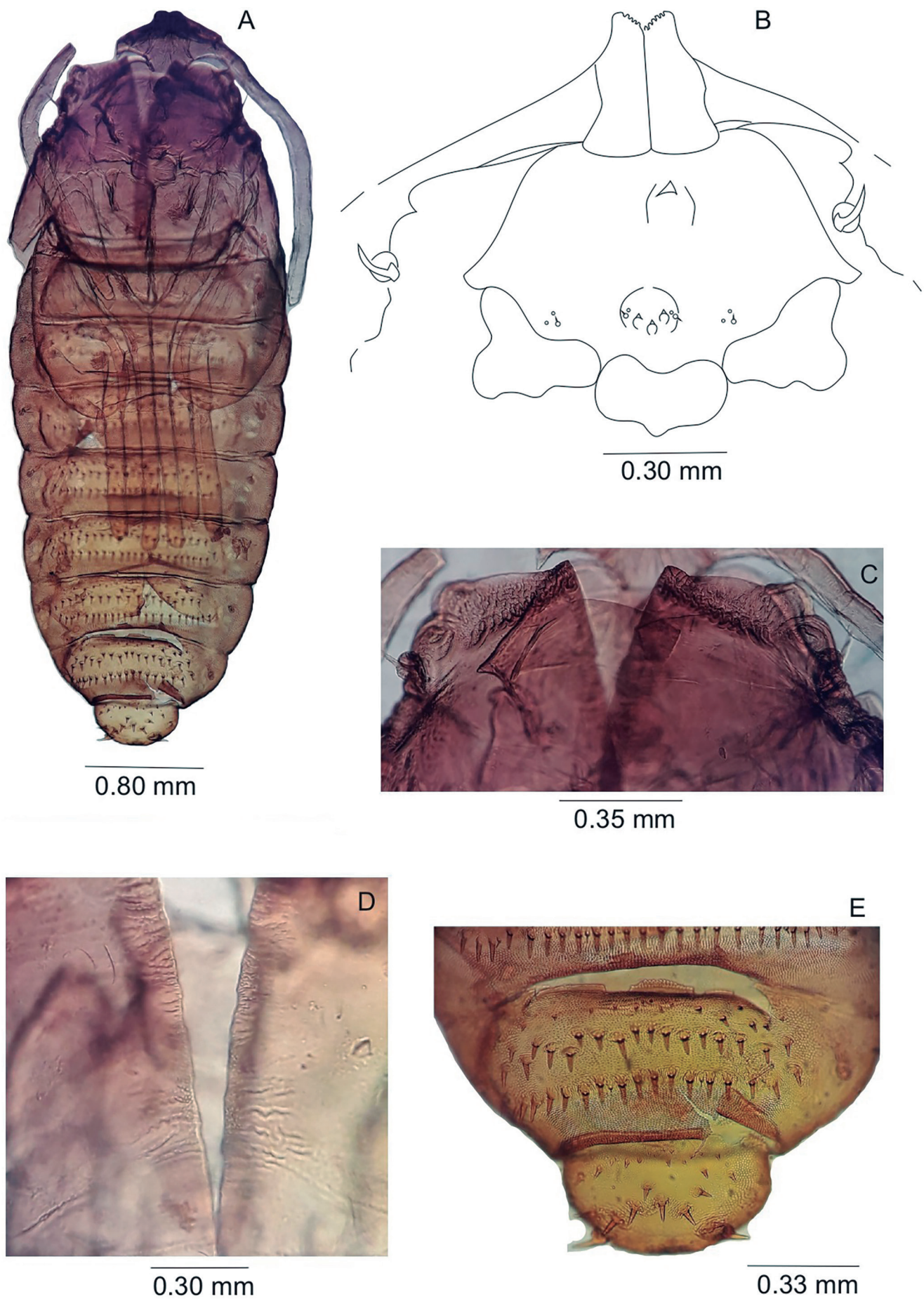


Figure 8. *Asphondylia mineira*, sp. nov., pupa: (A) General aspect, (B) Head, ventral view and prothoracic spiracle, c-d) Thorax integument, dorsal view, (C) basal margin, (D) central region, (E) 7th and 8th abdominal segments, dorsal view.

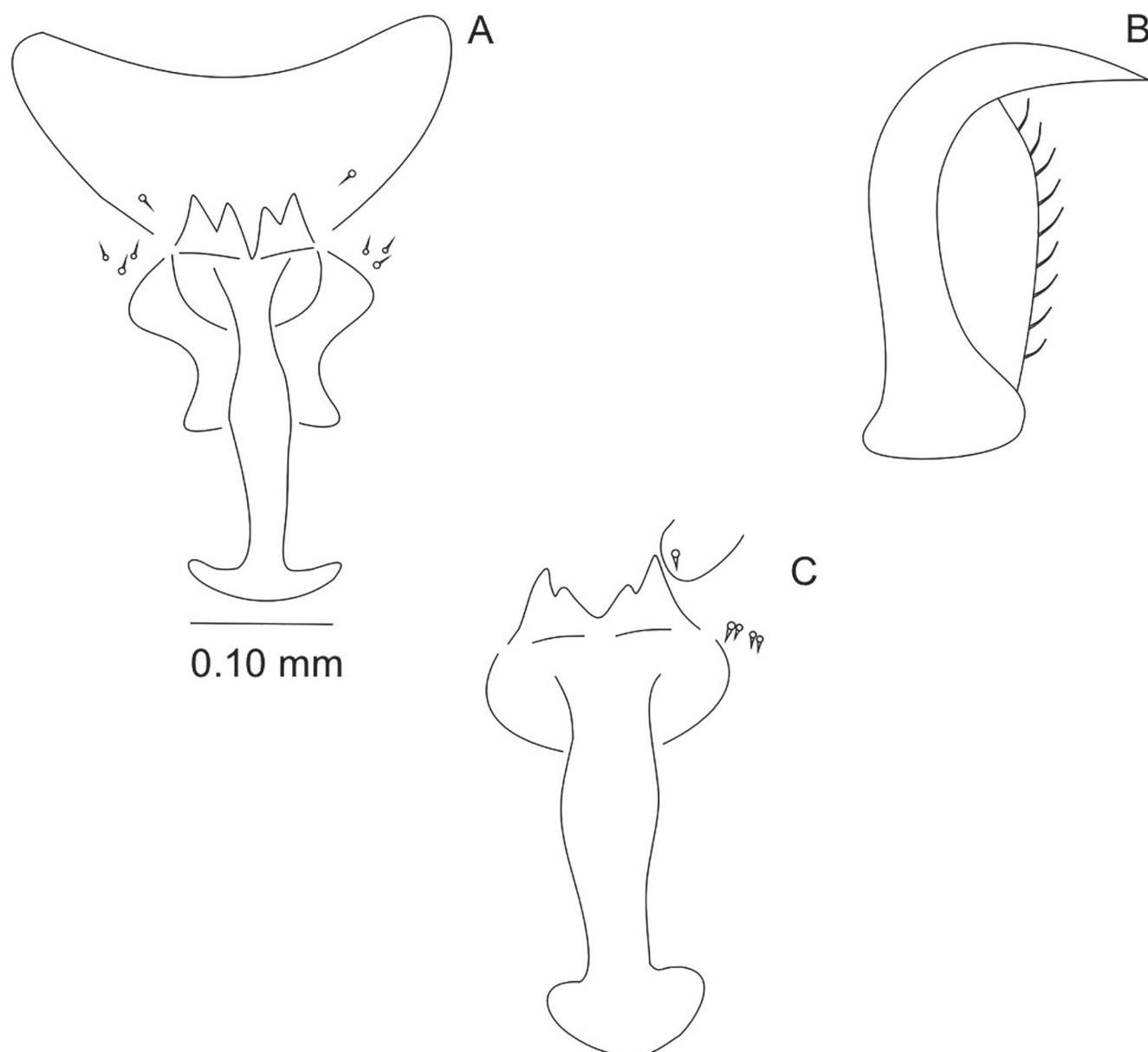


Figure 9. *Asphondylia* spp.: (A) *A. mineira*, **sp. nov.**, prothoracic spatula and associated papillae, ventral view, (B-C) *A. ajallai* Möhn, 1959 (redrawn from Möhn, 1959, original drawings without scale): (B) Hind leg, tarsal claw and empodium, lateral view, (C) prothoracic spatula and associated papillae, ventral view.

two pairs of lower facial papillae: one pair setose, the other bare; three pairs of lateral facial papillae: one pair setose, two bare; upper cephalic margin thickened laterally. **Thorax:** wrinkled integument (Figs. 8C-D); prothoracic spiracle 0.14-0.16 mm long, setiform, slightly curved (N = 4). **Abdomen:** segments 2-8 with transverse rows of crescent dorsal spines posterior row with 12-14 spines in the 2nd segment (N = 2), 18-21 in the 3rd (N = 3), 18-25 in the 4th (N = 4), 20-24 in the 5th (N = 4), 19-24 in the 6th (N = 4), 13-18 in the 7th (N = 4), and 8-9 in the 8th (N = 4) (Fig. 8E).

Larva (part of abdomen missing): Cephalic head 0.12 mm long, 0.12 mm wide. Prothoracic spatula (Fig. 9A) 0.29 mm long (N = 1), four-toothed, inner teeth shorter than outer, three setose lateral papillae on each side (Fig. 9A).

Gall: Fusiform, brown, glabrous on stems of *Vernonanthura polyanthes*.

Material examined: Holotype male, BRAZIL, Minas Gerais, Serra Negra do Funil, III.2021, B. Mascarenhas col., 1 male (MNRJ-ENT1-69147). Paratypes: same data as holotype, 6 females (MNRJ-ENT1-69149, MNRJ-ENT1-69150, MNRJ-ENT1-69151, MNRJ-ENT1-69152, MNRJ-ENT1-69153, MNRJ-ENT1-69154), 4 pupal exuviae (MNRJ-ENT1-69155), 1 larva (MNRJ-ENT1-69148).

Etymology: The name “*mineira*” means native of Minas Gerais.

Remarks: *Asphondylia gaucha* and *A. mineira* are the only two described species of *Asphondylia* associated with the genus *Vernonanthura* in Brazil. These species differ from each other mainly in the length of the female 1st and 2nd flagellomeres (longer in *A. mineira* than those of *A. gaucha*), the number of male frontal setae (26-32 in *A. gaucha* and 10 in *A. mineira*), shape of male hypoproct (deeply bilobed in *A. gaucha* and slightly bilobed in

A. mineira), ratio between 6th and 7th sternite length in females (1.75-1.90× in *A. gaucha* and 2.2-2.5× in *A. mineira*), shape of antennal horns in pupae (more pointed apically in *gaucha* than in *A. mineira*), length of prothoracic spiracle (about 2 times longer in *A. mineira* than in *A. gaucha*), and number of dorsal spines in the posterior row of 2nd abdominal segment (more numerous in *A. gaucha* than in *A. mineira*).

Möhn, 1959 described *Asphondylia ajallai* from El Salvador. This species induces bud galls on *Lepidaploa canescens* (Kunth) H. Rob. (recorded as *Vernonia canescens* Kunth.), *Vernonanthura patens* (Kunth) H. Rob. (recorded as *Vernonia patens* Kunth.) and *Vernonia* sp. (Asteraceae). It is known from the female and larva. Only females of *Asphondylia gaucha* and *A. ajallai* can be compared to each other. They differ from it mainly in the length of empodium (longer in *A. gaucha* than in *A. ajallai*) and shape of tarsal claws (more curve in *A. gaucha* than in *A. ajallai*) (Fig. 9B). Larvae and females of *Asphondylia mineira* can be compared with those of *A. ajallai*. The spatula of *A. mineira* has longer mesal teeth and wider anchor base than in *A. ajallai* (Fig. 9C). Furthermore, *A. mineira* has three lateral papillae on each side of the spatula, while *A. ajallai* has four (Fig. 9C). Females of both species have empodia subequal in length. Nevertheless, the tarsal claws of *A. mineira* are more curve than those of *A. ajallai*.

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