

A new species of *Asphondylia* (Diptera: Cecidomyiidae) and a key to separate species of the genus associated with Asteraceae from Neotropical region

Maria Virginia Urso-Guimarães^{1,2,3}

¹ Universidade Federal de São Carlos (UFSCAR), Centro de Ciências Humanas e Biológicas (CCHB), Departamento de Biologia (DBio), Laboratório de Sistemática de Díptera. Sorocaba, SP, Brasil.

² Universidade de São Paulo (USP), Museu de Zoologia (MZUSP). São Paulo, SP, Brasil.

³ ORCID: 0000-0003-3657-9379. E-mail: mvirginiaurso@gmail.com

Abstract. A new species, *Asphondylia cipo* sp. nov. (Diptera: Cecidomyiidae) causing stem and petiole galls on *Lessingianthus warmingianus* (Baker) H. Rob. (Asteraceae) is described and illustrated from Serra do Cipó, Minas Gerais State, Brazil. A key is provided to separate species of this genus associated with host plants in the Asteraceae family from the Neotropical region.

Key-Words. Asphondyliini; Insect-plant association; Morphology; Taxonomy.

INTRODUCTION

Asphondylia Loew, 1850 belongs to the tribe Asphondyliini of the subfamily Cecidomyiinae (Diptera: Cecidomyiidae). The genus is cosmopolitan with 299 species described to date, of which about 100 species occur in the Neotropical region and 21 in Brazil (Gagné & Jaschhof, 2017; Flor & Maia, 2017). *Asphondylia* species have been recorded on 66 plant families in the world, being most frequently found on Asteraceae, Fabaceae, and Chenopodiaceae (Gagné & Jaschhof, 2017). So far, 19 species of *Asphondylia* have been associated with Asteraceae species in the Neotropical region, mostly shrubs and herbs.

A new species, *Asphondylia cipo* sp. nov., is described here. The specimens were reared from stem and petiole galls of *Lessingianthus warmingianus* (Baker) H. Rob. (Asteraceae) sampled from the Serra do Cipó, Minas Gerais State, Brazil. *Lessingianthus* H. Rob. is a Neotropical genus of the tribe Vernoniaeae, which includes species that had previously been placed in *Vernonia* Schreber (Antar & Loeuille, 2015). This genus has more than 135 species distributed in South America, of which 115 occur in Brazil, with 85 being endemic (Dematteis & Almeida, 2015). *Lessingianthus warmingianus* is a perennial subshrub, native to Brazil and endemic to the Cerrado and rupestrian fields in Goiás and Minas Gerais (Dematteis & Almeida, 2015). Previously thirteen morphotypes of insect galls were described to *Lessingianthus* species, all in Cadeia do Espinhaço, MG. Twelve of the morphotypes were induced by

undescribed species of cecidomyiids in six species of *Lessingianthus* (*Lessingianthus coriaceus* (Less.) H. Rob., *Lessingianthus elegans* (Gardner) H. Rob., *Lessingianthus hoveaeifolius* (Gardner) H. Rob., *Lessingianthus linearifolius* (Less.) H. Rob., *Lessingianthus pchnostachius* (DC.) H. Rob., and *Lessingianthus tomentellus* (Mart.) H. Rob.); and one on stem of *Lessingianthus warmingianus* induced by an undescribed species of coleopterous (Carneiro *et al.*, 2009; Maia, 2012; Coelho *et al.*, 2013).

Previously no *Asphondylia* species have been described from *Lessingianthus* neither to Neotropics nor to other biogeographical region in the world. Here the new species is described, named *Asphondylia cipo* sp. nov. and compared to 19 congeners associated with Asteraceae in the Neotropical region. A key is provided to separate these species.

MATERIAL AND METHODS

Branches of *Lessingianthus warmingianus* (Baker) H. Rob. (Asteraceae) with galls of *Asphondylia cipo* sp. nov. were collected from rupestrian field vegetation on the Pedra do Elefante trail in Serra do Cipó, Municipality of Santana do Riacho, Minas Gerais State, Southeastern Brazil (S19°17.468"; W43°32.564", 1,237 m altitude) on 14.xi.2002. Galls were transferred to individual plastic bags for adult rearing. Some galls were dissected under a stereomicroscope to obtain immature specimens. All material was conserved

in 80% alcohol for slide mounting, following the method outlined in Gagné (1994), as well as the terminology of morphological characters. The type specimens of the new species were deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP).

Specimens of *Asphondylia anaceliae* Möhn, *Asphondylia serrata* Maia, *Asphondylia glomeratae* Gagné, *Asphondylia gochnatiae* Maia, and *Asphondylia cipo* sp. nov. were examined for comparison. The characters of other species were taken from original descriptions or revisions (Gagné, 1994; Gagné *et al.*, 2001; Kieffer & Herbst, 1905; Möhn, 1959, 1960, 1973; Rübсаamen, 1908; Wünsch, 1979).

RESULTS AND DISCUSSION

Taxonomy

Genus Asphondylia Loew 1850: 21, 37, as subg. of *Cecidomyia*.

Type species: *Asphondylia sarothamni* Loew (subs. des. Karsch, 1877: 15).

For the diagnosis of *Asphondylia* see Gagné (1994) and Flor & Maia (2017).

Asphondylia cipo sp. nov. (Figures 1-6)

Description: Adult: Thorax brown, abdomen orange. Body length, male 3.5-5.2 mm (n = 13), female 4.2-6.2 mm (n = 10). **Head (Fig. 1A):** Eyes black, holoptic, facets octagonal, closely adjacent, with long setae. Antenna typical of *Asphondylia* (2+12 cylindrical flagellomeres; male 2.2-3.1 mm; female 2.2-2.8 mm; scape elongated, male 0.17 mm, female 0.18 mm; and distally enlarged; pedicel round, male 0.06 mm, female 0.07 mm; sinuous circumfila in male (Fig. 1B), and simple in female (Fig. 1C); 9th-12th male flagellomere with length approximately equal (Fig. 1D); 9th-12th female flagellomeres progressively shorter (Fig. 1E). Frontoclypeus with about 20-24 setae (n = 16, males and females), labrum elongated with 2-3 pairs of ventral setae. Hypopharynx triangular with short lateral setulae, labella round-convex, each with 6-7 setae; palpus three-segmented, shape and setae as in figure 1F. **Thorax:** Dark brown, anteprenotal lobe bare, scutum with dorsocentral rows of setae and lateral setae present, anepisternum with 50-52 setae in male (n = 13) and 52-54 setae in female (n = 10); katepisternum bare; anepimeron with three rows with 56-58 setae in male (n = 13) and 60-62 setae in female (n = 10), mediotergite bare, laterotergite with eight trichoid sensilla near halter base. **Legs:** First tarsomere of each leg with an apicoventral

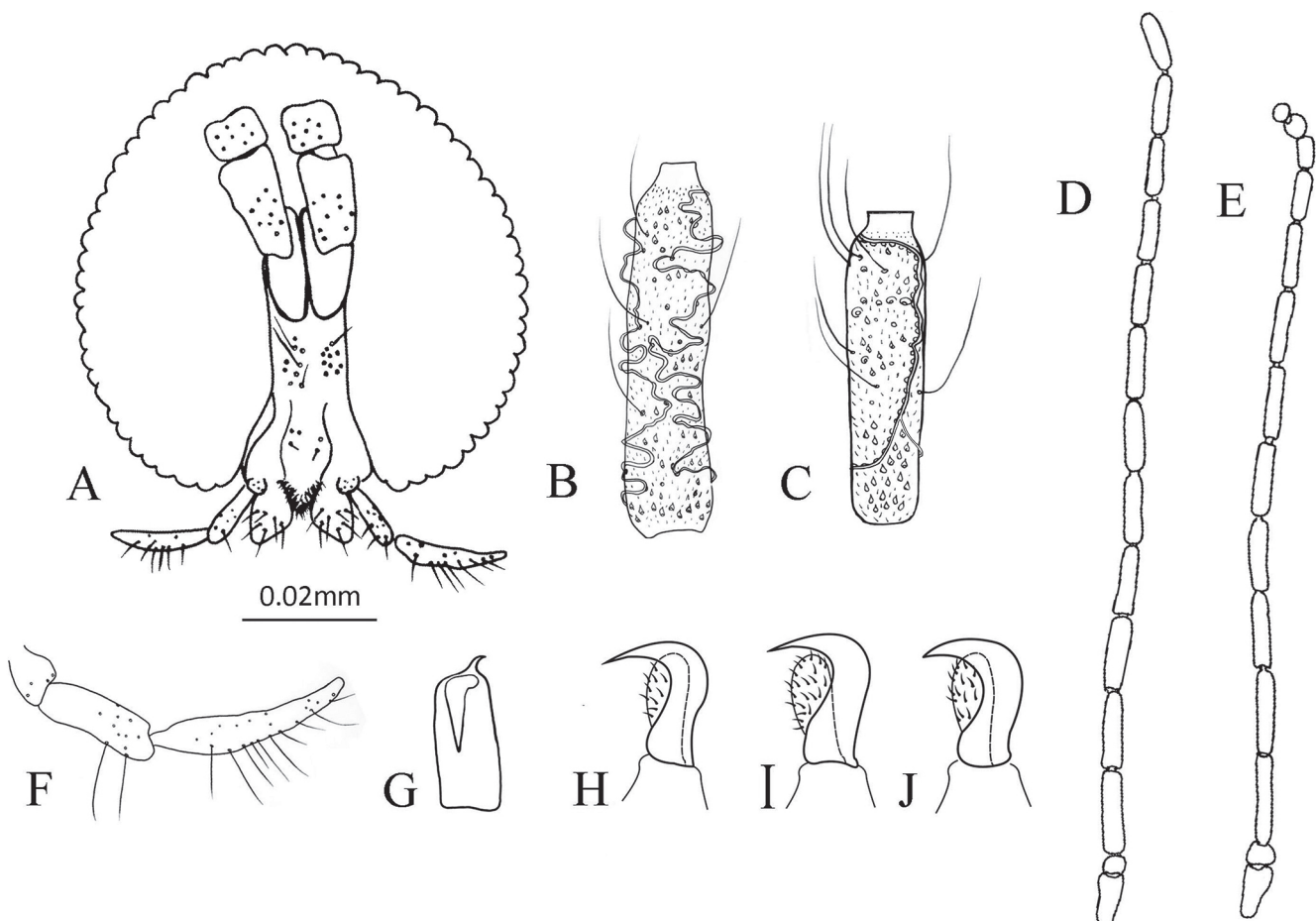


Figure 1. *Asphondylia cipo* sp. nov. (A) Head in frontal view; (B) Male 3rd flagellomere; (C) Female 3rd flagellomere; (D) Male 9th-12th flagellomeres; (E) Female 9th-12th flagellomeres; (F) Palpus; (G) First tarsomere with apicoventral spur; (H) Foretarsal claw and empodium; (I) Midtarsal claw and empodium; (J) Foretarsal claw and empodium.

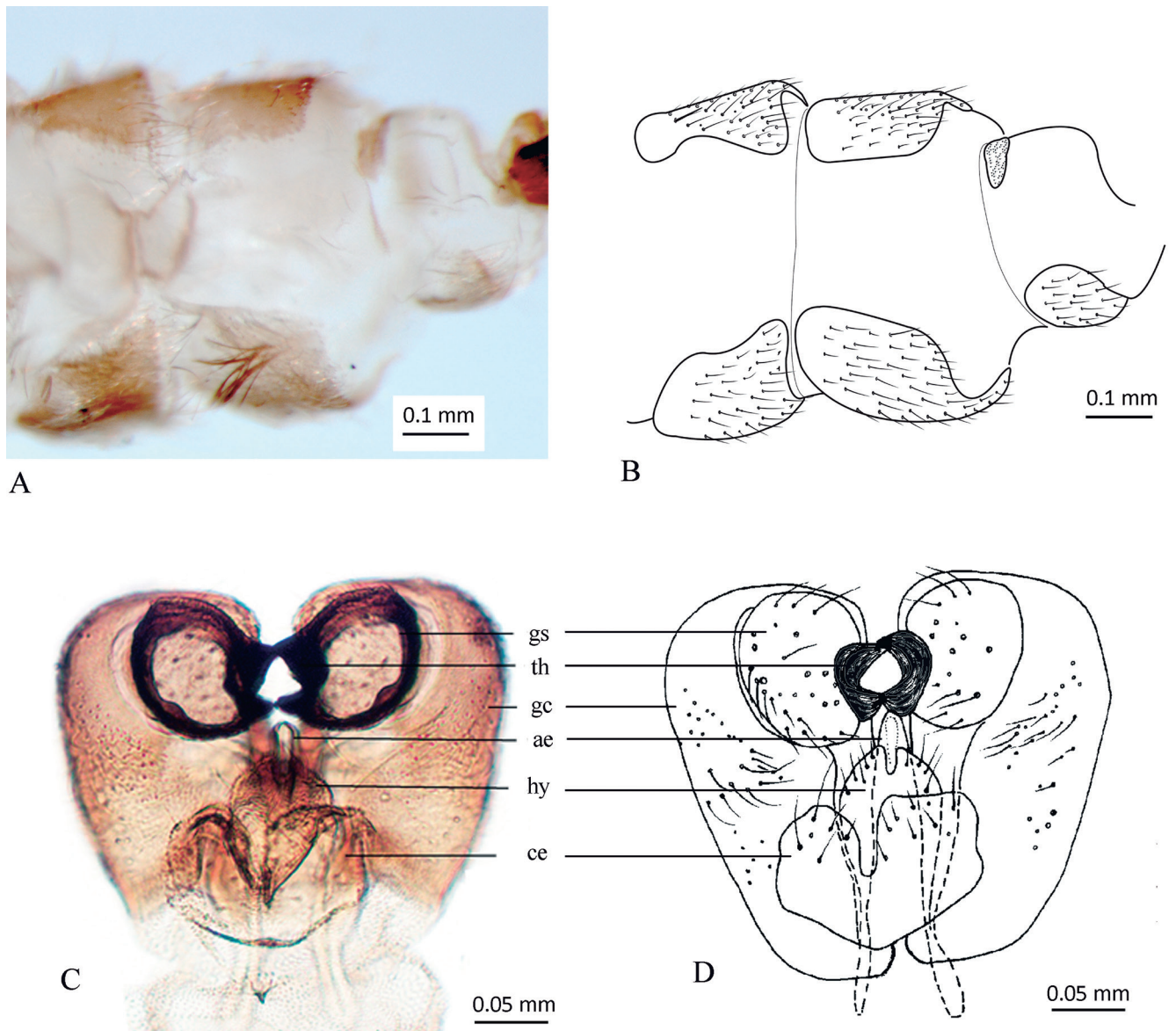


Figure 2. *Asphondylia cipo* sp. nov. (A, B) Male abdomen in lateral view; (C, D) Male terminalia in dorsal view. Abbreviations: ce = cercus, gc = gonocoxite, gs = gonostyle, hy = hypoproct, s7 = sternite 7, th = teeth of gonostyle.

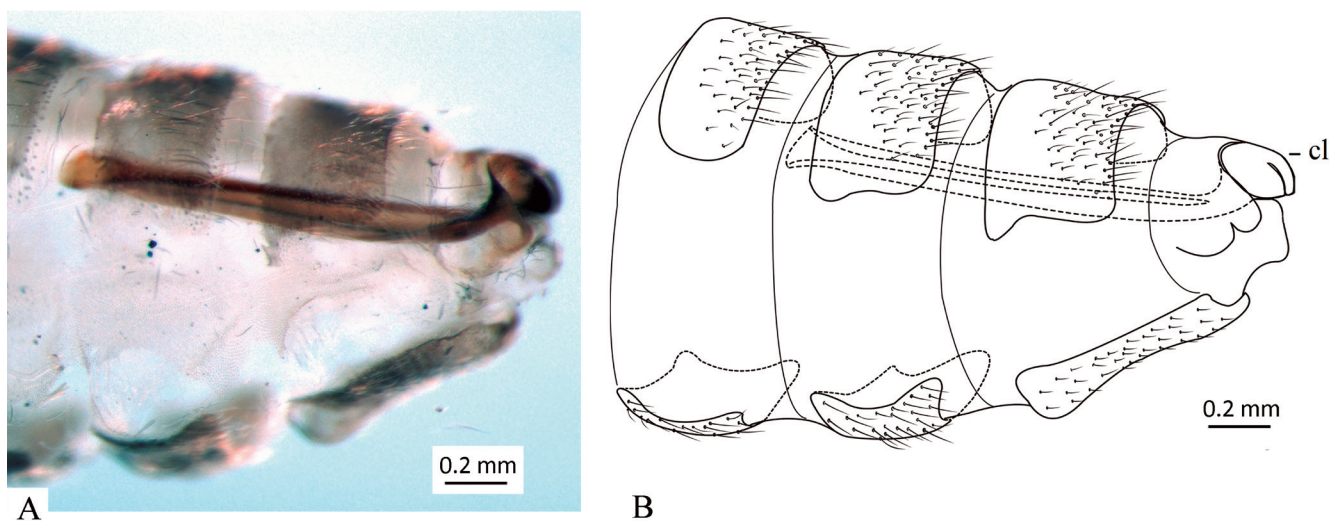


Figure 3. *Asphondylia cipo* sp. nov. (A, B) Abdominal segments 7 and 8 and ovipositor in ventro-lateral view. Abbreviation: cl = cercilike lobes.

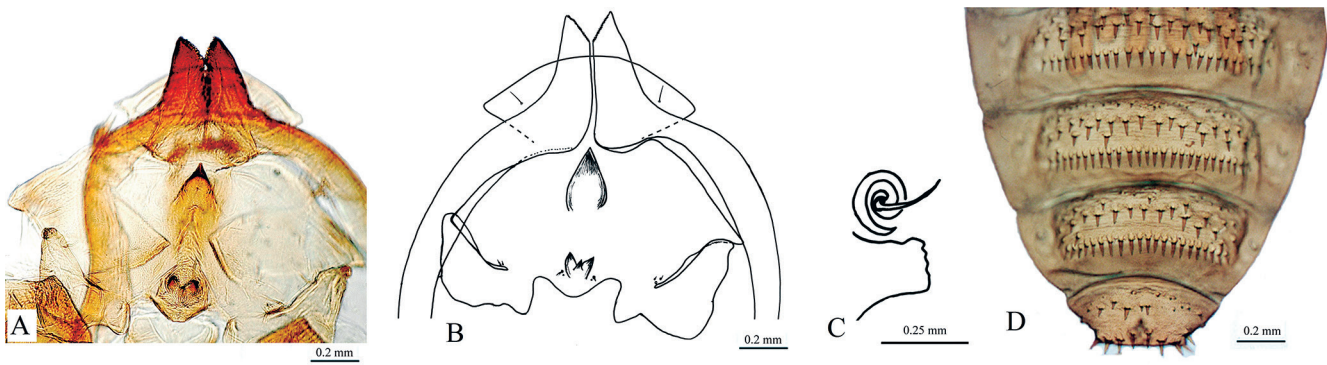


Figure 4. *Asphondylia cipo* sp. nov. (A, B) Pupa in ventral view; (C) Posterior region of pupa in dorsal view; (D) Prothoracic spiracle and the accessory structure.

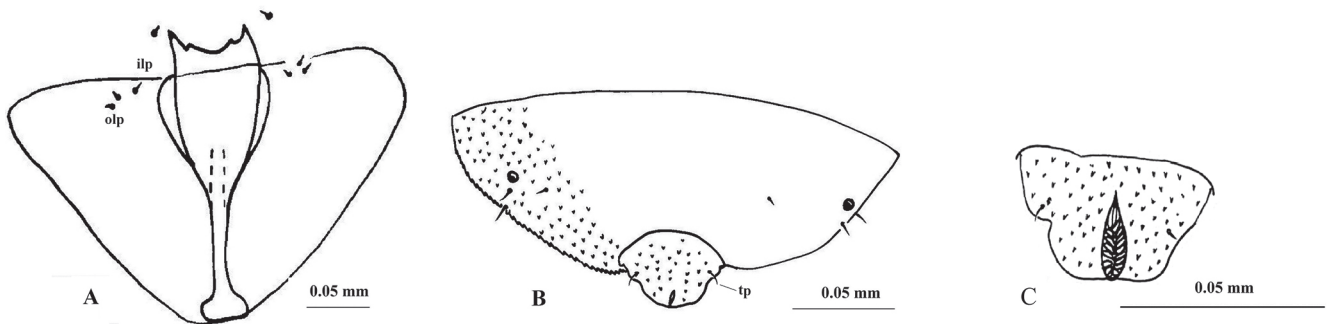


Figure 5. *Asphondylia cipo* sp. nov. (A) Larval spatula and lateral papillae in ventral view; (B) Larval eighth and terminal segment with terminal papillae, in dorsal view; (C) Larval terminal segment with elongated cells around anus, in terminal-dorsal view. Abbreviations: ilp = inner lateral papillae; olp = outer lateral papillae; tp = terminal papillae.



Figure 6. Stem and petiole galls induced by *Asphondylia cipo* sp. nov. in *Lessingianthus warmingianus* (Baker) H. Rob. (Asteraceae). Arrow indicates a petiole gall.

tral spur 0.03-0.04 mm long (Fig. 1G); tarsal claws all equal in size and shape, as long as empodia (Figs. 1H, 1I, 1J). Wing length (from arculus to apex): males: 3.5-4.4 mm ($n = 13$), females: 4.1-4.9 mm ($n = 10$), venation typical of *Asphondylia*.

Abdomen: Male: Tergites and sternites 1-7: rectangular and completely sclerotized; a row of strong setae along the posterior margin of tergites, setae scattered elsewhere, scales absent. Tergite 8 a narrow sclerotized band with a row of strong setae along the posterior margin. Sternite 8 ovoid, well sclerotized with several scattered setae concentrated caudally. Trichoid sensilla absent

in tergites and sternites (Figs. 2A, 2B). Male terminalia (Figs. 2C, 2D): Gonocoxite wide and setose, 0.2-0.23 mm length ($n = 13$) and 1.3-1.5 times as long as wide; gonostylus short ovoid, setose, 0.09 mm long ($n = 13$) and as long as wide, two-toothed; cercus round, fused at base, lobed at apex; hypoproct bilobed; aedeagus triangular, tapering gradually towards the apex and pointed apically, sclerotized.

Abdomen: Female (Figs. 3A, B): tergites 1-7 as in male. Sternites 2-6 as in male, sternite 7 ovoid, 0.7 mm long, with scattered setae; 1.5 of the length of sternite 6. Sternite 8 non-sclerotized. Trichoid sensilla absent in tergites and sternites. Ovipositor: protractible part 1.6 mm length, 2.3 times longer than sternite 7.

Pupa (Figs. 4A-D): Brown, abdominal integument rough, with microspines dorsally, and round sclerotized plates ventrally in abdomen surface. Body length, 4.3-6.4 mm, 1.8-2.0 mm maximum width ($n = 32$). Head (Figs. 4A, 4B). Antennal horns, 0.02 mm, well developed, triangular, inner margin finely serrate, outer margin smooth. Upper frontal horn simple, 0.11 mm length, lower frontal horn trilobed, 0.04 mm length each; presence of two pairs of lower facial papillae (one setose and the other bare), three pairs of lateral papillae (one setose and two bare); cephalic setae short, 0.07 mm length. **Thorax:** Prothoracic spiracle short, 0.12 mm length, setiform with an accessory structure in spiral format (Fig. 4C). Wing reaching third abdominal segment and legs reaching fifth abdominal segment. Abdominal tergites 2-8 with two rows of strong spines in caudal area and small spines

scattered in proximal area. Terminal segment with one row of hooked spines (Fig. 4D). Pupation in gall.

Larva 3rd instar: Light cream. Body, 3.1 mm length, 1.6 maximum width ($n = 1$). Integument sclerotized, cephalic setae, 0.01 mm length. **Thorax:** Area around prothoracic spatula pigmented, spatula 0.3 mm length, four teeth anteriorly, middle tooth smaller than lateral teeth, with narrow shaft; one pair of setose inner lateral papillae and two pairs of setose outer lateral papillae (Fig. 5A). Abdomen: Segments 1-8 covered by round plates with microspines dorsally and ventrally, spiracles short and sclerotized; terminal segment (Fig. 5B), 0.03 mm length, 0.07 maximum width, round with a pair of short setose papillae; anus dorsal in cleft, flanked by elongated cells (Fig. 5C).

Etymology: The specific name “*cipo*” is in apposition, referring to the type locality, Serra do Cipó.

Gall and biology (Fig. 6): Globoid stem and petiole swelling on *Lessingianthus warmingianus* (Baker) H. Rob. (Asteraceae). Galls are bare, monothalamous, unilocular even when closely approximated to one another. The interior of larval chamber is lined with a fungal mycelium, as described for *A. glomeratae* and *A. moehni* in Gagné *et al.* (2001). Pupation in gall. The adults emerged through an escape hole dug with the antennal horns of the pupa.

Holotype: Male: Brazil, Minas Gerais: Santana do Riacho, Pedra do Elefante trail in Serra do Cipó (S19°17.468”; W43°32.564”, 1,237 m altitude), collected 14.xi.2002; emerged 20.xi.2002, collected and reared by M.V. Urso-Guimarães from stem and petiole swellings on *Lessingianthus warmingianus* (Baker) H. Rob. (Asteraceae). Deposited in slides as mounted specimen at the MZSP.

Paratypes: 57 specimens, same data as holotype, except for: 1 male, 1 female, 1 pupal exuviae, 1 larva; in alcohol: same collect date of holotype, except for: 1 male, 2 females, 2 pupae, 4 exuviae emerged in 18.xi.2002; 1 male, 1 female, 10 pupae, 2 exuviae emerged in 19.xi.2002; 4 males, 4 females, 1 pupa, 8 exuviae, 2 larvae emerged in 21.xi.2002; 1 male, 1 exuvia emerged in 25.xi.2002;

1 male, 1 exuvia emerged in 26.xi.2002; and 3 males, 2 females, 2 exuviae emerged in 03.xii.2002 (deposited in MZSP).

Remarks: *Asphondylia cipo* sp. nov. can be easily differentiated from any other species of the genus by the following set of characters: the great body length; needle part of ovipositor 1.6 mm length, 2.3 times longer than sternite 7; upper frontal horn simple, lower frontal horn trilobed; prothoracic spiracle setiform with an accessory structure in spiral format; four-toothed prothoracic spatula of larva, the inner pair tiny and widely separated; one pair of discrete terminal papillae; galls on stem and petiole of *Lessingianthus warmingianus*.

Of the 16 species *Asphondylia* inducing galls on Asteraceae whose larvae are known, only *A. ajallai*, *A. serrata*, *A. ulei*, *A. zacatechichi*, and *A. cipo* sp. nov. have spatula with inner teeth much less than $\frac{1}{2}$ the size of the outer with the inner incision flat and wide (Fig. 7F), however, the distance between the inner teeth is much larger in *A. cipo* sp. nov. than in the other known species; from these, only *A. serrata* and *A. cipo* sp. nov. share one inner and two outer lateral papillae, *A. ajallai* and *A. ulei* have two inner and two outer lateral papillae, and *A. zacatechichi* has 3 inner and 2 outer lateral papillae. *Asphondylia cipo* sp. nov. differ of *A. serrata* by the shape of antennal horn, triangular in the former, rectangular in the later in pupa; and in females, the needle part of ovipositor is 2.3 times longer than sternite 7 in the former and 1.87 in the later. The morphological evidence discussed above indicates that this species is distinct from all other species of *Asphondylia* inducing galls on Asteraceae described previously.

Identification key to the species of *Asphondylia* associated with Asteraceae in the Neotropical region

The male and female characters of *Asphondylia* are near all similar among the species, that's why most of the characters used in the key are from pupa, larva, host plants, and galls. The adults of *A. ulei* Rübsaamen, *Asphondylia zacatechichi* Möhn, and *Asphondylia zexmeniae* Möhn; the pupa of *A. ajallai* Möhn, *A. corbulae* Möhn, *A. herculesi* Möhn; and the larvae of *A. tithoniae* Möhn are

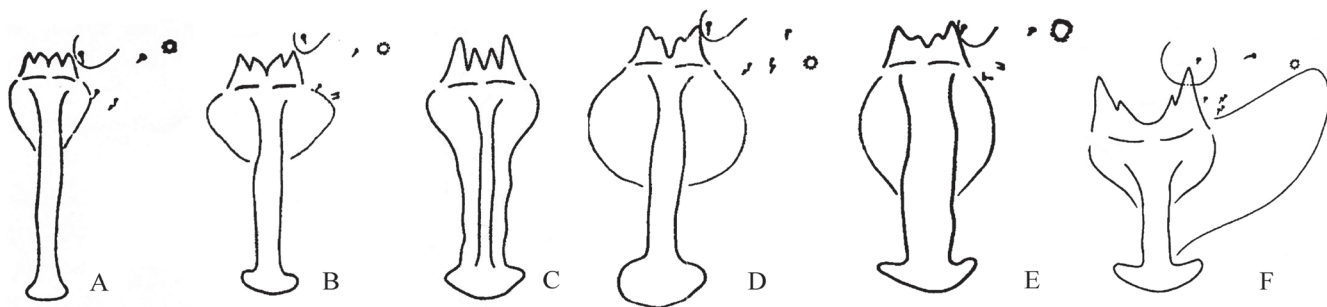


Figure 7. Relative size of inner and outer teeth of the larval prothoracic spatula of *Asphondylia* species associated with Asteraceae in Neotropical region. (A, B) Inner teeth approximately equal in size as outer, (A) *Asphondylia salvadorensis*, (B) *A. corbulae*; (C, D, E) Inner teeth reach at least $\frac{1}{2}$ of outer teeth, (C) Inner incision absent, *A. moehni*, (D) Inner incision deep and narrow, *A. caleae*, (E) Inner incision shallow, *A. trixidis*; (F) Inner teeth of spatula minute, inner incision flat and wide, *A. ulei*. Figures 7A, 7D, 7E modified from Möhn (1959), 7B from Möhn (1960); 7C, 7F from Möhn (1973).

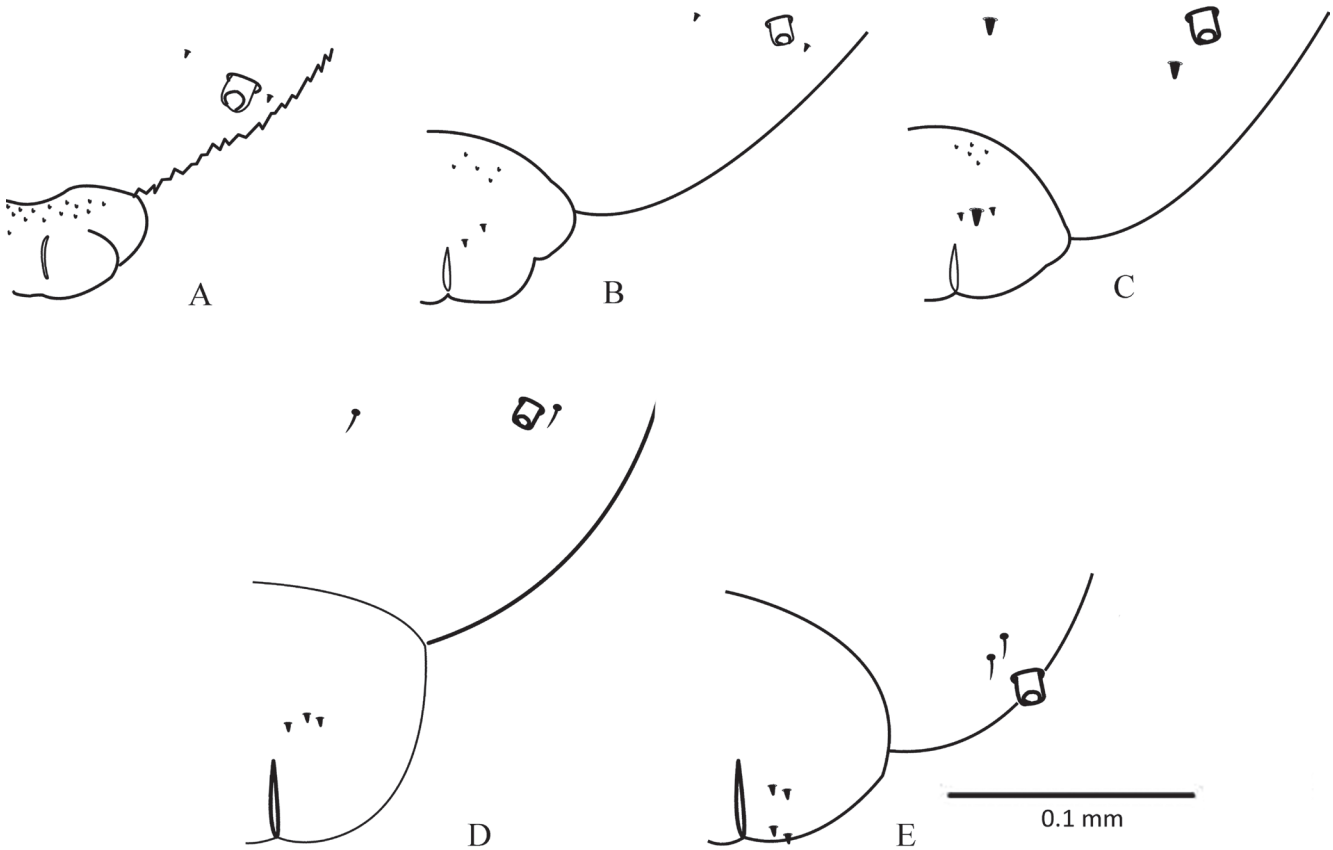


Figure 8. Terminal segment of *Asphondylia* species. (A) *Asphondylia glomerata*, (B) *A. aijalai*, (C) *A. salvadorensis*, (D) *A. ulei*, (E) *A. gochnatiae*, (F) *A. serrata*. Figure 8A modified from Gagné *et al.* (2001), 8B, 8C from Möhn (1959), 8D from Möhn (1973), 8E from Maia (2004).

unknown; *A. duplicornis* Wünsch is known only from female and pupa. The original description of *A. baccharis* Kieffer & Herbst is very unspecific and the type specimens have been lost. Of the twenty species of *Asphondylia* associated with Asteraceae in the Neotropical region, only four were not included in this key: *A. duplicornis* (Distrib. Colombia: Magdalena Prov., Canaverales) and *A. tithoniae* (Distrib. El Salvador: La Libertad, E Sitio del Nino) because the larvae are unknown; *A. baccharis* (Distrib. Chile:

vic. San Vicente) because the type specimens are lost. *Asphondylia hieronymi* (Weyenbergh) (Distrib. Argentina) could be included in the *Asphondylia* species grouped under the couplet 5', which larval spatula was described with four teeth, the inner much less than 1/2 of outer, with inner incision flat and wide, but the required information to the next steps of the key is unavailable in the original description and the type specimens are referred as lost in Gagné & Jaschhof (2017).

1. Larval spatula with four teeth, outer and inner pairs of spatula teeth approximately equal in size (Figs. 7A, 7B)..... 2
- Larval spatula with four teeth, outer and inner pairs of spatula teeth unequal in size (Figs. 7C, 7D, 7E, 7F) 5
2. Larva with two inner and two outer lateral papillae; terminal segment of larva with one (Fig. 8A) or four terminal papillae (Fig. 8E) 3
- Larva with one inner and two outer lateral papillae; terminal segment of larva with three papillae, two setose and one corniform (Fig. 8C) 4
3. Larva with terminal segment with one pair of setiform terminal papillae barely visible among microspines (Fig. 8A); vein swelling on leaves of *Mikania glomerata* Sprengl. (Distrib. Brazil: Rio de Janeiro, Poço das Antas; Minas Gerais, Lavras).....*A. glomeratae* Gagné
- Larva with terminal segment with four terminal papillae, three setiform and one corniform (Fig. 8E); hairy galls on leaf and petiole on *Moquiastrium polymorphum* (Less.) G. Sancho (Distrib. Brazil: Minas Gerais, Luz)..... *A. gochnatiae* Maia
4. Larva with the inner teeth of spatula slightly shorter than outer (Fig. 7B); bud galls on *Eupatorium* sp.; *Chromolaena odorata*, *Fleischmannia microstemon* (Distrib. El Salvador: Ahuachapan, NW Las Chinamas; Guadeloupe FWI, Trinidad) *A. corbulae* Möhn
- Larva with the inner teeth of spatula approximately equal in size to outer (Fig. 8A); bud galls in *Hymenostephium cordatum* (Distrib. El Salvador: San Salvador).....*A. salvadorensis* Möhn
5. Larva with the inner teeth of spatula reach at least 1/2 of outer teeth, inner incision absent (Fig. 7C) or, if present, deep and narrow (Fig. 7D) 6
- Larva with the inner teeth of spatula minute, with much less than 1/2 of outer teeth, inner incision present, flat and wide (Fig. 7E) 12
6. Larva with the inner teeth of spatula closer without inner incision (Fig. 7C); stem swellings galls on *Mikania glomerata* Sprengl. (Distrib. Brazil: Rio Grande do Sul, Rio de Janeiro) *A. moehni* Skuharavá
- Larva with the inner teeth of spatula with inner incision deep and narrow (Fig. 7D)..... 7
7. Larva with three inner and two outer lateral papillae; bud and axil leaf galls on *Melanthera nivea* (L.) Small (Distrib. El Salvador: San Miguel, N El Delirio) ..
.....*A. melantherae* Möhn
- Larva with two inner and two outer lateral papillae..... 8

8. Larva with three pairs of terminal papillae, two setose and one corniform; induce fruit galls on *Lepidaploa canescens* (Kunth) H. Rob. (Distrib. El Salvador: Chalatenango, SE La Palma) *A. herculesi* Möhn
- Larva with one or two pairs of terminal papillae 9
9. Larva with one pair of setose terminal papillae; galls on bud on flowers of *Zexmenia frutescens* (Mill.) S.F. Blake (Distrib. El Salvador: San Salvador) *A. zexmeniae* Möhn
- Larva with two pairs of terminal papillae 10
10. Larva with two pairs of terminal papillae, one setose and the other corniform; on stem and leaf vein on *Bidens squarrosa* Less. and *B. refracta* Brandege (Distr. El Salvador: La Libertad, Cumbre, Hacienda Chilata) *A. anaeliae* Möhn
- Larva with two pairs of terminal papillae, both setose 11
11. Larva with inner incision of spatula very deep (Fig. 6D); bud galls on flowers of *Calea integrifolia* (DC.) Hemsl. (Distr. El Salvador: San Salvador, Picacho) *A. caleae* Möhn
- Larva with the inner incision of spatula shallow (Fig. 6E); leaf galls on *Trixis radialis* (L.) Kuntze (Distrib. El Salvador: La Libertad, NE Sitio del Nino) *A. trixidis* Möhn
12. Larva with three inner and two outer lateral papillae; stem galls on *Calea zacatechichi* Schltdl. (Distrib. El Salvador: San Vicente, SE Santo Domingo, km 54) *A. zacatechichi* Möhn
- Larva with one or two inner and two outer lateral papillae 13
13. Larva with two inner and two outer lateral papillae; two pairs of setose terminal papillae of larva (Fig. 8B); bud galls on *Lepidaploa canescens* (Kunth) H. Rob. (Distr. El Salvador: La Libertad, Los Chorros) *A. ajallai* Möhn
- Larva with one inner and two outer lateral papillae, larva with another arrangement of terminal papillae 14
14. Larva with one pair of setose terminal papillae (Fig. 5B); pupa with lower frontal horn trilobed; stem and petiole galls on *Lessingianthus warmingianus* (Baker) H. Rob. (Distrib. Brazil: Minas Gerais, Santana do Riacho) *A. cipo* sp. nov. Urso-Guimarães
- Larva with three (Fig. 8D) or four pairs of terminal papillae (Fig. 8E); pupa with lower frontal horn absent or one-lobed 15
15. Larva with three pairs of corniform terminal papillae (Fig. 8D); pupa with lower frontal horn one-lobed; leaf galls on *Mikania* sp. (Distrib. Brazil: Rio de Janeiro, Palmeiras) *A. ulei* Rübsaamen
- Larva with four pairs of terminal papillae, three setose and one corniform (Fig. 8E); pupa with lower frontal horn absent; leaf galls on *Eremanthus erythropappus* (DC.) MacLeish (Distrib. Brazil: Minas Gerais, Tiradentes, Serra de São José) *A. serrata* Maia

ACKNOWLEDGMENTS

The author acknowledges support from FAPESP (Proc. #99/01429-1), Dr. Carlos J.E. Lamas for providing access to the facilities at MZUSP, Dr. Marcelo Monge Egea (IB/UNICAMP) for identifying the host plant species, Dr. Adolfo R. Calor (UFBA), Dr. Sidnei Matheus (FFCLRP/USP), and Dr. Charles M.D. dos Santos (UFABC) for collaboration in the field work; and Dr. Raymond J. Gagné for commenting on a draft version of the manuscript.

REFERENCES

- Antar, G.M. & Loeuille, B. 2015. Contribution to the Vernonieae (Asteraceae) of the Cerrado: a transfer to *Lessingianthus*, in a new rank and with a new name. *Phytotaxa*, 238(1): 082-091.
- Carneiro, M.A.A.; Borges, R.A.X.; Araújo, A.P.A. & Fernandes, G.W. 2009. Insetos indutores de galhas da porção sul da Cadeia do Espinhaço, Minas Gerais, Brasil. *Revista Brasileira de Entomologia*, 53(4): 570-592.
- Coelho, M. S.; Carneiro, M. A.A.; Branco, C. A. & Fernandes, G. W. 2013. Gall-inducing insects from Serra do Cabral, Minas Gerais, Brazil. *Biota Neotropica*, 13(3): 102-109. DOI
- Dematteis, M. & Almeida, G. 2015. *Lessingianthus*. In: Re flora. *Flora do Brasil 2020 – Algas, Fungos e Plantas*. [under construction]. Jardim Botânico do Rio de Janeiro. Available from: <http://floradobrasil.jbrj.gov.br/reflora/floradobrasil/FB27237>. Access in: 15/05/2018.
- Flor, I.C. & Maia, V.C. 2017. Representativity of the genus *Asphondylia* Loew, 1850 (Diptera, Cecidomyiidae) in Brazil. *Papéis Avulsos de Zoologia*, 57(30): 393-404. DOI. Access in: 15/05/2018.
- Gagné, R.J. 1994. *The Gall Midges of the Neotropical Region*. Ithaca, Cornell University Press. XV, 352p.
- Gagné, R.J. & Jaschhof, M. 2017. *A catalog of the Cecidomyiidae (Diptera) of the world*. 4. ed. Digital, 762 pp. Available online: https://www.ars.usda.gov/ARSUserFiles/80420580/Gagne_2017_World_Cat_4th_ed.pdf. Access in: 02/07/2018.
- Gagné, R.J.; Oda, R.A.M. & Monteiro, R.E. 2001. The gall midges (Diptera: Cecidomyiidae) of *Mikania glomerata* (Asteraceae) in Southeastern Brazil. *Proceedings of the Entomological Society of Washington*, 103: 110-134.
- Karsch, F. 1877. *Revision der Gallmücken*. Münster, E.C. Brunn. 58p., 1 pl.
- Kieffer, J.J. & Herbst, P. 1905. Über Gallen und Gallenerzeuger aus Chile. *Zeitschrift für wissenschaftliche Insektenbiologie*, 1: 63-66.
- Loew, H. 1850. *Dipterologische Beiträge*. IV. Posen, 40p, 1 pl.
- Maia, V.C. 2004. A new genus and six new species of gall midges (Diptera, Cecidomyiidae) from Serra de São José (Minas Gerais State), Brazil. *Arquivos do Museu Nacional*, 62: 69-82.
- Maia, V.C. 2012. Coleopterous galls from the Neotropical region. *Papéis Avulsos de Zoologia*, 52(15):175-184. DOI
- Möhn, E. 1959. Gallmücken (Diptera, Itonididae) aus El Salvador. 1. Teil. *Senckenbergiana Biologica*, 40: 297-368.
- Möhn, E. 1960. Gallmücken (Diptera, Itonididae) aus El Salvador. 2. Teil. *Senckenbergiana Biologica*, 41: 197-240.
- Möhn, E. 1973. Studien über neotropische Gallmücken (Diptera, Itonididae). 2. Teil. *Stuttgarter Beiträge zur Naturkunde*, 257: 1-9.
- Rübsaamen, E.H. 1908. Beiträge zur Kenntnis aussereuropäischer Zoocidien. III. Beitrag: Gallen aus Brasilien und Peru. *Marcellia*, 6: 110-173.
- Wünsch, A. 1979. *Gallenerzeugende Insekten nordkolumbiens, speziell Asphondyliidi und Lasiopteridi (Diptera, Cecidomyiidae) aus dem Küstenbereich um Santa Marta*. Wünsch, Ludwigsburg-Hoheneck, 238p.