Two new species of gall midges (Diptera, Cecidomyiidae) associated with *Erythroxylum ovalifolium* Peyr. (Erythroxylaceae) from the Barra de Maricá restinga, Maricá, Rio de Janeiro, Brazil

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(With 26 figures)

Abstract

Two new species of gall midges (Diptera, Cecidomyiidae) *Dasineura ovalifoliae* and *Clinodiplosis maricaensis* are described based on material from the Barra de Maricá restinga, Maricá, Rio de Janeiro, Brazil. Both species are associated with *Erythroxylum ovalifolium* Peyr. (Erythroxylaceae). The former is the gall inducer and the latter an inquiline.

Keywords: insect galls, *Dasineura*, *Clinodiplosis*, taxonomy.

Duas novas espécies de dípteros galhadores (Diptera, Cecidomyiidae) associadas com *Erythroxylum ovalifolium* Peyr. (Erythroxylaceae) da restinga de Barra de Maricá, Maricá, Rio de Janeiro, Brasil

Resumo

Duas novas espécies de dípteros galhadores (Diptera, Cecidomyiidae) *Dasineura ovalifoliae* e *Clinodiplosis maricaensis* são descritas com base em material da restinga da Barra de Maricá, Maricá, Rio de Janeiro, Brasil. As espécies estão associadas com *Erythroxylum ovalifolium* Peyr. (Erythroxylaceae), sendo a primeira galhadora e a segunda inquilina.

Palavras-chave: galhas de inseto, *Dasineura*, *Clinodiplosis*, taxonomia.

1. Introduction

"Restinga" (coastal shrub zone) environments are known for having rich flora mainly represented by Leguminosae, Rubiaceae, Orchidaceae and Myrtaceae (Rizzini, 1979). This flora provides a wide range of resources for gall inducing insects to colonize.

The Cecidomyiidae are the most important gallers. They are found in all biogeographical regions. So far, 5,451 species are known in the world. Among these, only 500 species are described for the Neotropical region (Gagné, 2004).

There are 109 insect galls which have been described from the Barra de Maricá restinga. Most of them are Cecidomyiidae galls (Maia, 2001; Maia et al., 2002). In this area, there are four Erythroxylaceae species (Silva and Oliveira, 1989) and one gall host: *Erythroxylum ovalifolium* Peyr. In this species, insect galls occur on leaves, fruits, buds and flowers. The two new species were obtained from triangular leaf galls. One is the galler and the other the inquilinous species.

The galler belongs to *Dasineura* Rondani 1840, a cosmopolitan genus with 448 known species. This genus is characterized by having palpus with four segments, tarsal claws toothed, wings with R5 shorter than it, male with gonostylus partially bare, ovipositor elongate-protrusible, female cerci fused, prothoracic spatula of larva two-toothed and larva with eight terminal papillae (Gagné, 1994). In the Neotropical region, the *Dasineura* species are associated with Asteraceae, Burseraceae, Chrysobalanaceae, Lamiaceae, Myrtaceae and Sterculiaceae (Gagné, 2004).

The inquilinous is a new species of *Clinodiplosis* Kieffer 1894. The main characteristics of this genus are wings with R5 longer than it and joining C beyond its apex, tarsal claws toothed on at least forelegs or untoothed, male cerci may be quadrate, secondarily lobed or acute, female ovipositor short or barely protrusible and female cerci separate. This genus is composed of 93 species (Gagné, 1994). Among them there are mycophagous, phytophagous and some predaceous species. The host families in the neotropics are Asteraceae, Euphorbiaceae, Lamiaceae, Malpighiaceae, Melastomataceae, Moraceae, Myrtaceae, Orquidaceae, Rubiaceae, Sapindaceae, Solanaceae, Sterculiaceae and Verbenaceae (Gagné, 2004).

The two new species are described and illustrated here based on material collected in the Barra de Maricá restinga, Maricá city, Rio de Janeiro state, Brazil.

2. Material and Methods

The Barra de Maricá restinga is located 50 km from Rio de Janeiro city and has an area of 150 ha. The local flora includes 204 species (Silva and Oliveira, 1989).

Samples of galls were collected by Valéria Cid Maia, Maria Antonieta Pereira de Azevedo and Roberta Novo Guedes in 1987, 1998, 2000 and 2005. The galls were taken to the laboratory to rear insects. The galls were kept in plastic pots layered at the bottom with a layer of soil and covered by fine screening. Immature insects were obtained by dissecting the galls. All specimens were preserved in 70% ethanol. The Cecidomyiidae were mounted on slides according to the methodology of Gagné (1994). Morphological terminology for immatures and adults also followed the methodology of the same author.

The field and laboratory work was done by the collectors previously mentioned and the taxonomic work by Fernandes and Maia. All material was deposited in the Diptera Collection of the Museu Nacional, Rio de Janeiro (MNRJ).

3. Results

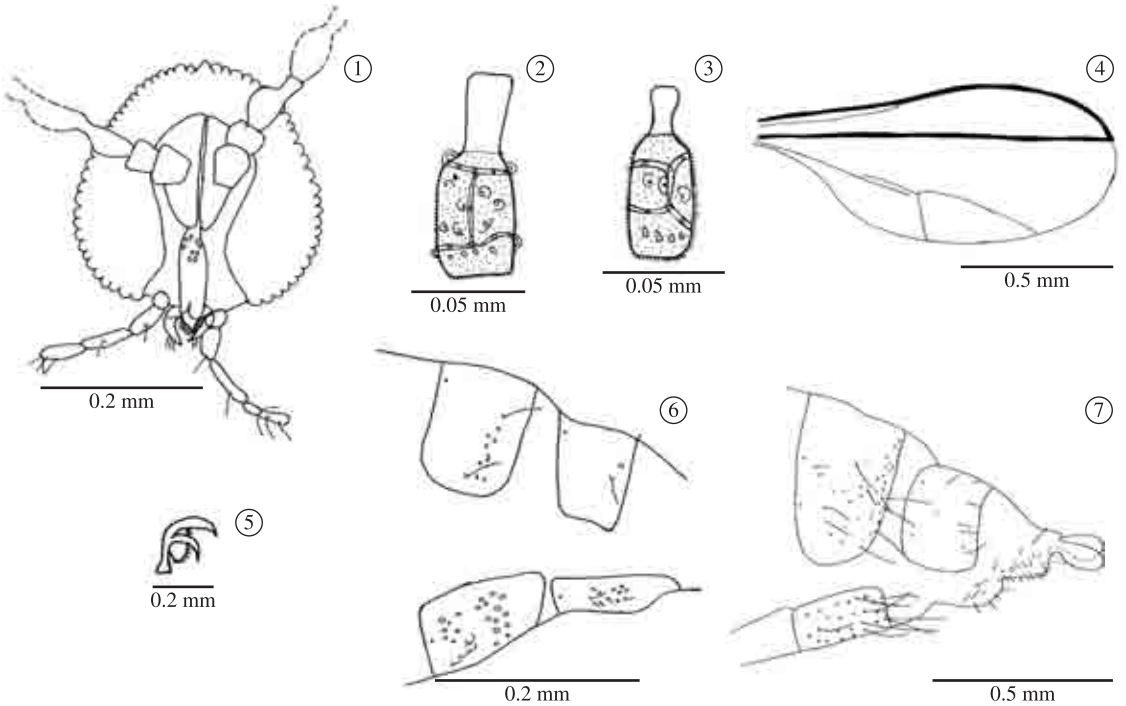
The *Dasineura* species attacks the leaves of *Erythroxylum ovalifolium* forming a triangular gall and the *Clinodiplosis* is an inquilinous species in this gall. Both species are described below.

Dasineura ovalifoliae Fernandes and Maia new species (Figures 1-14).

Adult – Head: Occipital process present (Figure 1). Eyes facets circular, all closely approximated. Antenna: male and female flagellomeres cylindrical (Figures 2 and 3), first two flagellomeres connate, 13 flagellomeres, flagellomere necks bare, long and subequal in length, node/neck proportion of fifth flagellomere in male (0.6-1) and female (0.5-0.6) (n = 5). Last flagellomere ovoid without apical process in both sexes. Scape obconic, pedicel globoid, the former longer than the latter. Frontoclypeus with 8-13 setae (n = 5). Labrum triangular, long-attenuate. Hypopharynx as long as labrum. Labellae each hemispherical, with few lateral setae and two pairs of short mesal setae. Palpus with four segments, the first globoid and the others cylindrical. Length of palpus segments: I: 0.01-0.02 mm; II: 0.03-0.04; III: 0.05-0.07 and IV: 0.04-0.07 (n = 6).

Thorax. Anepimeron with six setae (n = 4). Other pleura bare. Wing (Figure 4): length: 1.1-1.67 mm (n = 4). Rs absent, R_5 straight at juncture with C, R_5 joining C before wing apex, M_3 absent, Cu forked and Cup present. Legs: Tarsal claws curved after midlength, with one tooth (Figure 5). Empodia long reaching beyond bend in claws.

Abdomen. Male: Tergites 1-7 rectangular with a complete row of caudal setae and one anterior pair of trichoid sensilla, tergite 8 with a few setae and one anterior pair of trichoid sensilla (Figure 6). Sternites 2-7 rectangular, with caudal



Figures 1–7. *Dasineura ovalifoliae* new species: 1) female head, frontal view; 2) male flagellomere 10; 3) female flagellomere 12; 4) female wing; 5) female claw and empodium of midleg; 6) male abdomen, dorsolateral view; 7) female abdomen, dorsolateral view.

and mesal rows of setae and one anterior pair of trichoid sensilla. Mesal 1/3 of sternite 8 with setae and one anterior pair of trichoid sensilla. Female: tergites 1-8 rectangular with a caudal row of setae and one anterior pair of trichoid sensilla (Figure 7). Sternites 2-7 rectangular with irregular caudal and mesal rows of setae and one anterior pair of trichoid sensilla, sternite 8 not sclerotized. Male terminalia (Figure 8): Gonocoxite not splayed with mesobasal lobe; gonostylus elongate and striate, paramere slender, aedeagus truncate at the apex and longer than hypoproct, hypoproct with parallel lobes and cercus with divergent lobes. Female terminalia: ovipositor barely protrusible, cerci ovoid and setose, hypoproct bilobed with apical setae. Length from distal margin of tergite 8 to end: 0.25 mm (Figure 9).

Pupa – Body length: 1.35–1.45 mm (n = 2). Color: brownish. Cephalic region with antennal horn reduced, straight and smooth (Figure 10). Cephalic setae long with 0,25 mm of length, two pairs of lower facial papillae (one setose and the other asetose) and three pairs of lateral facial papillae (one setose and the others asetose). Prothoracic spiracle setiform with 0.12 mm of length (Figure 11). Abdominal tergites 2-8 with spines (Figure 12).

Larva – Body length: 2.25–2.5 mm (n = 3). Color: reddish. Spatula 2-toothed (Figure 13), length: 0.14 mm (n = 1). Lateral papillae barely visible. Terminal segment with three pairs of setose papillae (Figure 14).

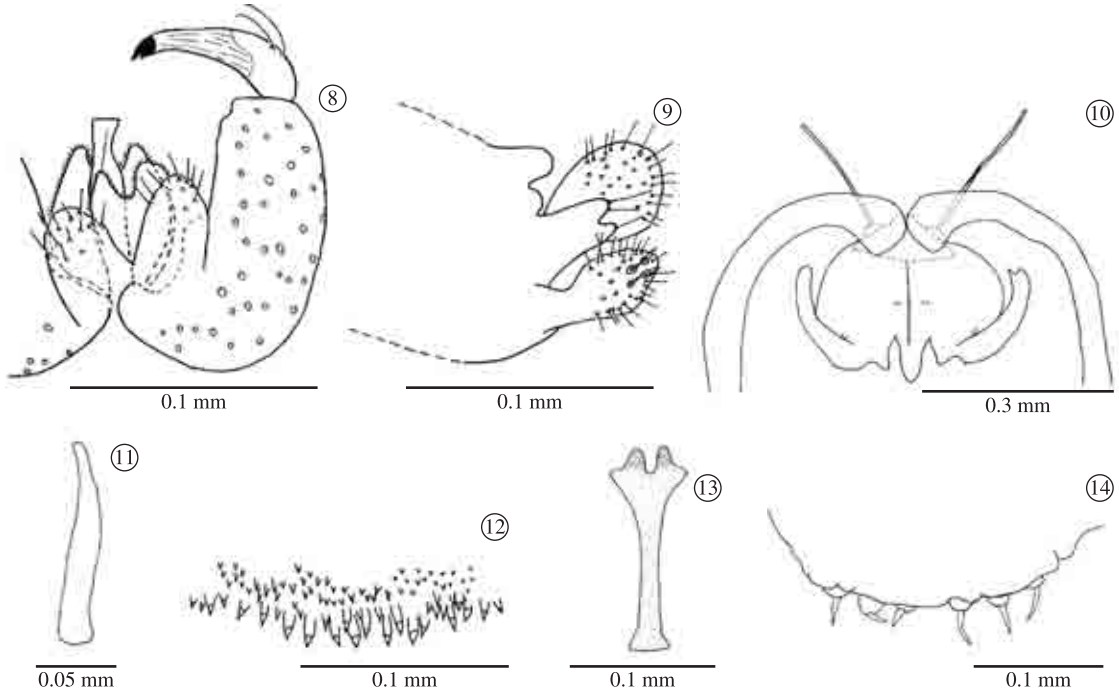
Material examined: Holotype male. Brazil, Rio de Janeiro: Maricá (Restinga da APA de Maricá), 16.IX.2004, Guedes and Maia leg., MNRJ. Paratypes, same locality, data and collector – 4 male, 17 female, 2 pupal exuviae; same locality, 14.III.1998, Maia leg. – 2 male, 4 female; same locality, 22.III.1998, Maia leg. – 1 female and 1 pupal exuviae; same locality, 12.VI.1998, Maia leg. – 1 male; same locality, 24.X.1987, Maia leg. – 1 larva, MNRJ. All specimen slides mounted.

Additional material examined: same locality, 16.IX.2005, Guedes and Maia leg. – 4 female, 1 male and 3 larva, MNRJ. All specimen slides mounted.

Gall (Figure 15): triangular leaf gall, greenish, monothalamous, one larva per gall. Periods of occurrence: from January to December. Pupation takes place in the soil. Besides the galler and the inquiline, four parasitoids species which belong to a new Tetrastichinae genus (Eulophidae), Platygastridae, Pteromalidae and Torymidae (Hymenoptera) were found (Maia and Azevedo, 2009).

Etymology: the name *ovalifoliae* refers to the specific name of the host plant.

Remarks: *Dasineura ovalifoliae* is only tentatively placed in this genus following the key for Neotropical species present in Gagné (1994). This species is unique in having the abdominal tergites 2-8 of the pupa with spines



Figures 8–14. *Dasineura ovalifoliae* new species: 8) male terminalia, dorsal view; 9) female terminalia, ventrolateral view; 10) pupa, cephalic region, ventral view; 11) pupa prothoracic spiracle; 12) pupa abdominal segment 8, dorsal view; 13) larva spatula, ventral view; 14) larva terminal segments, dorsal view.

Figure 15. Gall induced by *Dasineura ovalifoliae* new species on *Erythroxylum ovalifolium* Peyr. (Erythroxylaceae).

and the female with ovipositor barely protrusible. This is the first *Dasineura* species associated with Erythroxylaceae.

Discussion: Among the Brazilian *Dasineura* species, *Dasineura ovalifoliae* new species has the fewest number of flagellomeres, with 13 segments. In the others species, the number of flagellomeres varies between 14 and 32. *D. braziliensis* Tavares, 1922 differs from *D. ovalifoliae* new species by the tarsal claw with two teeth, short empodia and larva with four pairs of terminal papillae, while the new species has a one-toothed tarsal claw, long empodia and larva with three pairs of terminal papillae. *Dasineura ovalifoliae* new species differs from *D. copacabanensis* Maia, 1993 by prothoracic spatula of larva with separated teeth in the new species and together teeth in the last species. *Dasineura ovalifoliae* new species differs from *D. globosa*, Maia, 1995, *D. myrciariae*, Maia, 1995 and *D. tavaresi*, Maia, 1995 by the length of R5 that is in the new species longer than in the last three species. *D. gigantea* Angelo & Maia, 1999 differs from *D. ovalifoliae* new species by having the prothoracic spatula of larva with triangular teeth and short stalk while in the new species the teeth are rounded and the stalk is long. The new species differs from *D. couepiae*, Maia, 2001 by the length of cephalic setae of pupa that is four times longer than in the last species. *Dasineura ovalifoliae* new species differs from *D. marginalis* Maia, 2005 by the truncate form of aedeagus while in the last species the aedeagus tapers to the apex.

Clinodiplosis maricaensis Fernandes and Maia new species (Figures 16-26).

Adult – Head: occipital process present, post-vertical peak with two setae. Eyes facets circular, all closely approximated. Antenna: Female flagellomeres cylindrical with sinuous circumfila as in Figure 16. Male flagellomeres binodal, 12 flagellomeres, tri-circumfilar, circumfilar loops regular in length, flagellomere necks and internodes setulose and subequal in length (Figure 17). Twelfth flagellomere with apical process in both sexes. Scape obconic and pedicel globoid, the former longer than the latter. First two flagellomeres connate in both sexes. Frontoclypeus with six setae (n = 4). Labrum triangular, long-attenuate with three pairs of setae. Hypopharynx longer than labrum. Labellae elongate-convex, each with some lateral setae and two pairs of short mesal setae. Palpus with four setose cylindrical segments (Figure 18). Length of palpus: segment I: 0.08 mm; II: 0.08 mm; III: 0.06 mm and IV: 0.08 mm (n = 1).

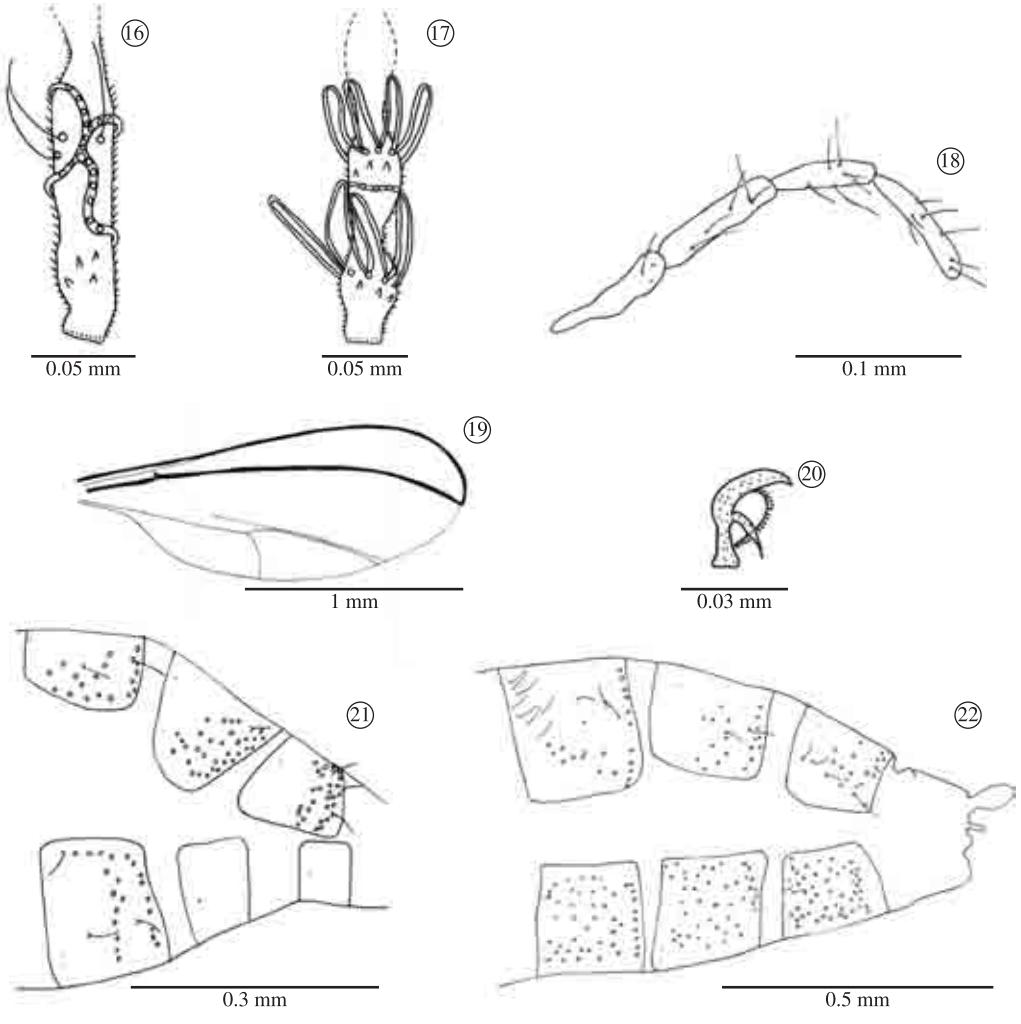
Thorax. Anepimeron with seven setae (n = 4). Other pleura bare. Wing (Figure 19): length: 1.7-2.1 mm (n = 3). Rs situated after midlength of R_1, weaker than R_1 and incomplete. R_5 slightly bent at juncture with C. R_5 joining C after wing apex. Cu forked and M_3 present. Legs: Tarsal claws curved near base, with one tooth (Figure 20). Empodia long and reaching bent in claws.

Abdomen. Male: Tergites 1-6 rectangular with single row of caudal and lateral setae, some mesal setae and two anterior trichoid sensilla, tergite 7 and 8 rectangular with one anterior pair of trichoid sensilla (Figure 21). Sternites 2-6 rectangular, with a caudal row of setae, some lateral setae, scattered setae at mesal region and one anterior pair of trichoid sensilla. Sternite 7 and 8 rectangular with many caudal and lateral setae, ½ distal region with scattered mesal setae and one anterior pair of trichoid sensilla. Female: tergites 1-7 rectangular with a caudal row of setae, irregular mesal rows of setae and one anterior pair of trichoid sensilla, tergite 8 rectangular not sclerotized (Figure 22). Sternites 2-7 rectangular with rows of proximal, caudal and mesal setae and one anterior pair of trichoid sensilla, sternite 8 not sclerotized. Male terminalia (Figure 23): Gonocoxite splayed with mesobasal lobe; gonostylus elongate, striate, with reentrances, cercus secondarily lobed and smaller than hypoproct, hypoproct with parallel lobes, aedeagus triangular, elongate, tapering to the apex and longer than hypoproct. Female terminalia: ovipositor barely protrusible, cerci ovoid and setose, hypoproct short with few setae concentrated ventrally (Figure 24).

Pupa – Unknown.

Larva – Body length: 1.98-2.2 mm (n = 3). Color: white. Spatula 2-toothed (Figure 25), length: 0.12-0.14 mm (n = 2). Full complement of lateral papillae. Terminal segment with three pairs of corniform papillae (the long with 0.02 mm and the short with 0.01 mm) and a pair of setose papillae (0.03 mm) (Figure 26).

Material examined: Holotype male. Brazil, Rio de Janeiro: Maricá (Restinga da APA de Maricá), 20.IX.2000, Maia and Azevedo leg., MNRJ. Paratypes, same locality, data and collector – 1 male and 2 female; same locality, 16.IX.2005, Guedes and Maia leg. – 2 larva; same locality, 24.X.1987, Maia leg. – 1 larva, MNRJ. All specimen slides mounted.

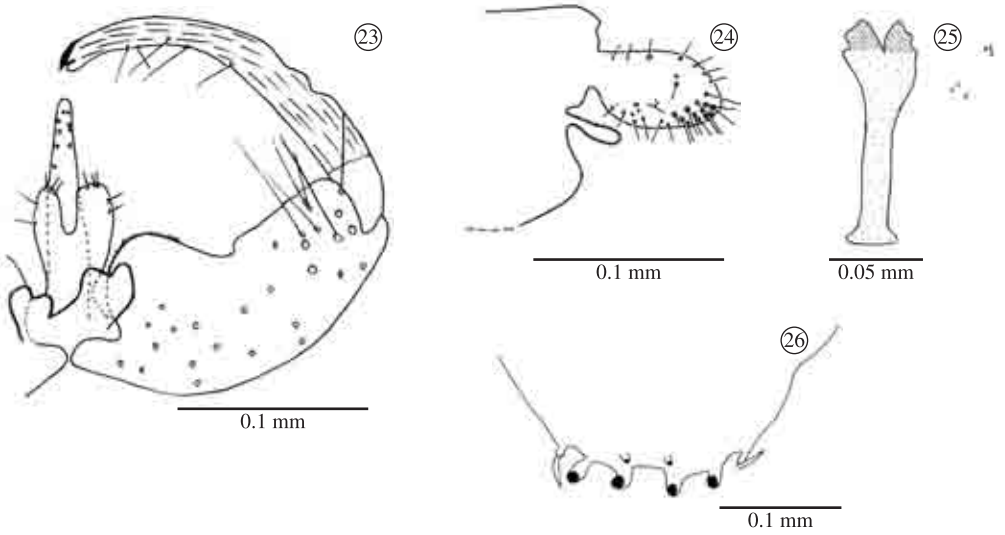


Figures 16–22. *Clinodiplosis maricaensis* new species: 16) female flagellomere 1; 17) male flagellomere 1; 18) palpus male; 19) male wing; 20) female claw and empodium of hindleg; 21) male abdomen, dorsolateral view; 22) female abdomen, dorsolateral view.

Etymology: The name *maricaensis* refers to the locality where the material was collected.

Remarks: This species is unique by having a sinuous female circumfila, wing with Rs incomplete not reaching R_1 and male tergite 8 without setae. This is the first *Clinodiplosis* species found in galls of Erythroxylaceae.

Discussion: *Clinodiplosis maricaensis* new species differs from *C. cattleyae* Molliard 1903 and *C. cearensis* Tavares 1917 by the form of the male cerci that is secondarily lobed in the new species, acute in the second species and quadrangular in the last species. It differs from *C. chlorophorae* Rübsaamen 1905 by the lengths of the larva and its prothoracic spatula which are smaller in the new species than in the last species. *C. maricaensis* new species differs from *C. eupatorii* Felt 1911, *C. pulchra* Tavares 1917 and *C. rubiae* Tavares 1918 by the number of palpus segments being four in the new species, three in the second species and five segments in the two last species. The new species differs from *C. bahiensis* Tavares 1917, *C. iheringi* Tavares 1925, *C. melissae* Maia 1993, *C. dioidae* Maia 2001b, *C. profusa* Maia 2001, *C. conica* Oliveira & Maia 2008 and *C. floricola* Novo Guedes & Maia 2008 by the tarsal claw which is one-toothed in the new species and simple in the others species. *C. maricaensis* new species differs from *C. marcetiae* Tavares 1917 by having wings with M_3 while in the other species this vein is not present. *C. costai* Maia 2005 differs from the new species by having a short empodia while *C. maricaensis* has a long empodia. Moreover, the first species has a wing with Cup present and in the new species this vein is not present.



Figures 23–26. *Clinodiplosis maricaensis* new species: 23) male terminalia dorsal view; 24) female terminalia lateral view; 25) Larva, spatula, ventral view; 26) larva, terminal segments, dorsal view.

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