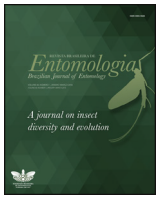
Revista Brasileira de Entomologia 66(3):e20220034, 2022

SOCIEDADE BRASILEIRA DE ENTOMOLOGIA
FUNDADA EM 1937

REVISTA BRASILEIRA DE
Entomologia
A Journal on Insect Diversity and Evolution



A new species of gall midge (Diptera, Cecidomyiidae) on *Ouratea cuspidata* (A.St.-Hil.) Engl. (Ochnaceae), a plant endemic to Brazil

Valéria Cid Maia[1]*

[1]*Museu Nacional, Quinta da Boa Vista, Rio de Janeiro, RJ, Brasil.*

urn: lsid:zoobank.org:pub:0E8A066D-EC47-4C22-890B-3083643344C

ARTICLE INFO

Article history:
Received 19 May 2022
Accepted 19 September 2022
Available online 21 October 2022
Associate Editor: Sarah Oliveira

Keywords:
Atlantic Forest
Gall-inducing species
Morphology
Taxonomy

ABSTRACT

Cerciplanus maricaensis, a new species of gall midge (Diptera, Cecidomyiidae) that induces galls on leaves of *Ouratea cuspidata* (A.St.-Hil.) Engl. (Ochnaceae) is described in the larval, pupal and adult stages (of both sexes), illustrated and compared with the other congeneric species. The host plant is endemic to Brazil and known only from the Atlantic Forest. A key to segregate them is presented. Data on the geographical distribution of *Cerciplanus maricaensis* based on gall records retrieved from the literature are given.

Introduction

Ouratea cuspidata (A.St.-Hil.) Engl. (Ochnaceae), an ornamental shrub commonly known as "sarará", is endemic to Brazil, where it occurs only in the Atlantic forest. Its distribution comprises the states of Ceará, Rio Grande do Norte and Bahia in the Northeastern region, Mato Grosso in the Mid West region, and Minas Gerais, Espírito Santo, and Rio de Janeiro in the Southeast region (Chacon and Yamamoto, 2015). Three kinds of insect galls have been recorded on leaves of this plant, in restinga areas of the Rio de Janeiro and Espírito Santo (Maia, 2001; Oliveira & Maia, 2005; Bregonci et al., 2010; Maia and Oliveira, 2010; Rodrigues et al., 2014; Maia and Carvalho-Fernandes, 2016; Maia and Silva, 2016). One of them was characterized as barrel-like with a pointed apical projection and its inducer was preliminary identified as *Contarinia* sp. (Cecidomyiini), based on the male morphology. Later, females, pupae and larvae were examined and the species was placed in the genus *Cerciplanus* Garcia & Urso Guimarães, 2020. This genus can be recognizable by the following combination of characters: flagellomeres binodal and bicircumfilar in males and cylindrical in females; palpi four-segmented; tarsal claws simple, curved before midlength, as long as empodia; gonocoxites cylindrical, gonostylus cloveshaped, hypoproct and aedeagus strongly sclerotized; hypoproct and cerci deeply bilobed, each lobe large, aedeagus large in the base tapering to the apex; female eighth abdominal segment with a setose ventral bulge, cerci dorso-ventrally flattened. Larva has spatula bidentate with incision flat and wide, and terminal segment with four papillae of equal size per side, two setose and two asetose (Garcia et al., 2020). In this paper, a new species of *Cerciplanus* is described and illustrated. A key to segregate the known species is presented.

Material and methods

Field works were carried out in three localities of the State of Rio de Janeiro (Maricá: 22º57'50"S, 42º50'44", Grumari: 43º31'00"S, 23003'10" W, and Ilha Grande: 22º00'24"S, 44º19'05"W), and in a single locality of the State of Espírito Santo (Guarapari: 20° 33'S, 40° 26' W), on different dates by various collectors (see Material examined).

Cylindrical galls with apical projection on leaves of *Ouratea cuspidata* (Ochnaceae) were collected and transported to the laboratory. Part of the sample was packed in transparent plastic bags with moist cotton and checked daily for adults and pupal exuviae. Some galls were dissected under a stereoscopic microscope to obtain larvae and pupae. All specimens were first preserved in 70% alcohol and later mounted on slides following the methodology outlined in Gagné (1994). The studied

* Corresponding author.
E-mail: maiavcid@acd.ufrj.br (M. Valéria)

https://doi.org/10.1590/1806-9665-RBENT-2022-0034

material (including the types) was deposited in the Diptera collection of Museu Nacional (MNRJ), Rio de Janeiro, Brazil.

Morphological studies and drawings were made with the aid of an optical microscope with coupled photographic camera and drawing tube. Measurements were done using a microscope slide with scale from 0.01 to 5.0mm. All drawings were scanned and then edited using Corel DRAW®. Adult morphological terminology follows Gagné (1994).

Data on the geographical distribution of the new species are given. They were obtained from the literature through the search for gall inventories carried out in the Atlantic Forest domain. Records of the same gall morphotype on *Ouratea cuspidata* were compiled, since the gall is considered the extended phenotype of the gall-inducing species. Hence, gall morphotype associated with information on the host plant species and attacked organs are reliable surrogates of the gall-inducing species (Carneiro et al., 2009)

Results

***Cerciplanus maricaensis*, sp. n.**

urn: lsid:zoobank.org:pub:0E8A066D-EC47-4C22-890B-3083643344C (Figs. 1-7)

Adult. Length: male: 1.9 mm (n=1), female: 1.6–2.1 mm (n=5). Head (Fig. 1a). Eye facets hexagonal, closely approximated. Antennae: scape trapezoid; pedicel globose; two first flagellomeres connate (Fig. 1b); male flagellomeres subequal in length, binodal and bicircumfilar, circumfilar loops regular in length, internodes and necks without setulae (Fig. 1c); female flagellomeres cylindrical with ring-like circumfila, necks without setulae (Fig. 1d); 12th flagellomere with setulose apical process in both sexes (Fig. 1e). Frontoclypeus with 10 setae. Labrum triangular, long-attenuate, with three pairs of ventral sensory setae. Hypopharynx with anteriorly directed lateral setulae. Labella subtriangular, each with lateral setae and two short mesal setae. Palpus: first segment with 0.030 mm of length; second segment with 0.050 mm of length; third segment with 0.065 mm of length; fourth segment with 0.070 mm in male (n=1); in female: 0.010 mm; 0.015 mm; 0.020 mm and 0.04 mm, respectively (n=1). Second segment the widest in both sexes.

Thorax. Anepisternum with seven setae. Other pleura bare. Wing length (from arculus to apex): male, 1.4–2.3 mm (n=3); female, 1.2–1.3 mm (n=2); R5 joining C at wing apex; Rs barely evident, present only at its junction with R5 and situated slightly before midlength of R1, M3 absent, CuA forked (Fig. 2a). Tarsal claws simple and bowed near 2/3 length in both sexes, empodium longer than bend in tarsal claws (Figs. 2b–c).

Abdomen. Male (Fig. 2d): 1st–8th tergites sclerotized, longer than wider, narrowing laterally, 1st–7th tergites with single posterior row of setae along entire posterior margin, no lateral setae, no anterior trichoid sensilla, and sparsely scales elsewhere; 8th tergite bare; 2nd–7th sternites sclerotized, rectangular, with single and dense posterior row

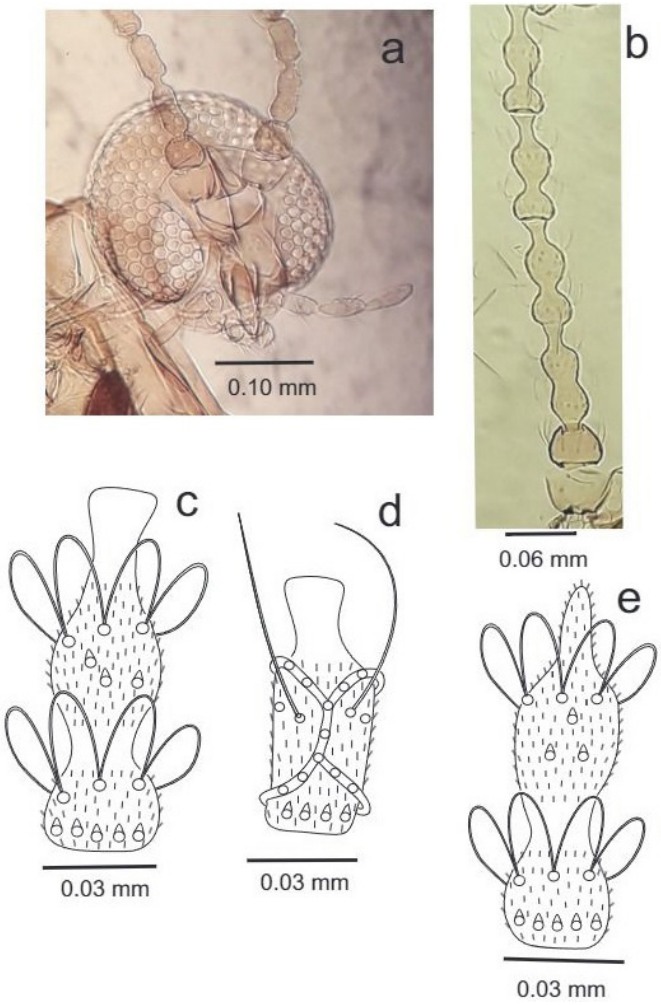


Figure 1. *Cerciplanus maricaensis* **sp. n.**: a) Female head, frontal view; b) Male scape, pedicel and 1st–4th flagellomeres; c) Male 5th flagellomere; d) Female 5th flagellomere; d) Male 12th flagellomere.

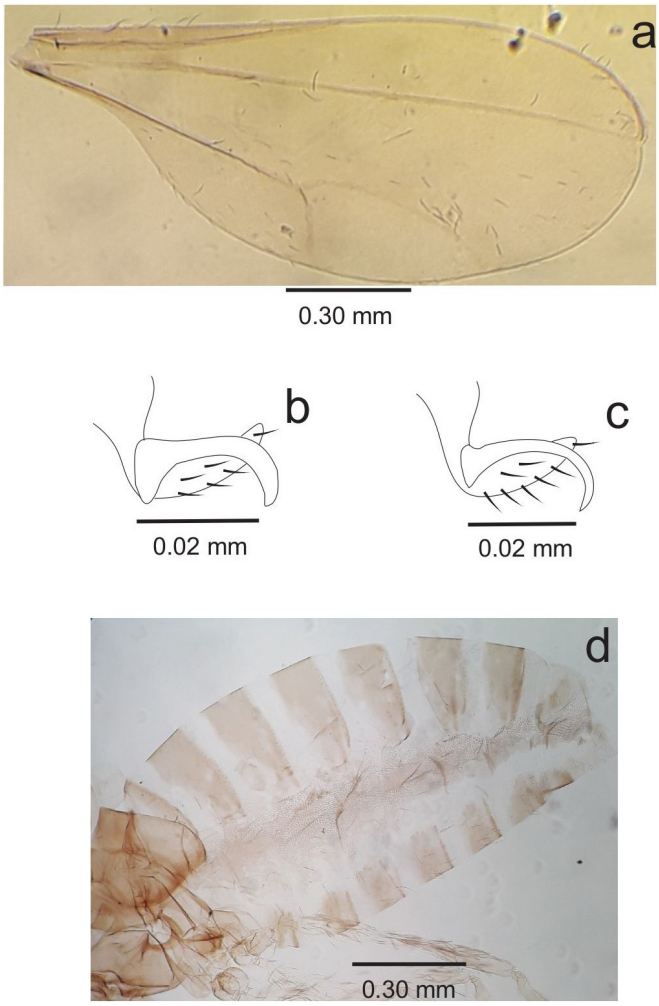


Figure 2. *Cerciplanus maricaensis* **sp. n.**: a) Male wing; b) Male hind tarsal claw and empodium, lateral view; c) Female fore tarsal claw and empodium, lateral view; d) Male abdominal segments, lateral view.

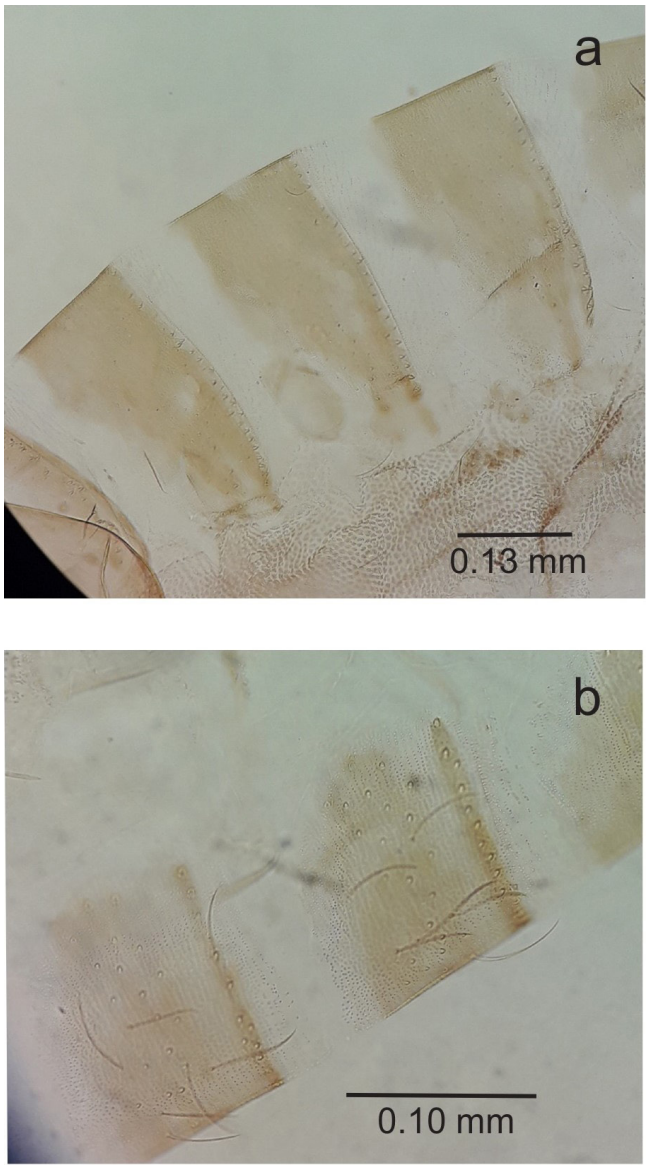


Figure 3. *Cerciplanus maricaensis* **sp. n.**, female abdomen: a) 3rd to 5th tergites, dorsolateral view; b) 4th and 5th sternites, ventrolateral view.

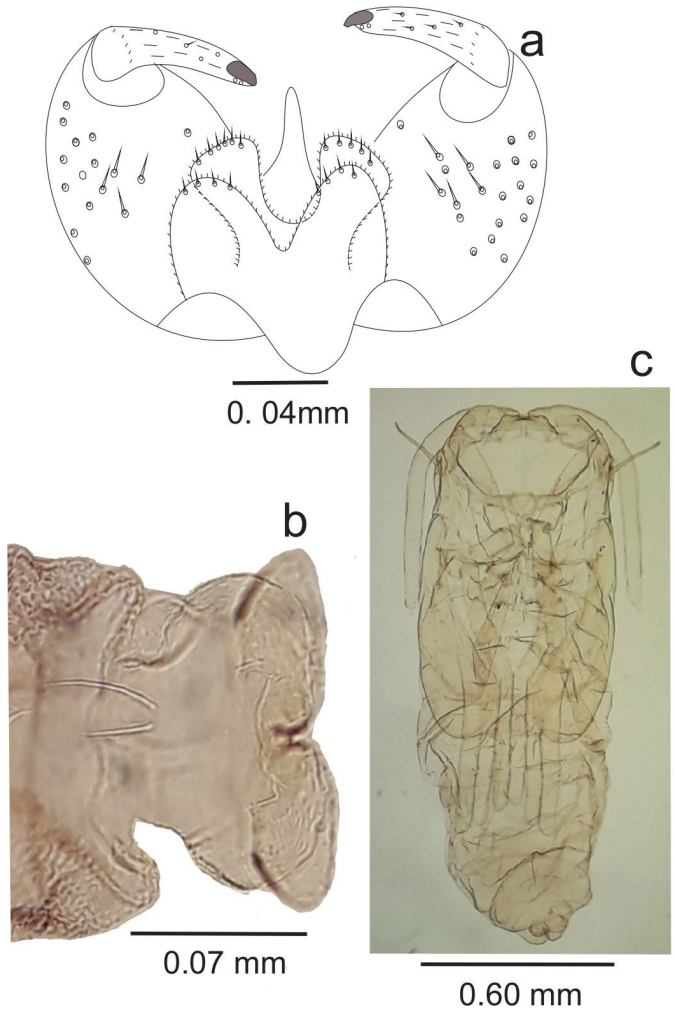


Figure 4. *Cerciplanus maricaensis* **sp. n.**: a) Male terminalia, dorsal view; b) Female cerci, dorsal view; c) Pupal exuviae, general aspect, ventral view.

of setae, several setae irregularly distributed at midlength (less dense than in the posterior row), no anterior trichoid sensilla, and sparsely scales elsewhere; 8th sternite sclerotized, ovoid with scattered setae and scales, no anterior pair of trichoid sensila. Female (Figs. 3a-b): 1st–7th tergites rectangular, with single posterior row of setae along entire posterior margin, no lateral setae, no anterior trichoid sensilla, and sparsely scales elsewhere; 8th tergite not sclerotized; 2nd–7th sternites as in male, 8th sternite not sclerotized. Male terminalia (Fig. 4a): gonocoxite stout, conical, truncated at apex, wide, 2.0 times longer than wide,; gonostylus claviform, slightly curved, 0.7 times the length of the gonocoxite, 6.7 times longer than wide, setulose at basal third and ridged elsewhere; cerci stout, widest basally, deeply bilobed, with irregular internal margin; hypoproct deeply bilobed, each lobe wider distally than basally, longer and thinner than cerci; aedeagus conical, elongate, longer than hypoproct, tapering to apex with few setose papillae dorsally. Ovipositor short, barely protrusible; cerci separate, 3.0 times wider than long, with setae evenly distributed, and microsetulae elsewhere (Fig. 4b); hypoproct short, bilobed, setose, with two long setae laterally at apex.

Pupa (Fig. 4c). Length: 1.6 mm (n=2). Head (Fig. 5a): apical seta with 0.17 mm of length (n=2), longer than dorsal plate length (Fig. 5b); antennal horns absent; antennal papilla present; upper cephalic margin thickened laterally; lower and lateral facial papillae absent. Thorax: prothoracic spiracle setiform, with 0.19 mm of length (n=2), as long as palpus sheath (Fig. 5a). Abdomen: 2nd–8th tergites with dorsal spicules, dorsal spines absent (Fig. 5c).

Larva. Body cylindrical; integument smooth; length: 5.2 mm (n=1); spatula clove-shaped with 0.35 mm of length (n=1), stalk long, less sclerotized distally than apically (Figs. 6a, b), full complement of lateral papillae; terminal segment (Fig. 6c) with four pairs of papillae, two pairs setose and two pairs asetose, ventral anus slit-shaped.

Gall (Figs. 7a-b). Leaf gall, cylindrical with a pointed apical projection; length: 0.5 cm; basal wide: 0.3 cm; glabrous; brown, one-chambered. Number of larva/gall: 01. Pupation in the gall.

Etymology. The name *maricaensis* refers to the type locality.

Material examined. Holotype male, BRAZIL, Rio de Janeiro State, Rio de Janeiro, Grumari, 21.III.2003, Oliveira & Maia col., MNRJ. Paratypes: same data as holotype, 1 male; Rio de Janeiro State, Maricá, Restinga of Barra de Maricá, 20.IX.2000, Maia & Azevedo col., 1 male, 2 females; same locality, 13.IV.1987, Maia col., 1 male; same locality and collector, 24.X.1987, 1 male; 25.VII.1989, 1 male; 25.VIII.1989, 1 female; 25.X.1998, 1 pupal exuvia; 23.XII, 1998, 1 male, 1 pupal exuvia, 1 larva; MNRJ.

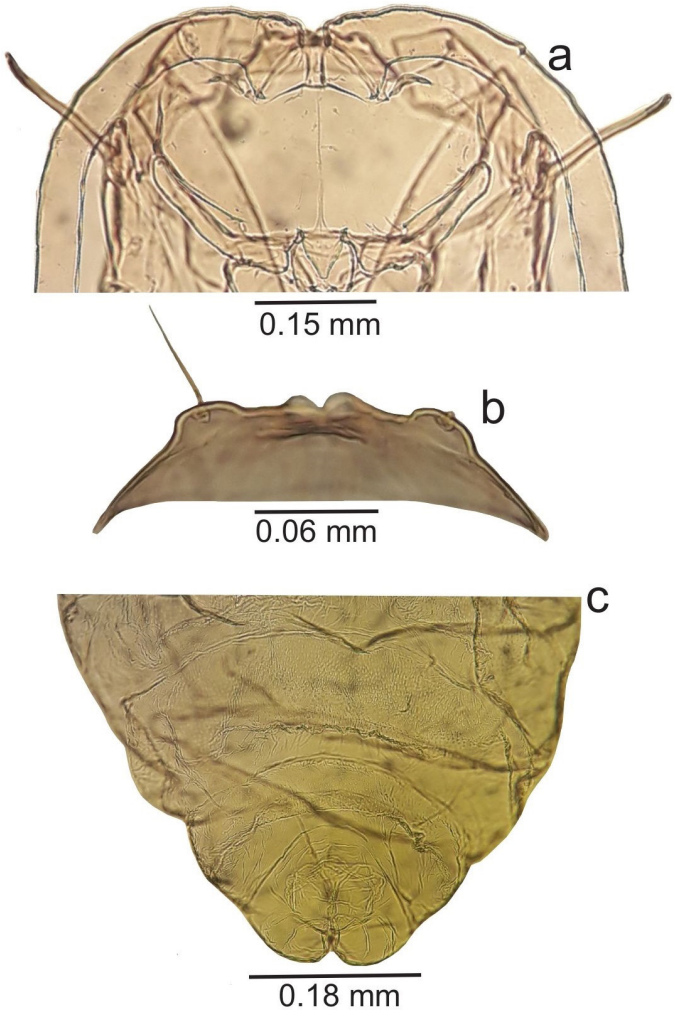


Figure 5. *Cerciplanus maricaensis* **sp. n.**, pupal exuviae: a) Head and prothoracic spiracle, ventral view; b) Apical plate, dorsal view (apical seta broken); c) Last abdominal segments, dorsal view.

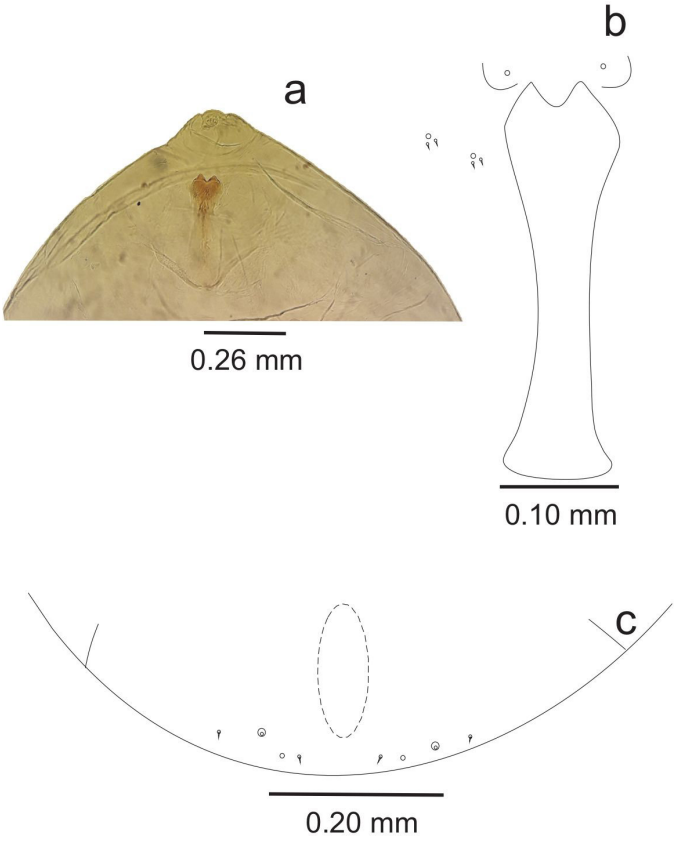


Figure 6. *Cerciplanus maricaensis* **sp. n.**, larva: a) Head and prothoracic spatula, ventral view; b) Prothoracic spatula, sternal and lateral papillae, ventral view; c)Terminal segment, ventral view.

Geographical distribution. The new species is restricted to Brazil, since its host plant is endemic to this country. *Cerciplanus maricaensis* occurs exclusively in the Atlantic Forest domain, where it has been recorded in two states:1) Espírito Santo: Guarapari (Parque Estadual Paulo César Vinha) (Bregonci et al., 2010), and 2) Rio de Janeiro: Angra dos Reis (Ilha Grande) (Maia and Oliveira, 2010), Mangaratiba (Ilha de Marambaia) (Rodrigues et al., 2014), Rio de Janeiro (Grumari and Marambaia) (Oliveira and Maia, 2005; Maia and Silva, 2016, respectively), Maricá (Itaipuaçu and Barra de Maricá), Carapebus (Parque Nacional da Restinga de Jurubatiba) (Maia, 2001), and São Francisco de Itabapoana (Estação Ecológica Estadual de Guaxindiba) (Maia and Carvalho-Fernandes, 2016).

Comments. The new species was included in the genus *Cerciplanus* by presenting all diagnostic morphological characters of adults (male and female). The genus was previously known from two species: *C. cipo* Garcia & Urso-Guimarães, 2020 and *C. tocantinensis* Garcia & Urso-Guimarães, 2020. The former induces galls on *Heteropterys* sp. (Malpighiaceae) and the latter on *Ouratea spectabilis* (Mart.) Engl. (Ochnaceae). The known geographic distribution of both species includes only Brazilian Cerrado: Serra do Cipó (State of Minas Gerais) and Araguaína (State of Tocantins), respectively. Therefore, *Cerciplanus maricaensis*, sp.n. is the first species described from the Atlantic Forest and the second associated with the plant genus *Ouratea* Aubl..

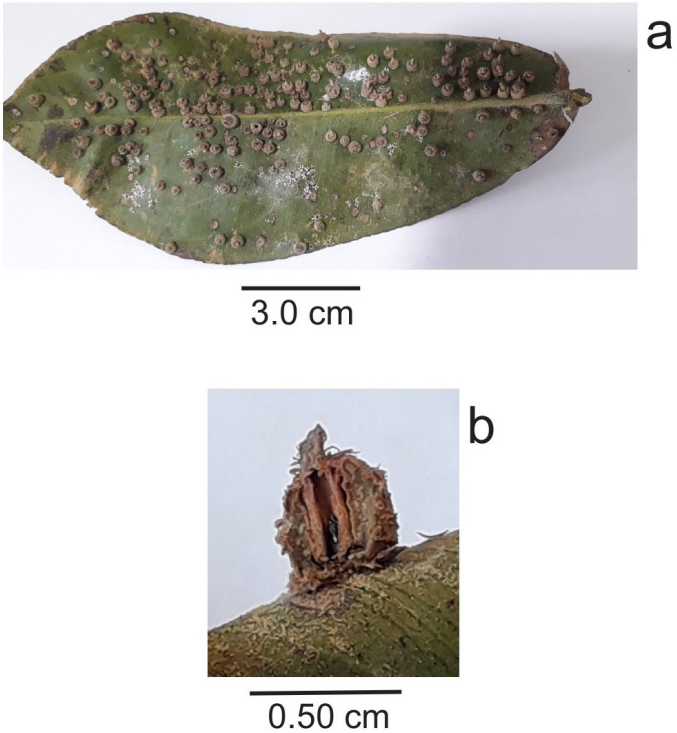


Figure 7. *Cerciplanus maricaensis* **sp. n.**: a) Galled leaf of *Ouratea cuspidata* (A.St.-Hil.) Engl. (Ochnaceae), general aspect; b) Galls on *Ouratea cuspidata* (A.St.-Hil.) Engl. (Ochnaceae), longitudinal section.

All *Cerciplanus* species induce galls on leaves, those of *C. cipo* and *C. tocantinensis* are conical, while the galls of *Cerciplanus maricaensis*, sp.n. are cylindrical with a pointed apical projection.

Cerciplanus maricaensis, sp.n. is easily distinguishable by the male tergites shape (narrowing laterally), female cerci shape (conspicuously wider than long), pupal antennal horns absent, elongate prothoracic spiracles, larval prothoracic spatula with wide teeth, long stalk and inner incision neither flat, nor wide, and asetose terminal papillae not equal in length. Based on larval morphological characters, the genus diagnosis need to be revised, as according to Garcia et al. (2020), larva has spatula with flat and wide inner incision, and asetose terminal papillae of equal size. As larva, pupa, male and female were obtained from gall rearing at laboratory and no other specimens of immature phases or adults of different morphology were obtained, there is no reason to doubt that immature phases and adults were correctly associated.

Key to the known species of *Cerciplanus* Garcia & Urso-Guimarães, 2020 (Cecidomyiidae)

1. Males with tergites rectangular, females with cerci as long as wide or slightly wider than long, pupa with rudimentary antennal horns and reduced prothoracic spiracle 2

1`. Males with tergites narrowing laterally, females with cerci conspicuously wider than long, pupal antennal horns absent, elongate prothoracic spiracle ..... *Cerciplanus maricensis* sp. n.

2. Male with cercal lobes rounded apically (Fig. 9 of Garcia et al., 2020), pupa with antennal horns somewhat developed and prothoracic spiracle slightly projected (Fig. 12 of Garcia et al., 2020) .... *Cerciplanus tocantinensis* Garcia & Urso-Guimarães, 2020

2`. Male with cercal lobes not rounded apically (Fig. 29 of Garcia et al., 2020), pupa with antennal horns rudimentary and prothoracic spiracle not projected (Fig. 30 of Garcia et al., 2020) .... *Cerciplanus cipo* Garcia & Urso-Guimarães, 2020

Acknowledgments

I am grateful to Bruno Gomes (Museu Nacional, scientific iniciation) and Dr. André Guimarães (Universidade Federal do Rio de Janeiro) for field assistance.

Conflicts of interest

The author declare no conflicts of interest.

References

Bregonci, J.M., Polycarpo, P.V., Maia, V.C., 2010. Galhas de insetos do Parque Estadual Paulo César Vinha (Guarapari, ES, Brasil). Biota Neotrop. 10 (1), 265–274.

Carneiro, M.A.A., Branco, C.S.A., Braga, C.E.D., Almada, E.D., Costa, M.B.M., Fernandes, G.W., Maia, V.C., 2009. Are gall midge species (Diptera: Cecidomyiidae) host plant specialists? Rev. Bras. Entomol. 53 (3), 365–378.

Chacon, R.G., Yamamoto, K., 2015. *Ouratea* in lista de espécies da flora do Brasil. Jardim Botânico do Rio de Janeiro. Available in: http://floradobrasil2015.jbrj.gov.br/FB19920. (accessed 19 May 2022).

Gagné, R.J., 1994. The Gall Midges of the Neotropical Region, Cornell University Press, Ithaca, 352 pp.

Garcia, C.A., Scareli-Santos, C., Oliveira, F.G.S., Silva, M.D., Urso-Guimarães, M.V., 2020. A new genus and two new species of Cecidomyiini (Diptera: Cecidomyiidae) from Brazil. Ann. Zool. 70 (2), 263–271.

Maia, V.C., 2001. The gall midges (Diptera, Cecidomyiidae) from three restingas of Rio de Janeiro State, Brazil. Rev. Bras. Zool. 18 (2), 583–629.

Maia, V.C., Carvalho-Fernandes, S.P., 2016. Insect galls of a protected remnant of the Atlantic Forest tableland from Rio de Janeiro State (Brazil). Rev. Bras. Entomol. 60, 40–56.

Maia, V.C., Oliveira, J.C., 2010. Galhas de insetos da Reserva Biológica Estadual da Praia do Sul (Ilha Grande, Angra dos Reis, RJ). Biota Neotrop. 10 (4), 227–237.

Maia, V.C., Silva, L.O., 2016. Insect galls of Restinga de Marambaia (Barra de Guaratiba, Rio de Janeiro, RJ). Braz. J. Biol. 76, 787–795.

Oliveira, J.C., Maia, V.C., 2005. Ocorrência e caracterização de galhas de insetos na restinga de Grumari (Rio de Janeiro, RJ, Brasil). Arq. Mus. Nac. 63 (4), 669–676.

Rodrigues, A.R., Maia, V.C., Couri, M.S., 2014. Insect galls of restinga areas of Ilha da Marambaia, Rio de Janeiro, Brazil. Rev. Bras. Entomol. 58, 173–197.