

The genus *Dasineura* Rondani, 1840 (Diptera, Cecidomyiidae) in Brazil

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Abstract

Dasineura (Diptera, Cecidomyiidae) is the gall midge genus with the highest number of known species (466 throughout the world). Only 39 species have been described from the Neotropics, being 10 from Brazil. Many records of not determined species are found in the literature. Furthermore, many unidentified specimens are deposited in the Cecidomyiidae Collection of the Museu Nacional/UFRJ, which comprises material from several Brazilian biomes. This paper provides these data, presents new records of localities and host plants, and discusses the representativeness of *Dasineura* in Brazil. The results point to the occurrence of 32 species in Brazil and show that the genus is much more diversified than previous knowledge indicates.

Keywords: gall, insect-plant interaction, geographic distribution, new records.

O gênero *Dasineura* Rondani, 1840 (Diptera, Cecidomyiidae) no Brasil

Resumo

Dasineura (Diptera) é o gênero de Cecidomyiidae com o maior número de espécies conhecidas (466 no mundo). Apenas 39 espécies foram descritas da região Neotropical, sendo 10 do Brasil. Muitos registros de espécies não determinadas são encontrados em literatura. Além disso, muitos exemplares não identificados estão depositados na Coleção de Cecidomyiidae do Museu Nacional/UFRJ, que compreende material de diversos biomas brasileiros. Este artigo compila estas informações, apresenta novos registros de localidades e de plantas hospedeiras e discute a representatividade de *Dasineura* no Brasil. Os resultados assinalam a ocorrência de 32 espécies no Brasil e mostram que o gênero é muito mais diversificado do que o conhecimento prévio indica.

Palavras-chave: galha, interação inseto-planta, distribuição geográfica, novos registros.

1. Introduction

Dasineura Rondani, 1840 (Diptera, Cecidomyiidae) is the gall midge genus with the highest number of known species (466 throughout the world). The majority of the species have been described from the Palearctic region. Only 39 species are known from the Neotropics, and among them, 10 occur in Brazil. *Dasineura* is included in the Dasineurini tribe, which comprises seven more genera (Gagné, 2010). It is traditionally characterised by presenting: larva - two-toothed prothoracic spatula, six lateral papillae per side, and eight terminal papillae; adult - antennae with 15 flagellomeres, four-segmented palpi, toothed tarsal claws, and R5 joining C at least slightly before the wing apex; male - flagellomeres with marked necks, gonocoxites with mediobasal lobe that gradually tapers from base to abdominal tergite as long or longer than seventh and tending to divide longitudinally (Gagné, 1994). Nevertheless, *Dasineura* presents a great morphological variation and many species do not fit into the traditional definition. According to Gagné 2010,

Dasineura is a broadly defined polyphyletic genus, which explains such variation.

The aim of this work is to evaluate the diversity of *Dasineura* in Brazil, to determine the plant organs where galls are induced, to give an inventory of the host plant species, to verify the species richness by biomes, and to upgrade geographic distribution of the genus.

2. Material and Methods

The Museu Nacional/UFRJ comprises the unique reference collection of gall midges from Brazil. It includes material from several biomes: Amazonian forest, Atlantic forest, Caatinga, Cerrado and Pantanal. This collection was investigated to find Brazilian specimens of *Dasineura*. A literature survey was also carried out; data until 2010 were extracted from Gagné, 2010; data from 2010 to 2012 were obtained from “Thomson IS database”, using *Dasineura* (title) and Brasil/Brazil (topic) as key words. This literature investigation was conducted in April, 2012.

The information was organised in tables, the Brazilian species of *Dasineura*, host plants, galled organs, galls characterisation (shape, colour, and number of chamber), localities, biomes of occurrence, and references are presented.

3. Results and Discussion

Dasineura is represented by 32 species in Brazil, among them, ten are already known and 22 are not determined. Considering the high host specificity of the gall midges, the last ones probably belong to new species, as they are associated with new records of plants. Based on

this specificity, we can include the undetermined species of *Dasineura* in the following discussion.

Dasineura is associated with 30 plant species and 14 plant families in Brazil. Myrtaceae and Asteraceae comprise the greatest richness of *Dasineura* species (12 and 07, respectively), followed by Malpighiaceae (02 spp.). The other families (Anacardiaceae, Bignoniaceae, Burseraceae, Chrysobalanaceae, Erythroxylaceae, Fabaceae, Melastomataceae, Ochnaceae, Rubiaceae, Solanaceae, and Symplocaceae) are associated each with a single species of *Dasineura* (as shown in Table 1). *Eugenia* L. (Myrtaceae) and *Chromolaena* DC. (Asteraceae) were the most important host plant genera, with six and four species of *Dasineura*, respectively.

Table 1 - Distribution of the number of *Dasineura* species (Diptera, Cecidomyiidae) per host plant families and species in Brazil.

Host plant		Number of <i>Dasineura</i> species (n = 32)
Family (n = 14)	Species (n = 30)	
Anacardiaceae	<i>Tapirira guianensis</i> Aubl.	01
	Total	01
Asteraceae	<i>Chromolaena chaseae</i> (B.L. Tob.) R.M. King & H. Rob.	01
	<i>Chromolaena pedunculosa</i> (Hook. & Arn.) R.M. King & H. Rob.	01
	<i>Chromolaena pungens</i> (Hook. & Arn.) R.M. King & H. Ron.	01
	<i>Chromolaena squalida</i> (DC.) R.M. King & H. Rob.	01
	<i>Emilia sonchifolia</i> (L.) DC.	01
	<i>Gochnatia barrosii</i> Cabrera	01
	<i>Gochnatia pulchra</i> Cabrera	01
Total	07	
Bignoniaceae	<i>Macfadyena unguis-cati</i> (L.) A. H. Gentry	01
	Total	01
Burseraceae	<i>Protium heptaphyllum</i> (Aubl.) Marchand	01
Chrysobalanaceae	<i>Couepia ovalifolia</i> (Schott) Benth.	01
	Total	01
Erythroxylaceae	<i>Erythroxylum ovalifolium</i> Peyr.	01
	Total	01
Fabaceae	<i>Stryphnodendron</i> sp.	01
Malpighiaceae	<i>Byrsonima sericea</i> DC.	01
	<i>Heteropterys nitida</i> DC.	01
	Total	02
Melastomataceae	Not determined	01
	Total	01
Myrtaceae	<i>Eugenia copacabanensis</i> Kiaersk.	02
	<i>Eugenia florida</i> DC.	01
	<i>Eugenia rotundifolia</i> Casar	01
	<i>Eugenia umbelliflora</i> O. Berg and <i>E. rotundifolia</i>	01
	<i>Eugenia uniflora</i> L.	01

Table 1 - cont.

Host plant		Number of <i>Dasineura</i> species (n = 32)
Family (n = 14)	Species (n = 30)	
	<i>Myrcia ovata</i> Cambess.	01
	<i>Myrciaria floribunda</i> (H. West ex Willd.) O. Berg	01
	<i>Neomitranthes obscura</i> (DC.) N. Silveira	01
	<i>Psidium cattleianum</i> Sabine	01
	<i>Siphoneugeia reitzii</i> D. Legrand	01
	Not determined	01
	Total	12
Ochnaceae	<i>Ouratea hexasperma</i> (A. St.-Hil.) Baill.	01
	Total	01
Rubiaceae	<i>Psychotria leiocarpa</i> Cham. & Schldtl.	01
	Total	01
Solanaceae	<i>Capsicum</i> sp.	01
	Total	01
Symplocaceae	<i>Symplocos uniflora</i> (Pohl) Benth.	01
	Total	01

Eugenia copacabanensis Kiaersk, (Myrtaceae) was the unique plant species that comprised more than one species of *Dasineura*. According to Gagné, 2010, *Dasineura* is associated with 65 plant families in the world, being more frequent on Fabaceae, Asteraceae, and Rosaceae. These families comprise 69, 42 and 35 species of *Dasineura*, respectively, while Myrtaceae comprise only seven species. In our study, Asteraceae are also pointed out as an important host plant family, but this is not the case for Fabaceae, and Rosaceae. Another difference is that Myrtaceae are indicated as the most important host.

Most species (94%) were gall-inducers, and only two were free-living. The majority of the species occurred on leaves (43% or 14 spp.), two on buds, three on flower buds, one on a stem, and one on leaves and stem. The plant organs were not specified for 11 species of *Dasineura* (as shown in Table 2). The galls were classified as simple (08 morphotypes) or complex 06 (morphotypes), according to Möhn (1961) (16 morphotypes

cannot be classified due to the lack of information). According to Gagné, 2004 *Dasineura* includes free-living species as well as species that form simple or complex galls.

Many gall shapes were found: globose, ovoid, rosette, marginal roll, discoid, conical and fusiform.

Table 3 - Distribution of the number of *Dasineura* species (Diptera, Cecidomyiidae) per Brazilian biomes.

Brazilian biome	Number of <i>Dasineura</i> species (n = 32)
Atlantic forest	20
Cerrado	10
Cultivated plants	02

Table 4 - Distribution of the number of *Dasineura* species (Diptera, Cecidomyiidae) per Brazilian states.

Brazilian state	Number of <i>Dasineura</i> species
Pernambuco	01
Bahia	01
Distrito Federal	01
Minas Gerais	01
Rio de Janeiro	12
São Paulo	12
Paraná	01
Santa Catarina	01
Rio Grande do Sul	01

Table 2 - Distribution of the number of *Dasineura* species (Diptera, Cecidomyiidae) per plant organs in Brazil.

Plant organ	Number of <i>Dasineura</i> species (n = 32)
Leaves	14
Flower buds	03
Buds	02
Stems	01
Leaves and stem	01
No data	11

Table 5 - Host plants, gall characterisation and geographic distribution of *Dasineura* species (Diptera Cecidomyiidae) in Brazil.

<i>Dasineura</i> species	Host plant	Plant organ	Gall	Locality (State)	Biome	Reference
<i>Dasineura brasiliensis</i> (Tavares, 1922)	<i>Protium heptaphyllum</i>	Leaf	Globose, complex, one-chambered	Bahia	AF (restinga)	Tavares 1922; Gagné 1994, 2004
<i>Dasineura copacabanensis</i> (Maia, 1993)	<i>Eugenia copacabanensis</i>	Bud	Ovoid, complex, one-chambered	RJ (1)	AF (restinga)	Gagné 2004; Maia 1993
<i>Dasineura byrsonimae</i> (Maia, 2010)	<i>Byrsonima sericea</i>	Leaf	Circular, simple, one-chambered	RJ (04 08, 10, 14) ES (07)	AF (restinga)	Maia 2010; Bregonci et al., 2010 Oliveira and Maia 2005
<i>Dasineura couepiae</i> (Maia, 2001)	<i>Couepia ovalifolia</i>	Leaf	Spherical, simple, one-chambered	RJ (01 14) ES (07)	AF (restinga)	Maia 2010ab Gagné 2004 Bregonci et al., 2010
<i>Dasineura gigantea</i> (Ángelo and Maia, 1999)	<i>Psidium cattleianum</i>	Bud	Rosette, complex, 1-16 chambered	Paraná (17, 18) SC (11) SP (2)	AF (OF) (restinga)	Ángelo and Maia 1999 Gagné 2004 Maia et al.
<i>Dasineura globosa</i> (Maia, 1995)	<i>Eugenia rotundifolia</i>	Leaf	Globose, simple, one-chambered	RJ (08, 14)	AF (restinga)	Maia 1995, 2001a; Gagné 2004; Oliveira and Maia 2005
<i>Dasineura marginalis</i> (Maia, 2002)	<i>Eugenia umbelliflora</i> and <i>E. rotundifolia</i>	Leaf	Marginal roll, simple, one-chambered	RJ (01, 14)	AF (restinga)	Maia et al., 2005
<i>Dasineura myrciariae</i> (Maia, 195)	<i>Myrciaria floribunda</i>	Leaf	Marginal roll, simple, one-chambered	RJ (04, 14) ES (07)	AF (restinga)	Maia 1995, 2001b; Gagné 2004 Bregonci et al., 2010
<i>Dasineura ovalifolia</i> (Maia and Fernandes, 2011)	<i>Erythroxylum ovalifolium</i>	Leaf	Conical, simple, one-chambered	RJ (04 08, 14)	AF (restinga)	Maia and Fernandes, 2011; Oliveira and Maia 2005
<i>Dasineura tavaresi</i> (Maia, 1995)	<i>Neomitranthes obscura</i>	Leaf	Marginal roll, simple, one-chambered	RJ (04 14) ES (07)	AF (restinga)	Maia 1995, 2001a; Gagné 2004; Bregonci et al., 2010
<i>Dasineura</i> sp. 1	<i>Capsicum</i> sp.	No data	No data	SP (16)	Cultivated plant	Eicher et al., 2003
<i>Dasineura</i> sp. 2	<i>Chromalaena chaseae</i>	No data	No data	SP (09)	Cerrado	New record
<i>Dasineura</i> sp. 3	<i>Chromalaena pedunculosa</i>	No data	No data	SP (20)	Cerrado	New record
<i>Dasineura</i> sp. 4	<i>Chromalaena pungens</i>	No data	No data	SP (12)	Cerrado	New record
<i>Dasineura</i> sp. 5	<i>Chromalaena squalida</i>	No data	No data	SP (12)	Cerrado	New record
<i>Dasineura</i> sp. 6	<i>Emilia sonchifolia</i>	No data	No data	SP (20)	Cerrado	New record

Table 5 - cont.

<i>Dasineura</i> species	Host plant	Plant organ	Gall	Locality (State)	Biome	Reference
<i>Dasineura</i> sp. 7	<i>Eugenia copacabanensis</i>	Flower bud	Free-living larvae	RJ (14)	AF (restinga)	Maia et al., 2002
<i>Dasineura</i> sp. 8	<i>Eugenia florida</i>	No data	No data	RS (23)	AF (restinga)	New record
<i>Dasineura</i> sp. 9	<i>Eugenia uniflora</i>	No data	No data	RS (15)	Cultivated plant	New record
<i>Dasineura</i> sp. 10	<i>Gochmatia barrosi</i>	No data	No data	SP (20)	Cerrado	New record
<i>Dasineura</i> sp. 11	<i>Gochmatia pulchra</i>	No data	No data	SP (12)	Cerrado	New record
<i>Dasineura</i> sp. 12	<i>Heteropterys nitida</i>	Flower bud	(free-living larvae)	RJ (14)	AF (restinga)	New record
<i>Dasineura</i> sp. 13	<i>Macfadyena unguis-cati</i>	Stem	Spherical	RS (13)	AF	New record
<i>Dasineura</i> sp. 14	Melastomataceae	Leaf	Circular, simple, one-chambered	RJ (14)	AF (restinga)	New record
<i>Dasineura</i> sp. 15	<i>Myrcia ovata</i>	Leaf	Spherical, complex, one-chambered	RJ (14)	AF (restinga)	Maia et al., 2002
<i>Dasineura</i> sp. 16	Myrtaceae	Çeaf	No data	PE (05)	AF (OF)	New record
<i>Dasineura</i> sp. 17	<i>Ouratea hexasperma</i>	Flower bud	No data	DF (03)	Cerrado	New record
<i>Dasineura</i> sp. 18	<i>Psychotria leiocarpa</i>	Leaf	Spherical, sulcated, complex, one-chambered	SP (02)	AF (restinga)	Maia et al., 2008
<i>Dasineura</i> sp. 19	<i>Siphonoegenia reitzii</i>	No data	No data	RS (21)	AF (OF)	New record
<i>Dasineura</i> sp. 20	<i>Stryphnodendron</i> sp.	Leaf	No data	MG (22)	Cerrado (rupestrian fields)	New record
<i>Dasineura</i> sp. 21	<i>Symplocos uniflora</i>	Leaves and stem	Fusiform	RS (06)	AF (OF)	New record
<i>Dasineura</i> sp. 22	<i>Tapirira guianensis</i>	Leaves	Conical, complex	SP (19)	Cerrado	Urso-Guimarães and Scareli-Santos, 2006

AF - Atlantic Forest, DF - Distrito Federal, ES - Espírito Santo, MG - Minas Gerais, OF - Ombrophylla forest, PE - Pernambuco, RJ - Rio de Janeiro, RS - Rio Grande do Sul, SP - São Paulo.
 01. Arraial do Cabo, 02. Bertioga, 03. Brasília, 04. Carapebus, 05. Dois Irmãos (Recife), 06. Flona, 07. Guarapari, 08. Grumari (Rio de Janeiro), 09. Ibaté, 10. Ilha Grande (Angra dos Reis), 11. Itapoá, 12. Itirapina, 13. Maquiné, 14. Maricá, 15. Pelotas, 16. Piracicaba, 17. Piraquara, 18. Pontal do Paraná, 19. Santa Rita do Passa Quatro, 20. São Carlos, 21. São Francisco de Paula, 22. Tiradentes, 23. Vião.

Twelve gall morphotypes were one-chambered, a single morphotype presented from one to 16 chambers. All chambers were occupied by a single galling larva. There is no data for the other galls.

The genus was found in two biomes, Atlantic forest (20 spp.) and cerrado (10 spp.). Two species were found in cultivated plants (02 spp.) (as shown in Table 3). The species from Atlantic forest were found mainly in restinga areas (16 spp., being 15 exclusive).

The species were collected in Pernambuco (01 sp.), Bahia (01 sp.), Distrito Federal (01 sp.), Minas Gerais (01), Espírito Santo (04), Rio de Janeiro (12 spp.), São Paulo (11 spp.), Paraná (01 sp.), Santa Catarina (01 sp.), and Rio Grande do Sul (05 spp.) (as shown in Table 4). The majority of the species were collected in Rio de Janeiro and São Paulo, the best surveyed states. Although Minas Gerais is a well investigated area, it comprises only one *Dasineura* species. The other states have been less surveyed. The records for Recife (Pernambuco), Brasília (Distrito Federal), Itirapina, Ibaté, São Carlos (São Paulo), Tiradentes (Minas Gerais), Flona, Maquiné, Pelotas, São Francisco de Paula and Viamão (Rio Grande do Sul) are new.

The following plants are recorded for the first time as host plants of *Dasineura* species: *Heteropterys nitida* DC. (Malpighiaceae), *Ouratea hexasperma* (A. St.-Hil.) Baill. (Ochnaceae), *Macfadyena ugüis-cati cati* (L.) A. H. Gentry (Bignoniaceae), *Stryphnodendron* sp. (Fabaceae), *Siphoneugenia reitzii* D. Legrand (Myrtaceae), *Symplocos uniflora* (Pohl) Benth. (Symplocaceae), *Chromolaena chaseae* (B.L. Rob. R.M. King & H. Rob. (Asteraceae), *Chromolaena pedunculosa* (Hook. & Arn.) R.M. King & H. Rob. (Asteraceae), *Chromolaena pungens* (Hook. & Arn.) R.M. King & H. Rob. (Asteraceae), *Chromolaena squalid* (DC.) R.M. King & H. Rob. (Asteraceae), and *Emilia sonchifolia* (L.) DC. (Asteraceae).

Table 5 summarises data of geographic distribution of the species and presents the attacked plant organ, as well as a brief gall characterisation (based on shape and number of internal chamber).

Dasineura couepiae Maia, 2001, *D. gigantea* Maia, 1995, *D. myrciariae* Maia, 1995, *D. byrsonimae* Maia, 2010, and *D. ovalifoliae* Maia and Fernandes, 2011 are described as larva, pupa, male, and female. The larvae of *D. globosa* and *D. marginalis*, the pupa of *D. copacabanensis*, the male of *D. tavaresi*, and the pupa and male of *D. brasiliensis* are still unknown. The morphology of the last species is partially known, so new collections of galls and gall maker rearing are necessary to complete the species characterisation.

As *Dasineura* is polyphyletic, phylogenetic studies are necessary to define the limits of the genus. Gagné, 2010 suggested that Dasineurini on Fabaceae and Brassicaceae can be separate monophyletic groups, and added that “no groupings within Dasineurini can be satisfactory until the tribe is revised in a comprehensive way”.

4. Conclusions

Dasineura is poorly known in Brazil, where it includes 22 undescribed species and four partially described ones. Data on attacked plant organs is lacking for 11 species.

In Brazil, the most important host plant families are Myrtaceae and Asteraceae. The importance of the latter was pointed out by Gagné, 2010, but the former is indicated thus for the first time.

The records of free-living and galling species confirm the known feeding habits of the larva.

The majority of the species was recorded in two biomes: Atlantic forest and cerrado. Little information is available for the other Brazilian biomes. The best investigated localities are Rio de Janeiro and São Paulo. Few records are known for other Brazilian states. So it is necessary to investigate other localities and biomes to understand the geographic distribution of *Dasineura* spp. as well as the diversity of each biome.

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