

## Orchid bees (Hymenoptera: Apidae) of Ilha de Maracá, Roraima, northern Brazil

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### Abstract

Male orchid bees attracted to cineole and vanillin during six days were collected in two sites at different distances from the forest edge in the Ilha de Maracá, Roraima state, northern Brazil. Ninety individuals belonging to eleven species were collected. Considering both sites together, *Eufriesea superba* (Hoffmannsegg) was the most common species (twice as abundant at the edge) followed by *Euglossa chalybeata* Friese (three times as abundant in the interior). *Eulaema cingulata* (Fabricius), the fourth-commonest species, was collected only at the border. Cineole was the most attractive bait in the interior of the forest, whereas vanillin attracted the largest number of specimens at the edge of the forest. While cineole was equally attractive both in the interior and at the edge of the forest, vanillin attracted three times as much bees at the edge of the forest than in its interior. When compared to other studies carried out in similar periods, this study suggests that abundance and richness of orchid bees at this site may be high.

**Keywords:** Insecta, orchid bees, *Euglossina*, Fauna, Amazonia, Roraima.

### Introduction

*Euglossina* is a strictly Neotropical group of bees occurring from northern Argentina (Pearson & Dressler, 1985) to southern United States (Minckley & Reyes, 1996). Their males are remarkable for collecting aromatic compounds at flowers and storing them for unknown functions in special organs in their posterior tibiae (Dodson et al., 1969). They are important pollinators of several plant species in the Orchidaceae, Gesneriaceae, Araceae, Euphorbiaceae, and Solanaceae (Williams, 1982). The discovery of the aromatic compounds attractive to males and their artificial synthesis increased the studies on composition and seasonality of the local faunas of euglossine bees (e.g. Morato et al., 1992).

Samplings of orchid bees have revealed a higher richness and abundance of these bees in Central America and in the Amazon Basin (reviewed by Nemésio, 2004). However, all the published data on the orchid bee fauna in the Brazilian Amazon Forest (Powell & Powell, 1987; Becker et al., 1991; Morato et al., 1992; Oliveira & Campos, 1996) come from a single area, ca. 90 km north from Manaus. From the biogeographic standpoint, a better understanding of the distribution of orchid bee species is desirable, and no list of species of northern Brazilian Amazonia is available.

### Material and methods

#### Study Area

The present study was carried out at the Ilha de Maracá (03° – 04° N, 61° – 62° W), which is a riverline island of some 92,000 ha, formed by the bifurcation of the Rio Uraricoera and located in the municipality of Boa Vista, state of Roraima, northern Brazil. The following general comments on the island were extracted from Flint Jr. (1991):

Maracá is 60 km long and up to 25 km wide, and located approximately 110 km west of Boa Vista. Most of the island is fairly flat and about 100 m in elevation above sea level, but in the center and west some low peaks composed of metamorphic rock reach 200 m - 300 m. The soils are, in general, weathered acidic residues on the older surfaces and younger alluvial soils on the most recent superficial deposits.

The climate is tropical seasonal with a mean annual temperature of about 26° C (ranging from 14° C to 43° C) and an annual precipitation of 1750 mm - 2250 mm. The hottest months are May to July, with a dry season from November to March; however, some of the heaviest rainstorms may occur in the dry season.

The island is near the junction of the Amazonian Forest and the dry savanna. Most of the island is in Amazonian Forest, which runs unbroken westwardly into southern Venezuela and to the foothills of the Andes, although on the island a fringing form of the forest is typical. The savanna, which becomes more extensive to the south and east of Roraima, only occurs in a few small patches on the eastern end of the island.

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### Sampling

Two aromatic compounds were used to attract male orchid bees: 1,8-cineole and vanillin. Two sites were chosen for collecting bees: one in the interior of the forest and the other one close to its edge. The chemical baits were imbibed in cotton waddings inside plastic traps modified according to Campos et al. (1989). The traps hanged from branches at about 1.5 m above the soil surface and distant at least 2.0 m from each other. From 11 to 19 September 1996, baits were installed for three days in each site, between 08:00-16:00h. Bees attracted to these lures were killed with ethyl acetate and pinned. The substance to which each bee was attracted and the local where it was collected were recorded. The specimens mentioned here are deposited in the Museu de Entomologia of the Universidade Federal de Viçosa and in the Entomological Collection of the Taxonomic Collections of the Universidade Federal de Minas Gerais. Bees were identified with the aid of taxonomic keys and by comparison with specimens previously identified by specialists.

### Results

Ninety male orchid bees belonging to twelve species were collected, 35 in the interior of the forest and 55 at the edge (Tab. 1). Considering both sites together, *Eufriesea superba* was the most common species ( $n = 19$ ), followed by *Euglossa chalybeata* ( $n = 16$ ; this was the dominant species in the interior of the forest). Eleven species were caught at the edge and nine in the interior of the forest. *Eg. modestior*, *Eg. townsendi*, and *El. cingulata* were only recorded at the edge. Cineole was the most attractive bait in the interior of the forest and vanillin attracted more individuals at the edge (Tab. 1). However, while cineole attracted as much bees in the interior as at the forest edge, vanillin attracted three times as much bees at the edge.

### Discussion

#### Richness and abundance

The results suggest a high diversity of orchid bees in the Ilha de Maracá, since only two baits were used and some baits which usually attract several individuals and species in the Amazon Basin, such as benzyl acetate and methyl salicylate, were not employed in the present study. Moreover, baited traps are less efficient than capture with insect nets, since many bees attracted to the baits do not enter the traps and some of those that do enter end up escaping (Nemésio & Morato, 2004). It should be stressed that the present study was carried out in a single month and full comparisons with samplings over longer periods are not appropriate. However, seasonal data are available for one study in the Amazon Forest (Oliveira, 1999). In this study, two sites were sampled twice a month, with eight different aromatic baits. In each site, six sets of eight traps were established, three ones in the canopy and the other three in the understory. In September 1989, in one of the sites, 154 individuals belonging to 17 species were collected, whereas 109 specimens of 20 species were caught in the other site. Compared to those data, the result presented here is remarkable, since a considerable number of specimens and species were recorded with a much smaller sampling effort, suggesting not only a high richness, but also a high abundance of orchid bees in Ilha de Maracá.

#### Edge $\times$ interior of the forest

Contrary to Morato's (1994) findings, in the present study the edge presented the highest diversity and abundance. Morato (1994) collected in three distinct sites in the Brazilian state of Amazonas: the first one outside the forest, the second one at the edge, and the third one 50 m inside the forest. He suggested that

**Table 1** - Specimens of Euglossina collected in two baits at the edge and in the interior of the forest in Ilha de Maracá, Roraima state, Brazil, in September 1996.

SPECIES	Interior			Edge			TOTAL
	Cineole	Vanillin	Subtotal	Cineole	Vanillin	Subtotal	
<i>Eufriesea superba</i> (Hoffmannsegg, 1817)	01	06	07	01	11	12	<b>19</b>
<i>Euglossa allosticta</i> Moure, 1969	01	–	01	01	–	01	<b>02</b>
<i>Euglossa augaspis</i> Dressler, 1982	01	03	04	–	06	06	<b>10</b>
<i>Eg. chalybeata</i> Friese, 1925	11	01	12	04	–	04	<b>16</b>
<i>Eg. modestior</i> Dressler, 1982	–	–	–	03	–	03	<b>03</b>
<i>Eg. townsendi</i> Cockerell, 1904	–	–	–	–	01	01	<b>01</b>
<i>Euglossa</i> sp.	01	–	01	–	–	–	<b>01</b>
<i>Eulaema cingulata</i> (Fabricius, 1804)	–	–	–	–	10	10	<b>10</b>
<i>El. meriana</i> (Olivier, 1789)	04	01	05	07	02	09	<b>14</b>
<i>El. nigrita</i> Lepeletier, 1841	01	–	01	01	02	03	<b>04</b>
<i>Exaerete smaragdina</i> (Guérin-Méneville, 1845)	03	–	03	04	–	04	<b>07</b>
<i>Ex. frontalis</i> (Guérin-Méneville, 1845)	01	–	01	02	–	02	<b>03</b>
<b>TOTAL</b>	<b>24</b>	<b>11</b>	<b>35</b>	<b>23</b>	<b>32</b>	<b>55</b>	<b>90</b>

a gradient of tolerance to open or disturbed habitats among orchid bees could lead to his findings, meaning that most Amazonian species should be considered less tolerant to open habitats (explaining, thus, the highest diversity in the interior of the forest). In another work carried out in the Atlantic Forest domain (Parque Estadual do Rio Doce, southeastern Brazil) (Nemésio, 2004), however, in which several sites at different distances from the edge (0 m, 50 m, 400 m, 500 m, 2,000 m, and 4,000 m inside the forest) were sampled, it was found that the edge presented the highest diversity (although not the highest abundance, which was found at 2,000 m from the edge). Then, presently, there are contradictory data available on the literature and different explanations for these. It was suggested (Nemésio, 2004) that the edge at Parque Estadual do Rio Doce presented the highest diversity since species typical of the interior of the forest could be collected there (although in low frequencies), as well as species highly tolerant to open and/or disturbed areas. It is possible that this same phenomenon happened in the Ilha de Maracá.

#### Biogeography and distribution

In biogeographic terms, the presence of *Euglossa allosticta* represents the first record of this species in northern Brazilian Amazonia. Until recently, it was known only from Central America and northern Colombia (see Nemésio, 2004), but Nemésio & Morato (2004) recorded it also for the state of Acre, southwestern Brazilian Amazonia. *Eufriesea superba* and *Euglossa augaspis* are species common to both the Amazon Basin and the Atlantic Forest. *Euglossa chalybeata*, *Eg. townsendi*, *Eulaema cingulata*, *El. nigrita*, *Exaerete frontalis* and *Ex. smaragdina* are widely distributed in the Neotropics. It is interesting to note that *El. cingulata* was only collected at the forest edge (n = 10), contrasting with Oliveira's (2000) suggestion that this species is typical of environments in the interior of the forest. *Eg. chalybeata*, the dominant species in the interior of the forest in the present study, is regarded by Roubik (2004) as the most common species of the subgenus *Glossura* in the Amazon Basin. It is one of the dominant species both in the Brazilian Amazonia (e. g. Oliveira, 1999) and in the Peruvian Amazonia (Pearson & Dressler, 1987). *Eg. chalybeata* was also a common species in Linhares, state of Espírito Santo, deep inside the Atlantic Forest domain (Bonilla-Gomez, 1999). *Euglossa modestior* is the only species recorded in this study, which has been treated as endemic to the Amazon Basin (Nemésio, 2004).

A systematic, long-term survey of the orchid bee fauna of this area would be important, due to the few available information on the composition of the orchid bee fauna of northern Amazonia.

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