EUGLOSSINI BEES (HYMENOPTERA: APIDAE) IN SANTA RITA, PANAMA

TECNOCIENCIA

ABEJAS EUGLOSSINI (HYMENOPTERA: APIDAE) EN SANTA RITA, PANAMÁ

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Abstract: Santa Rita is a town located in the province of Colón, Panama. This area is threatened by various human activities that not only threaten the landscape and its vegetation, but also the integrity of the pollinators that live there. Considering this, we collected samples of bees from the Euglossini tribe in a fragmented area of Santa Rita, to get an idea of the population status in which these bees could be found at the site. Sampling was carried out one day during the dry season and one day in the rainy season of 2017. We collected 179 males belonging to 20 species, belonging to the three genera *Euglossa* (14 spp.), *Eufriesea*(4 spp.), and *Eulaema* (3 spp.). We know that these results are not enough to determine if Euglossini bee populations are stable or have decreased, but they give us a basis on the abundance and richness of the recorded species.

Keywords: Abundance, Colón, conservation, fragmented ecosystems, euglossines.

Resumen: Santa Rita es un poblado ubicado en la provincia de Colón, Panamá. Esta zona está amenazada por diversas actividades humanas que no solo atentan contra el paisaje y su vegetación, sino también con la integridad de los polinizadores que habitan allí. Considerando esto, colectamos muestras de abejas de la tribu Euglossini en un área fragmentada de Santa Rita, con el objetivo de hacernos una idea del estatus poblacional en el que podrían encontrarse estas abejas en el sitio. El muestreo se realizó un día durante la época seca y un día en la época lluviosa del 2017. Colectamos 179 machos pertenecientes a 20 especies, pertenecientes a los tres géneros *Euglossa*(14 spp.), *Eufriesea* (4 spp.) y *Eulaema* (3 spp.). Sabemos que estos resultados no son suficientes para determinar si las poblaciones de abejas Euglossini se encuentran estables o han disminuido, pero nos da una base sobre la abundancia y riqueza de las especies registradas.

Palabras clave: Abundancia, Colón, conservación, ecosistemas fragmentados, euglossinos.

INTRODUCTION

Euglossine bees are distributed exclusively in the Neotropical region and these bees play a critical role in the stability of several plant families since they offer pollination services to a wide range of plants, especially orchid species through a wide range of distance (Dressler 1968; Williams & Dodson 1972; Dressler 1982;

Silva & Rebêlo 2002; Roubik & Hanson 2004; Ramírez et al. 2002; Parra-H et al. 2016). These bees have a high affinity to humid and drier forests (Dressler 1982; Silveira et al. 2002; Roubik & Hanson 2004; Santos & Añino 2016). Euglossine bees have been used to evaluate environment quality according to their distribution, susceptibility to disturbance, and resource quality (Pemberton & Wheeler 2006; Hedström et al. 2006; Parra-H & Nates- Parra 2007; Meléndez et al. 2015; Añino et al. 2019).

Studies have shown a decline of pollinators and flying insect biomass around the world due to deforestation, pollution, use of pesticides, fertilizers, herbicides, and climate change (Humphries et al. 1995;

Vanbergen 2013; Goulson et al. 2015; Holland et al. 2015; Nemésio et al. 2016; Dudley et al. 2017; Hallmann et al. 2017; Habel et al. 2019; Vega-Hidalgo et al. 2020). Habitat fragmentation has been recognized as one of the main causes of biodiversity loss (Fahrig 2003; Biesmeijer et al. 2006; Potts et al. 2010; Krauss et al. 2010; Lebuhn et al. 2012; Haddad et al. 2015; Ollerton 2017; Sánchez & Wyckhuys 2019; Van Klink et al. 2020). Bee population declines are occurring even in protected areas (Hallmann et al. 2017; Rada et al. 2019; Vega-Hidalgo et al. 2020). The slightest alteration to plant abundance or phenology due to anthropogenic changes and trends in biodiversity decline may therefore have severe consequences for insect populations (Sánchez & Wyckhuys 2019; Basset & Lamarre 2019). Euglossini bees' population are declining due to environmental impacts caused by human activities and competition (Hedström et al. 2006; Brosi 2009; Ramalho et al. 2009; Nemésio & Silvera 2010; Potts et al. 2010; Willmer 2012; Vega- Hidalgo et al. 2020). Contrary, Roubik et al. 2021 reported stable populations in a long-term monitoring in Panama.

Importar imagenGiven the importance of orchid bees, the lack of recent information on the region in the past 30 years, continuous development of human activities, deforestation, and current bees and pollinators declines; here we provide recent data about the abundance of Euglossine bees, showing preliminary data of two samplings. Considering previous records on Santa Rita Colon-Panama by Ricklefs et al. (1969) and Roubik & Ackerman (1987). Few flora studies have been carried out in Colón and no formal study have been performed in Santa Rita, where it is believed there is high endemism (Lewis 1971; Ortiz et al. 2019).

MATERIAL AND METHODS

Site selection

Considering the two previous censuses performed on the area, we aimed to detect evidence of changes in euglossine bees' communities in Santa Rita. The selected area is a fragmented habitat near forest patches, where trees approximately reached a height of less than 8 meters. It is in Colón, Republic of Panama, (9°20'N, 79° 46'W) Figure 1. It is part of the Panama Canal, in the sub-basin of Gatun River (206 m elevation). The

community is located between the protected areas of Chagres and Soberanía National Parks, which are part of the Mesoamerican Biological Corridor and denotes the convergence of biodiversity points in Mesoamerica and Chocó-Darién and forests of the Panama Canal Watershed that contribute to its proper functioning (Ibáñez et al. 2002; Moyer & Shebell 2014).

FIGURE 1.
Location of the study area (Santa Rita). Google Earth 2022.

Collection

Orchid bee males were collected using an entomological net. Three baits were used: cineole, methyl salicylate, and vanillin. The soaked cotton balls laden baits were hung at about 2 m above the ground and 5 m from each other as described in Nemésio & Morato (2006). These synthetic products mimic natural components found mainly in orchid flowers and are collected by male Euglossini bees to attract females during courtship (Dressler 1982; Eltz et al. 2005). Samplings were done twice, one day each season: the first one by the end of the dry season and the other during the rainy season, 8 April 2017, and 21 October 2017, respectively. Both collections were done from 8:00 a.m. to 12:00 p.m.

Captured bees were pinned, identified, and deposited at the Museo de Invertebrados G. B. Fairchild-Universidad de Panamá (MIUP) in Panamá, Panamá. Taxonomic characterization was based on Roubik & Hanson (2004) key.

RESULTS AND DISCUSSION

We collected a total of 179 male Euglossini bees belonging to 20 species, and three genera: 108 specimens during the dry season and 71 during the rainy season (table 1). Euglossa (14 spp.), Eufriesea (4 spp.), and Eulaema (3 spp.), which represent 30% of 70 species reported for Panama. During each season 13 species were recorded (Table 1). Euglossa imperialis Cockerell 1922 was the most abundant species, followed by E. despecta Moure 1968, E. deceptrix Moure 1968, E. mixta Friese 1899, and Eulaema nigrita Lepeletier 1841. Five species were collected during both seasons: E. bursigera Moure 1970, E. championi Cheeseman 1929, E. imperialis Cockerell 1922, E. mixta Friese 1899 and E. nigrita Lepeletier 1841 (Table 1). During both collections the methyl salicylate bait attracted most bees (58), followed by cineole (33) and vanillin (17). E. deceptrix was the only species attracted to all three scents. The species that registered the most individuals in April were Euglossa despecta Moure, 1968 (21), E. imperialis, and (19) and E. deceptrix (9); those of April were E. imperialis (26), E. cognata Moure 1970 (6), and E. sapphirina Moure 1968 (6).

This study was not as extensive, nor carried out in a protected area, as that of Roubik (2001) in Parque Soberanía, which reported that the most common of the set of species studied gradually declined. Roubik & Ackerman (1987) censused in February 1979, October 1979, March 1980 and February 1986, the same day each month and counted 46 species in Santa Rita Ridge, averaging 22 species per month (ranged 13-31) approaching the baits. We collected 13 species on both days, which is under their average, but still the minimum of their record. Ricklefs et al. (1969), reported having collected 22 species in Santa Rita Ridge attracting bees with 1,8-cineole, which is the most common attractant of orchid bees. It should be considered that factors such as the seasonality of the species and dispersion of the attractants employed could have influenced the results (Janzen et al. 1982; Pearson & Dressler 1985;

Nemésio & Silveira 2004). It is necessary to conduct long-term studies to demonstrate trends.

Most of the species collected were from the genus Euglossa, which is the most diverse in the tribe (Roubik & Hanson 2004). The diversity and abundance of these bees could be determined by multiple factors such as climate, vegetation, and competition with similar species (Rosenzweig 1995). Even with small collection efforts, E. imperialis seems to be the most abundant species (Roubik & Ackerman 1987; Roubik 2001; Nemésio & Silveira 2007; Rasmussen 2009;Santos & Añino 2016). In general, during the wet season the species abundance decreased, which could be related to flower scarcity, the age distribution of male Euglossini community, and increase of bee numbers early in the year which may provide a flux of young bees with general chemical needs or another environmental factors (Ackerman 1983, 1985; Roubik 2001).

Ricklefs et al. (1969) mentioned 18 species of the genus Euglossa; 17 of these species were also mentioned by Roubik & Ackerman (1987), except for E. villosa Moure, 1968. E. deceptrix and E. maculilabris Moure, 1968 that can be found in the area. As we only collected one day in April and another in October, we did not record all species mentioned by Roubik & Ackerman (1987), but here we add Euglossa obtusa, Eulaema marcii and Eufriesea rufocauda. This may suggest changes to these bees' community composition. Several human activities are carried out at the area and its forests have been deforested for many years (Roubik & Ackerman 1987). Regardless this area is fragmented, Euglossini bees continue around in search of resources, and it seems that these bees inhabit disturbed areas when the land-use change caused by humans is not extreme, as can be deduced in Brosi et al. (2008) and Galgani-Barraza et al. (2019).

TABLE 1.
Abundance of Euglossini bees attracted by different fragrances in Santa Rita Arriba, Colon, Panama. C= cineole, SM= methyl salicylate, VA= vanillin

Species	Fragrances	Dry season	Rainy season	Total, collected
Eufriesea lucifera Kimsey, 1977	VA		1	1
Eufriesea pulchra Smith, 1854	SM	3	4	7
Eufriesea rufocauda Kimsey, 1977	SM; VA	2		2
Euglossa allosticta Moure 1969	C		1	1
Euglossa bursigera Moure, 1970	C; VA	1	4	5
Euglossa championi Cheesman, 1929	SM; VA	6	1	7
Euglossa cognata Moure, 1970	SM		6	6
Euglossa crassipunctata Moure, 1968	SM		2	2
Euglossa deceptrix Moure, 1968	C; SM; VA	16		16
Euglossa despecta Moure, 1968	C; SM	24		24
Euglossa imperialis Cockerell 1922	C; SM	23	29	52
Euglossa mixta Friese, 1899	SM	15	4	19
Euglossa nigrosignata Moure, 1969	SM	1		1
Euglossa obtusa Dressler 1978	VA	1		1
Euglossa sapphirina Moure, 1968	SM; VA		7	7
Euglossa tridentata Moure, 1970	C; VA		5	5
Euglossa variabilis Dressler, 1982	C		2	2
Eulaema marcii Nemésio, 2009	VA	1		1
Eulaema nigrita Lepeletier 1841	C; VA	11	5	16
Eulaema meriana Oliver, 1789	SM	4		4
Abundance		108	71	179

CONCLUSION

Unlike previous studies conducted on the area, we collected 13 Euglossini bee species on both days; it is less than previous averages, possibly due to our small collection effort. This is concerning, but not enough to determine if these bee populations are stable or have declined, nor the possible causes. We know that these collections are not enough to reach any conclusion, but we believe that these preliminary results are locally interesting, so long-term studies that include ecological variables before and during long sampling collections are necessary to understand the trends and community composition that allow comparable statistical analyzes. Protection of insect biodiversity and ecosystem are reasons to conserve small ecosystem fragments. We

encourage researchers to perform live sightings of bees and studies on the flora and vegetation of Santa Rita.

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