Biodiversity of parasitoids (Hymenoptera: Figitidae: Eucoilinae) collected in Goiás, Brazil

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Abstract

Studies on the diversity of parasitic Hymenoptera (biomarkers) constitute a tool for studying the important degree of degradation and the impacts borne by natural ecosystems. The objective of this study was to verify the diversity of parasitoids (Hymenoptera: Figitidae: Eucoilinae) collected in an area of forest and pastures of Goiás, Brazil. The samples of insects were obtained using yellow buckets. In total, 97 specimens of the Figitidae family were collected in the forest and in the pastures. With 55.3% collected in the forest and 44.7% in the pastures. The diversity index (D) for the parasitoid species was similar in pastures (D = 0.33) and in the forest (D = 0.38). In the present scenario of agriculture, the destruction and fragmentation of natural habitats caused by the expansion of cultivated areas constitutes the main causes of biodiversity change.

Keywords: Arthropoda, Insecta, diversity, natural enemy, biological control.

1. Introduction
Parasitoids are favored because of their autonomy, their ability to disperse and locate their host, and their ability to have stable and specific interactions with the host, thus making them an interesting biological model (Santos and Perez-Maluf 2012).

Surveys of arthropod fauna in currently preserved areas are of great importance and may provide parameters for comparison between areas modified by human actions (Scatolini and Penteado-Dias 2003).

Studies on the diversity of parasitic Hymenoptera (biomarkers) constitute a tool for studying the important degree of degradation and the impacts borne by natural ecosystems (Scatolini, 1997).

The objective of this study was to verify the diversity of parasitoids (Hymenoptera: Figitidae: Eucoilinae) collected in an area of forest and pastures of Goiás, Brazil.

2. Materials and Methods

Sampling was carried out every week, with 10 traps formed by yellow bowls that were placed at ground level and allocated at random, in order to sample areas of native vegetation adjacent to pasture. Five bowls were placed in the pastures and five in the forest. These cylindrical yellow plastic bowls were approximately 30 cm in diameter and 12 cm in height, and a mixture of 2 liters of water, 2 ml of detergent and 2 ml of formaldehyde was placed in each of them. Flasks were retrieved every 7 days and the trapped specimens were separated, using a fine mesh sieve, and stored in 70% ethanol until identification (Marchiori and Penteado-Dias, 2002).

To study the diversity in the samples, we used the index described by Southwood (1978), for both areas, in accordance with the formula: \( D = \frac{N_{max}}{N} \), where \( N \) is the total number of individuals and \( N_{max} \) is the number of individuals of the most abundant species.

3. Results and Discussion

In total, 97 specimens of the Figitidae family were collected in the forest and in the pastures. With 55.3% collected in the forest and 44.7% in the pastures (Table 1).

Eucoilinae is a subfamily that, although cosmopolitan, is little known and contains about 1000 species and 70 genera scattered around the world. They are primary endoparasitoids of coelobionts of dipterous larvae, including phytophagous, and are
found in large numbers around manures, decomposing carcasses and sites rich in dipterans in the Neotropical region (Díaz and Gallardo 1996).

The greater number of individuals were collected in the forest area that are important local sources of parasitoids that are natural enemies of the insects, many of them of economic importance (Marchiori et al. 1998).

The most frequent specie in the two study sites was *Zaeucoila* sp. with 53.6% in the forest and 46.4% in the pastures. *Zaeucoila* sp. probably behaves as a parasitoid of Agromyzidae (Diptera) (Díaz and Gallardo 1996).

The diversity index (D) for the parasitoid species was similar in pastures (D = 0.33) and in the forest (D = 0.38), possibly the proximity of the pastures to a natural vegetation fragment was characterized by a great diversity of host plants, and an ability to accommodate a wider range of natural enemies.

The diversity of Eucoilinae species was higher in the pastures. Probably due to the presence of hosts in the feces of the animals.

The estimated Shannon diversity in an area of forest was slightly higher than in a coffee plantation (2.08 and 1.96, respectively), in a study by Santos and Perez-Maluf (2012) on the diversity of parasitic Hymenoptera in areas of forest and vine coffee plantations in Vitória da Conquista, Bahia. In the present scenario of agriculture, the destruction and fragmentation of natural habitats caused by the expansion of cultivated areas constitutes the main causes of biodiversity change (Santos and Perez-Maluf 2012).

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| Taxonomic Group | Forest | Pasture | Total |
|-----------------|--------|---------|-------|
| *Hymenoptera*   |        |         |       |
| Figitidae       |        |         |       |
| *Aganaspis pelleranoi* | 00     | 02     | 02    |
| Agrostocynips sp. | 00     | 01     | 01    |
| Dettmeria sp.    | 00     | 03     | 03    |
| Dieucolia sp.    | 01     | 01     | 02    |
| Eleidetona nigra| 05     | 10     | 15    |
| Neralisia splendens | 00   | 01     | 01    |
| Odontoeucola sp. | 09     | 01     | 10    |
| Paragranaspis egeria | 05  | 05     | 10    |
| Triplastia atrocovalis | 08   | 06     | 14    |
| Triplastia covalis | 04    | 00     | 04    |
| Zauucola sp.     | 20     | 15     | 35    |
| Total            | 52     | 45     | 97    |

Table 1. Parasitoids (Hymenoptera: Figitidae: Encolinae) collected in forested and pastures in the State of Goias, Brazil