Trigona branneri (Hymenoptera: Apidae) as a Collector of Honeydew from *Aethalion reticulatum* (Hemiptera: Aethalionidae) on *Bauhinia forficata* (Fabaceae: Caesalpinoideae) in a Brazilian Savanna

by

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ABSTRACT

The presence of aggregates of *A. reticulatum* on *Bauhinia* has been reported, but the insects were mainly attended by ants of the genus *Camponotus*, and stingless bees were not regularly recorded in aggregations. We observed a colony of thetreehopper *A. reticulatum* and stingless bees, *Trigona branneri*, interacting on *Bauhinia forficata* (Fabaceae). Agonistic behavior was observed in bees when another individual of the same species or ants approached. Although this is not proof that the interaction between stingless bees and treehoppers is mutualistic, the interactions between ants and this insect are common and mutualistic. Thus, if *T. branneri* effectively provides protection for the aphids, a new mutualism can be the focus of future research to determine if the bee-aphid interactions have same ecological functions as the ant-aphid interactions.

Key words: Ant-aphid interaction, *Camponotus*, trophobiosis, stingless bees, hemipterans

INTRODUCTION

The interactions between species that coexist in time and space have an important role for biodiversity in the communities (Del-Claro 2004). Among

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the types of interactions, mutualisms are important processes for the structure and composition of communities (Way 1963; Stadler & Dixon 2005; Bascompte & Jordano 2007).

Symbiotic interactions have been reported involving *Aethalion reticulatum* Linnaeus 1767 with wasps or ants (Letourneau & Choe 1987). There are other species associated with this treehopper, such as *Synoeca septentrionalis* (Vespidae) on *Piper aduncum* (Ramoni-Perazzi *et al*. 2006), and *Polistes erythrocephalus* on Solanaceae in Peru (MacCarroll & Reeves 2004), and even stingless bees of the genus *Trigona*, which take advantage of treehoppers' sugary excretions (Castro 1975; Vieira *et al*. 2007; Oda *et al*. 2009).

Bees of the genus *Trigona* Jurine 1807, popularly known as Xupé, Mombuca and Arapuá, are common in the Neotropics (Michener 2000) and very important pollinators of the Brazilian Cerrado species (Almeida & Laroca 1988, Nogueira-Neto 1997, Silva *et al*. 2007), Amazon (Maués & Couturier 2002) and cultivated species (Lorenzon *et al*. 1993; Silva *et al*. 1997). Some of these species have the behavior of robbing resources (nectar thiefs), negatively affecting the relationship between plants and pollinators (Murphy & Breed 2008; Santos & Absy 2010).

Bauhinia forficata Link., belonging to the Fabaceae family, generally known as pata-de-vaca, is a thorny plant of 5 to 9 meters in height, and is heliophytic, deciduous or semi-deciduous (Lorenzi 2002). It is found in the Northern (Pernambuco, Bahia, Alagoas), Southern (Minas Gerais, Espírito Santo, São Paulo, Rio de Janeiro) and South (Paraná, Santa Catarina, Rio Grande do Sul) regions of Brazil (Lorenzi 2002; Vaz 2010). This species is commonly used as a shade tree in urban areas (Fowler 1992), which may explain their presence in other regions of the country that are not within the Cerrado. The presence of *A. reticulatum* aggregations in *Bauhinia* has already been observed by Fowler (1992), but the insects were mainly attended by ants of the *Camponotus* genus, and no stingless bees or wasps were regularly recorded at the aggregations.

The goal of this work is show the interaction between the stingless bee *Trigona branneri* Cockreall, 1912 and the treehopper *A. reticulatum*.

MATERIAL AND METHODS

We observed interactions between *A. reticulatum* and *T. branneri* three times daily for four consecutive days in August and September 2009 in one

individual of *Bauhinia forficata* in Parque Nacional das Emas, GO, Brazil. Our observations were at 6:00, 12:00 and 18:00 hours, lasting at least 60 minutes each.

The treehopper *A. reticulatum* is a small (< 10 mm) rusty brown sucking insect which lives in colonies made up of young wingless nymphs and winged adults (Santana *et al*. 2005). Individuals feed on by sucking the content of leaf tissues from host plants and releasing a carbohydrate-rich solution known as honeydew (Gallo *et al*. 2002). Drops of this sweet substance are consumed by ants, bees and other insects (Brown 1976). Through continuous sap sucking, treehoppers negatively affect the growth and development of host plants to the extent of killing the plant in the most severe cases (Gallo *et al*. 2002; Santana *et al*. 2005).

RESULTS

We detected the presence of 19 individuals of *Trigona banneri* collecting honeydew exudates of eight individual *A. reticulatum* adults and 167 nymphs of the same species. On *B. forficata*, these stingless bees touched primarily the proximal upper abdomen of *A. reticulatum* with their front legs and antennas. The bees repeated the stimulus toward the distal part of the abdomen where the exudate droplet was collected with the first pair of legs and inserted into the proboscis. This behavior of the bees was recorded in both adult treehoppers and their nymphs, although there was always at least one adult on the same branch as the nymphs. The behavior was clearly observed in individuals in nymphal stages. However, the stimulus in adults across the back of the *A. reticulatum* abdomen was not observed with the same frequency as in the nymphs (Fig. 1).

In the early hours of the morning and late afternoon there were no bees around the aggregations and the presence of at most three *Camponotus* ants patrolling on insects were observed, but without collecting honeydew. We did not find ant nests in proximity to host plant.

Agonistic behavior was observed in bees when touched by another individual of the same species or by very close ants. After they raised their wings partially as a warning sign, they started a short flight over the *A. reticulatum* colony (Fig. 2).

Fig. 1. Antennal stimulation by *T. branneri* on the distal part of *A. reticulatum* nymphs' abdomen, next to a flower of *B. forficata* in Parque Nacional das Emas, Goiás, Brazil (A). Note the number of *Trigona* bees on the colony of *A. reticulatum* (B).

DISCUSSION

T. branneri has been registered eating and storing exudates of *Terminalia argentea*, and foraging in groups (Boff *et al*. 2008). However, Bittrich & Amaral (1996) showed it as a nectar-thief in *Symphonia globulifera*. Although the interaction between the stingless bee *Trigona hyalinata* Lepeletier, 1836 and *Aethalion reticulatu*m and has already been observed (Oda *et al*. 2009), this paper is the first record of interaction between *T. branneri* and *A. reticulatum*.

In the interaction of *A. reticulatum* and *T. spinipes* on *Mangifera indica*, an exotic fruit species very common in Brazil, the Meliponines excite *A. reticulatum* individuals by walking over them. Initially the bees stay on treehoppers touching their antenna to the head of the insects and the first two pairs of legs on the back of the abdomen, after that beating the antennas on the distal part of the abdomen and quickly sucking the droplet released after stimulation (Vieira *et al*. 2007). In the same study the researchers also observed agonistic behavior in relation to other bees or ants of the *Camponotus* genus, although

Fig. 2. *T. branneri* making a short flight over the *A. reticulatum* colony.

the insects were less frequent in the period of greatest bee activity.

These interactions are determining factors for both species and community (Blüthgen *et al*. 2000; Wimp & Whitham 2001; Styrsky & Eubanks 2007). Wimp & Whitham (2001) showed that aphids indirectly influence community structure by reducing the diversity of arthropods found in habitats where there is a mutualism with ants. In the same study, they experimentally showed that there is an effect of predators (top-down control) well as an effect of host plants (bottom-up) in aphid abundance. The association between aphids and ants is essential for survival in view of the negative top-down effects, and protection from predators the most important service provided by ants to the aphids (Wimp & Whitham 2001). The authors also demonstrated that there is a dependence on ants for the establishment of aphids, as the number of aphids decreased as the distance from the nests of ants increased.

Although in our observations there is evidence that stingless bees could protect *A. reticulatum* we cannot say this with certainty, but in these kinds of interactions is common for the ants to protect the aphids in order to preserve the resource (honeydew) that is released by the aphids (Wimp & Whitham 2001; Styrsky & Eubanks 2007; Blüthgen & Chung 2008).

We showed two interacting species possibly mutualistic, on *B. forficata* a host species commonly encountered in Brazilian regions. Thus, if *T. branneri* effectively provides protection for the aphids, this mutualism may be deserving of future studies to determine whether the bee-aphid interactions provide the same patterns or ecological functions as the ant-aphid interactions do (Styrsky & Eubanks 2007).

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