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SHORT NOTE

Oxytrigona tataira (Smith) (Hymenoptera: Apidae: Meliponini) as a collector of honeydew from *Erechtia carinata* (Funkhouser) (Hemiptera: Membracidae) on *Caryocar brasiliense* Cambessèdes (Malpighiales: Caryocaraceae) in the Brazilian Savanna

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Abstract

Trophobiont insects are of general interest to behavioral ecology due to the fact that the outcomes of their interactions with hymenopterans can result in strong facultative mutualisms. In this paper we present observations of *Oxytrigona tataira* (Smith) collecting honeydew from *Erechtia carinata* (Funkhouser) on *Caryocar brasiliense* Cambessèdes in a cerrado *sensu stricto* fragment from Brazilian Savanna. Our observations showed that these bees stimulate *E. carinata* individuals touching them with the antennas in the gaster to collect honeydew. *O. tataira* has not been previously recorded collecting honeydew on *E. carinata*. Thus, we present these observations as a novel bee-treehopper interaction.

Mutualisms are interspecific interactions where individuals of two species experience higher fitness when they occur together than when they occur alone (Bronstein, 1998). This interaction is an important process for the structure and composition of communities (Bascompte & Jordano, 2007; Lange & Del-Claro, 2014). Many species of phytophagous hemipterans (e.g. aphids, coccids and treehoppers) are mutualistically associated with ants (Flatt & Weisser, 2000; Offenberg, 2001; Fagundes et al., 2013). In these relationships, ants protect their hemipteran partners against predators and parasites (Schultz & McGlynn, 2000; Fagundes et al., 2013) and often rely on honeydew as one of their most important food source (Davidson et al., 2003), besides extrafloral nectar (Del-Claro et al., 2013) and lepidopteran secretions (Alves-Silva et al., 2013).

Although ants are the most common hymenopteran interacting with treehoppers, bees and wasps can also be associated with them (Lin, 2006). Mutualistic interactions have been reported involving the aetalionid treehopper *Aetalion reticulatum* (Linnaeus) with wasps or ants (Letourneau & Choe, 1987; Ramoni-Perazzi et al., 2006), and even *Trigona* Jurine, a stingless bee, which take advantage of treehoppers sugary excretions, the honeydew (Castro, 1975; Vieira et al., 2007; Oda et al., 2009; Barônio et al., 2012). Godoy et al. (2006) reported eight associations between membracids and bees, including the interaction between *Potnia* Stål and *Oxytrigona tataira* (Smith). Azevedo et al. (2007) reported the associations between *Trigona spinipes* (Fabricius) and five membracids species, and observed that the bees repelled some insects that approached the membracids, although with low aggressiveness.



This kind of interaction has not been reported between the stingless bee *O. tataira* (Apidae: Meliponini) and the treehopper *Erechtia carinata* (Funkhouser) (Auchenorrhyncha: Membracidae). This membracid belongs to the tribe Talipedini and it was recently reassessed, and *Trinarea* Goding is considered a junior synonym of *Erechtia* Walker (Sakakibara, 2012).

Oxytrigona tataira has a wide distribution, occurring in eight Brazilian States (Silveira et al., 2002; Lima et al., 2013). *Oxytrigona* Cockerell is commonly known in Brazil as “tataira” or “cospe-fogo” (fire spitting), due to caustic substance (formic acid) produced by worker bees for defense. These bees are highly aggressive, and also cleptobiotic, being colony’s robbers of other meliponine species (Roubik et al., 1987; Roubik, 1992).

Caryocar brasiliense Cambessèdes has a wide distribution, occurring in 15 Brazilian States and Paraguay (Lopes et al., 2006). It is commonly known as “pequi”, found from shrubs to trees of 1.5 to 11 meters high, with semi-deciduous behavior of foliar change (Lopes et al., 2006). Although the use of secretions from sucking insects (Hemiptera) by species of *Trigona* and *Oxytrigona* has been reported before (Cortopassi-Laurino, 1977; Letourneau & Choe, 1987), herein we present first observations of interaction between *O. tataira* and *E. carinata* on *C. brasiliense* in the Brazilian Savanna.

During three non-consecutive days in January 2012, individuals of *O. tataira* were observed collecting honeydew from *E. carinata* in a cerrado *sensu stricto* fragment (17° 21’ S, 53° 18’ W) at Alto Araguaia municipality, State of Mato Grosso, mid-western Brazil. The observations were carried out once per day, between 7:00 and 10:00 h. Each observation lasted 15 to 20 minutes.

Voucher specimens were collected, processed and given to specialists for identification and deposition in the Entomological Collection Padre Jesus S. Moure (DZUP) of the Department of Zoology at the Universidade Federal do Paraná (UFPR).

We observed variable numbers of individuals of *O. tataira* (mean = 55 individuals \pm 42.7 SD) collecting honeydew of approximately 130 nymphs and one adult of *E. carinata*. The number of *O. tataira* was lower during the second day of observations after heavy rain.

The bees stimulated *E. carinata* individuals by primarily touching the treehoppers at the proximal upper abdomen with their front legs and antennae. The bees repeated the stimulus toward the distal part of the abdomen where the exudate droplet was collected with aid of the first pair of legs and quickly sucked. This behavior of the bees was recorded mainly in the treehoppers nymphs because only one adult was with the nymphs on the branch (Fig 1).

As a result of our presence the bees defended the food source by beating their wings as a warning sign (Fig 2), and some individuals started a short flight over the *E. carinata* colony. In the first day of observations,



Fig 1. *Oxytrigona tataira* (Smith) (Hymenoptera: Apidae: Meliponini) collecting honeydew from *Erechtia carinata* (Funkhouser) (Hemiptera: Membracidae) on branch of *Caryocar brasiliense* Cambessèdes (Malpighiales: Caryocaraceae).

inattentive researchers were attacked by the bees. We did not record the presence of ants patrolling the treehoppers.

The behavior of *E. carinata* stimulation by *O. tataira* resembles that observed in species of *Trigona* in association with *A. reticulatum*: the bees touch their antennae to the head of the treehoppers, and then the first two pairs of legs on the back of the abdomen, after that touching the antennae on the distal part of the abdomen and quickly sucking the honeydew droplet released after stimulation (Vieira et al., 2007; Oda et al., 2009; Barônio et al., 2012). This behavior is also similar to that reported between ants and honeydew-producing hemipterans, including membracids, in which the ants actively touch the body of the insects with their antennae to stimulate the releasing of honeydew droplets (Stefani et al., 2000; Pfeiffer & Linsenmair, 2007; Guerra et al., 2011; Gjonov & Gjonova-Lapeva, 2013).

Previous studies suggest that this possibly facultative mutualistic association is beneficial for both species (Vieira et al., 2007; Oda et al., 2009; Barônio et al., 2012), promoting a protection against natural enemies of the treehoppers, and supplying part of the bees diet with the honeydew rich in carbohydrates (Way, 1963; Fagundes et al., 2013). Additionally, the association with the bees can reduce fungus attack because of the removal of the contaminant honeydew (Way, 1963; Buckley, 1987), decreasing the chances of local extinction of these hemipterans (Buckley, 1987).

On ant-tending, the mortality risks of the tended insects can be considerably reduced due to protection against predators and parasitoids (Flatt & Weisser, 2000; Fagundes et al., 2013). However, we did not test it. Thus, it is important to emphasize the necessity of future studies, which are essential to know the true nature of this interaction.



Fig 2. Agonistic behavior displayed by *Oxytrigona tataira* (Smith) (Hymenoptera: Apidae: Meliponini) as a result of feeling threatened by the presence of the researchers.

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