

Research Article

First Record of Trophobiotic Interaction between a Ponerine Ant and a Cicadelid Bug

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The interactions of the ant *Odontomachus bauri* with nymphs of the sap-sucking bug *Xedreota tuberculata* (Cicadellidae: Ledrinae) were studied on *Sipanea* aff. (Rubiaceae) along a trail in an upland forest in the Ecological Reserve of Anavilhanas, AM, Brazil. Five complete interactions at day and at night (about 60 minutes) were analyzed. The care of cicadelid nymphs ranged between 12 and 961 seconds.

1. Introduction

Ants are the main arthropod predators in tropical forests [1–3] with many species using plants as shelters or foraging areas [4–7]. Some of these interactions are obligatory and several other facultative with plants attracting ants opportunistically. Extrafloral nectaries (EFNs) which are present in at least 66 angiosperm families [8, 9] or food bodies, present in at least 20 angiosperm families, are the main attractive agent and consequently, promote myrmecophily [10]. The presence of some insects such as bugs (Insecta: Hemiptera) on a plant is virtually a guaranty of the presence of ants which attend them [5, 11–13]. These insects suck the phloem and secrete honeydew from the anus which is fed on by some ant species [14–17].

Recent revisions on Hemiptera-Formicidae interactions include [18–20]. Ponerine ants are mainly solitary predators [1, 11], and some of them live in plants with EFNs or bearing sap-sucking bugs [1, 21].

Sap-sucking bugs generally secrete honeydew by ejecting high pressure drops some distance from insect body. This action avoids the attraction of predators and the development of mold in the colony and reduces the chance of colony drowning. Ants inhibit this behavior [22] eliciting the bug body with their antennas to obtain a perfect extruded drop which they then collect [23, 24].

Historically trophobiotic interactions between ponerine ants and cicadelid bugs have been little known [25]; the goal of this work was to describe our observations made in the Amazon on the interaction between workers of the ant *Odontomachus bauri* (Hymenoptera: Formicidae, Ponerinae) and nymphs of *Xedreota tuberculata* (Hemiptera: Cicadellidae).

2. Materials and Methods

The ant was identified following [26, 27] and the hemiptera following [28–30] and confirmed by Dr. Chris Dietrich (Center for Biodiversity, Illinois Natural History Survey) with vouchers deposited in the collections of MZUSP (USP) and MHNU (UNICAMP).

The observations were made on two plants of *Sipanea* aff. (Rubiaceae; Figure 2(a)), the first with 35 leaves, a height of 110 cm, and distant 140 cm away from the second with 15 leaves and a height of 60 cm, which were located in a trail behind Base de Pesquisas Dois on the Ecological Reserve of Anavilhanas, Brazil (2°32′01″ S; 60°50′03″ W). The higher plant grew next to a decomposing trunk which was diagonally placed in the trail with the nest of *Odontomachus bauri* being located at the base of this plant.

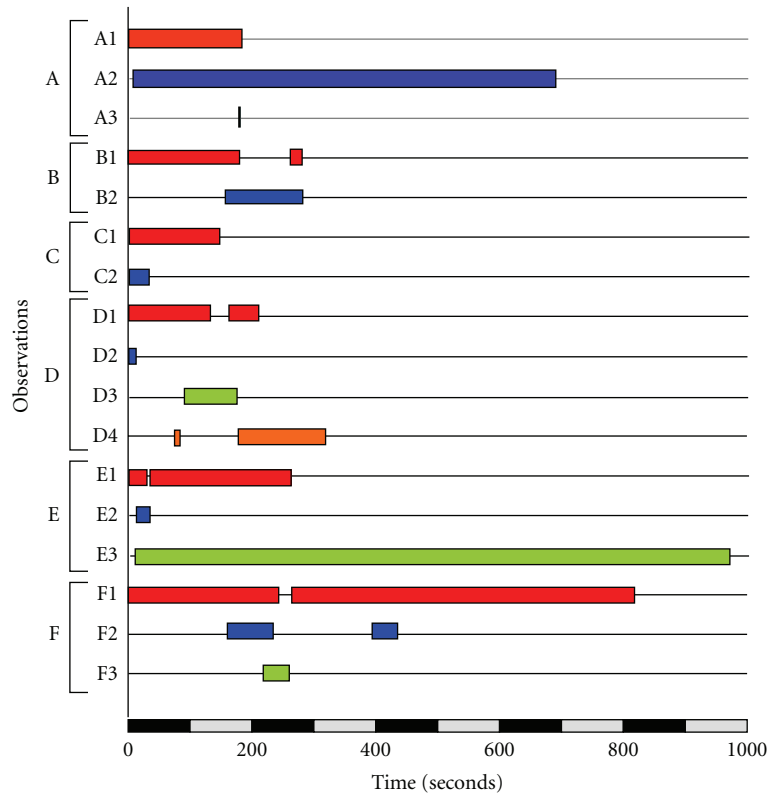


FIGURE 1: Duration of six video sessions of the interaction between different individuals of *Odontomachus bauri* attending nymphs of *Xedreota tuberculata*. The different colors represent different individuals of *Odontomachus bauri* observed simultaneously.

From July 13th to July 19th, we observed the interactions between the cicadelid nymphs and ants during the day and night. A total of 240 minutes of ant-cicadelid interaction were recorded on video, comprising six sequences of approximately 60 minutes each. We considered a sequence as the moment of arrival of an ant at the nymph location, its interactions with the nymphs, and the departure of ant from the group of nymphs.

3. Results and Discussion

This was the first time that *X. tuberculata* was found on *Sipanea* aff. (Rubiaceae) although [31] reported this species as a generalist, found on plants of the families Lauraceae, Leguminosae, Caesalpiniaceae, and Bombacaceae.

The workers of *O. bauri* attended the nymphs of *X. tuberculata* both during the day (morning and afternoon) and at night. The nymphs of *X. tuberculata* focussed on feeding on the more apical stems of the plant, where the stem or leaves are red. The care of nymphs ranged between 12 and 961 seconds not fitting a normal distribution (mean = 196.2 seconds; variance = 74674.32 seconds; kurtosis = 3.20; skewness = 1.97) (Figure 1A–F). Between 2 and 4 ants were observed interacting with a group of nymphs (Figure 1D). During the longest video sequence, one ant spent 961 seconds in the presence of two other ants (Figure 1E). When

eliciting a nymph the ants vibrated their antennas on the anterior region of the bug’s abdomen (Figure 2(a)). The ant would consume the drop either directly from bug’s anus with open jaws (Figure 2(b)) or by capillary action in the space between the closed or partially closed jaws. When full replenished the ant would return to the nest. Occasionally, ants were observed patrolling the plants where the nymphs were located occasionally stopping to check for nymphs.

If the plant was disturbed, the ants would respond, descending to the base. An attempt to remove one stipule caused an ant to bite the tweezers used. Two species of ant (*Crematogaster* sp and an unidentified formicine) were observed in close proximity to the *Odontomachus* ant, without eliciting a response.

According to [11], *Odontomachus* species are solitary forest predators; however this research has shown that *O. bauri* showed a nonpredatory behavior known towards *X. tuberculata*, a cicadelid bug capable of producing honeydew. This behavior has also been observed among some Ponerinae species which are used to collect the honeydew produced by hemipterans including: *O. haematodus*, from west Africa [32], and the American species *O. troglodytes* [33] from Cuba, *Ectatomma tuberculatum* (Colombia) and *E. ruidum* [34] from Ecuador and Trinidad, and *E. sp.* [35] from Guyana. In addition, L. Passos and P. S. Oliveira [36] found *Odontomachus chelifer* as disperser of nonmyrmecophilous seeds present in the soil of tropical forests in the coastal areas



(a)



(b)

FIGURE 2: (a, b) interaction of a worker of *Odontomachus bauri* to obtain a drop of the sugar liquid secreted by the nymph.

of southeastern Brazil. Thus it would seem that ants of the genus *Odontomachus* are not strictly predators and are able to feed off both honeydew and seeds.

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