AN OVERVIEW OF THE ASSOCIATION BETWEEN AMERICAN CETONIINAE BEETLES AND ANTS

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INTRODUÇÃO

The presence of arthropods inhabiting the nests of social insects is a common phenomenon and individuals cohabiting the nests of these insects frequently find food, protection and climatic stability inside the nest chambers. Ant colonies have a great diversity of other arthropods cohabiting their nests, which are known as myrmecophilous. Among these myrmecophilous, Cetoniinae beetles (Coleoptera, Scarabaeidae) represents a very important group. The subfamily Cetoniinae has around 4,000 species worldwide (Krikken 1984); and 300 species are estimated for the American continents (Orozco 2012). Adults often present a variable bright coloration, typically diurnal habit, and are easily attracted to flowers and ripe fruits. Larvae have been found feeding on various substrates in the different locations in which they live, and are occasionally found in termite (e.g., Puker *et al*. 2012) and ant nests (e.g., Alpert 1994). Despite the large number of reports of cohabitation (Puker *et al*. unpublished data), the relationship of Cetoniinae beetles with their ant hosts still remains unclear (Alpert and Ritcher 1975).

OBJETIVOS

Due to the lack of knowledge about these interactions, here we provide an overview on the association between American Cetoniinae beetles and ants.

MATERIAL E MÉTODOS

We reviewed and compiled the information on American Cetoniinae beetles associated with ants. For this, we used only papers published in journals and/or books. Since many of these relationships are species-specific, only data from ants and beetles identified to species level were included. Given the alterations in the taxonomic classification

of Cetoniinae beetles and ants over approximately 190 years that this association has been documented in America (e.g., Haldeman 1848), we verified the taxonomic validity of the names of all taxa cited and used the current nomenclature, corresponding to the taxon mentioned in the original.

RESULTADOS

Diversity of Cetoniinae beetles associated with ants. We summarize the 52 species already reported, distributed in three tribes and nine genera of Cetoniinae beetles associated with nests of 73 ant species in the Americas. Cremastocheilini with two genera and 31 species is the tribe with the highest number of species registered associated with ant nests, followed by Cetoniini (one genus and 13 species) and Gymnetini (five genera and eight species). *Cremastocheilus* Knoch with 30 myrmecophilous species recorded (57.69% of the total) is the genus with the largest number of species that cohabit ant nests, followed by *Euphoria* Burmeister with 13 (25.00%) and *Cotinis* Burmeister with three species (5.77%). *Cremastocheilus armatus* (Walker) is the species that cohabits the nests of more ant species (13), followed by *Cremastocheilus castaneus* Knoch (12) and *Cremastocheilus crinitus* (LeConte) (11). Diversity of ants. We summarize the 73 species already reported, distributed in three subfamilies, nine tribes and 14 genera of ants associated with cetoniines. Formicini with two genera and 35 species is the tribe with the highest number of species records followed by Myrmicini (two genera and nine species), Lasiini (two genera and eight species), Pheidolini (three genera and seven species), Attini (two genera and five species), Leptomyrmecini and Tapinomini with one species each. *Formica* L. with 32 species (43.84% of the total) is the genus with the greatest number of ant species with which Cetoniinae beetles are associated, followed by *Pogonomyrmex* Mayr with eight (10.96%), *Camponotus* Mayr and *Myrmecocystus* Wesmael with five species each (6.85%). *Formica obscuripes* Forel is the ant species that shows the greatest number of Cetoniinae beetle species (14), followed by *Pogonomyrmex barbatus* Smith (10) and *Atta mexicana* (Smith) (9).

DISCUSSÃO

Knowledge on the association of species of *Cremastocheilus* with ant colonies has been available for more than a century (e.g., Haldeman 1848). Of the estimated 45 species in the genus (Mynhardt and Wenzel 2010) we record here 30 associated with ants, but we predict that additional species can also be associated with ants. Phylogenetic studies involving both beetles and ants may generate information for understanding the evolutionary history within *Cremastocheilus* and their possible coevolution with ants. The pronotum is home to most of the glands the enable interaction between some of the members of the Cetoniinae beetles (mainly Cremastocheilini) and their ant hosts (Alpert 1994). Nevertheless, the nature of the interaction between members of the Cetoniini and Gymnetini with ants is unknown. Because both adult and immature beetles in these tribes are known not to predate on the ants it is suspected the main benefit they get from the association is the stable environment the nest provides. *Formica obscuripes* is the main host of American Cetoniinae. This probably occurs due to the abundance of their nests, primarily in western North America (Alpert and Richter 1975). Although not proven the species of Cetoniinae may prefer the nests of *Formica* we consider this hypothesis because a single ant colony may host numerous adult individuals of more than one species of Cetoniinae (Ratcliffe 1976). Because ants of this genus are normally considered aggressive, this suggests that semiochemicals (mainly allomones) may be involved in the interaction between ants and the Cetoniinae cohabiting their nests.

CONCLUSÃO

Notably, the knowledge on myrmecophilous Cetoniini and Gymnetini is very limited. Moreover, it is necessary to investigate the actual role of glandular trichomes on the interaction between Cremastocheilini (and some Cetoniini) and their host ants.

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