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Note

Robber stealing robber: a case of kleptobiosis in bees

Ladrão roubando ladrão: um caso de cleptobiose em abelhas

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Abstract: Kleptobiosis is a behavior where bees steal resources from other colonies. We observed *Apis mellifera* collecting cerumen from a *Lestrimelitta limao* nest without resistance. Reported in Brazil's Atlantic Forest–Cerrado transition zones, this may reflect resource scarcity or nest traits. Such behavior may be more common than previously thought.

Keywords: Meliponini, Cerrado, Atlantic Forest, *Apis mellifera*.

Resumo: Cleptobiose é um comportamento em que abelhas roubam recursos de outras colônias. Observamos *Apis mellifera* coletando cerúmen de um ninho de *Lestrimelitta limao* sem resistência. Registrado nas zonas de transição entre a Mata Atlântica e o Cerrado no Brasil, esse comportamento pode refletir escassez de recursos ou características do ninho. Esse tipo de comportamento pode ser mais comum do que se pensava.

Palavras-chave: Meliponini, Cerrado, Mata Atlântica, *Apis mellifera*.

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Even though the behavior of most eusocial bees is related to the collection of floral resources, such as nectar, pollen and resin, some species use the invasion of other colonies to collect resources already produced by other bees. This behavior, known as kleptobiosis, can happen atypically in periods when blooms are scarce or even be a usual behavior for a given species[1,2].

Colony kleptobiosis between species of stingless bees (the Meliponini tribe) has been documented in different biomes in Brazil, such as the Amazon[3], the Atlantic Forest[4] and the transition areas of the Caatinga[5]. Such behavior is common in species of the genus *Lestrimelitta*, such as *L. limao* (Smith, 1863), a robber stingless bee, but it can also occur in species introduced to Brazil, such as *Apis mellifera* L., 1758[3]. On the other hand, the opposite can rarely occur, where specimens of *A. mellifera* have collected material from the colony of *L. limao*, as shown by observations made in 1971 in São Paulo state[6].

Although having a wide geographical distribution in Brazil due to its great commercial interest[7], *A. mellifera* has caused many environmental problems[8,9]. Among these are attacks on native bee colonies, especially when they are weakened[10]. However, there are few reports of kleptobiosis by these bees on *L. limao* colonies[6]. Therefore, the aim of this study is to add information about the interaction between these two species in transition areas between the Atlantic Forest and the Cerrado.

The record was made by chance in June 2024, in the morning, on the Federal University of Lavras campus (21º13'37.74"S 44º58'47.23"O), southern Minas Gerais state, Brazil, a transition region between the Atlantic Forest and the Cerrado. Two *A. mellifera* workers were observed removing cerumen from the entrance tube of a *L. limao colony* nesting in the hollow of a Fabaceae tree for approximately 40 minutes, using the *ad libitum* method[11] (Fig. 1). The bees were identified by IRVT using identification keys[12].

The behavior observed was as follows: first, the two specimens of *A. mellifera* collected cerumen from the ends of the protuberances of the nest entrance tube (Fig. 1C-F), cutting off small fragments of cerumen with their mandibles; then, the cerumen was allocated to the corbiculae of the hind legs (Fig. 1D-E); finally, after about 40 minutes, the individuals of *A. mellifera* flew away, probably towards their colony. Throughout the observation period, no individual of *L. limao* exhibited agonistic behavior towards the specimens of *A. mellifera*.

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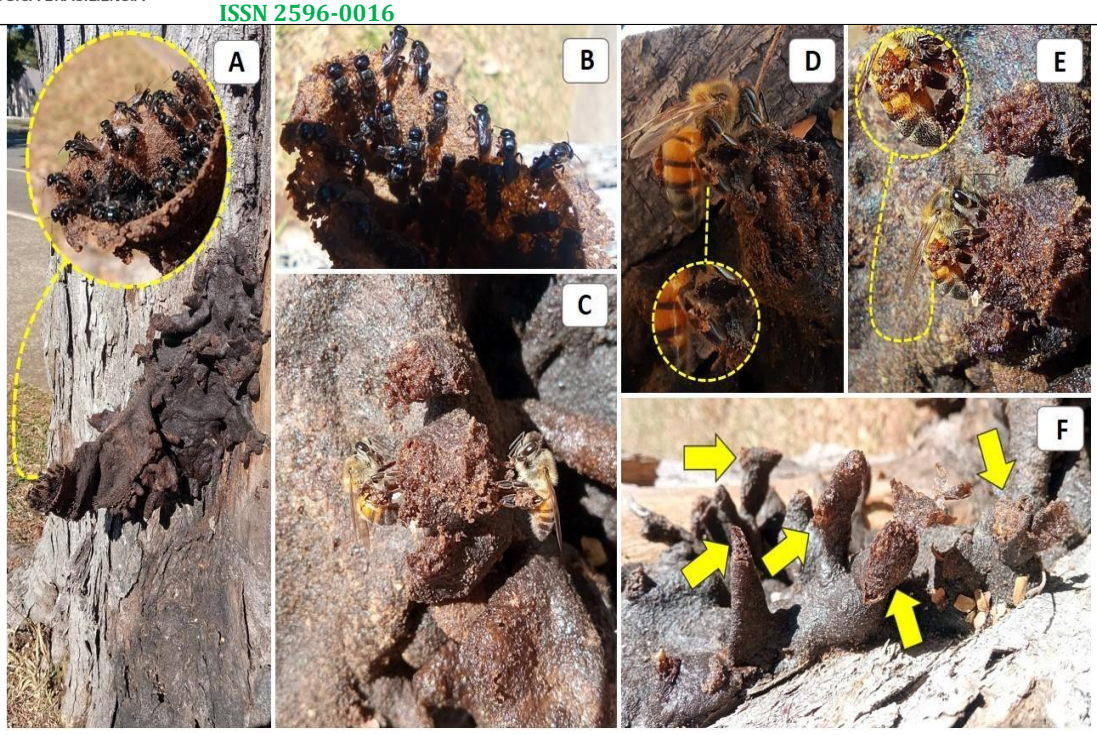

Figure 1 - A - General view of the entrance tube of a *Lestrimelitta limao* colony; B. *L. limao* workers in detail; C. *Apis mellifera* workers removing cerumen from the entrance tube of *L. limao*; D, E. Removal process of cerumen fragments and corbiculae of *A. mellifera* in detail; F. Yellow arrows point to cerumen removal marks by *A. mellifera*.

In general, stingless bees exhibit complex defense mechanisms, reported for more than 60 species. These mechanisms include narrow nest entrances, clay balls blocking the entrance, fighting swarms, lookouts, soldiers, and chemical cues to confuse enemies[13,14]. Many of these defensive behaviors can result in the premature death of individuals, characterizing self-sacrifice widely reported in social insects[15]. However, in this case, these behaviors were possibly not observed, as the cost of defense would probably be greater than the gain in preventing the loss of the stolen material, since the activity was limited to the external area of the nest. Apparently, kleptobiosis was not only carried out by the two observed *A. mellifera* individuals, as there were more wax removal marks at other points in the entrance tube where the individuals were foraging (Fig. 1F).

The observed behavior may be the result of the low availability of floral resources, particularly during the dry season[14,16], and may be frequent in Cerrado and transitional areas where *L. limao* overlaps with *A. mellifera*[7,17]. Other possible hypotheses are: (i) the amount of material (cerumen) exposed in entrance tubes of *L. limao*, which are unusually large and full of protuberances[18], and (ii) the lack of defensive aggression of colonies against invaders observed in *L. limao* workers. Interestingly, the kleptobiosis of *A. mellifera* occurred on a species recognized as

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invading colonies to usurp resources[1,6], including colonies of *A. mellifera* itself, which can have their colonies reduced or even decimated by *L. limao*[3].

Although the kleptobiosis behavior of *A. mellifera* individuals in *L. limao* colonies was recorded more than half a century ago[6], our observation of this interaction in a new geographical location suggests that this behavior may not be as rare as previously thought. We therefore recommend further studies to shed more light on this interaction, as well as its ecological and economic implications for the species involved.

Conflict of interest

The authors declare that there are no conflicts of interest.

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