Sociobiology
An international journal on social insects

SHORT NOTE

First Record of the Stingless Bee *Lestrimelitta rufa* (Friese) (Hymenoptera: Apidae: Meliponini) in NE Brazil and its Cleptobiotic Behavior

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Article History

Edited by
Evandro N. Silva, UEFS, Brazil
Received 01 December 2016
Initial acceptance 27 February 2017
Final acceptance 01 May 2017
Publication date 17 October 2017

Keywords
Robber bee, *Melipona, quinquefasciata*, ethology, inquiline bee.

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Abstract

The aim of this study was to expand occurrence records of *Lestrimelitta rufa* (Friese, 1903) to the Brazilian Northeast and to document the cleptobiotic behavior of this robber species in colonies of *Melipona quinquefasciata* Lepeletier, 1836. Two attacks were carried out in a meliponary in the county of Barbalha (Ceará, Brazil), where pot and larval food were sacked. Even with direct confrontation between invading and inquiline bees, there was a total loss of one of the attacked nests because robber workers remained insistently in search of resources of these nests during the attacks.

The geographic distribution of the genus *Lestrimelitta* Friese, 1903, includes the Neotropical region, with 21 species and part of the Neartic region, with two species (Camargo & Pedro, 2013). The species were reviewed by Schwarz (1948) and Marchi and Melo (2006), but the latter studied only species from Brazil. There are records of only three species in the state of Ceará: *Lestrimelitta limao* (Smith, 1863), *Lestrimelitta rufipes* (Friese, 1903) and *Lestrimelitta tropica* Marchi and Melo, 2006 (Camargo & Pedro, 2013).

According to Marchi and Melo (2006), *Lestrimelitta rufa* (Friese, 1903) is a species with records of occurrence from the south and west of the Amazon basin to Ecuador (Figure 1). There is no record of the species from the Brazilian Northeast region.

Bees of the genus *Lestrimelitta* are characterized for not having a corbicule or penicillium (Schwarz, 1948; Moure, 1951; Silveira et al., 2002). Because it does not present these morphological characteristics, the bee cannot collect pollen from flowers, assuming obligatory cleptobiotic behavior and robbing other bees' nests to keep its own (Roubik, 1989; Marchi & Melo, 2006; Michener, 2007).

Invasive bees can rob all resources of an inquiline colony, causing the complete death of the nest, or stealing part of the resources, but not exterminating the invaded colony (Sakagami & Laroca, 1963; Santana et al., 2004; Rech et al., 2013). However, some species of bees have developed important features to neutralize attacks and defend its own colonies, such as the ability to recognize citral, resistance to the effect of this substance and defense systems, for example, *Duckeola ghilianii* (Spinola, 1853) and *Melipona fulva* Lepeletier, 1836, developed a gallery of protection to part of the resources, besides direct confrontation with invasive *Lestrimelitta* bees through the perception of the citric odor (Van Zweden et al., 2011; Grüter et al., 2012; Rech et al., 2013).

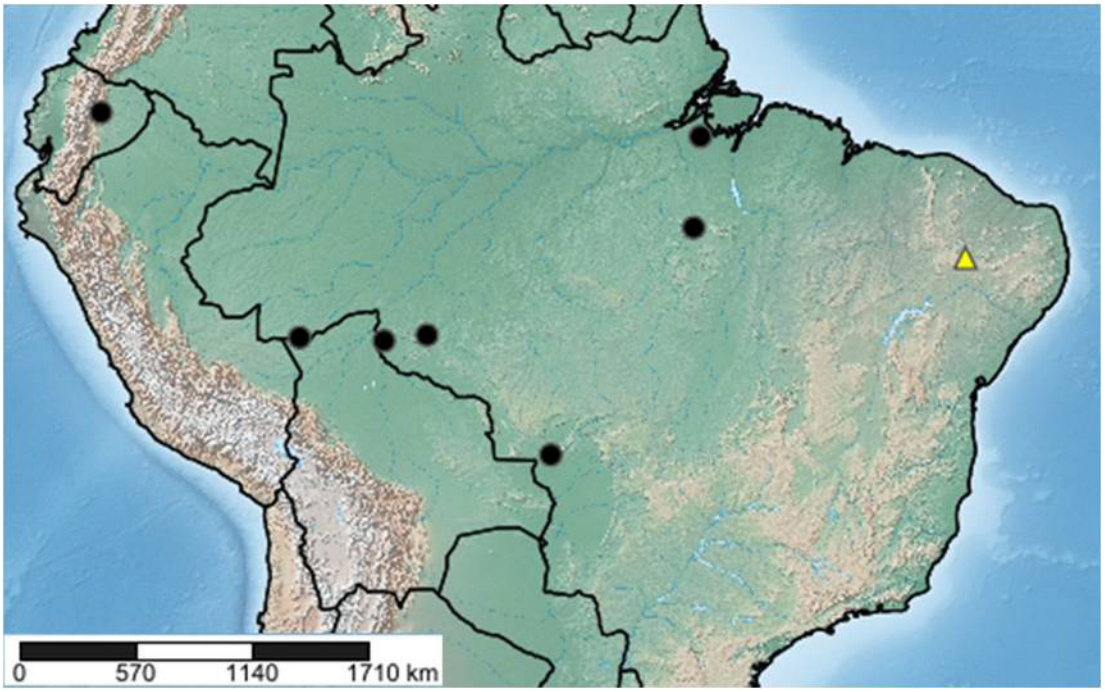

Fig 1. Map of recorded occurrences for *Lestrimelitta rufa* (Friese, 1903). Circles (○) are occurrences recorded by Marchi and Melo (2006); triangle (Δ) is the new geographic record.

The aim of this study is to expand the record of occurrence of this species to the Brazilian Northeast and to document the cleptobiotic behavior of *L. rufa* in colonies of *Melipona quinquefasciata* Lepeletier, 1836. *Lestrimelitta rufa* was observed looting a meliponary near the Casa de Guarda da Santa Rita of the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), in the Chapada do Araripe, within the permanent conservation area of the Araripe-Apodi National Forest, county of Barbalha, Ceará, Brazil (7º23'01.92"S, 39º21'15.97"W), with altitude of 929 meters, and annual rainfall of 1000 mm (CPMR, 2011). The locality has a sedimentary tabular relief from the Cretaceous age and diverse vegetation formations with areas covered by caatinga from the sedimentary, cerrado, cerradão and rain forest also from the sedimentary (Moro et al., 2015).

We believe the occurrence of *L. rufa* on highland forests in the state of Ceará is due to the ecological similarity, including animal and plant species, to the Amazonian ecosystem, where the species originates. According to Andrade-Lima (1982), the vegetation of high elevation forests in NE Brazil is associated to the Amazonian vegetation because climate variations during the Pleistocene allowed contact of these forests before a subsequent separation after interglacial periods. This is the first record of this species in NE Brazil.

The meliponary had five wooden and five pottery hives inhabited by colonies of *M. quinquefasciata*. Two attacks were observed; in the first one, there was a total loss of the inquiline bee colony. In the second attack, we had to intervene to prevent a complete attack and another colony loss. In both attacks, inquiline and looter specimens were collected for further identification.

The first attack occurred between May 12 and 15, 2014, and the first sign of invasion by *L. rufa* was noted by the modification of *M. quinquefasciata*'s characteristic nest entrance for a thin wax tube with widened exit edge, as reported by some authors (Sakagami et al., 1993; Bego et al., 1991), that in cases of long-lasting attacks, the entrance of the victim colony is modified or a new tube is constructed with cerumen and resin, collected from the same colony nest. Besides the nest entrance, it was noticed the presence of about five guard bees (Figure 2), as already reported to happen in other cases of attack (Sakagami & Laroca, 1963; Sakagami et al., 1993; Rech et al., 2013). In addition, it was noticeable a strong odor of volatile compounds coming from this beehive. This odor is typical of species of this genus and is used to signal the site of attack to workers of the same colony and disorganize the inquiline bees (Blum et al., 1970; Sakagami & Laroca, 1993; Pompeu & Silveira, 2005; Rech et al., 2013; Van Zweden et al., 2011).

When we opened the hive, we noticed that all pollen from pots and larval food had been looted, and there were many individuals of *M. quinquefasciata* dead on the hive floor, including the queen. The inquiline bees that still resisted were constantly attacked by the looter bees, and forid larvae (Diptera: Phoridae) were observed among the rest of food, brood cells and wax. The flies apparently attacked the nest, because it was already unstructured by attack of looter bees.

The second attack occurred on June 2, 2014, at around 9 a.m.. About ten workers of *L. rufa* surrounded a hive of *M. quinquefasciata* and around 3 p.m. the same day, about 50 workers invaded the inquiline nest and the citric odor was perceptible even up to five meters away from site of attack.

Fig 2. Small wax tube constructed by *Lestrimelitta rufa* (Friese, 1903) at the entrance orifice of a nest of *Melipona quinquefasciata* Lepeletier, 1836.

After the invasive workers entered the colony, a guard bee of *M. quinquefasciata* was seen ventilating in the entrance orifice. The attack continued inside the hive and individuals of both species were in direct confrontation. A single individual of *M. quinquefasciata* was attacked by three to four individuals of *L. rufa*. The inquiline workers were apparently disoriented, probably due to effect of citric pheromone, as well as the stress of being attacked. Many inquiline bees searched for shelter beneath the involucrum of the brood comb area, demonstrating no effective response to the attack. From this moment we had to intervene to prevent the total loss of that *M. quinquefasciata* nest. We removed the invasive bees and closed the hive until the following day.

During a twelve-month period, these two attacks were the only ones observed. Because *L. rufa* is an obligatory cleptobiotic species, these bees probably found other nests to rob in the surroundings to remain in same area or moved somewhere else. However, the latter situation is less likely to occur because stingless bee queens develop large gasters after fecundation which unable them to fly and colonies do not migrate without their queens (Michener, 1974; Roubik, 1989).

The attacks of *L. rufa* showed to be potentially fatal to colonies of *M. quinquefasciata* living in man-made hives. Considering that *M. quinquefasciata* bees do not react to the attack of *L. rufa*, it is possible that its defense relies in the discrete nesting behavior of this bee species. In meliponaries, the number of hives and much greater bee movement makes their nests easier to be found by *L. rufa*.

Acknowledgments

We thank Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for funding the scholarships, Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) for a Productivity in Research sponsorship (#305126/2013-0) to BM Freitas and Instituto Nacional de Pesquisas da Amazônia (INPA) for the structure necessary to identify the bees.

Fig 3. Large number of specimens of *Melipona quinquefasciata* Lepelletier, 1836 killed on the ground of hive, after the first attack observed. In detail physogastric queen.

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