Occupation of *Chartergellus communis* Richards, 1978 (Vespidae, Polistinae) nest by *Nasutitermes unduliceps* Mathews, 1977 (Termitidae, Nasutitermitinae)

Ocupação de um ninho de *Chartergellus communis* Richards, 1978 (Vespidae, Polistinae) por *Nasutitermes unduliceps* Mathews, 1977 (Termitidae, Nasutitermitinae)

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Abstract: Epiponini (Hymenoptera, Vespidae, Polistinae) species typically construct their nests with an external envelope, which providesprotection against predators and the weather, as in *Chartergellus communis*. For this reason, these nests, when abandoned, are reused by different orders of insects, although until now there had been only a single record involving termites (Blattodea, Termitidae). This study adds information on the reuse of social wasp nests by Termitidae. The record was made in a building next to a gallery forest, a Cerrado phytophysiognomy, in the Parque Nacional Grande Sertão Veredas. The nest still had a protective envelope and the cells of the first comb were blocked by stercoral material, which suggests that the *C. communis* nest was being used as a satellite nest by termites. This reuse of abandoned wasps' nests as satellite nests may be frequent in the Cerrado, so we suggest that more observations need to be made to validate this hypothesis, as well as answer an important question: do termites invade the nests of social wasps that are still active, or do they just reuse those that have already been abandoned?

Keywords: *Cerrado*. Reutilization. Social wasp. Termite. Protection. Satellite nest.

Resumo: As espécies de Epiponini (Hymenoptera, Vespidae, Polistinae), comumente, constroem seus ninhos com um envelope externo, o que confere proteção contra predadores e intempéries, assim como em *Chartergellus communis*. Por isso, esses ninhos, quando abandonados, são reutilizados por diversas ordens de insetos, porém, até o presente trabalho, só havia um registro para cupim (Blattodea, Termitidae). Dessa forma, o presente estudo tem como objetivo acrescentar informações sobre a reutilização de ninho de vespas sociais por Termitidae. O registro ocorreu em uma edificação próxima à mata de galeria, fitofisionomia do Cerrado, no Parque Nacional Grande Sertão Veredas. O ninho ainda apresentava envelope protetor e as células do primeiro favo estavam obstruídas por material estercoral, por isso, provavelmente, o ninho de *C. communis* estava sendo utilizado como ninho satélite pelos cupins. Essa reutilização de vespeiros abandonados como ninhos satélites pode ser frequente no Cerrado, por isso sugere-se que mais observações sejam feitas para validar esta hipótese, além de responder a um questionamento importante: os cupins invadem os ninhos de vespas sociais ainda ativos ou apenas reutilizam os já abandonados?

Palavras-chave: Cerrado. Reutilização. Vespa social. Cupim. Proteção. Ninho satélite.

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INTRODUCTION

Abandoned nests of social wasps (Vespidae: Polistinae) provide different resources that are exploited by other arthropods, whether to obtain shelter, food, protection against predators and bad weather, as recorded for spiders (Araújo & De Maria, 2008), ants (Souza et al., 2022), bees (Pinto, 2005), solitary wasps (Eumeninae) (Jacques et al., 2022) and other social wasp species (Renne et al., 2022). However, only one study has documented this occupation by termites, which was reported in the Brazilian *Cerrado* (Jacques et al., 2023).

This biome, considered a global hotspot (Myers et al., 2000), constitutes the Savanna with the greatest biodiversity in the world, with an endemism rate exceeding 44% (Klink & Machado, 2005; Simon et al., 2009; Joly & Padgurschi, 2019). Originally occupied 25% of the Brazilian territory, however, around 46% of the biome was eliminated between the 60s of the 20th century and the first two decades of the 21st, with only 11% of the area protected by Conservation Units (Strassburg et al., 2017; Sano et al., 2008).

This panorama makes studies on biodiversity, ethology, and ecology on the biota of the *Cerrado* an emergency, to propose strategies for their conservation (Resende et al., 2021). Thus, the objective here is to add information about the reuse of social wasp nests by termites in this Biome.

MATERIAL AND METHODS

An active nest of social wasp was recorded, in November 2022, as part of a social wasp inventory project in the Grande Sertão Veredas National Park (PARNA GSV), in the north of Minas Gerais, Brazil (Francisco et al., 2023). The nest was located in the woodwork of a kiosk, 1.7 m above the ground, about 20 meters from the Rio Preto (15° 11' 16.4" S, 45° 41' 00.9" W), associated with Mata de Galeria, *Cerrado* phytophysiognomy. Specimens of the wasp were collected and identified by Dr. Orlando

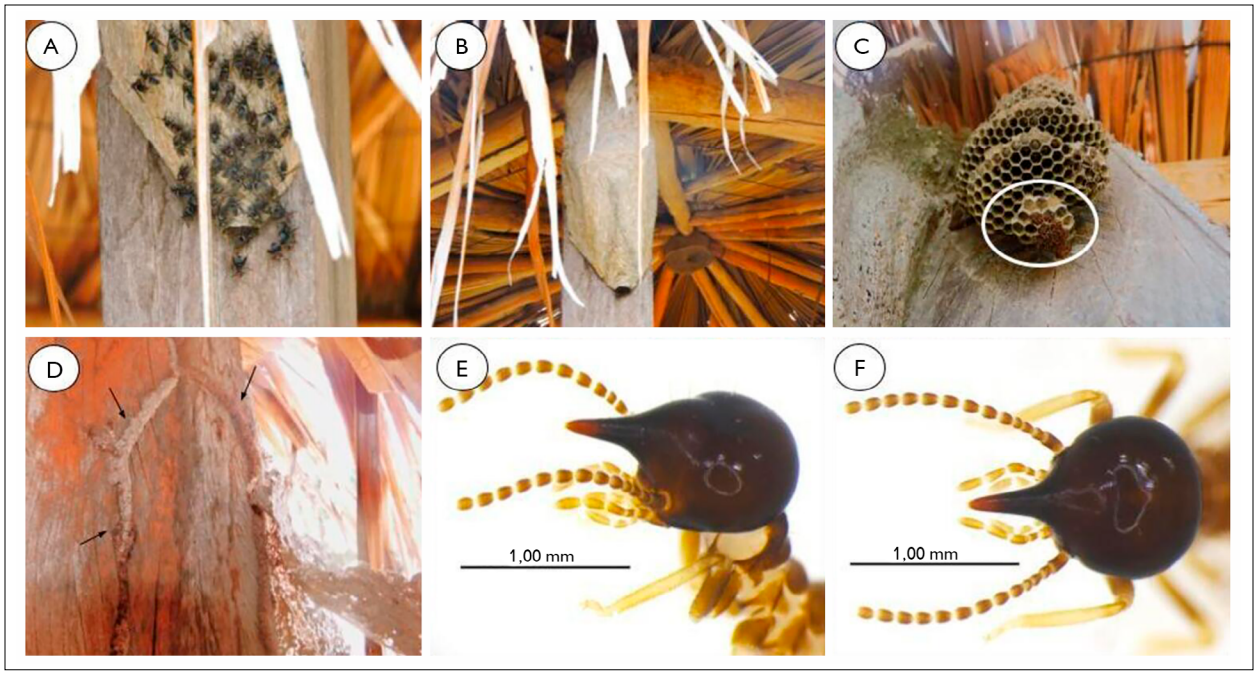

Figure 1. Active nest of *Chartergellus communis* (A), nesting in the structure of a kiosk (B), and after abandoned, occupied by storage material (C), with termite foraging galleries communicating with the wasp nest (D), soldiers of the termite *Nasutitermes unduliceps* in dorsal (E) and lateral (F) views collected in these galleries. Images: M. M. Souza (2022).

Tobias da Silveira (*Museu Paraense Emílio Goeldi* - MPEG, Belém, Pará). In January 2023, this same nest was found abandoned and occupied by termites, from which specimens were collected, identified by Dr. Reginaldo Constantino (University of Brasília - UnB), and deposited in the UnB collection, under number 11717. The photographs, at both times, were taken with a camera (Nikon coolpix 60× Optical Zoom Wide).

RESULTS

The nest, of the social wasp *Chartergellus communis* Richards, 1978 (Figures 1A, 1B), was found abandoned with the external envelope preserved. When removing the external envelope, it was observed that some breeding cells, those closest to the nest opening, were occupied by sterol material (Figure 1C), which shows the occupation by termites. It was also noted that termite galleries were connected to the wasp nest (Figure 1D). No termites were observed in the nest when the envelope was removed, only in the galleries that provided communication, identified as *Nasutitermes unduliceps* Mathews, 1977 (Termitidae: Nasutitermitinae) (Figures 1E, 1F).

DISCUSSION

The presence of obstructed cells in the comb indicates that the termite began occupying the *C. communis* nest, probably to be used as a satellite nest. This behavior has already been reported for another species of termite, *Nasutitermes obscurus* (Holmgren, 1906), in two nests of the social wasp *Synoeca surinama* (Linnaeus, 1767), in the same area as the present record (Jacques et al., 2023).

Nasutitermes spp. have an arboreal habit, adapting to different conditions to expand or change their colonies (Thorne & Haverty, 2000), including the establishment of satellite nests, in which these termites can use resistant structures built by other insects, such as the abandoned nests of social wasps (Jacques et al., 2023), since it is theoretically less costly than creating a new structure. Therefore, this behavior is an important strategy for saving energy and survival, as these satellite nests can serve as a foraging support and food storage area (Holt & Easey, 1985). However, there is little information about the biology, behavior, and ecology of *N. unduliceps*, with studies focusing only on its occurrence and geographic distribution (Constantino & Cancello, 1992; Cunha et al., 2006).

The nests of *Nasutitermes* spp. are composed of stercoral material (partially digested wood together with salivary and fecal fluids) and are built directly on the substrate, such as tree trunks (Light, 1933; Emerson, 1938; Thorne et al., 1996) or wood present in human buildings (Cruz et al., 2012). Thus, the structure and the construction site of the *C. communis* nest may have facilitated the location and occupation by the termites.

The nest of this social wasp has a protective envelope with a single opening, is resistant, and built directly on the nesting substrate (Silva et al., 2022), like the nest of *S. surinama* (Jacques et al., 2023), which also builds enveloped nests directly on the substrate and with a single opening (Somavilla et al., 2012). However, they have distinct architectural patterns (Richards & Richards, 1951), as the position of the combs is very different, while in *S. surinama* they are parallel and adhered to the nesting substrate, Astelocytar architecture, in *C. communis*, the combs are perpendicular to the substrate, Calyptodomic Stelocytarus architecture (Carpenter & Marques, 2001), which may be a reflection of the adaptability and resilience of these termites when using nesting structures.

This study adds information about the ecology and behavior of *N. unduliceps* and is the second report on the reuse of abandoned nests of social wasps by termites. Based on the above, it is plausible that the reuse of these nests by termites as satellite nests is frequent in the Biome. However, it is suggested that more observations are needed to validate this hypothesis, in addition to answering an important question, whether termites invade social wasp nests still active or just reusing abandoned ones.

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AUTHORS' CONTRIBUTION

M. M. Souza contributed to project administration and writing (original draft, review, and editing); D. G. S. Renne contributed to data collection and writing (original draft, review, and editing); F. G. A. Crispim contributed to data collection and writing (original draft, review, and editing); and G. C. Jacques contributed to supervision and writing (original draft, review, and editing).