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ABSTRACT. Interactions between birds and social wasps (Vespidae: Polistinae) include both harmonious and antagonistic relationships, involving predation, competition for nesting sites, and mutual benefits. This study documents an unusual association between *Mischocyttarus socialis* (Saussure, 1854) and *Tolmomyias sulphurescens* (Spix, 1825), recorded in December 2024 at Pico do Itambé State Park, Minas Gerais, Brazil, a transition zone between Cerrado and Atlantic Forest. A *T. sulphurescens* nest was found abandoned near a *Polybia* sp. (Hymenoptera: Vespidae: Polistinae) colony and occupied by an active colony of *M. socialis*. Additionally, the nest housed two solitary wasp nests (Eumeninae) and Lepidoptera pupae. *Mischocyttarus socialis* may have used the abandoned nest as shelter against predators and climatic factors. The proximity of the *T. sulphurescens* nest to a *Polybia* sp. colony suggests a potential benefit for the bird, as the presence of wasps might deter potential predators. This work presents the first record of *M. socialis* nesting inside a *T. sulphurescens* nest and highlights the importance of future studies to understand the frequency and factors influencing such associations.
Keywords: bird; ecological relationship; social wasp.

RESUMO. Interações entre aves e vespas sociais (Vespidae: Polistinae) incluem relações harmônicas e desarmônicas, que envolvem predação, competição por locais de nidificação e benefícios mútuos. Este estudo documenta uma associação incomum entre *Mischocyttarus socialis* (Saussure, 1854) e *Tolmomyias sulphurescens* (Spix, 1825), registrada em dezembro de 2024 no Parque Estadual do Pico do Itambé, Minas Gerais, Brasil, transição de Cerrado e Mata Atlântica. Um ninho de *T. sulphurescens* foi encontrado abandonado, próximo de uma colônia de *Polybia* sp. (Hymenoptera: Vespidae: Polistinae), e ocupado por uma colônia ativa de *M. socialis*. Além disso, o ninho abrigava dois ninhos de vespa solitária (Eumeninae) e pupas de Lepidoptera. *Mischocyttarus socialis* pode ter utilizado o ninho abandonado para abrigo contra predadores e fatores climáticos. Já a proximidade do ninho de *T. sulphurescens* com uma colônia de *Polybia* sp. sugere um possível benefício para a ave, pois a presença das vespas pode afastar potenciais predadores. Este trabalho apresenta o primeiro registro de nidificação de *M. socialis* no interior de um ninho de *T. sulphurescens* e destaca a importância de estudos futuros para compreender a frequência e os fatores que influenciam essas associações.
Palavras-chave: Ave, relação ecológica, vespa social.

INTRODUCTION

Birds and social wasps (Vespidae: Polistinae) establish various ecological relationships, which can be either harmonious or disharmonious (Sazima and D'Angelo, 2015). Birds may prey on these insects (Rossetto, 2021) and in some cases, young birds can be preyed upon by social wasps (Frankhuizen et al., 2020; Somavilla et al., 2024). Moreover, these animals may compete for nesting sites (Myers, 1935; Gibo, 1980; Stanback et al., 2009), as both seek environments offering suitable conditions such as shelter, nest attachment sites, camouflage, predator concealment, and temperature regulation (Joyce, 1993).

On the other hand, beneficial interactions are also observed, such as when bird's nest near social wasp colonies (Souza et al., 2017; Carvalho et al., 2023). In such cases, birds may potentially benefit from the presence of wasps, which deter potential predators, thereby increasing the survival of their offspring, especially during the vulnerable juvenile stages (Joyce, 1993).

In addition to nesting near social wasp colonies, there are records of birds using abandoned social wasp colonies for nesting, likely seeking protection against predators and/or thermal insulation (Araújo et al., 2025). The opposite also occurs, with social wasps utilizing bird nests for nesting (Barbosa et al., 2021; Oliveira and Souza, 2024). In this type of interaction, wasps may benefit from the aggressive defensive behaviour of certain birds, as observed with hummingbirds (Barbosa et al., 2021), from camouflage (Oliveira and Souza, 2024), and/or from the availability of prey attracted to bird droppings (Bologna et al., 2007).

The association between birds and insects is well-documented in birds of the genus *Tolmomyias*, which often nest near social wasps and other social insects, such as ants (Menezes et al., 2014; Carvalho et al., 2023; Silva et al., 2023; Souza et al., 2023).

However, there are no records of social wasps nesting inside the abandoned nests of bird species from this genus. Thus, the aim of this study was to report, for the first time, the nesting of *Mischocyttarus socialis* (Saussure, 1854) (Vespidae: Polistinae) inside an abandoned nest of *Tolmomyias sulphurescens* (Spix, 1825) (Passeriformes: Rhynchocyclidae), in a transitional area between the Atlantic Forest and Cerrado domains in southeastern Brazil.

METHODOLOGY.

The observation occurred incidentally during entomological studies on December 1, 2024, at Pico do Itambé State Park (-18.42960342271921, -43.338373730869385), in the state of Minas Gerais, southeastern Brazil. This conservation unit, covering 6,520 hectares, comprises vegetation types from the Atlantic Forest and Cerrado domains within the Espinhaço Mountain Range, Jequitinhonha Valley (IEF-MG, 2024). According to Köppen's climate classification, the region's climate is predominantly Cwa, with Cwb characteristics at higher elevations (Alvares et al., 2013).

A bird's nest was observed on a Annonaceae tree, near a social wasp colony, and both were collected for further investigation. The plant species was determined based on Mello-Silva et al. (2012). The

bird was identified based on the geographic distribution of the species and on biological and behavioral aspects, based on the nest's shape and architecture, as well as the materials used for its construction (fibers of *Marasmius* spp. fungi) (Sick, 1997; Crozariol, 2016). The social wasp colony located near the bird's nest was identified to the genus level based on nest architecture (Barbosa et al., 2021).

Inside the bird's nest, there was an active colony of social wasps, which were collected and the number of cells, pupae, larvae and eggs counted. Some adult wasps were collected, stored in 70% alcohol and taken to the Zoology Laboratory of the Instituto Federal do Sul de Minas Gerais (IFSULDEMINAS) –Campus Inconfidentes. Identification was performed using a taxonomic key (Silveira, 2006) and comparison with the Coleção Biológica de Vespas Sociais (CBVS) of IFSULDEMINAS – Campus Inconfidentes (https://specieslink.net/col/CBVS/), where they were also stored. Additionally, the bird's nest contained three solitary wasp nests and Lepidoptera cocoons.

RESULTS.

The bird's nest was located approximately 100 cm from an abandoned social wasp colony, likely *Polybia* sp., on a monkey-pepper tree [*Xylopia aromatica* (Lam.) Mart., Annonaceae], at a height of 6.66 m above ground near the Água Santa stream (Figure 1A). The nest, measuring 17 cm in length and 11 cm in width (Figure 1B), was devoid of adult or juvenile birds and was identified as belonging to *Tolmomyias sulphurescens* (Spix, 1825) (Passeriformes: Rhynchocyclidae).

Inside the bird's nest, an active colony of the social wasp *Mischocyttarus socialis* (Saussure, 1854) was discovered (Fig 1C, 1D), containing 46 cells, of which five had pupae, nine had larvae, and 12 contained eggs. Behind this colony, two mud nests of solitary wasps (Vespidae: Eumeninae) were observed-marking the first reported instance of this interaction. Additionally, 10 Lepidoptera (undetermined) pupae enveloped in silk were found further inside the nest (Figure 1D). Behind the silk structure, another mud nest of Eumeninae was identified.

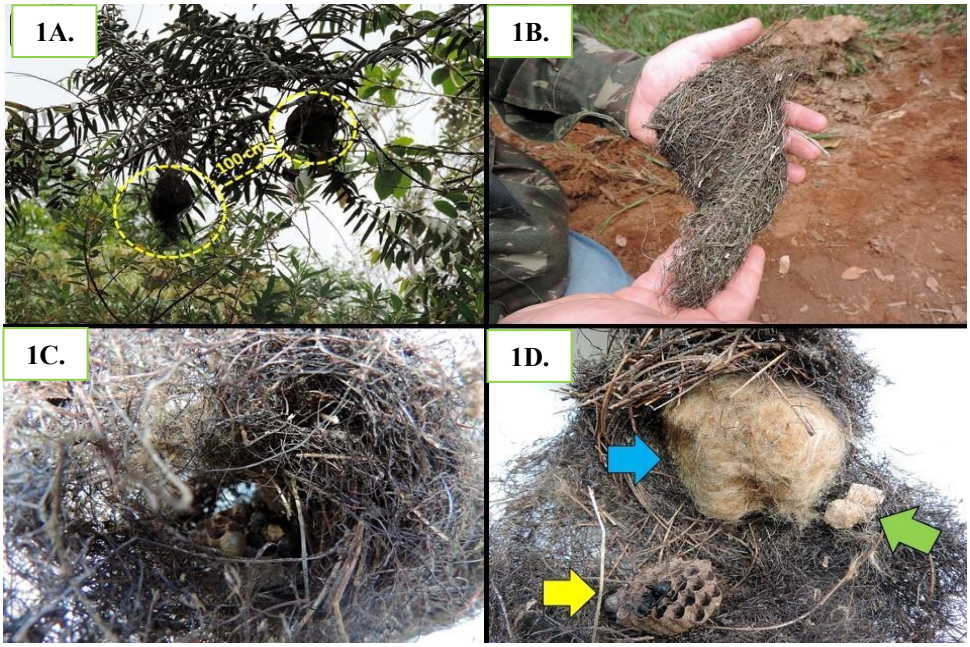

Figure 1A. Nest of *Tolmomyias sulphurescens* (left) associated with a colony of *Polybia* sp. (right). **1B.** Nest of *T. sulphurescens* collected. **1C.** View of the interior of the nest of *T. sulphurescens*, with a colony of *Mischocyttarus socialis* in evidence in the center. **1D.** Insects nested inside the nest of *T. sulphurescens*. Yellow arrow points to the colony of *M. socialis*: green arrow points to nests of solitary wasps and blue arrow points to Lepidoptera cocoons.
(Photos credit: The authors, 2024).

DISCUSSION.

It is likely that *T. sulphurescens* nested near the *Polybia* sp. colony to benefit from the potential protection offered by these wasps, which attack intruders that come too close to their colonies. Species of this genus can provide effective protection within a radius of one meter from their colonies (Wunderle and Pollock, 1985). The association between *T. sulphurescens* and social wasps is well-documented in Brazil and involves various vespid species (Menezes et al., 2014; Souza et al., 2017; Carvalho et al., 2023; Silva et al., 2023). In general, this relationship is considered commensal, with supposed benefits for the birds only, as *T. sulphurescens* individuals typically do not exhibit defensive behaviors towards their colonies (Sick, 1997). However, social wasps can also benefit from associations with birds that display aggressive behavior. For example, some *Mischocyttarus* species nest in hummingbird nests (Barbosa et al., 2021) or they utilize bird colonies as a food source. An example from Africa, reported by Bologna et al. (2007), describes the social wasp *Belonogaster lateritia* Gerstaecker, 1857 (Hymenoptera: Vespidae) nesting within colonial bird nests of *Philetarius socius* (Latham, 1790) (Passeridae). According to the authors, this association was mutually beneficial: the birds gained protection from the wasps, while the wasps benefited from prey (flies) attracted to the bird droppings accumulated in the nests. In addition to these supposed benefits, the nesting of *Mischocyttarus cassununga* (R. von Ihering, 1903) (Vespidae: Polistinae) in a nest of *Phacellodomus rufifrons* (Wied, 1821) (Furnariidae) in the Brazilian Cerrado has recently been documented (Oliveira e Souza, 2024). In that case, the authors hypothesized that the social wasp exploited camouflage for colony protection. Regarding the present report of *M. socialis* nesting within a *T. sulphurescens* nest, it is possible that the wasp utilized the bird's nest as shelter and protection against predators and parasitoids. *Mischocyttarus* species lack protective nest envelopes and have atrophied stingers, which make them more susceptible to predation. This vulnerability likely drove the evolution of various strategies for nest protection, such as careful selection of nesting sites (Raposo-Filho and Rodrigues, 1984) and camouflage (Milani et al., 2020; Souza et al., 2020; Milani et al., 2021; Brügger et al., 2024). Furthermore, bird nests may provide protection against environmental factors such as rain and wind, as the vegetation cover and structural substrate used for nesting by some bird species can shield nests from harsh climatic conditions (Paton, 1994; Aguilar et al., 2008). Social wasps can use diverse nesting substrates for this purpose, including masonry constructions (Prezoto et al., 2007; McGlynn, 2012). Bird nests are often complex structures that provide shelter for various invertebrates, including mites, spiders, cockroaches, beetles, centipedes, flies, and true bugs (Sick, 1997). They can also serve as substrates for the nesting of social Hymenoptera, such as bees (Camargo e Pedro, 2003), or as nocturnal resting sites for these insects (Azevedo and Faria Jr., 2007). This explains the occurrence of social wasps, as well as Eumeninae and Lepidoptera, within the *T. sulphurescens* nest. However, as this study was a single observation, it remains unclear whether social wasps consistently nest inside bird nests.

CONCLUSION.

This study reports an uncommon association in the literature, with *Mischocyttarus socialis* nesting inside a *Tolmomyias sulphurescens* nest, presumably for protection against biotic and abiotic factors. Further studies are suggested to determine the frequency and driving factors of this little-known interaction.

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