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Cryptic nest of *Mischocyttarus iheringi* (Hymenoptera: Vespidae: Polistinae) with description of camouflage

Bruno Corrêa Barbosa*, Marcelle Leandro Dias, Karine Munck Vieira, and Fábio Prezoto

The species of the genus *Mischocyttarus* Saussure (Hymenoptera: Vespidae: Polistinae: Mischocyttarini) are distributed exclusively in South and Central America. It is the largest genus of social wasps with 245 species belonging to 9 subgenera, being essentially a Neotropical taxon with a few species in northern Mexico (Richards 1978; Raw 1985; Cooper 1998; Silveira 2008; Carpenter & Andena 2013). This genus was originally characterized by Saussure (1853) as wasps with very long petioles of meso- and metasoma and nests tending toward being a single circular comb suspended by a central petiole (Richards 1978; Wenzel 1998; Silveira 2008).

The great diversity of species and the absence of a protective envelope considerably facilitate the observation of the wasps' behavior, but less than a dozen species of the genus have been studied adequately (Prezoto et al. 2011). Recent studies have demonstrated the fascinating diverse behavior of the genus, which appears to be more complex than previously thought (De Souza et al. 2012; Castro et al. 2014; Togni 2014).

The nests made by *Mischocyttarus* species have various architectural patterns, ranging from a single petiole with a comb in *Mischocyttarus cassanunga* (von Ihering) to a single line supported by multiple petioles as in *Mischocyttarus fraudulentus* Richards. Even more elaborate are the nests of *Mischocyttarus weyrauchi* Zikán built with a short petiole and a single line supported centrally and of *Mischocyttarus mirificus* Zikán, which builds a vertical nest consisting of a single row of cells (Jeanne 1972; Wenzel 1998).

One of the species about which little is known is *Mischocyttarus iheringi* Zikán, whose occurrence is limited to southeastern Brazil (Richard 1978; Barbosa 2015). Its colonies can be found mainly in rocks, trees, orchids, and bromeliads. They are inconspicuous and difficult to locate in the environment (Richards 1978; Wenzel 1998). This study aimed to increase knowledge of nesting of *M. iheringi* from the description and characterization of its nest, identification of materials used for construction, and notes about the behavior of individuals who assist in making the colony cryptic.

The study was performed in the Botanical Gardens of the Federal University of Juiz de Fora (21.724444°S, 43.279722°W), a fragment of seasonal semi-deciduous montane forest (Veloso et al. 1991), located on the urban perimeter of the municipality of Juiz de Fora, southeastern state of Minas Gerais, Brazil, 750 m a.s.l. The area has a warm subtropical climate with a dry winter and rainy summer (Cwa), according to the classification of Köppen (Sá Júnior et al. 2012). The area, which covers 34 ha (84 acres) in length, has recently been classified by Santiago et al. (2014) as a complex of expressive richness, diversity, and

floristic heterogeneity of woody vegetation with endangered species and a predominance of pioneer plants, in addition to the considerable presence of exotic species. Maciel & Barbosa (2015) suggest this area represents novel ecosystems.

Fortnightly visits were conducted between Jun and Nov 2013. When colonies were found, the numbers of cells were recorded, the colony was photographed, and the ad libitum method was used to record all behavioral activities (Altmann 1974). Some individuals and nests were collected for identification. The nests were analyzed by Professor Ana Paula Gelli de Faria, Department of Botany, Federal University of Juiz de Fora for identification of plant material used for camouflage.

Four nests of *M. iheringi* were found. Two of these (1 active and 1 abandoned) were located on the petiole of *Euphorbia cotinifolia* L. (Malpighiales: Euphorbiaceae), whereas the other 2 nests (1 active and 1 abandoned) were found under a leaf of *Portea petropolitana* (Wawra) Mez (Poales: Bromeliaceae).

The small number of recorded nests is probably due to the fact that the populations of this species are much smaller compared with those of other local species (Barbosa 2015), evidenced by the present data, and due to their limited occurrence hitherto restricted to the 2 areas Itatiaia National Park and Botanical Garden of the Federal University of Juiz de Fora (Richard 1978; Barbosa et al. 2015). In addition, the cryptic characteristics and small size of the nests, which had only about 10 to 20 cells, made it difficult to locate them (Fig. 1).

The architectural pattern of the nests revealed that the cell openings face the substrate, at an angle of 42° from the petiole, which is positioned at the upper end (Fig. 2G). The posterior part of the comb was covered with plant material, more precisely bryophytes: Metzgeriaceae (*Metzgeria* spp.) (Fig. 2A), Lejeuneaceae (*Lejeunea* spp.) (Fig. 2B), Orthotrichaceae (*Macrocoma* spp.) (Fig. 2C), and Stereophyllaceae (*Pilosium* spp.) (Fig. 2D). The plants were "bitten," indicating that they had been collected from nearby areas and deposited with saliva on the nest to resemble the substrate chosen for nesting, simulating the bark of the tree in which the nest was found or the leaf surface of the plants (Figs. 2E and 2F). Note in Fig. 1B a newly established nest (abandoned) devoid of camouflage, which can be seen by the yellowing of the cells, suggesting that after construction of a small number of cells, the process of camouflage is initiated and continues until the end of the cycle and nest abandonment.

This particular construction behavior suggests a possible form of camouflage used to protect the colony from natural enemies. This could be a consequence of the behavior displayed by adult wasps of *M.*

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Fig. 1. Construction patterns of *Mischocyttarus iheringi* nests found in the Botanical Gardens of the Federal University of Juiz de Fora, Brazil, showing the number of cells.

iheringi, which leave the nest during a disturbance and do not exhibit stinging behavior similar to that displayed by most species of social wasps.

In wasps that found their nests independently, newly emerged (young) individuals usually hide behind the comb, whereas older wasps remain above the cells (Grazinoli et al. 2010; Togni 2014). This behavior was not observed in this study (Fig. 2H); instead, wasps avoided staying above the nest and so helped to maintain the camouflage of the colony.

Such camouflage, evidenced by the construction of small and inconspicuous nests, is the main strategy of defense for many *Mischocyttarus* species that, by concealment, hide the search image from predators such as birds (Silveira 2008). This seems to be a strategy used by the low-aggressive species of *Mischocyttarus* that mimic species with more aggressive behavior, such as *M. cassununga* that mimics *Agelaia vicina* (de Saussure) and *Mischocyttarus cerberus* Ducke that mimics *Agelaia pallipes* (Olivier) (Richards 1978; Giannotti 1999; O'Donnell & Joyce 1999).

Some studies have shown that camouflaging of nests is a common behavior of *Mischocyttarus* species (Jeanne 1972; Gianotti 1999; Montagna et al. 2010). Besides being social wasps with low aggressive behavior (Manzoli-Palma 1993), species of *Mischocyttarus* have atrophied muscles in the sting (Raposo-Filho & Rodrigues 1984), which is why camouflage and nest evasion are their major defensive strategies.

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Summary

Camouflage is a strategy widely used by various insects in the wild. However, the use of plant material to construct nests is not a widespread habit among the Polistinae. In this study, we describe the nest of *Mischocyttarus iheringi* Zikán (Hymenoptera: Vespidae) with notes on the use of plant material and the wasps' behavior.

Key Words: nesting habitat; nest construction; social wasp

Sumario

El camuflaje es una estrategia muy utilizada por varios insectos en la naturaleza. Sin embargo, el uso de material vegetal para la construcción de nidos no es un hábito generalizado entre los Polistinae. En este estudio, se describe el nido de *Mischocyttarus iheringi* Zikán (Hymenoptera: Vespidae) con notas sobre el uso de material vegetal y el comportamiento de las avispas.

Palabras Clave: hábitat de anidación; construcción del nido; avispas sociales

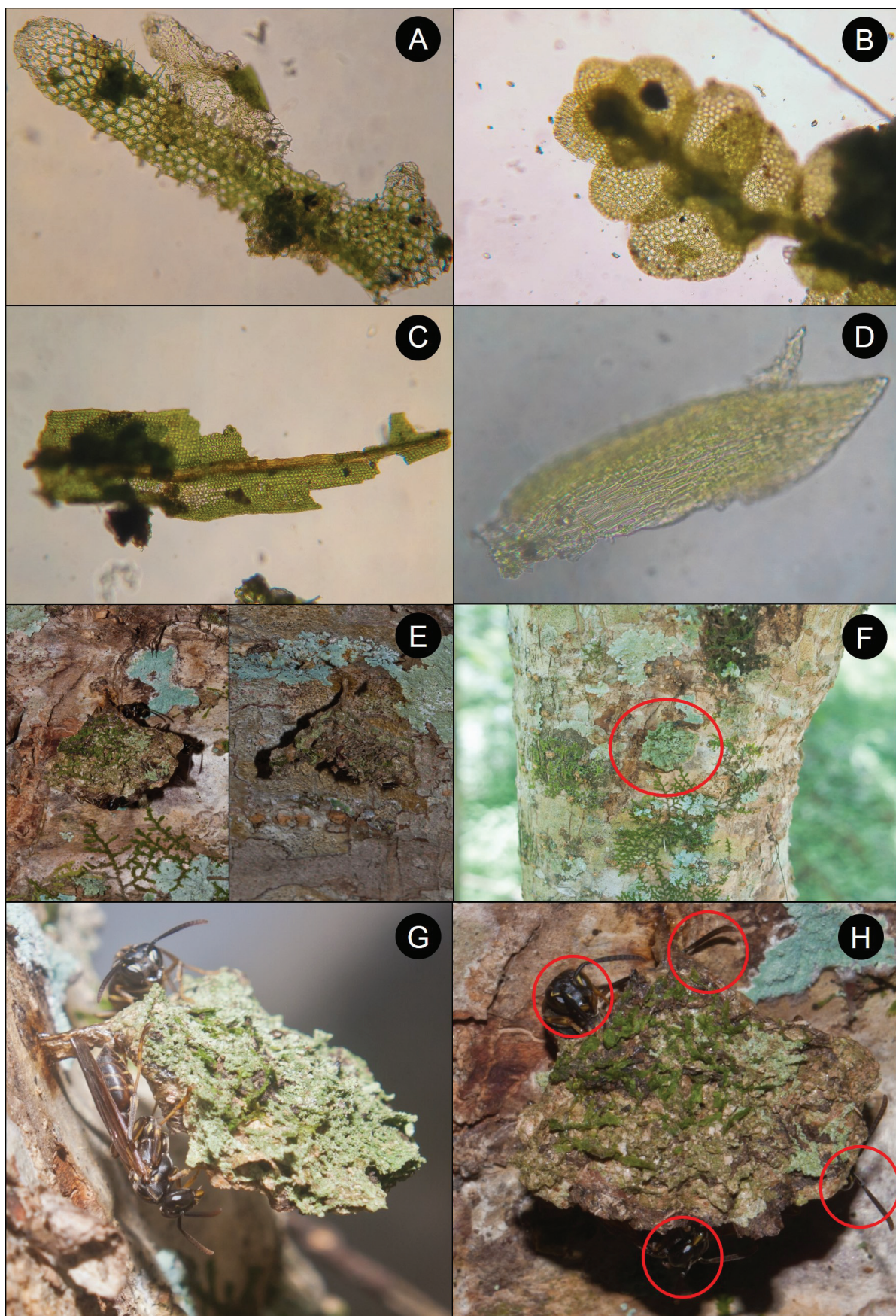


Fig. 2. Bryophytes used as camouflage material: A, *Metzgeria* spp.; B, *Lejeunea* spp.; C, *Macrocoma* spp.; D, *Pilosium* spp.; E and F, nests showing camouflage with the substrate; G and H, detail of the positioning of individuals of *Mischocyttarus iheringi*.

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