



Short Communication

Note on predation of the brood of *Mischocyttarus injucundus* (de Saussure) by another social wasp in Caxiuanã, Pará, Brazil, with new records of species for the Ferreira Penna Research Station (Hymenoptera, Vespidae, Polistinae)



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ABSTRACT

Predation of the brood of *Mischocyttarus injucundus* by another polistine social wasp is reported from an Amazonian rainforest locality. This is the first report for the American tropics of naturally occurring predation by one social wasp on the brood of another. Three species are added to the list of the Ferreira Penna Research Station, raising known local richness to 81 species: *Mischocyttarus filiformis* (de Saussure, 1854), *Mischocyttarus vaqueroi* Zikán, 1949, and *Parachartergus griseus* (Fox, 1898).

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Observations reported in this note were made in the Ferreira Penna Research Station (ECFPn) of the Goeldi Museum, in Caxiuanã, Melgaço, Pará, Brazil. The general physiographic aspects of the region were described in Silveira (2002), together with an inventory of the local social wasp fauna, which is currently known to comprise 81 species. The area is covered mainly by typical lowland rain forest, and is drained by numerous variably sized mainly black water rivers (see also Lisboa et al., 2013). The Curuá River, with a generally north-to-south course is one of those streams flowing into the huge Caxiuanã Bay, and it is also the main access to the base of the ECFPn (Fig. 1(1a)). Near the station, this river is 70–150 m wide, its margins being covered by a narrow fringe of “igapó” vegetation, a kind of seasonally inundated forest (Fig. 1(3)).

On March 12, 2015, ca. 3:00 PM, the authors (by boat and helped by a native guard of ECFPn) discovered a relatively small polistine nest with a single unenveloped comb (Fig. 1(2)) amidst vegetation on the West bank of the Curuá River, some 500 m upstream from the ECFPn base (Fig. 1(1b)). As we approached the nest, which was fixed to a leaf ca. 1.50 m above the water surface (Fig. 1(3) – black arrow),

two very large wasps, yellow with tip of the metasoma black, were perching on the nest as seen by all three observers. One of these wasps soon flew away. While one of us (SMCS) prepared to collect the individual that remained on the comb, the wasp quite rapidly removed a resident larva from its cell, and took off with the prey held in its forelegs and mandibles, only to land on the nearby vegetation some 5 m away (Fig. 1(3) – red arrow), where it stayed for a short time masticating the captured larva. The observers then decided to move the boat toward the sitting wasp, and tried (OTS) to collect it with a hand net, but this was not successful and the wasp escaped.

The observers returned to the site after some 45 min in the hope that wasps had returned to the nest. However, they were surprised to find a very different outcome. Considering that in this part of Amazonia there are only two species that make single open combs and are at the same time very large and yellow with the tip of metasoma black, the observers would expect to find on the nest individuals either of *Mischocyttarus flavicans* (Fabricius, 1804) (Fig. 1(4c)) or of *Polistes testaceicolor* Bequaert, 1937 (Fig. 1(4d)). Instead, it was noted that the nest cells were of a much smaller size than those of *M. flavicans* or of most *Polistes*, and furthermore there were upon the nest (comb with 24 cells, two capped) correspondingly much smaller and darker wasps. The nest and two female

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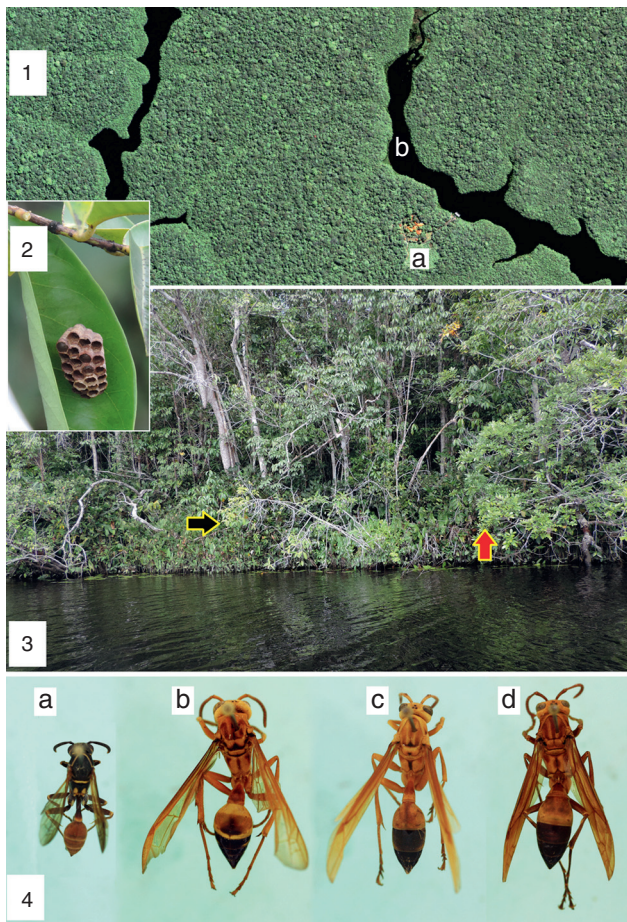


Fig. 1. (1) General satellite view of the landscape in the region of the ECFPn (a) and (b) near the site where described events occurred in the Curuá River, in Caxiuanã; (2) nest of *M. injucundus* on leaf of a tree in Igapó vegetation; (3) Curuá River margin at the point where predation of the brood of *M. injucundus* was observed; black arrow: nest site; red arrow: site where the predatory wasp was observed masticating a larva of *M. injucundus*; (4) (a) general views of *M. injucundus* (body length ca. 10 mm) and three other polistine species with body size and color fitting observed aspects of the predatory wasp: (b) *A. testacea*, (c) *M. flavicans*, (d) *P. testaceicolor* (all females, to same scale).

wasps were collected (a further female and a male emerged in the lab after several days) and identified as *Mischocyttarus injucundus* (de Saussure, 1854) (Fig. 1(4a)).

So what at first sight seemed to us to be an improbable instance of conspecific cannibalism, turned into an even less expected case of predation of the brood of a *Mischocyttarus* species by another polistine wasp. There are a few similarly sized and colored eumenine species in eastern Amazonia, but behavior and general morphological aspects (such as head and mandible proportions) seemed to rule out such a possibility. Furthermore, while eumenine wasps sting and paralyze prey before taking them to a nest, in the present case the *M. injucundus* larva was not observed to have been stung, while mastication movements by the predatory wasp could be definitely seen by two observers.

Given that the large yellow-and-black wasps seen on the nest so typical of polistine independent founders did not build it, the list of candidates for the observed predatory behavior then should also include *Agelaia testacea* (Fabricius, 1804) (Fig. 1(4b)). According to Silveira (2002), this species has been found in the area of the ECFPn. However, it was not collected at river margins but only at interior forest habitats, and was quite uncommon, much less frequent than *Agelaia angulata* (Fabricius, 1804), a similarly sized congener. It was also not found among several *Agelaia* species collected in intensive

sampling with carrion traps in that locality by Silveira et al. (2005). Indeed, *A. testacea* was not collected by the present authors after four days exploring forest habitats at the ECFPn in the same period in which this observation was made. In another site in Caxiuanã (PPBio site), 30 km distant from the ECFPn, Silva and Silveira (2009) found *A. testacea* at somewhat higher frequency, being the seventh most common species. In that site, *M. flavicans* was collected with very small frequency at interior forest habitats, and *P. testaceicolor* was again absent.

Two circumstances deserve emphasis in the context of the events here described. First, no adult individuals of *M. injucundus* were seen at the focal nest or in the proximity during the short period in which the large yellow-and-black wasps were observed. Second, there were two individuals of the large species, as noted by all observers, and they apparently did not reciprocally display aggressive behaviors. Given that forager recruitment of the kind occurring in ants and *A. mellifera* (with information of specific locations or food resources) is up to now unknown in Neotropical social wasps (Jeanne et al., 1995; Taylor et al., 2011), the simultaneous presence of the two invading individuals could possibly result from regular exploration of river margins by foragers of that species. In this regard, O'Donnell and Hunt (2013), in explaining occurrences of group hunting in two epiponine species [*Parachartergus apicalis* (Fabricius, 1804) and *Agelaia cf. angulata*] admit that the responses by conspecific foraging (nestmates) to local cues could help to promote formation of such hunting groups (local enhancement). Actually, *A. testacea* may have very large colonies (Jeanne, 1970) which enhances the chances of two foragers of meeting at a point resource such as this *M. injucundus* nest but, as mentioned above, *A. testacea* is relatively rare in the ECFPn area, and unknown to forage there at river margins. Regarding the other two candidate species, *M. flavicans* and *P. testaceicolor*, they have much smaller colonies, and furthermore have not yet been recorded at the ECFPn.

M. injucundus (reported by Silveira, 2002 as *M. juruanus* Richards, 1978; see also Silveira, 2006 for synonymy between these names) is the most commonly found species of social wasp nesting at river margins in the region of Caxiuanã, followed by *M. foveatus* Richards, 1940 and *Apoica pallida* (Olivier, 1791). Brood of these colonies may thus constitute a regular and relatively abundant resource for predatory wasps powerful enough to overcome their defensive capacity. We believe this is the first report for the American tropics of interspecific predation by one social wasp on the brood of another. Such predator-prey relations between vespidae species have been commonly reported in the Old World tropics, involving species of Vespinae. *Vespa tropica* (Linnaeus, 1758) specializes upon species of Polistinae, *Ropalidia*, *Parischnogaster* and *Stenogaster*, and *V. mandarinia* has been reported to prey on the brood of *Vespula* spp. (Matsuura and Yamane, 1990). Some of these species may indeed be mentioned as possibly playing a significant role controlling polistine populations in Asia (Miyano, 1980). Regarding Neotropical social wasps, only in experimental conditions has a similar phenomenon been observed in Costa Rica, with *P. occidentalis* (Olivier, 1791) preying upon the brood of artificially approximated (1.8 cm) colonies of *M. rufidens* (de Saussure, 1854) from which adults had been removed (London and Jeanne, 1997).

Planned and more intensive studies of natural populations of *M. injucundus* will be necessary to attest the true importance of predation by other social polistines in the ecology of the species. Of course, the findings here reported also alert us to the possibility of similar naturally occurring phenomena involving other species of tropical Polistinae. A large size difference between the involved species appears to be a prerequisite for brood predation since, due to the probable lack of forager recruitment, massive invasions (as in mass-recruiting ants) seem to be improbable between polistine wasps unless in very special conditions of close proximity between colonies (see London and Jeanne, 1997).

Update of the species list of Polistinae of the ECFPn.

Since the paper by Silveira (2002) in which 79 polistine species were listed for the ECFPn, only three other species can now be confirmed as new to the area:

- *Mischocyttarus filiformis* (de Saussure, 1854): 1 female, Brasil, Pará, Melgaço, FLONA Caxiuanã, ECFPn, 06/viii/2000, C. K. Starr (MPEG).
- *Mischocyttarus vaqueroi* Zikán, 1949: 3 females, Melgaço, Caxiuanã, ECFPn, 11/iii/2015, Silveira & Felizardo (MPEG).
- *Parachartergus griseus* (Fox, 1898): 1 female, Brasil, Pará, Melgaço, Caxiuanã, Base Física, 13/x/1991, J. Dias (MPEG).

Because Silveira (2006) synonymized one of the specific names in the 2002 list [*Mischocyttarus juruanus* Richards, 1978, to *M. injucundus* (de Saussure, 1854)], the currently known social wasp richness reaches 81 species. Other improvements to that list are the identifications of *Apoica thoracica* du Buysson, 1906 (by K.M. Pickett; originally listed as “sp. 30 – *Apoica* sp. nr. *thoracica*”), and *Agelaia timida* Cooper, 2000 (listed as “sp. 38 – *Agelaia* sp. nr. *cajennensis*”), and the description of *Protopolybia aliciae* Silveira, 2004 (listed as “sp. 51 – *Protopolybia* sp. nr. *scutellaris*”).

Conflicts of interest

The authors declare no conflicts of interest.

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References

- Jeanne, R.L., 1970. Descriptions of the nests of *Pseudochartergus fuscatus* and *Stelopolybia testacea*, with a note on a parasite of *S. testacea* (Hymenoptera, Vespidae). *Psyche* 77, 54–69.
- Jeanne, R.L., Hunt, J.H., Keeping, M.G., 1995. Foraging in social wasps: *Agelaia* lacks recruitment to food. *J. Kans. Entomol. Soc.* 68, 279–289.
- Lisboa, P.L.B., Bezerra, M.G.F., Cardoso, A.L.R., 2013. Caxiuanã. História natural e ecologia de uma floresta nacional da Amazônia. MPEG, Belém.
- London, K.B., Jeanne, R.L., 1997. Site selection by a social wasp in a nest association (Hymenoptera: Vespidae). *J. Insect Behav.* 10, 279–288.
- Matsuura, M., Yamane, S., 1990. *Biology of the Vespine Wasps*. Springer-Verlag, Berlin.
- Miyano, S., 1980. Life tables of colonies and workers in a paper wasp, *Polistes chinensis antennalis*, in central Japan. *Res. Popul. Ecol.* 22, 69–88.
- O'Donnell, S., Hunt, J.H., 2013. Group hunting by workers of two Neotropical swarm-founding paper wasps, *Parachartergus apicalis* and *Agelaia* sp. *Insectes Soc.* 60, 369–372.
- Silva, S.S., Silveira, O.T., 2009. Vespas sociais (Hymenoptera, Vespidae, Polistinae) de floresta pluvial Amazônica de terra firme em Caxiuanã. Melgaço, Pará, Iheringia, pp. 317–323.
- Silveira, O.T., 2002. Surveying Neotropical social wasps, 2002. An evaluation of methods in the Ferreira Penna Research Station (ECFPn), in Caxiuanã, PA, Brazil. *Papéis Avulsos de Zoologia* 42, 299–323.
- Silveira, O.T., 2006. Revision of the subgenus *Kappa* de Saussure of *Mischocyttarus* de Saussure (Hym.; Vespidae, Polistinae, Mischocyttarini). *Zootaxa* 1321, 1–108.
- Silveira, O.T., Esposito, M.C., Santos Jr., J.N., Gemaque Jr., F.E., 2005. Social wasps and bees captured in carrion traps in a rain forest in Brazil (Hymenoptera: Vespidae; Apidae). *Entomol. Sci.* 8, 33–39.
- Taylor, B.J., Nordheim, E.V., Schueller, T.I., Jeanne, R.L., 2011. Recruitment in swarm-founding wasps: *Polybia occidentalis* does not actively scent-mark carbohydrate food sources. *Psyche*, Article ID 378576, 7 pages.