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Scientific note: the histerid beetle *Omalodes foveola* (Coleoptera: Histeridae) found as a Melittophile, co-inhabiting Africanized honeybee hives in Brazil

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Social bee symbionts (Melittophiles) are considered scarce in nature (Kistner 1979). Even so, some arthropods have been observed to co-inhabit beehives (Neumann and Ritter 2004). These arthropods may be parasites, commensals, or mutualists, and range from mere invaders occasionally using a nest as shelter to invaders forming more intricate and evolutionarily significant relationships with their hosts (Atkinson 2011). Many of these Melittophile arthropods are found to be beetles (Ellis et al. 2008, Haddad et al. 2008, Marini et al. 2013, Audisio et al. 2014). One of the best known coleopteran beehive symbionts is *Aethina tumida* Murray (Coleoptera, Nitidulidae), which in their native sub-Saharan Africa are largely benign hive scavengers (Hepburn and Radloff 1998), but in North America (Hood 2004), Australia (Neumann et al. 2016) and many parts of the world (Neumann et al. 2016) are invasive pests, causing severe damage to apiaries. More recently, *A. tumida* has been found in Brazil (OIE 2016), raising awareness of beekeepers and researchers to previously unknown or unrecognized hive symbionts.

In this note, we describe a close association between a histerid beetle species and beehives. The predator *Omalodes* (*Omalodes*) *foveola* Erichson,

1834 has never been mentioned as a beehive symbiont, though its wide geographical distribution suggests that it may be a Melittophile species also in other regions. These findings suggest that the interactions between *O. foveola* and honey bees, and stingless native social bees (Meliponinae), need to be evaluated in order to determine whether there is a negative impact.

Beetles were reported inside *Apis mellifera* L. colonies in a commercial apiary located inside an orange farm in the state of São Paulo (Piracicaba city: 22° 42' 53.0" O; 47° 36' 51.0" S), Brazil. The apiarists first reported their observations to governmental animal health agencies as a case of *A. tumida* Murray (Coleoptera, Nitidulidae) infestation. On the basis of this report, we collected adult specimens of the beetle directly from the hives. Specimens were immediately labeled and stored in ethanol (70°GL). Some of the specimens were pinned in dry mount and the vouchers were stored in the Coleção Entomológica Pe. Jesus Santiago Moure - DZUP (Curitiba, Paraná, Brazil) and in the Coleção Entomológica Embrapa Florestas (Colombo, Paraná, Brazil).

The purpose was to investigate the *Aethina* notification: the floor and honeycombs of hives were visually inspected and the area immediately outside was inspected in search of adults and pupae.

Histerid beetle samples were first identified based on Almeida and Mise (2009), and Almeida et al. (2015). Later, specimens were sent to the Unidade Laboratorial de Referência Fitossanitária, Instituto Biológico,

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Secretaria da Agricultura e Abastecimento de São Paulo and also to the Laboratório de Sistemática e Bioecologia de Coleoptera (LSBC, Dr. Lúcia M. Almeida) and the Laboratório de Pesquisas em Coleoptera (LaPCoL, Fernando W. T. Leivas), both from Universidade Federal do Paraná—the latter with a long tradition of histereid systematics.

Adult beetles were found in the entrance and on the floor of the beehive model Langstroth, in variable numbers. After the initial detection, we inspected 21 hives (in the same locality) with beetles found in three more (inside the hive). An average of 12 beetles per beehive/colony was found. The species was later confirmed as the histereid beetle *O. foveola* Erichson, 1834.

The recent detection of *A. tumida* in the region had increased the awareness of the beekeeping community to any beetles found in beehives. However, misidentification of symbionts is probably common among beekeepers, leading to the risk that apiaries could be unnecessarily discarded (the invasive species and the native symbiont are illustrated in Figure 1).

In fact, there are sufficient morphological differences between the two species to allow prompt differentiation. *O. foveola* adults differ from *A. tumida* in the following characteristics: (i) a rounded, compact, and non-pubescent body; (ii) geniculate antenna, clubs with three compact antennomeres; (iii) a broad prosternal keel; (iv) hind coxae widely separated by a broad, truncate

intercoxal process of the first ventrite; (v) undilated basal tarsomeres that are hairless beneath, and (vi) a short truncate elytra exposing two non-flexing terga (Figure 1b). In contrast, *A. tumida* adults differ from *O. foveola* by the following: (i) a pubescent and more elongated body; (ii) strongly transverse antennal clubs with the segments clearly separated; (iii) a narrow prosternal keel; (iv) hind coxae not widely separated by a broad, truncate intercoxal process; (v) basal tarsomeres dilated and hairy beneath, and (vi) a short elytra exposing a single tergite (Figure 1a) (sometimes the females may show more if they are close to egg laying). With respect to the larvae, *Omalodes* spp. usually have setae on the body and a long and falcate mandible, while the larvae of *A. tumida* have spines on the body and less evident mandibles (Teixeira et al. 2016).

Moreover, adults of *O. (Omalodes) foveola* differ from all known *Omalodes (Omalodes)* species in having frons with strong longitudinal sulcus medially; frontal stria slightly projected towards the epistoma medially lateral punctures of pronotum and indicated on entire lateral margin; and propygidium with a medial area smooth or with sparse punctures, with a pair of strong foveae on the posterior half (Moura 2014).

O. foveola is widely distributed in South and Central America (Mazur 2011) and was recorded for the first time in Paraná state (Brazil) by Leivas et al. (2013). This species is considered potentially useful to control *Cosmopolites sordidus* Germar, 1924, one of the main pests of banana cultivation (Mesquita 2003).

The association of Histeridae species with social insect colonies was already known (Caterino and Vogler 2002), although *O. foveola* was not noted as a Melittophile. In Manaus (Brazilian state of Amazonas), *Hololepta (Leionota) reichii* Marseul and other species of histereid have been recorded in stingless beehives (Hymenoptera: Apidae). Here, they act as natural enemies with intense predatory activity on stingless bee larvae and pupa (Coletto-Silva and Freire 2006). However, our account is the first record of *O. foveola* in *A. mellifera* colonies and only the second record of histereid beetles associated with Apidae nests to Brazil.

Finally, it is important to stress the need for further research on *O. foveola* ecology and interactions with bee colonies (especially in association with orange orchards). The wide distribution of this beetle species means that it could also be widespread as a beehive symbiont. The impact of the *O. foveola* on apiaries and also on native bees (Meliponinae) should also be further evaluated.

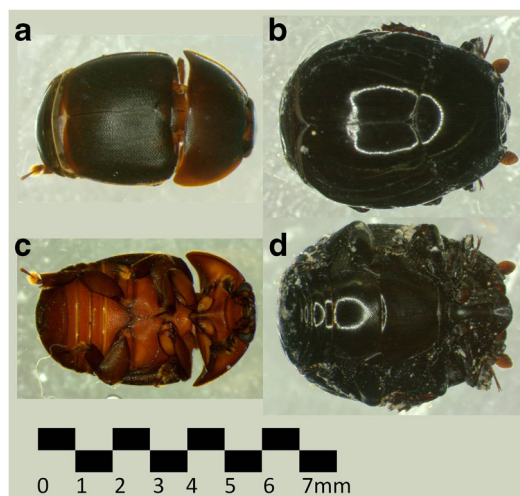


Figure 1. Morphological comparison between *Aethina tumida* (a, c) and *Omalodes foveola* (b, d): dorsal view (a, b) and ventral view (c, d).

Authors' contributions EK: collection, fieldwork, composition; CK: sanitary discussion; FWTL: Histeridae systematist; GSS: discussion, systematics, and manuscript composition.

***Omalodes foveola* (Coleoptera: Histeridae) découvert comme une espèce symbionte dans des colonies d'abeilles africanisées au Brésil**

Der Stutzkäfer *Omalodes oveola* (Coleoptera: Histeridae) wurde als melittophiler Symbiont in afrikanisierten Honigbienenvölkern in Brasilien gefunden

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