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SHORT NOTE

Host records and cleptoparasitic behavior of the cuckoo bee *Mesonychium asteria* (Smith) (Apidae, Ericrocidini) in nests of *Centris xanthomelaena* Moure & Castro (Apidae, Centridini)

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Abstract

Mesonychium asteria (Smith) is a cleptoparasitic bee with occurrence restricted to South America. In this study, we provide new information related to the host association and cleptoparasitic behavior of this species in nests of *Centris xanthomelaena* Moure and Castro. Observations were conducted at the nesting sites of *C. xanthomelaena* in a Caatinga area of Pernambuco state, Brazil. Females of *M. asteria* were observed performing overflying in nest aggregations and attacking some nests. We have confirmed the cleptoparasitic association with the emergence of adult *M. asteria* from the host bee nests, and also by the presence of its larva on the brood cells.

Ericrocidini comprise a tribe of cleptoparasite bees composed of 11 genera, mostly with Neotropical distribution (Snelling & Brooks, 1985; Moure & Melo, 2007). These bees are almost exclusively related to *Centris* Fabricius nests (Snelling & Brooks, 1985; Rozen & Buchmann, 1990;Rocha-Filho et al., 2009), except *Mesoplia rufipes* (Perty) and *Mesonychium asteria* (Smith) which have been respectively reported as cleptoparasites (Rozen, 1969;Hiller & Wittmann, 1994; Gaglianone, 2005; Rocha-Filho et al., 2008) and probable cleptoparasites (Gaglianone, 2005; Rocha-Filho et al., 2008) of *Epicharis* Klug species. Despite the large number of species belonging to this tribe, the associations between cleptoparasites and hosts in this group still poorly known.

The genus *Mesonychium* Lepeletier and Serville, is the second most diverse of Ericrocidini, with nine species (Moure & Melo, 2007). This genus is widespread distributed in the high and/or dry regions in South America (Michener, 1979; Snelling & Brooks, 1985; Silveira et al., 2002). Little is known about the biology of this genus and its association with hosts, with *M. asteria* and *Mesonychium jenseni* (Friese, 1906) the only two species with their host records available in the literature (see Rocha-Filho et al., 2009 and references therein). From this study, we provide new information related to the cleptoparasitic behavior of *M. asteria* in nests of *Centris* (*Paracentris*) *xanthomelaena* Moure and Castro, a ground-nest bee endemic of Caatinga.

Observations on *M. asteria* were carried out at the nesting sites of *C. xanthomelaena* in a Caatinga area at the Campus de Ciências Agrárias of the Universidade Federal do Vale do São Francisco (CCA/ UNIVASF) (9°19'44.2"S, 40°33'30.1"W), Petrolina, Pernambuco state, Brazil. The climate is dry and hot semiarid (BSh according to Köpen

classification) with low rainfall mostly from February to April (Alvares et al., 2013). The monitoring of the nests was done from May to June 2015 and from July to November 2017. Field observations were conducted between 04:50 a.m. and 06:00 p.m. Voucher specimens were sent to bee taxonomists for identification and then they were deposited in the Entomological Collection of the National Museum in Rio de Janeiro (MNRJ).

Mesonychium asteria was the main natural enemy of the nests of *C. xanthomelaena*. We identified two behaviors performed by females of *M. asteria*: (1) overflying of nesting sites, and (2) invasion of nests (Fig 1A). Cleptoparasitic females visited the nest site at least twice a day, once during the morning and another during the afternoon. Besides that, females of *M. asteria* flyover near the ground patrolling any hole in the ravine. After finding an active nest of *C. xanthomelaena*, the female of *M. asteria* either invaded it immediately or landed close to the nest entrance waiting until the host left temporarily the nest, for about 10/15 min, to invade it (Fig 1B, C).

Mesonychium asteria spent between 50 seconds and 14 minutes inside the host nests (n = 6). After landing close to the nest entrance, the females externalized their ovipositors immediately. During the period of invasion we sometimes observed a buzz inside the nest. After parasitized, the nests were quite frequently visited, and the overfly behavior was suppressed.

Fig 1. Behavior of the female of *Mesonychium asteria*. (a) cleptoparasite bee invading nest, (b), (c) female waiting close to the nest entrance, (d) *M. asteria* visiting flower of *Rhaphiodon echinus* close to nest site.

It indicated that *M. asteria* might be able to memorize their parasite nests, as reported to other cleptoparasite bees (Coville et al., 1983). In three occasions, the female of *M. asteria* entered the nest while the host bee was inside and the cleptoparasite was thrown out of the nest.

Eleven adults of *M. Asteria* emerged from nine nests. The developing time for these adults ranged from 159 to 227 days. Four larvae of a natural enemy, probably *M. Asteria,* based on larval development of bees from the same tribe (Vinson et al., 1987; Rozen et al., 2011), were observed in open brood cells of four different nests. In one brood cell a first instar larval stage was found above the pollen mass with no presence of the host bee's egg or larvae (Fig 2A). Larva from the first instar stage had a prognathous head, head capsule pigmented and sclerotized with an elongate mandible, and the chorion attached to its end (Fig 2B), as visualized on other first instar larva of Ericrocidini tribe (Vinson et al., 1987; Rozen et al., 2011). In three brood cells we observed a well-developed larva, already with the cocoon. The cocoon of *M. Asteria* has a silken fibrous consistency (Fig 2C), that is different from the cocoon of *C. Xanthomelaena*.

In addition, we also observed *M. Asteria* and *C. Xanthomelaena* sharing the same source of nectar: *Poincianella microphylla* (Fabaceae) and *Rhaphiodon echinus* (Lamiaceae) (Fig 1D).

Despite of the genus *Mesonychium* have been reported as a parasite of nests from the subgenus *Centris* (*Paracentris*) Cameron, (Rocha-Filho et al., 2009), this study is the first to confirm the association of both. For the genus *Centris*, only *Centris* (*Centris*) *pulchra* Moure, Oliveira and Viana, was reported as host of *M. Asteria* (Rocha-Filho et al., 2009). However, Mahlmann and Oliveira (2012) pointed to a possible error in the identification of *M. Asteria* in their study, which makes the present study unprecedented in the registration of *M. Asteria* as a nest cleptoparasite for the genus *Centris*. Further, the records of *M. Asteria* which indicated association with *Epicharis* nests, were based on indirect evidence of parasitism in nests of *Epicharis nigrita* (Friese) and *Epicharis icolour* Smith, (Gaglianone, 2005; Rocha-Filho et al., 2008), because there were not records of emergence of *M. Asteria* from these possible host bee brood cells.

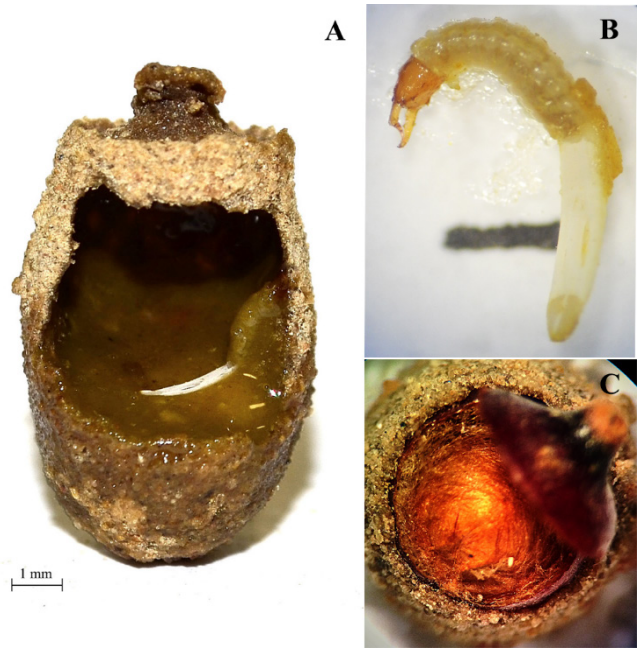

Fig 2. Larvae and parasitized cells feature.(a) parasitized cell, (b) first instar larvae, (c) *Mesonychium asteria* cocoon.

Finally, it is probable that *M. Asteria* has a preference for *C. Xanthomelaena* nests, since in the same area two other species of *Centris* (*Centris*) Fabricius, and one of *Centris* (*Trachina*) Klug, are nesting, however no cases of invasion or emergence of *M. Asteria* from their nests was observed. This fact may be associated first with the body similarity of the parasite species with its host, as well as brood cell size. Beyond that, the evidence of parasite and host sharing the same food source may explain the *M. Asteria* preference for *C. Xanthomelaena* nests.

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