

## First report of whip scorpions (Arachnida: Uropygi) feeding on dung beetles (Coleoptera: Scarabaeidae)

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**Abstract:** Dung beetles are among the most important insect groups in ecosystems, but despite this little information exists about their predators. In the present study, predation on dung beetles by whip scorpions is reported for the first time, based on observations carried out under captivity. Further research and analyses of the predators of this group are necessary.

**Key words:** Arachnida, Uropygi, whip scorpions, Coleoptera, Scarabaeidae, *Dichotomius*, *Mastigoproctus*, predation, Colombia.

### Primer registro de vinagrillos (Arachnida: Uropygi) depredando sobre escarabajos coprófagos (Coleoptera: Scarabaeidae)

**Resumen:** Los escarabajos coprófagos son uno de los grupos de insectos más importantes en los ecosistemas, pero a pesar de ello es muy poca la información que se tiene de sus depredadores. En el presente estudio se reporta por primera vez la depredación de escarabajos coprófagos por parte de uropígididos, a partir de observaciones realizadas en cautiverio. Se hacen necesarios más estudios y análisis de los depredadores del grupo.

**Palabras clave:** Arachnida, Uropygi, vinagrillos, Coleoptera, Scarabaeidae, *Dichotomius*, *Mastigoproctus*, depredación, Colombia.

The family Scarabaeidae (Coleoptera: Scarabaeoidea) is very important in Neotropical ecosystems due to its significant role in nutrient recycling (Halffter & Matthews 1966, Gill 1991). Despite being an important and well-studied group, there is little in the literature on predators of dung beetles. Most references make mention of general groups such as birds, mammals, reptiles and other insects, but very few is available on the precise species or genera either of predators or preys (Woodruff, 1973; Howden & Young, 1981; Dunkle & Belwood, 1982; Cambefort, 1991; Young, 1998; Noriega, 2002).

Among the predators of this group reported in the literature under scientific names, there is only one known case of an arachnid, *Argiope argentata* (Fabricius, 1775) (Araneae: Araneidae) (Robinson & Robinson, 1970). For the remaining arachnid orders, including Uropygi, none record of predation on dung beetles was found.

The order Uropygi includes approximately 100 species in 15 genera (Ballesteros & Francke, 2006), mainly distributed in the tropics, and is made up of nocturnal, predatory species strongly associated with damp places (Cooke & Shadab, 1973). Despite their predatory habits are well known, knowledge of their food resources is still incipient. Existing reports mention that they feed on cockroaches, crickets, termites, isopods, slugs, larvae, snails, myriapods, beetles, toads and frogs (Millot, 1949; Armas & Milera, 1989; Armas *et al.*, 1989; Armas, 2000, 2001, 2002, 2004).

Most of the above preys are not recorded in the literature under scientific names. Records at the species or genus levels exist only for the whip scorpion *Mastigoproctus baracoensis* Franganillo, 1931, *M. proscorpio* (Latreille, 1806) and *M. pelegriini* Armas, 2000 (Thelyphonidae) (Armas & Milera, 1989; Armas *et al.*, 1989; Armas, 2004).

The study was carried out in april 21-25/2006, at the Hacienda Tocancipá, located in the municipality of San Martín (Meta department, Colombia), at an altitude of 350 m, in some remnants of gallery forests. Sampling was carried out especially focused on dung beetles and whip scorpions. The sampling of beetles was conducted using pitfall traps baited with human excrement. The whip scorpions, identified as *Mastigoproctus colombianus* Mello-Leitão, 1940, were taken from under fallen trunks in daylight.

22 whip scorpions (males and females) were collected in a plastic container (40 x 30 x 25 cm) with dirt and fragments of decomposing wood. To keep the whip scorpions alive, they were given individuals of Scarabaeidae: five individuals of *Dichotomius satanas* (Harold, 1880), three of *Dichotomius mamillatus* (Felsche, 1901) and four of *Canthon aequinoctialis* Harold, 1868.

After three days in captivity it was observed that the five individuals of *D. satanas* were consumed by *M. colombianus* (Fig. 1), whereas those of *D. mamillatus* and *C. aequinoctialis* were not

preyed upon. Unfortunately, the hunting and feeding processes by the whip scorpions could not be observed in detail, although at the end of the feeding process remains of elytra and tarsus were found. The predation by *M. colombianus* on this species raises to two the number of species of this order of insects recorded as part of the diet of whip scorpions [Armas (2004) reported predation on *Phyllophaga* sp.]; likewise it constitutes a first contribution to the biology of *M. colombianus*.

The results suggest that *D. satanas* is a possible food source for this arachnid in the area of study, although the observations presented herein were obtained under captivity. The reason *M. colombianus* did not feed on *D. mamillatus* could be the size of the individuals of this species (~22 mm), which is greater than that of *D. satanas* (~15 mm). With regard to *C. aequinoctialis*, it is important to note that some species of this genus have shown to possess repulsive substances that decrease their palatability (Bellés & Favila, 1983). Given this, we suggest that this species could present the same mechanism against predation (although they do not exhibit aposematic coloring), a supposition that needs confirmation. B. Gill (pers. comm.) has seen individuals of this species placing their hind legs on the head, what could function as an additional defense mechanism.

This is the first report of whip scorpions feeding on dung beetles, based in observations carried out in captivity. It is necessary to make a complete review of the predators of this group to understand the importance of the effect of predation in the population dynamics of dung beetles, which would allow a better clarity on the role that this group plays within trophic webs.

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**Fig. 1.** Adult specimens of *D. satanas* (female, left) and *M. colombianus* (male, right) from the study area. Scale bar equals 15 mm.

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