Two records of harvestman (Opiliones: Gonyleptidae) predation in the Brazilian Atlantic Forest region

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Abstract: Field records of predation of harvestmen are scarce in literature. We present here two events of predation by another arachnids. A predation of the tarantula *Iridopelma* sp. Simon, 1892 upon an adult female Heteropachylinae and a predation of the scorpion *Tityus pusillus* Pocock, 1893 upon an adult female of *Pseudopucrolia discrepans* (Roewer, 1943). Such events were recorded in remnants of the Brazilian Atlantic Forest during nocturnal field collections. This is the first record of predation of harvestmen in the Northeastern Brazilian Atlantic Forest.
Key words: Buthidae, Gonyleptidae, South America, Theraphosidae.

Dos registros de depredación de opiliones (Opiliones: Gonyleptidae) en la región de el Bosque Atlántico brasileño
Resumen: Los registros de campo de depredación de opiliones son escasos en la literatura. Presentamos aquí dos eventos de depredación por parte de otros arácnidos. Una depredación de la tarántula *Iridopelma* sp. Simon, 1892 sobre una hembra adulta de Heteropachylinae y una depredación del escorpión *Tityus pusillus* Pocock, 1893 sobre una hembra adulta de *Pseudopucrolia discrepans* (Roewer, 1943). Tales eventos fueron registrados en remanentes del Bosque Atlántico brasileño durante colectas de campo nocturnas. Este es el primer registro de depredación de opiliones en el Bosque Atlántico del Nordeste de Brasil.
Palabras clave: Buthidae, Gonyleptidae, Sudamérica, Theraphosidae.

Harvestman is the third order of the class Arachnida in diversity with more than 6,000 described species (Kury *et al*., 2020). These invertebrates have preferences for humid habitats, with a high rate of diversity and endemism especially in tropical rainforests (DaSilva *et al*., 2015; Pinto-da-Rocha *et al*., 2005), where they are found in the litter and on the vegetation (Porto *et al*., 2016). The Brazilian Atlantic Forest is the biome which presents the greater harvestmen diversity (Pinto-da-Rocha, 1999) with exceptional levels endemism, ca. 97.5% of Laniatores and Eupnoi species are endemics of this biome (Pinto-da-Rocha *et al*., 2005). Despite this, events of predation upon harvestmen under field conditions are rarely reported in literature (Cook *et al*., 2013). Therefore, hereafter we report two predation cases on harvestmen in the Brazilian Atlantic Forest.

These reports are based on observations made during nocturnal field study (19:00-21:00h) in 2016-2017, on a native forest remnant situated at "Fazenda Provisão" (14°38'53"S, 39°13'16"W), Ilhéus, Bahia and on a second-growth Atlantic Forest remnant from "Campo de Instrução Marechal Newton Cavalcanti" (07°46´55″S, 35°09´02″W), Abreu e Lima, Pernambuco, Brazil. Voucher specimens deposited in the Arachnological collections of the Universidade Federal de Pernambuco, Recife and Universidade Federal da Paraíba, João Pessoa, Brazil.

Our first observation (June-2016) occurred in a native forest remnant situated at "Fazenda Provisão". We recorded a juvenile of *Iridopelma* sp. Simon, 1892 (Araneae: Theraphosidae) on vegetation (ca. 1.60 m of height) with its chelicerae inserted into the ventral portion of the body of an adult female Heteropachylinae harvestman (Opiliones: Gonyleptidae) (Figure 1A). When disturbed, the predator fled on vegetation with the harvestman in its mouthparts, without releasing its prey. Our second record (May-2017), we found an adult male *Tityus pusillus* Pocock, 1893 (Scorpiones: Buthidae) feeding upon a *Pseudopucrolia discrepans* (Roewer, 1943) (Opiliones: Gonyleptidae) adult female on the forest floor (Figure 1B). When disturbed, the scorpion fled on leaf litter releasing its prey.

Harvestmen are mostly nocturnal arachnids known for array of defensive mechanisms such as chemical defenses and a thick armor (e.g., Gnaspini & Hara, 2007; Souza & Willemart, 2011). Despite their defensive mechanisms, some groups of vertebrates and invertebrates predate harvestmen (Cokendolpher & Mitov, 2007). Within invertebrate predators, spiders are probably the most common, even those belonging to diverse guilds as orb weavers or hunter spiders (Souza & Willemart, 2011; Carvalho *et al*., 2012; Dias & Willemart, 2013). However, our observation is the first report of predation of harvestmen by tarantulas. Mygalomorph spiders are generalist predators with powerful chelicerae able to feeding upon invertebrates to small vertebrates (Butler & Main, 1959; Pompozzi & Copperi, 2018). *Iridopelma* spp. are considered as arboreal spider that sometimes can be found under tree barks (Almeida-Silva *et al*., 2008). Therefore, the occurrence of *Iridopelma* sp. feeding on a harvestman may occur since both species use the same vegetation strata for foraging (Almeida-Silva *et al*., 2008; Lira & DeSouza, 2016).

In contrast to spiders, field records of harvestmen predation by scorpions are scarce in literature. Our observation of the scorpion *T. pusillus* feeding upon an adult *P. discrepans* correspond to the fourth report of scorpion predation upon a harvestman in the Neotropics (Cloudsley-Thompson, 1958; Cook *et al*., 2013; Hernández-Borroto & Alegre, 2020), and the second to provide an identification at species level of both predator and prey. Records of harvestmen predation by scorpions may be related to the places that these two arachnids have in common. For example, Hernández-Borroto & Alegre (2020) found a *Tityopsis inexpectata* (Moreno, 1940) scorpion feeding a *Neoscotolemon* sp. harvestman under a stone. According to these authors, both scorpion and harvestman are commonly found on forest floor. Scorpions are generalist predators that perform a sit-and-wait hunting strategy and forage in the same microhabitat of their prey (Polis, 1990). Thus, the predation recorded here may be associated to the microhabitats that these species share, since both *T.*



Fig. 1. Record of gonyleptid harvestmen predation by *Iridopelma* sp. tarantula (**A**) and *Tityus pusillus* scorpion (**B**) in the Brazilian Atlantic Forest.

pusillus scorpions and *P. discrepans* harvestmen are leaf litter dwelling (Lira *et al*., 2013; Lira & DeSouza, 2016).

Finally, our observations extend the list of invertebrate predators of harvestman, and, to our knowledge, they are the first predation reports of these arachnids in the Northeastern Brazilian Atlantic Forest. Further studies are required to better understand the predator–prey interactions between harvestmen and their predators as well as the ecological implication on their respective population of these interactions.

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