Predation of a pseudoscorpion (Pseudoscorpiones, Olpiidae) by *Gymnodactylus geckoides* (Squamata, Phyllodactylidae) in a Brazilian seasonal tropical dry forest

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Abstract: Pseudoscorpions are involved in many interspecific interactions, from mutualism to predation. Here, we report the predation of the pseudoscorpion *Apolpium ecuadorense* Hoff 1945 (Pseudoscorpiones: Olpiidae) by *Gymnodactylus geckoides* Spix 1825 (Squamata: Phyllodactylidae) lizards in a Brazilian seasonal tropical dry forest. Pieces belonging to four *A. ecuadorense* individuals were found in stomach content of *G. geckoides*. To our knowledge, this is the first report of pseudoscorpion predation by lizards in this biome, and the new data expand the list of prey items for *G. geckoides*.
Key words: Pseudoscorpiones, Olpiidae, *Apolpium ecuadorense*, Squamata, Pyllodactylidae, *Gymnodactylus geckoides*, antagonistic interaction, microhabitat, caatinga biome, Brazil.

Depredación de un pseudoscorpión (Pseudoscorpiones, Olpiidae) por *Gymnodactylus geckoides* (Squamata, Phyllodactylidae) en un bosque tropical estacional seco de Brasil
Resumen: Los pseudoescorpiones están involucrados en muchas interacciones interespecíficas, desde mutualismo hasta depredación. Aquí, informamos la depredación del pseudoescorpión *Apolpium ecuadorense* Hoff 1945 (Pseudoscorpiones: Olpiidae) por el lagarto *Gymnodactylus geckoides* Spix 1825 (Squamata: Phyllodactylidae) en un bosque seco tropical estacional de Brasil. Se encontraron piezas pertenecientes a cuatro individuos de *A. ecuadorense* en el contenido estomacal de *G. geckoides*. Hasta donde sabemos, este es el primer informe de depredación de pseudoescorpión por lagartos en este bioma, y los presentes datos amplían la lista de presas de *G. geckoides*.
Palabra clave: Pseudoscorpiones, Olpiidae, *Apolpium ecuadorense*, Squamata, Pyllodactylidae, *Gymnodactylus geckoides*, interacción antagonista, microhábitat, caatinga, Brasil.

Pseudoscorpions are arachnids that inhabit almost all terrestrial ecosystems (Weygoldt, 1969; Del-Claro & Tizo-Pedroso, 2009; Belozerov, 2013; Harvey, 2013). Pseudoscorpions are more abundant in the tropics and subtropics; some, with circumpolar distribution (Weygoldt, 1969; Harvey, 1998, 2013). Most species live in leaf litter, under stones, in the bark of living trees and falling trunks, in the forests of tropical and temperate regions (e.g. Weygoldt, 1969; Mahnert & Adis, 2002; Belozerov, 2013; Harvey, 2013; Mahnert, 2014; Cosgrove *et al*., 2016). Pseudoscorpions occur associated with many specialized microhabitats such as bat guano, ant and bee nests, and parts of plants; likewise, pseudoscorpions are known to establish phoretic relationships with birds, insects and mammals (e.g. Weygoldt, 1969; Zeh & Zeh, 1992a, 1992b; Cole *et al*., 1995; Poinar *et al*., 1998; Francke & Villegas-Guzmán, 2006; González *et al*., 2007; Martínez *et al*., 2018). These animals play an important component of the food webs, playing a key role by being active predators, offering a potential use in pest control (Weygoldt, 1969; Donovan & Paul, 2005; Read *et al*., 2014). Similarly, they have been reported as part of the diet of different invertebrates and vertebrates (Villegas-Guzmán *et al*., 2012). In this sense, pseudoscorpions were recorded in the diet of spiders, scorpions and some harvestmen (Jones, 1975; Dimitrijević, 2001, 2002); also, in the stomach content of some mammals, reptiles and birds (e.g. Whitaker & Maser, 1976; Tejero *et al*., 1983; Barden & Shine, 1994; Dimitrijević, 2001, 2002). Here, we report the case of pseudoscorpions predation by a lizard *Gymnodactylus geckoides* Spix 1825 in the Brazilian seasonal tropical dry forest; this is the first reported case of pseudoscorpion predation in this biome.

Pseudoscorpions were obtained from stomach contents of lizards collected between September/2018 and August/2019 in a Brazilian seasonal tropical dry forest (Caatinga domain) located in Buíque municipality (8°24'00" to 8°36'35" S and 37°09'30" to 37°14' 40" W), Pernambuco state, Brazil. Stomach contents of lizards were obtained through stomach remotion after a longitudinal incision from throat to cloaca (Garda *et al*., 2014). From the stomach contents, the material was separated in vials with 70% alcohol and were identified using the specialized keys for family and genus of Harvey (1992), Mahnert & Adis (2002), Tooren (2002, 2011) and the descriptions made by Hoff (1945). Finally, the remains of the specimens were deposited in the laboratory collection (Coleção Herpetológica e Paleoherpetologica, UFRPE).

At total of four pseudoscorpions were obtained in *G. geckoides* stomach contents (Figure 1). The remains examined agreed with the description made by Hoff (1945), Mahnert (1985), Mahnert & Adis (1986) for *Apolpium ecuadorense* Hoff 1945 (Figures 2-4). The predation of *A. ecuadorense* by a *G. geckoides* described in this study is also first record of this lizard species predating pseudoscorpions. *Gymnodactylus geckoides* is a small (<60 mm) sit-and-wait lizard species, which occurs in Restinga and Caatinga areas in Northeastern Brazil (Souza-Oliveira *et al*., 2017; Costa & Bérnils, 2018). Previous studies, investigating the trophic ecology of this lizard found that *G. geckoides* possess a generalist feeding habit

► **Fig. 1.** *Habitus, Apolpium ecuadorense* Hoff, 1945, complete individual extracted from the stomach contents of *Gymnodactylus geckoide*s Spix, 1825. Scale line= 1 mm.



with its diet being mainly composed by invertebrates (Souza-Oliveira *et al*., 2017; Alcantara *et al*., 2019). Souza-Oliveira *et al*., (1997) assessed prey captured by *G. geckoides* from Restinga and found 15 arthropod orders were predated with orthopterans were a most important prey consumed. In Caatinga domain were found five arthropod orders predated by *G. geckoides* with orthopterans also being the most important prey item (Alcantara *et al*., 2019). In this way, our report may be considered as occasional, once that *G. geckoides* is a generalist feeder and in addition sit-and-wait foragers typically consume more active prey as orthopterans.

The observation reported in this study extends the list of predators of pseudoscorpions, and, to our knowledge, it is the first report of a lizard preying on a pseudoscorpion in Caatinga domain. Further studies are required to obtain more and detailed information on predator–prey interactions between lizards and pseudoscorpions and to understand the ecological implication of this interaction.

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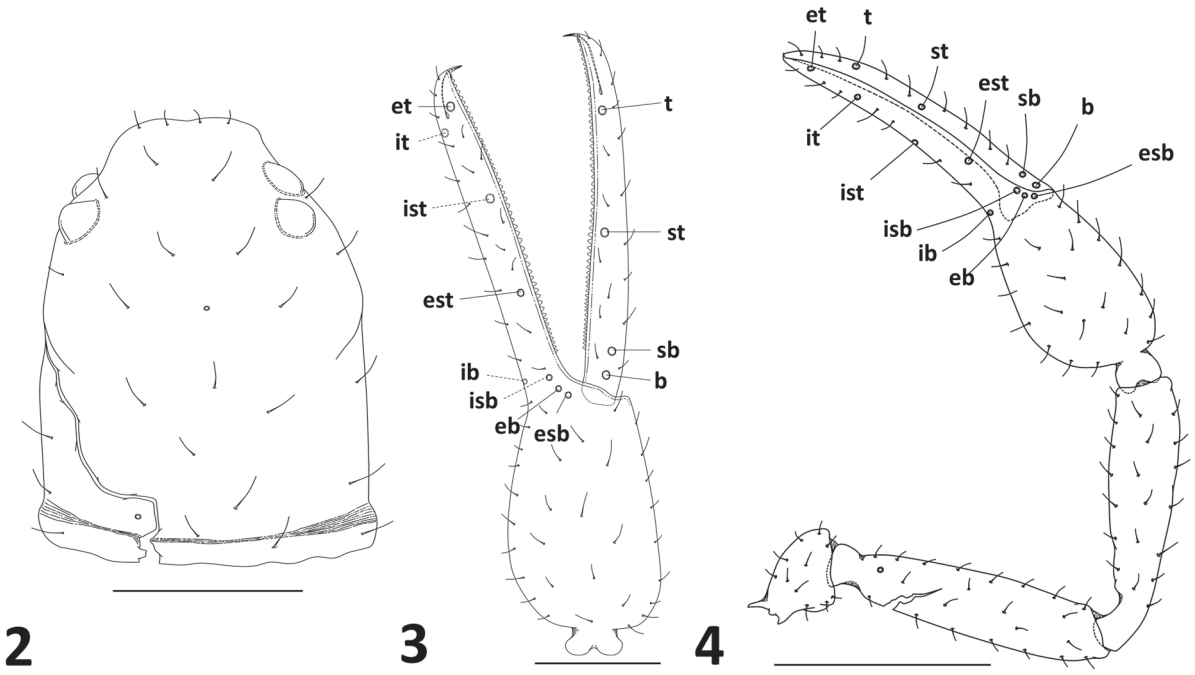


Fig. 2-4. *Apolpium ecuadorense* Hoff, 1945, extracted from the stomach contents of *Gymnodactylus geckoide*s Spix, 1825. **2**, Aspect of the carapace. **3**, Distribution of the trichobothria on the chela pedipalpal right. **4**, Aspect of the pedipalp right. Scale line: Figures 3 and 5= 5 mm; Figure 4= 0.05 mm.

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