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Record of *Tityus stigmurus* (Scorpiones: Buthidae) predation by *Dinoponera quadriceps* (Hymenoptera: Formicidae) in the Caatinga biome, Brazil

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Abstract: Soil-dwelling arthropods are involved in many interspecific interactions, from mutualism to predation. We report herein the predation of the scorpion *Tityus stigmurus* (Thorell 1876) by the ant *Dinoponera quadriceps* (Santschi 1921) during a nocturnal manual search for scorpions in an area of Caatinga vegetation. The ant was carrying an adult individual of *T. stigmurus* in its jaws; when disturbed, the predator fled on the ground with the scorpion in its mouthparts, without releasing its prey. To the best of our knowledge, this is the first report of predator–prey interactions between an ant and a scorpion in this biome.
Key words: Scorpiones, Buthidae, *Tityus stigmurus*, Hymenoptera, Formicidae, *Dinoponera quadriceps*, queenless ant, natural history, species interactions, Pernambuco State, Brazil.

Registro de predación sobre *Tityus stigmurus* (Scorpiones: Buthidae) a cargo de *Dinoponera quadriceps* (Hymenoptera: Formicidae) en el bioma de caatinga en Brasil
Resumen: Los artrópodos de suelo están involucrados en muchas interacciones interespecíficas, del mutualismo a la predación. Aquí se registra la predación del escorpión *Tityus stigmurus* (Thorell 1876) por la hormiga *Dinoponera quadriceps* (Santschi 1921) durante una colecta activa nocturna en un área de la vegetación de caatinga. La hormiga se encontró cuando llevaba un individuo adulto de *T. stigmurus* en sus mandíbulas; cuando fue perturbado, el predador huyó por el suelo con el escorpión en sus piezas bucales, sin liberar la presa. Creemos que este es el primer relato de la interacción predador-presa entre una hormiga y un escorpión en este bioma.
Palabras clave: Scorpiones, Buthidae, *Tityus stigmurus*, Hymenoptera, Formicidae, *Dinoponera quadriceps*, hormiga sin reina, historia natural, interacciones entre especies, estado de Pernambuco, Brasil.

Many ants are generalist predators, capable of capturing many arthropods and even small vertebrates (Bernays & Cornelius, 1989; Corbara *et al*., 2009; Peeters & De Greef, 2015; Erickson & Baccaro, 2016; Gifford *et al*., 2017). Including poisonous animals such as scorpions, this antagonistic interaction causes high mortality rates among juveniles and smaller species of scorpions (McCormick & Polis, 1990). However, knowledge about Brazilian scorpion predation by invertebrates remains more fragmented than that regarding by vertebrates. In Brazil, predation records are rare and recent (Lourenço *et al*., 2006; Lira & Costa, 2014; Lira *et al*., 2016a, b; Lira *et al*., 2017a, b). Here, we report the first case of scorpion predation by an ant, during a nocturnal collection of scorpions in the Caatinga vegetation; this constitutes the second reported case of scorpion predation by invertebrates in this environment (Lira *et al*., 2016b).

Materials and methods

We observed the antagonistic relationship in an area of Caatinga vegetation, belonging to the Instituto Agronômico de Pernambuco, located in the municipality of São Bento do Una (08°31′45.7″S; 036°27′23.8″W), Pernambuco state, Brazil. Animals were collected and identified using taxonomic keys, Lourenço (2002) for the scorpion and Lenhart *et al*. (2013) for the ant. Voucher specimens were deposited in the Entomological Collection and the Arachnological Collection of Universidade Federal de Pernambuco, Brazil.

Results and Discussion

The scorpion was identified as *Tityus stigmurus* (Thorell 1876) a mid-sized scorpion that is the main cause of scorpionism in northeastern Brazil (Albuquerque *et al*., 2013; Pucca *et al*., 2015; DeSouza *et al*., 2016) and has a wide distribution, including the Atlantic Forest, Caatinga, and urban areas (Lira-da-Silva *et al*., 2006; Carmo *et al*., 2013; Lira & Albuquerque, 2014; Lira *et al*., 2017c). The insect was identified as *Dinoponera quadriceps* (Santschi, 1921),



Fig. 1. Queenless ant *Dinoponera quadriceps* (Santschi 1921) preying on a scorpion *Tityus stigmurus* (Thorell 1876).

which is a typical species of queenless ant that is distributed widely, including in the Caatinga (a xerophytic vegetation) of northeastern Brazil, Cerrado (i.e., a savannah-like vegetation), brejos de altitude (i.e., upland humid forest), and Atlantic forest (Kempf, 1971; Paiva & Brandão, 1995).

During collection, we observed the *D. quadriceps* ant carrying an adult individual of *T. stigmurus* in its jaws (Figure 1). The scorpion was paralyzed and presented with irregular spasms through the ventral region of its mesosome. Body size of both ant and scorpion were similar and the ant may have preyed upon the scorpion while the scorpion was hunting. Both these species are predatory, but the

ant also consumes some plant items, such as fruits and seeds (Kempf, 1971; Fourcassié *et al*., 1999, Fourcassié & Oliveira, 2002; Araújo & Rodrigues, 2006; Polis, 1990). It is possible, however, that a confrontation occurred between the two animals, in which *D. quadriceps* would have had a competitive advantage. For example, ants of the genus *Dinoponera* (Roger 1861) have a venom gland associated with their stinger; the stinger functions in prey capture and defense. These ants are described as solitary, predominantly carnivorous foragers with habitats, ranging from humid forest soil to dry savannas (Kempf, 1971; Fourcassié *et al*., 1999; Fourcassié & Oliveira, 2002).

The observation reported in this study expands the list of invertebrate predators of scorpions, and, to our knowledge, this is the first report of an ant preying on a scorpion in the Caatinga. Although *D. quadriceps* is essentially carnivorous (Araújo & Rodrigues, 2006), its most common prey items are insects and the present report may represent only an occasional event.

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