Revista Ibérica de Aracnología, nº **28** (31/12/2016): 87–89.
Grupo Ibérico de Aracnología (S.E.A.). ISSN: 1576 - 9518.

Reports of scorpion predation by spiders in the Brazilian Atlantic forest and Caatinga (Arachnida: Scorpiones, Araneae)

André Felipe de Araújo Lira[1*], Stênio Ítalo Araújo Foerster[2] & Arthur Álvaro Costa Silva-Filho[3]

[1] Programa de Pós-graduação em Biologia Animal, Departamento de Zoologia, Universidade Federal de Pernambuco, UFPE, Rua Prof. Moraes Rego S/N, Cidade Universitária, Recife, Pernambuco, CEP 50670-420, Recife, PE, Brazil.
[2] Universidade Federal Rural de Pernambuco, Unidade Acadêmica de Serra Talhada, Avenida Gregório Ferraz Nogueira, s/n, José Tomé de Souza Ramos, CEP 56909-535, Serra Talhada, PE, Brazil.
[3] Centro de Estudos Fernando Beltrão, Rua Benfica 480, CEP 50720-001, Recife, PE, Brazil.
*Author for correspondence: — andref.lira@gmail.com

Abstract: Scorpions are the top predators in litter arthropod communities, where they have various types of interactions with other invertebrates. This study reports predation on *Bothriurus asper* Pocock, 1893 (Scorpiones, Bothriuridae) by *Ctenus rectipes* F. O. Pickard-Cambridge, 1897 (Araneae, Ctenidae) and on *Rhopalurus rochai* Borelli, 1910 (Scorpiones, Buthidae) by *Sicarius* sp. (Araneae, Sicariidae) in the Brazilian Atlantic Forest and Caatinga biomes, respectively. These new records contribute to a better understanding of the interspecific relationships among these arachnids and increase the list of known scorpion predators in these biomes.
Key words: Scorpiones, Araneae, Ctenidae, Sicariidae, *Bothriurus asper*, *Rhopalurus rochai*, intraguild predation, Brazil.

Registros de predación sobre escorpiones por arañas en el Bosque Atlántico brasileño y la Caatinga (Arachnida: Scorpiones, Araneae)
Resumen: Los escorpiones son los principales depredadores en las comunidades de artrópodos de hojarasca, en las que tienen diversos tipos de interacción con otros invertebrados. En este estudio se registra la depredación sobre *Bothriurus asper* Pocock, 1893 (Scorpiones, Bothriuridae) por *Ctenus rectipes* F. O. Pickard-Cambridge, 1897 (Araneae, Ctenidae) y sobre *Rhopalurus rochai* Borelli, 1910 (Scorpiones, Buthidae) por *Sicarius* sp. (Araneae, Sicariidae) en los biomas del Bosque Atlántico brasileño y la Caatinga, respectivamente. Estos nuevos registros contribuyen a una mejor comprensión de las relaciones interespecíficas de estos arácnidos y aumentan la lista de los depredadores conocidos de escorpiones en estos biomas.
Palabras clave: Scorpiones, Araneae, Ctenidae, Sicariidae, *Bothriurus asper*, *Rhopalurus rochai*, depredación, Brasil.

Introduction

Scorpions are important constituents of their habitats due to their impact capacity on energy flow through predation of different preys (Polis, 1990; McCormick & Polis, 1990). However, these arachnids are also subject to predation. Polis *et al*. (1981) summarized a list of approximately 150 taxa of scorpion predators, which were mostly vertebrates. Regarding scorpion predation by invertebrates, knowledge remains more fragmented than knowledge on vertebrates (Lourenço *et al*., 2006). Invertebrate predation causes high mortality among juveniles and smaller scorpion species, which is mainly attributed to ants, assassin bugs, centipedes, sun spiders, whip spiders, spiders and other scorpions (Williams, 1966; Cloudsley-Thompson, 1977; Punzo, 1998; McCormick & Polis, 1990; Melic, 2000; Forcelledo & Armas, 2014; Lira & Costa, 2014; Lira *et al*., 2016). In the case of spiders, records relate mainly to black widows (Theriididae), wolf spiders (Lycosidae), crab spiders (Thomisidae), tarantulas (Theraphosidae) and caponiids (Caponiidae) (McCormick & Polis, 1990; Melic, 2000; Teruel & Sánchez, 2000; Lourenço *et al*., 2006; Teruel & Armas, 2012; Lira & Costa, 2014).

Records for scorpion predation by spiders in Neotropical forests are scarce (Teruel, 1996; Lourenço *et al*., 2006; Teruel & Sánchez, 2000; Teruel & Armas, 2012; Lira & Costa, 2014). Therefore, the first case of predation by wandering spider (Ctenidae) and six-eyed sand spider (Sicariidae) in the Brazilian Atlantic Forest and Caatinga biomes, respectively, are reported here.

Material and Methods

The observation in the Brazilian Atlantic Forest was conducted during a field work in 03 April, 2015, between 1900 and 2300, at Reserva Particular de Patrimônio Natural Nossa Senhora do Oiteiro de Maracaípe (08°31'48"S, 35°01'05"W), Ipojuca municipality, Brazil. The reserve area totals 76.2 ha. Of these, 29.7 ha are occupied by *restinga* and 46.5 ha are occupied by mangroves (Lira & Costa, 2014). Observation in Caatinga was conducted in 29 August, 2014, between 1100 and 1200, at Parque Estadual Mata da Pimenteira (07°53'24.2"S, 38°18'21.6"W), Serra Talhada municipality, Brazil, in an area of 887.24 ha of deciduous forest (Diniz *et al*., 2013; Ramalho *et al*., 2014). Voucher specimens were deposited in the Arachnological Collection of Universidade Federal de Pernambuco, Brazil.

Results and Discussion

An adult female of the wandering spider *Ctenus rectipes* F. O. Pickard-Cambridge, 1897, was found on the upper layer of a leaf litter in the Atlantic Forest with its chelicerae inserted into the ventral portion of the mesosoma of an adult female scorpion *Bothiurus asper* Pocock, 1893 (Figure 1). When disturbed, the predator fled on leaf litter with the scorpion in its mouthparts, without releasing its prey. *Ctenus* spiders typically forage on leaf litter, actively searching for preys and capturing them after a quick attack (Rego *et al*., 2005). The fact that the spider was larger than the scorpion may have contributed to the predation record presented here. Overall, spiders are considered prey for scorpions (Polis, 1990; Lourenço, 1979a, b; Battirola *et al*., 2015). However, as arachnids can be dangerous prey due to their venom, the predator can easily become potential prey.

On the record for Caatinga, *Sicarius* sp. Walckenaer, 1847 was found under a stone with its chelicerae inserted on the ventral surface of a juvenile scorpion *Rhopalurus rochai* Borelli, 1910 (Figure 2). Next to *Sicarius* sp., a scorpion exuvia was found. In addition, *R. rochai* showed a lighter coloration, typical of an animal that is just out of ecdysis, suggesting that the spider captured its prey after this event. It is known that scorpions typically hold their moult in sheltered places (Gaban & Farley, 2002), since this event is an especially vulnerable time, as a new exoskeleton is relatively soft (Hadley, 1994). In fact, *R. rochai* soft exoskeleton may have facilitated its capture by *Sicarius* sp.

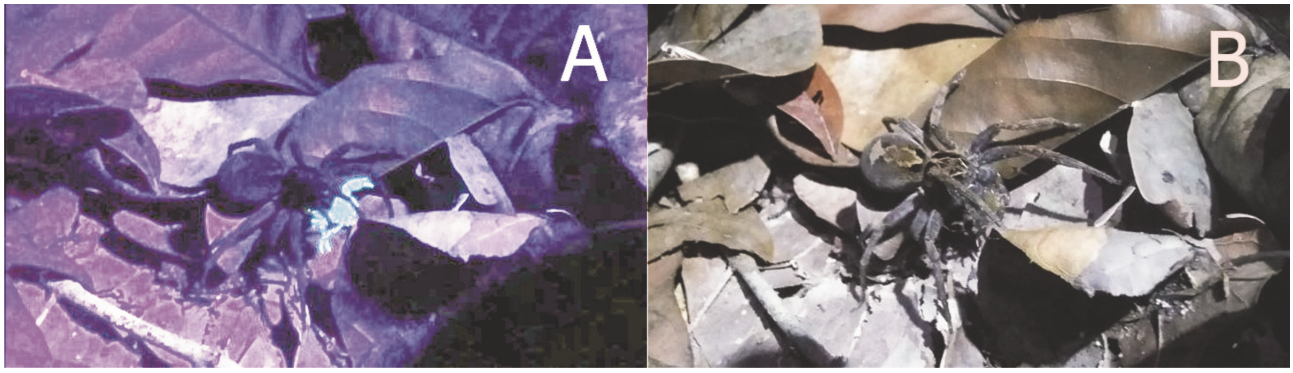


Fig. 1. *Bothriurus asper* Pocock, 1893 (Scorpiones, Bothriuridae) preyed by *Ctenus rectipes* F. O. Pickard-Cambridge, 1897 (Araneae, Ctenidae) in the Brazilian Atlantic Forest. **A**, Picture under UV radiation evidencing the scorpion on spider's chelicerae; **B**, Picture without UV radiation.



Fig. 2. *Sicarius* sp. (Araneae, Sicariidae) feeding a juvenile *Rhopalurus rochai* Borelli, 1910 (Scorpiones, Buthidae) in Caatinga.

In conclusion, predation events by spiders on scorpions described in this study may be considered as occasional, once wandering and six-eyed sand spiders are considered generalist predators and not scorpion specialist predators.

Acknowledgements

We are very grateful to Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the doctoral scholarship to the first author.

Cited References

Battirola, L.D., D.J. Rodrigues, D.A. Batistella, A.P.S. Da Silva & A.D. Brescovit 2015. Um caso de predação de *Ancylometes rufus* (Walckenaer, 1837) (Araneae, Ctenidae) por *Tityus strandi* (Werner, 1939) (Scorpiones, Buthidae) no sul da Amazônia. *Acta Biológica Paranaense*, **44**: 145-151.

Cloudsley-Thompson, J.L. 1977. Adaptational biology of Solifugae (Solpugida). *Bulletin of the British Arachnological Society*, **4**: 61-71.

Diniz, L.P., L.M.A. Elmoor-Loureiro, V.L.D.S. Almeida & M. Melo-Júnior 2013. Cladocera (Crustacea, Branchiopoda) of a temporary shallow pond in the Caatinga of Pernambuco, Brazil. *Nauplius*, **21**: 65-78.

Forcelledo, L. J. & L. F. De Armas 2014. Depredación de *Centruroides gracilis* (Scorpiones: Buthidae) por *Paraphrynus cubensis* (Amblypygi: Phrynidae). *Revista Ibérica de Aracnología*, **25**: 97-98(*).

Gaban, R.D. & R.D. Farley 2002. Ecdysis in scorpions: supine behavior and exuvial ultrastructure. *Invertebrate Biology*, **121**: 136-147.

Hadley, N.F. 1994. *Water Relations of Terrestrial Arthropods*. Academic Press. United Kingdom.

Lira, A.F.A. & A.A. Costa 2014. First record of a brown widow spider *Latrodectus geometricus* Koch, 1841 (Araneae, Theridiidae) feeding scorpion (Scorpiones, Bothriuridae) in a Brazilian Atlantic Forest. *Brazilian Journal of Biology*, **74**: 1011.

Lira, A.F.A., V.L.N. Araújo & C.M.R. Albuquerque 2016. Predation of a scorpion (Scorpiones: Buthidae) by an assassin bug (Heteroptera: Reduviidae) in the Brazilian Atlantic Forest. *Turkish Journal of Zoology*, **40**: 294-296.

LOURENÇO, W.R. 1979a. The Buthidae scorpion: *Tityus mattogrossensis* Borelli, 1901. Morphology, ecology, biology and postembryonic development. *Bulletin du Muséum National d'Histoire Naturelle*, **1**: 95-117.

LOURENÇO, W.R. 1979b. La biologie sexuelle et le développement postembryonnaire du scorpion Buthidae: *Tityus trivittatus fasciolatus* Pessôa, 1935. *Revista Nordestina de Biologia*, **2**: 49-96.

LOURENÇO, W.R., A.D. BRESCOVIT, C.A. RHEIMS & J.L. CLOUDSLEY-THOMPSON 2006. First record of a crab spider (Thomisidae) preying on a scorpion. *Boletín de la Sociedad Entomológica Aragonesa (S.E.A.)*, **39**: 404-405(*).

MCCORMICK, S.J. & G.A. POLIS 1990. Prey, predators, and parasites. In: *The Biology of Scorpions*. Polis, G.A. (ed.). Stanford University Press. Stanford. 294-320.

MELIC, A. 2000. El género *Latrodectus* Walckenaer, 1805 en la peninsula Ibérica (Araneae: Theridiidae). *Revista Ibérica de Aracnología*, **1**: 13-30(*).

POLIS, G.A. 1990. *The Biology of Scorpions*. Stanford University Press. United States of America.

POLIS, G.A., W.D. SISSOM & S.J. MCCORMICK 1981. Predators of scorpions: field data and a review. *Journal of Arid Environments*, **4**: 309-326.

PUNZO, F. 1998. *The Biology of Camel Spiders (Arachnida, Solifugae)*. Kluwer Academic Publisher. United States of America.

RAMALHO, T.K.A., C.H.C. MATOS, A.L. MELO, C.R.F. OLIVEIRA, T.G.C. MENEZES & J.K. LIMA-SILVA 2014. Leaf domatia in montane forest and Caatinga in the semiarid of Pernambuco State: Morphology and ecological implications. *Acta Scientiarum*: *Biological Sciences*, **36**: 327-332.

REGO, F.N., E.M. VENTICINQUE & A.D. BRESCOVIT 2005. Densidades de aranhas errantes (Ctenidae e Sparassidae, Araneae) em uma floresta fragmentada. *Biota Neotropica*, **5**: 45-52.

TERUEL, R. 1996. Enemigos naturales de los escorpiones cubanos. I. *Garciana* (Holguín), **24-25**: 13-14.

TERUEL, R. & L.F. ARMAS 2012. Redescripción de *Rhopalurus junceus* (Herbst 1800) (Scorpiones: Buthidae). *Boletín de la Sociedad Entomológica Aragonesa (S.E.A.)*, **50**: 153-174(*).

TERUEL, R. & A. SÁNCHEZ 2000. Nota sobre la depredación de un escorpión (Scorpiones: Buthidae) por una araña (Araneae: Caponiidae). *Biodiversidad de Cuba Oriental*, **4**: 82-83.

WILLIAMS, S.C. 1966. Burrowing habitat of the scorpion *Anuroctonus phaeodactylus* (Wood) (Scorpionida: Vaejovidae). *Proceedings of the California Academy Science,* **34**: 419-428.

(*) Available/Disponible: www.sea-entomologia.org