

SHORT COMMUNICATION

Predation of *Tropidurus hispidus* (Squamata, Tropiduridae) by *Siphlophis leucocephalus* (Squamata, Dipsadidae)

Predação de *Tropidurus hispidus* (Squamata, Tropiduridae) por *Siphlophis leucocephalus* (Squamata, Dipsadidae)

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Abstract

The discovery of predator-prey relationships are relevant to improve the knowledge regarding ecological processes, such as trophic ecology, mortality sources, and paths of fluxes of matter and energy in ecosystems. Snakes of the genus *Siphlophis* feed on mammals, birds, frogs, lizards, lizard eggs, and snakes, whereas *Tropidurus hispidus* lizards are prey for both invertebrates and vertebrates. Here, we report a predator-prey relationship involving *T. hispidus* and *Siphlophis leucocephalus*. As a behavioural strategy to reduce the resistance promoted by appendages and body scales, thus diminishing the time and energy expended to swallow the prey, the individual of *S. leucocephalus* ingested the lizard headfirst. *Tropidurus hispidus* has mucronate scales that may be difficult to manipulate and swallow. Predators might die because of swallowing lizards with spiny and pointed dermic structures because of perforation of organs and of asphyxia. With this report, we added knowledge about the trophic ecology of *S. leucocephalus* and mortality sources for *T. hispidus*, besides reinforcing the idea of the importance of the consumption of lizards by snakes of the tribe Pseudoboini and of the genus *Siphlophis*.

Keywords: diet, feeding habits, headfirst, Pseudoboini, saurophagy, Xenodontinae.

Resumo

A descoberta de relações predador-presa é relevante para aprimorar o conhecimento sobre processos ecológicos, tais como ecologia trófica, fontes de mortalidade e vias de fluxos de matéria e de energia em ecossistemas. Serpentes do gênero *Siphlophis* se alimentam de mamíferos, aves, anuros, lagartos, ovos de lagartos e serpentes, enquanto lagartos *Tropidurus hispidus* são presas para invertebrados e vertebrados. Neste estudo, nós relatamos uma relação predador-presa envolvendo *T. hispidus* e *Siphlophis leucocephalus*. Como uma estratégia comportamental para reduzir a resistência promovida por apêndices e escamas, portanto, diminuindo o tempo e a energia gastos para engolir a presa, o indivíduo *S. leucocephalus* ingeriu o lagarto iniciando pela cabeça. *Tropidurus hispidus* tem escamas mucronadas que podem ser difíceis de manipular e engolir. Predadores podem morrer ao engolir lagartos com estruturas dérmicas espinhosas e pontiagudas devido à perfuração de órgãos e asfixia. Neste relato, adicionamos informações sobre a ecologia trófica de *S. leucocephalus* e fontes de mortalidade para *T. hispidus*, além de reforçarmos a ideia da importância do consumo de lagartos para serpentes da tribo Pseudoboini e do gênero *Siphlophis*.

Palavras-chave: dieta, hábitos alimentares, ingestão a partir da cabeça, Pseudoboini, saurofagia, Xenodontinae.

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The discovery of predator-prey relationships is relevant to improve the knowledge regarding ecological processes, such as trophic ecology, mortality sources, and paths of fluxes of matter and energy in ecosystems. Currently, the genus *Siphlophis* FITZINGER (Dipsadidae, Xenodontinae, Pseudoboini) is composed by seven described species of snakes distributed along South and Central Americas: *Siphlophis ayauma* (SHEEHY *et al.*, 2014), *Siphlophis cervinus* (LAURENTI, 1768), *Siphlophis compressus* (DAUDIN, 1803), *Siphlophis leucocephalus* (GÜNTHER, 1863), *Siphlophis longicaudatus* (ANDERSSON, 1901), *Siphlophis pulcher* (RADDI, 1820), and *Siphlophis worontzowi* (PRADO, 1940). Individuals of this genus feed on mammals, birds, frogs, lizards, lizard eggs, and snakes (Cunha and Nascimento, 1978, 1993; Duellman, 1978; Nascimento *et al.*, 1987; Cadle and Greene 1994; Sazima and Argôlo, 1994; Prudente *et al.*, 1998; Martins and Oliveira, 1999; Withworth and Beirne, 2011; Neto *et al.*, 2013). The only study providing information about feeding habits of *S. leucocephalus* reported the presence of insects and fragments of fingers of non-identified lizards (Prudente *et al.*, 1998). *Tropidurus hispidus* (SPIX, 1825) (Squamata, Iguania, Tropiduridae) is a lizard species widely distributed along South America that may

be found in different habitats throughout its geographic distribution (Rodrigues, 1987, 1988; Avila-Pires, 1995; Carvalho, 2013). Lizards of this species feed on arthropods, small vertebrates, and plant material (Vitt *et al.*, 1996; Van Sluys *et al.*, 2004; Ribeiro and Freire, 2009, 2011; Zanchi *et al.*, 2012), and serve as prey for both invertebrates, such as spiders (Vieira *et al.*, 2012) and vertebrates, as, for example, lizards (Sales *et al.*, 2011; Silva *et al.*, 2013). *Siphlophis leucocephalus* and *T. hispidus* are sympatric in some locations along their geographical range. Here, we report a predator-prey relationship involving *T. hispidus* and *S. leucocephalus*.

We collected an individual of *S. leucocephalus* (Figure 1A), on 25 February of 2013, during the morning, in the district of Igatu, municipality of Andaraí, state of Bahia, northeast Brazil (12°53'57"S, 35°19'21"W, 760 m above sea level). The area is composed by rock outcrops and sandy soils covered by undergrowth, herbaceous and shrubby vegetation. The middle portion of its body was noticeably distended, indicating the presence of a prey in its digestive tract. We dissected the snake for prey identification and found a specimen of *Tropidurus hispidus* (Figures 1B and 1C) measuring 106.7 mm of snout-vent length and 137.2 mm of tail length and weighing 25 g.



Figure 1. (A) Individual of *Siphlophis leucocephalus* collected in Igatu, state of Bahia, northeast Brazil, and the lizard *Tropidurus hispidus* consumed by the snake in dorsal (B) and ventral (C) views. Note in A the distension in the middle region of the body of the snake due to the presence of the lizard. Photos by Thiago Maia-Carneiro.

Table 1. Lizard families, genera, and species consumed by snakes of the genus *Siphlophis* and source of information.

Predator	Prey	Source
<i>S. cervinus</i>	<i>Bachia trisanale</i> (COPE, 1868)	Duellman, 1978
<i>S. cervinus</i>	<i>Techadactylus rapicaudus</i> (HOULTUYN, 1782)	Nascimento <i>et al.</i> , 1987
<i>S. cervinus</i>	<i>Gonatodes</i> , Gymnophthalmidae, <i>Mabuya</i> and Tropiduridae (including <i>Tropidurus</i>)	Prudente <i>et al.</i> , 1998
<i>S. cervinus</i>	<i>Gonatodes</i> , <i>Hemidactylus</i> , <i>Mabuya</i> , <i>Plica</i> [including <i>Plica umbra</i> (LINNAEUS, 1758)], <i>Polychrus</i> , <i>Thecadactylus</i> , <i>Tropidurus</i>	Martins and Oliveira, 1999
<i>S. compressus</i>	<i>Tropidurus</i>	Withworth and Beirne, 2011
<i>S. compressus</i>	<i>Iguana iguana</i> (LINNAEUS, 1758)	Neto <i>et al.</i> , 2013
<i>S. leucocephalus</i>	<i>Tropidurus hispidus</i> (SPIX, 1825)	This study
<i>S. longicaudatus</i>	<i>Enyalius</i> and <i>Placosoma</i>	Martins and Oliveira, 1999
	Gekkonids [including <i>Gymnodactylus darwini</i> (GRAY, 1945) and <i>Hemidactylus</i>	
<i>S. pulcher</i>	<i>mabouia</i> (MOREAU DE JONNÈS, 1818)] and gymnophthalmids [including <i>Placosoma</i>	Sazima and Argôlo, 1994
	<i>garbellum</i> (PETERS, 1870)]	
<i>S. pulcher</i>	Gymnophthalmidae (including <i>Placosoma</i>), <i>Mabuya</i> , <i>Ophiodes striatus</i> (SPIX, 1824) and Tropiduridae	Prudente <i>et al.</i> , 1998
<i>S. worontzowi</i>	<i>Iphisa elegans</i> GRAY, 1851	Prudente <i>et al.</i> , 1998

The snake measured 675 mm of snout-vent length and 227 mm of tail length and weighed 49.7 g (after dissection). The snake was collected under the permission licence IBAMA/ICMBio n° 17474-1.

The occurrence of saurophagy is common among the Pseudoboini, occurring in species of different genera in this tribe (e.g., Duellman, 1978; Nascimento *et al.*, 1987; Cunha and Nascimento, 1993; Cadle and Greene 1994; Sazima and Argôlo, 1994; Prudente *et al.*, 1998; Neto *et al.*, 2013). Of the seven species of *Siphlophis*, there is information regarding feeding habits of six of them and all consumed lizards (Duellman, 1978; Nascimento *et al.*, 1987; Sazima and Argôlo, 1994; Prudente *et al.*, 1998; Neto *et al.*, 2013; this study; Table 1), suggesting that these prey is greatly relevant as energy source for these snakes. Species in the family Tropiduridae (particularly in the genus *Tropidurus*) are among the lizards most commonly consumed by those snakes, having been reported as prey for four species: *S. cervinus* (Prudente *et al.*, 1998; Martins and Oliveira, 1999), *S. compressus* (Withworth and Beirne 2011), *S. leucocephalus* (this study), and *S. pulcher* (Prudente *et al.*, 1998) (Table 1). Nevertheless, there was no previous record of consumption of *T. hispidus* by any species of *Siphlophis* until now.

The individual of *S. leucocephalus* collected in Igatu ingested the lizard headfirst. Typically, the behaviour of ingesting prey headfirst is a strategy to reduce the resistance promoted by appendages and body scales, thus reducing the time and energy expended to swallow the prey (Greene, 1976; Queiroz and Queiroz, 1987; see also references therein). *Tropidurus hispidus* has mucronate scales that may be difficult to manipulate and swallow. Predators may die because of swallowing lizards with spiny and pointed dermic structures because of perfora-

tion of tissues and organs and of asphyxia (snakes and birds – Pianka and Vitt, 2006; Vitt and Caldwell, 2014). There is information about the ingestion of prey by *S. cervinus* both starting from the head and from the hind portion of the body, and headfirst ingestion by *S. compressus*, *S. leucocephalus*, *S. longicaudatus*, and *S. pulcher* (Prudente *et al.*, 1998; Neto *et al.*, 2013; this study). These data is suggestive that the orientation of the prey when swallowed by snakes within this genus may be variable, but predominantly headfirst.

In this report, we revealed the existence of a predator-prey interaction involving *S. leucocephalus* and *T. hispidus*, adding knowledge regarding the trophic ecology of the snakes and mortality sources for the lizards and reinforcing the idea of the importance of the consumption of lizards by snakes of the tribe Pseudoboini and of the genus *Siphlophis*.

Acknowledgements

We thank Paulo Passos and Pedro Pinna for the identification of the species and for the measurements taken from the snake, respectively. We thank the anonymous reviewers for their valuable suggestions for improvement of this work. We also thank Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), which provided research grants to CFDR (processes 304791/2010-5, 472287/2012-5 and 302974/2015-6), Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ), which supports CFDR through Programa Cientistas do Nosso Estado (processes E-26/102.765/2012 and E-26/202.920/2015), and Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), which granted a PhD scholarship to TMC.

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Submitted on July 2, 2015

Accepted on November 17, 2015