



Squamate Reptiles in the Diet of the Neotropical Lava Lizard, *Tropidurus hispidus* (Spix 1825): New Records and Habitat Types

Maria Clara de Claro¹, Patricio Adriano da Rocha^{1,2}, Daniel Oliveira Mesquita², and Raone Beltrão-Mendes³

¹Programa de Pós-Graduação em Ecologia e Monitoramento Ambiental, Universidade Federal da Paraíba (Litoral Norte), 58.297-000, Rio Tinto, Brasil (mariaclara.claro@gmail.com [corresponding author]; <https://orcid.org/0000-0001-5002-6194>)

²Programa de Pós-Graduação em Ciências Biológicas (Zoologia), Departamento de Sistemática e Ecologia, Universidade Federal da Paraíba, 58.051-090, João Pessoa, Brasil (parocha2@yahoo.com.br; <https://orcid.org/0000-0003-1661-3779>) (danmesq@dse.ufpb.br; <https://orcid.org/0000-0002-8174-6837>)

³Programa de Pós-Graduação em Ecologia e Conservação, Universidade Federal de Sergipe, 49.100-000, São Cristóvão, Brasil (raonebm@yahoo.com.br; <https://orcid.org/0000-0002-3631-5229>)

The Neotropical Lava lizard (*Tropidurus hispidus*) is widely distributed throughout South America (Carvalho 2013). In Brazil, this species is typically found in the Caatinga and Atlantic Forest (Santana et al. 2014; Gomes et al. 2015; Albuquerque et al. 2018). Lizards in the genus *Tropidurus* are opportunistic, generalist, sit-and-wait foragers (Schoener 1971) and have a correspondingly broad diet composed of both animals and plants (Vitt 1995; Gogliath et al. 2010) that is positively correlated with food availability (Van Sluys et al. 2004; Ribeiro and Freire 2011; Gomes et al. 2015). The most frequently consumed prey items are ants and termites (Rodrigues 1987; Vitt 1995; Vitt and Carvalho 1995; Vitt et al. 1996), and records of vertebrate prey are largely anecdotal.

We sampled *T. hispidus* from five localities in the Atlantic Forest of northeastern Brazil. Four locations were sampled between October 2017 and January 2019 in the states of Paraíba and Rio Grande do Norte, Brazil: a rural area in the Municipality of Conde (-7.2737; -34.8893), an industrial sugar cane plantation at the Gargaú Sugar Plant (-7.029535; -34.974076), the Municipality of Santa Rita; and the cities of João Pessoa (-7.149338; -34.835558) and Natal (-5.781991; -35.2013). Lizards from a fifth locality, Barreira do Inferno Launching Center (-5.9235; -35.16742), were collected in 2012 (June–December) and 2013 (February–October) and were examined in the Herpetological Collection at the Federal University of Paraíba (CHUFPB, Coleção Herpetológica da Universidade Federal da Paraíba). We examined 263 individuals as part of a larger study on the diet and morphology of the species; of these, 84 were found in natural environments (forests and coastal broadleaf forests) and 179 were in non-natural environments (urban, periurban, rural, and agricultural areas). After capture, the animals were anesthe-

tized (Zoletil 50®) and euthanized (lethal dose of potassium chloride, 19.1%), and morphological traits were measured with a digital caliper (*Mitutoyo*®) to the nearest 0.1 mm. Specimens were fixed with 4% formaldehyde, preserved in 70% alcohol, and deposited at CHUFPB. Stomach contents were removed and examined using a stereoscopic microscope (Leica EZ4). Morphological data from each vertebrate prey item were measured to the extent possible. Data sampling was authorized by the Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio) via permit SISBio Nº 60124.

We identified 1,277 food items. Of these, seven (≈ 0.5%) were squamate reptiles (Tables 1 & 2; Fig. 1) found in three female and four male *T. hispidus* (2.6% of the sampled animals). A *Brasiliscincus heathi* (Schmidt and Inger 1951) (Brazilian Mabuya or Calango-Liso; part of a head) and an amphisbaenian (wormlizard or cobra-de-duas-cabeças; only fragments of the body were present, compromising species identification) were in animals from Natal (urban environment). A *Hemidactylus mabouia* (Moreau de Jonnés 1818) (Tropical House Gecko or Lagartixa-de-Parede) and a *Micrablepharus maximiliani* (Reinhardt and Lütken 1862) (Blue-tailed Microteiid or Calango-do-Rabo-Azul) were in animals from Conde (periurban environment). The two *Ameivula ocellifera* (Spix 1825) (Spix's Whiptail or Calango-da-Praia; a recently-consumed complete individual and a head and forelimb) were in animals from the Gargaú Plant (agricultural ecosystem). A largely intact juvenile *T. hispidus* was in an animal from Barreira do Inferno (native coastal broadleaf forests) was an example of cannibalism. Noteworthy is that the wormlizard, *B. heathi*, *H. mabouia*, and *M. maximiliani* were novel prey items for *T. hispidus*, whereas two of the prey items we found had been recorded previously in *T. hispidus* and *Ameivula ocellifera* by Costa et al. (2010) and Zanchi

et al. (2012) and *T. hispidus* by Van Sylus et al. (2004) and Sales et al. (2011), albeit only tails, whereas our record was an entire juvenile.

Cannibalism is relatively common in the genus *Tropidurus* (see Pergentino et al. 2017 for review), and the consumption of *A. ocellifera* has been reported in *T. itambere* (Faria and Araújo 2004) and *T. torquatus* (Kokubum and Lemos 2004). Of the first records, *M. maximiliani* had been recorded as a food item for *T. oreadicus* (Faria and Araújo 2004), and *H. mabouia* for *T. torquatus* (Teixeira and Giovanelli 1999; Galdino and Van Sluys 2004). An amphisbaenian (*Amphisbaena* cf. *vermicularis*) has also been reported in *T. oreadicus* (Faria and Araújo 2004). To date, *B. heathi* has not been recorded as a food item for any species of

Table 1. Squamate reptiles (amphisbaenian and lizards) found in the stomachs of Neotropical Lava Lizards (*Tropidurus hispidus*) and the respective habitat where those records originated. All are based on single records except *Ameivula ocellifera*, of which we found two individuals. Items marked with an asterisk (*) are new prey records for *T. hispidus*.

Prey Species	Habitat
<i>Ameivula ocellifera</i> (Spix 1825)	Agricultural land (non-natural)
Amphisbaenidae*	Urban (non-natural)
<i>Brasiliscincus heathi</i> (Schmidt and Inger 1951)*	Urban (non-natural)
<i>Hemidactylus mabouia</i> (Moreau de Jonnès 1818)*	Periurban (non-natural)
<i>Micrablepharus maximiliani</i> (Reinhardt and Luetken 1862)*	Periurban (non-natural)
<i>Tropidurus hispidus</i> (Spix 1825)	Restinga (natural)

Table 2. Morphological measurements for Neotropical Lava Lizards (*Tropidurus hispidus*) and their respective vertebrate prey. Measurements are in millimeters (mm). FSCHUFPB = Field Series Coleção Herpetológica da Universidade Federal da Paraíba. SVL = snout-vent length; TL = tail length; TBL = tail base length; BW = body width; BH = body height; HW = head width; HH = head height; HL = head length; FL = forelimb length; HL = hindlimb length. The asterisk (*) marks a measurement of the remaining parts.

Voucher Number (sex)										
Vertebrate Prey	SVL	TL	TBL	BW	BH	HW	HH	HL	FL	HL
FSCHUFPB06022 (male)	97.9	—	—	—	—	20.6	13.1	23.7	44.9	66.9
<i>Tropidurus hispidus</i>	—	—	—	—	—	—	15.7	9.4	—	20.0
FSCHUFPB12099 (female)	86.4	144.6	—	21.5	15.8	16.1	9.9	19.5	38.6	57.9
<i>Micrablepharus maximiliani</i>	28.6	—	—	5.3	4.5	3.9	3.7	6.5	7.4	9.5
FSCHUFPB12133 (female)	78.7	96.8	—	23.5	13.4	14.6	9.8	19.6	36.7	55.2
<i>Ameivula ocellifera</i>	51.1	—	21.3	11.2	7.3	8.5	6.9	14.0	17.6	32.8
FSCHUFPB12170 (male)	103.1	169.1	—	24.7	17.6	20.1	12.3	23.7	43.0	69.7
Amphisbaenidae	63.5*	—	—	5.3	—	—	—	—	—	—
FSCHUFPB12186 (female)	86.4	93.6	36.1	26.9	17.0	15.7	9.9	19.1	38.4	56.2
<i>Hemidactylus mabouia</i>	37.2	—	6.1	15.3	12.9	9.8	5.4	13.9	15.1	17.6
FSCHUFPB12212 (male)	76.2	113.7	77.1	21.0	13.5	14.9	9.9	18.2	35.8	57.7
<i>Brasiliscincus heathi</i>	27.6	—	—	13.8	—	—	—	—	—	13.9
FSCHUFPB12218 (male)	105.6	—	—	—	—	—	—	25.3	45.9	73.0
<i>Ameivula ocellifera</i>	—	—	—	—	—	9.9	—	—	16.3	—



Figure 1. Squamate reptiles consumed by Neotropical Lava Lizards (*Tropidurus hispidus*): (A) *Tropidurus hispidus*, (B) *Micrablepharus maximiliani*, (C) *Ameivula ocellifera*, (D) Amphisbaenidae, (E) *Hemidactylus mabouia*, (F), *Brasiliscincus beathi*, and (G) *Ameivula ocellifera*. White bars = 1 cm. Photographs by Maria Clara de Claro.

Tropidurus, although a congener, *B. agilis*, has been recorded for *T. torquatus* (Teixeira and Giovanelli 1999).

The new records reported herein indicate that the number of species consumed by *T. hispidus* is still unknown and suggest that the species feeds opportunistically on small vertebrates, which is reinforced by records in urban, periurban, and rural/agricultural habitats. Preliminary observations indicate that prey are more elongate than the predator, which could be crucial for swallowing but might also be suggestive

of some selectivity on the part of *T. hispidus* and could limit predation on small but relatively robust vertebrates that might otherwise be taken.

Sympatry obviously plays a role in opportunistic predation. *Tropidurus hispidus* is sympatric with and is active at the same time as most of the vertebrate prey we recorded. In addition, species that are typically nocturnal are sometimes active during the day or might exploit diurnal refuges accessible to *T. hispidus*. This might be the case for *H. mabouia* as well

as anurans, which also have been documented as prey (e.g., Beltrão-Mendes 2017).

Cannibalism is known in *T. hispidus* (Van Sluys et al. 2004; Sales et al. 2011), and since the species is intensely territorial (Eloi and Leite-Filho 2013; Melo et al. 2017), conspecific tails, especially in the stomachs of adult males, could result from either territoriality or opportunism (Sales et al. 2011; Passos et al. 2013; Melo et al. 2017). In this case, however, the small size of the juvenile *T. hispidus* is indicative of true cannibalism.

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