



NOTA BREVE / SHORT NOTE

ECOLOGÍA

## ***Leptodactylus vastus* (LEPTODACTYLIDAE) PREDATION ON AN ENDEMIC FROG, AND A COMPILATION OF ITS DIET**

### **Depredación de *Leptodactylus vastus* (Leptodactylidae) en una rana endémica y una recopilación de su dieta**

Felipe Eduardo Alves COELHO<sup>1</sup> , Felipe de Medeiros MAGALHÃES<sup>2,3</sup> \*, Aldenir Ferreira da SILVA-NETA<sup>2</sup> , Ricardo MARQUES<sup>2</sup>

<sup>1</sup> Programa de Pós-Graduação em Ecologia, Universidade Federal do Rio Grande do Norte, Centro de Biociências, Avenida Senador Salgado Filho, S/N, Lagoa Nova, 59078-900, Natal, RN, Brazil

<sup>2</sup> Programa de Pós-Graduação em Ciências Biológicas (Zoologia), Universidade Federal da Paraíba, Centro de Ciências Exatas e da Natureza, Departamento de Sistemática e Ecologia, Campus I - Cidade Universitária, S/N, Cidade Universitária, 58051-900 João Pessoa, Paraíba, Brasil.

<sup>3</sup> Earth and Environmental Sciences, Ecology and Evolution, Rutgers University-Newark 195 University Ave, Newark, NJ 07102 (current address)

\* **For correspondence:** felipemm17@gmail.com

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#### **ABSTRACT**

Diet composition constitutes basic information on the natural history of the species. Despite the amount of data acquired in the last years, much remains to be known specially for geographically widespread species. Here we compiled the available dietary items of *Leptodactylus vastus* and report the first predation event upon *Rupiranca cardosoi* by a juvenile *L. vastus*. The fact these species are syntopic in the region probably resulted in this novel predation event. Different from previous *L. vastus* predation observations, the specimens we observed do not present a striking difference in body size, but *L. vastus* was able to almost swallow *L. cardosoi*, coherent with findings that mouth size is related to prey selection in anurans. Also, our literature review showed that *L. vastus* is a generalist and opportunistic predator, that prey upon small vertebrates (Amphibia, Squamata, and Mammalia).

**Keywords:** batrachophagy, Caatinga, Chapada Diamantina, literature review, Northeastern Pepper Frog.

#### **RESUMEN**

La composición de la dieta constituye información básica sobre la historia natural de la especie. A pesar de la cantidad de datos adquiridos en los últimos años, aún queda mucho por conocer, especialmente para especies geográficamente extendidas. Aquí compilamos los elementos dietéticos disponibles de *Leptodactylus vastus* y reportamos el primer evento de depredación de *Rupiranca cardosoi* por un juvenil de *L. vastus*. El hecho de que estas especies sean sintópicas en la región probablemente resultó en este nuevo evento de depredación. A diferencia de las observaciones previas de depredación de *L. vastus*, los especímenes que observamos no presentan una diferencia notable en el tamaño corporal, pero *L. vastus* fue capaz de casi tragarse *R. cardosoi*, en coherencia con los hallazgos de que el tamaño de la boca está relacionado con la selección de presas en los anuros. Además, nuestra revisión de la literatura mostró que *L. vastus* es un depredador generalista y oportunista, que se alimenta de pequeños vertebrados (Amphibia, Squamata y Mammalia).

**Palabras clave:** Batracofagia, Caatinga, Chapada Diamantina, Rana Pimienta del Noreste, revisión de literatura.

Diet composition constitutes basic information of the natural history of the species and is necessary to understand one of the requirements for species occurrence and ecological interactions in prey-networks (Ceron et al., 2019). Despite the importance and amount of data acquired on what species eat, much remains to be known on this subject. For instance, when it comes to species with wide geographic range, information on diet from different localities is needed to assess if species have specialized on distinct items at ecologically different regions according to prey abundance and energetic demand (Davis et al., 2015). Anurans play an important role in trophic networks, and a relatively well studied group concerning latitudinal global patterns of dietary preferences (Ceron et al., 2019). Nevertheless, for most Neotropical anuran species dietary patterns are reported from single populations and through punctual field note, making it difficult to observe patterns on a large geographical scale.

*Leptodactylus vastus* Lutz, 1930 is a large terrestrial leptodactylid frog (adult specimens' snout-vent length range from 120–180 mm; de Sá et al., 2014) occurring along open formations from the Cerrado and Caatinga biomes in Brazil and boundaries of Chiquitano forest in Bolivia (Heyer, 2005; Jansen and Schulze, 2012; de Sá et al., 2014). This species mainly feeds on arthropods and small vertebrates (e.g., frogs and bats; Santana et al., 2012; Leite Filho et al., 2014; Caldas et al., 2019). Herein we report for the first time a predation on the endemic leptodactylid *Rupirana cardosoi* Heyer, 1999 by a juvenile *L. vastus* in Bahia state, Brazil, and provide a prey items compilation for *L. vastus*.

On 4 February 2020 at Chapada Diamantina in the municipality of Mucugê ( $13^{\circ}00' S$ ,  $41^{\circ}22' W$ , 991 m.a.s.l.), Bahia state, Brazil, at 19:25 h, we observed a juvenile preying on *R. cardosoi* adult male at the margins of a narrow sandy bottom river stream. At the time of observation, we found an individual of *L. vastus* ingesting its prey first from the back,

with only the head outside its mouth (Fig. 1a). In addition to the predated *R. cardosoi* individual, we also observed several males of that species calling exposed over sandbanks along the margins of this same stream. We manually captured the frog *L. vastus* (AAGARDA 12852, SVL = 44.17 mm) and placed it in a plastic bag for later procedures in laboratory, when it regurgitated an already dead *R. cardosoi* (AAGARDA 12851, SVL = 28.91 mm). The prey represented 65.5 % of the predator's SVL (Fig. 1b). We sacrificed the *L. vastus* with lidocaine 5 %, fixed in 10 % formaldehyde and preserved in 70 % ethanol. Animals are housed at Laboratório de Anfíbios e Répteis at Universidade Federal do Rio Grande do Norte, collected under SISBio permit 19828.

Additionally, we gathered additional data on the prey items of *L. vastus* in the literature using the combined search terms “*Leptodactylus vastus*” + “predation”, “diet” in the following online sources: Google Scholar (scholar.google.com.br), Scielo (scielo.org), semantic scholar (semanticscholar.org), academic Microsoft (academic.microsoft.com), and Dimensions (app.dimensions.ai). We also included publications that we were aware of and were not detected in these databases, such as publication about frog's community diet.

Our observation is the first record of *R. cardosoi*, a near threatened species endemic to the Chapada Diamantina (Acuña Juncá and Silvano, 2020), as a prey item of another species. Due to their small size (Mean = 34.4mm, SD = 1.6, Acuña Juncá and Lugli, 2009), *R. cardosoi* is probably a prey item of other anuran species and vertebrates of the region, as small frogs are susceptible to being preyed upon by any predator (Toledo et al., 2007). The predation event here reported is probably a consequence of both species are syntopic in the terrestrial strata along stream's margins and due to increased exposure during calling activity of *R. cardosoi*. However, our observation reports for the first time a juvenile *L. vastus* preying on another frog.



**Figure 1.** a) *Leptodactylus vastus* preying on *Rupirana cardosoi* backwards at stream margin in the municipality of Mucugê, Bahia state, Brazil. b) Preserved individuals of *L. vastus* (AAGARDA 12852) and *R. cardosoi* (AAGARDA 12851).

**Table 1.** dietary items of *Leptodactylus vastus* reported in the literature in the biomes Atlantic forest (AF) and Caatinga (CA) in Northeast Brazil.

Prey item	Biome	Locality	Source material
<b>ARTHROPODA</b>			
Araneae	CA	Aiuaba ESEC /CE	Teles et al. (2017)
Coeloptera	CA	Aiuaba ESEC/CE; Seridó ESEC/RN	Caldas et al. (2019)
Diptera	AF	Jardim Botânico Benjamim Maranhão/PB	Caldas et al. (2019)
Formicidae	AF	REBIO Guaribas/PB	Caldas et al. (2019)
Hymenoptera	CA	Aiuaba ESEC /CE	Teles et al. (2017)
Orthoptera	CA	Aiuaba ESEC /CE	Teles et al. (2017)
<b>AMPHIBIA-ANURA</b>			
Undetermined frog	CA	Seridó ESEC/RN	Caldas et al. (2019)
<b>Hylidae</b>			
<i>Boana albomarginata</i>	AF	Capela/SE	Santana et al. (2012)
<i>Boana faber</i>	AF	Refúgio da Vida Silvestre Mata do Junco/SE	Santos Neto et al. (2015)
<b>Leptodactylidae</b>			
<i>Leptodactylus latrans</i>	AF	Capela/SE	Santana et al. (2012)
<i>Leptodactylus natalensis</i>	AF	ESEC Tapacurá/PE	dos Santos (2009)
<i>Leptodactylus vastus</i>	AF	Reserva Sapiranga/BA	Guimarães et al. (2015)
<i>Physalaemus albifrons</i>	CA	ESEC Aiuaba/CE	Teles et al. (2015)
<i>Physalaemus cuvieri</i>	AF	ESEC Tapacurá/PE	dos Santos (2009)
<i>Rupirana cardosoi</i>	CA	Mucugê/BA	This study
<b>REPTILIA-SQUAMATA</b>			
<b>Tropiduridae</b>			
<i>Tropidurus</i> sp. (skin)	CA	ESEC Aiuaba/CE	Teles et al. (2017)
<b>MAMMALIA-CHIROPTERA</b>			
<b>Mormoopidae</b>			
<i>Pteronotus personatus</i>	AF	Itabaiana/SE	Gouveia et al. 2009
<b>Natalidae</b>			
<i>Natalus stramineus</i>	AF	Itabaiana/SE	Gouveia et al. 2009
<b>Phyllostomidae</b>			
<i>Glossophaga soricina</i>	CA	Boqueirão da Onça/BA	Leite Filho et al. (2014)
<i>Lonchophylla mordax</i>	CA	Boqueirão da Onça/BA	Leite Filho et al. (2014)
<i>Tonatia bidens</i>	CA	Boqueirão da Onça/BA	Leite Filho et al. (2014)
<b>Vespertilionidae</b>			
<i>Myotis nigricans</i>	CA	Boqueirão da Onça/BA	Leite-Filho et al. (2014)
Plant material	AF	REBIO Guaribas/PB	Caldas et al. (2019)

We found nine papers addressing diet or predation events of *L. vastus* reported from the Caatinga ( $N = 4$ ) and “Mata Atlântica” (the Atlantic Forest;  $N = 5$ ) biomes (Table 1). Some of the available papers report invertebrate consumption (six categories at the levels of Order and Family), representing an important component in the diet of *L. vastus*. In all available papers there are reports of vertebrates in the diet of *L. vastus*, mostly on anurans (seven species) followed by bats (six species) and one species of lizard (Table 1). Batrachophagy by *L. vastus* seems common (Table 1), being anurans the most

important prey item of the species during the dry season in one locality (Caldas et al., 2019). Most anuran preys’ reports are leptodactylids, followed by two species of hylids preyed around ponds (Table 1). Leptodactylids are terrestrial species more accessible to *L. vastus* since they are syntopic (i.e. species present in the same habitat), whereas hylids are often found on a higher vegetal strata, but occasionally forage on the ground and might be opportunistically preyed (Haddad et al., 2013). As for bats, reports show that *L. vastus* actively preyed on bats trapped into mist nets (see Leite Filho et al.,

2014) or positioned themselves near a cave entrance and waited for fallen bats that collided with the narrow entrance (see Gouveia et al., 2009). Our survey reinforces *L. vastus* as a generalist and opportunistic predator (Santana et al., 2012) of small vertebrates and arthropods (Teles et al., 2017; Caldas et al., 2019). Although this species is easily detectable and common throughout its wide distribution, we found only one paper (Caldas et al., 2019) reporting *L. vastus* diet at the same localities for long time span (e.g. one year). These authors observed changes in the importance of some items between wet and dry seasons at different biomes, reporting that *L. vastus* can even rely on plant material during the dry season (Table 1).

All papers reporting batrachophagy of adult *L. vastus* (Table 1) showed proportionally larger specimens when compared to their preys (e.g. *L. vastus*, SVL: 114.6 mm, *L. latrans*, SVL: 75.2 mm; Santana et al., 2012). Proportional larger body sizes allow predators to easily subdue preys (Toledo et al., 2007). In our observation, specimens do not present a striking difference in body size, but *L. vastus* was able to almost swallow *R. cardosoi*. Even though we were not able to measure *L. vastus* mouth width, this predation event seems to be coherent with previous works highlighting that mouth size is related to selection of prey items in most frogs (Coco et al., 2014). Also, our observation and literature survey reinforce *L. vastus* as a generalist and opportunistic species.

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## CONFLICT OF INTEREST

The authors declare no conflict of interest.

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