



Predation Attempt on Miranda Ribeiro’s Toad, *Rhinella mirandaribeiroi* (Anura: Bufonidae), by Cope’s Toad, *Rhinella diptycha* (Anura: Bufonidae), and a Review of Batrachophagy by Anurans in Brazil

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Miranda Ribeiro’s Toad, *Rhinella mirandaribeiroi* (Gallardo 1965) (Fig. 1A), is a small toad, with SVL of

adult males ranging from 40.9 to 71.4 mm (mean = 51.2 mm) and that of adult females ranging from 49.1 to 73 mm (mean =



Fig. 1. A predation attempt on a Miranda Ribeiro’s Toad (*Rhinella mirandaribeiroi*) (A) by a Cope’s Toad (*Rhinella diptycha*) (B). The attempt at predation, when the latter had grasped the leg of the former (C). After vocalizing for about 2 min, the *R. mirandaribeiroi* managed to escape, exhibited stiff-legged defensive behavior (D), and subsequently jumped away from the putative predator. Photographs by the author.

60.3 mm) (Narvaes and Rodrigues 2009). The species is widely distributed in Brazil; within the Cerrado ecoregion in enclaves in the Amazon Forest and in the Caatinga biome; and in Noel Kempf National Park in Bolivia (Narvaes and Rodrigues 2009; Benício et al. 2015; Pina et al. 2015). Reproduction occurs in permanent or temporary ponds in open areas after heavy summer rains (Narvaes and Rodrigues 2009).

Cope's Toad, *Rhinella diptycha* (Cope 1862) (Fig. 1B) is a large stout toad with SVLs of approximately 147 mm in males and 134 mm in females (Stevaux 2002). This species is distributed widely in northeastern Brazil and in the states of Espírito Santo, Pará, and Rio Grande do Sul (Frost 2021). These toads breed in both permanent and temporary ponds (Andrade and Carnaval 2004). Although primarily insectivorous (Oliveira et al. 2015), this species is known for its voracity, and is known to feed on other vertebrates, including bats (Gouveia et al. 2009; Silva et al. 2010a) and amphibians (Fonseca et al. 2018). Herein I present the first record of attempted predation on *R. mirandaribeiroi* by *R. diptycha*.

At 2210 h on 9 November 2020 in the backyard of my house in the municipality of Barras (42.296006°W, 4.253766°S; 85 m asl.), Piauí, in northeastern Brazil, I observed a *Rhinella diptycha* (SVL 125 mm) grab an adult *R. mirandaribeiroi* (SVL 65 mm) by the left leg (Fig. 1C). The

latter immediately vocalized intensely and inflated its body, which might have facilitated its escape. The predation attempt lasted approximately 2 min, after which the *R. mirandaribeiroi* exhibited stiff-legged defensive behavior (Fig. 1D), registered here for the first time for this species, before jumping away. I subsequently captured the *R. mirandaribeiroi* to check for injuries. It seemed fine, so I released it in the same place.

Measures such as head and body size and mouth width determine the types and sizes of prey frogs can consume (Duellman and Trueb 1994; Moroti et al. 2021). This *Rhinella diptycha* had a mouth width of 40 mm and a labial commissure of 60 mm, sufficiently large to allow consumption of prey larger than small invertebrates.

Batrachophagy by Brazilian anurans has been documented for 18 species of predators and 51 species of prey (Table 1), including predation by *Rhinella diptycha* on another bufonid from the same species group as *R. mirandaribeiroi* (i.e., *R. granulosa*; Fonseca et al. 2018). Although these records are largely anecdotal and amphibians were not the principal prey of any species, França et al. (2004) found that frogs represented by volume the second most important dietary component of Miranda's White-lipped Frog (*Leptodactylus macrosternum*) and the first for the South American Pepper Frog (*L. labyrinthicus*).

Table 1. Batrachophagy of adults and tadpoles in nature by anurans in Brazil (1977–2021). I searched various databases (e.g., Google Scholar, Scielo, Scopus, Web of Science) for these reports, disregarding references in which identification of predator or prey was missing or listed only to order (Anura), family (e.g., Bufonidae), or developmental stage (e.g., tadpole). I retained the taxonomic uncertainties (e.g., sp., cf., aff.) in the original sources, but checked for synonyms and standardized nomenclature according to Frost (2021) and Segalla et al. (2021). I did not consider reports of predation involving invasive species (for this, please see Oda et al. 2019).

Predator	Prey	References
Cope's Toad (<i>Rhinella diptycha</i>)	Granular Toad (<i>Rhinella granulosa</i>)	Chaves et al. (2012), Fonseca et al. (2018)
	Miranda Ribeiro's Toad (<i>Rhinella mirandaribeiroi</i>)	This study
South American Cane Toad (<i>Rhinella marina</i>)	South American Common Toad (<i>Rhinella margaritifera</i>)	Fróis et al. (2015)
Brazilian Horned Frog (<i>Ceratophrys aurita</i>)	Cope's Toad (<i>Rhinella diptycha</i>)	Silva-Soares et al. (2016), Toledo et al. (2007)
Brazil-nut Poison Frog (<i>Adelphobates castaneoticus</i>)	Brazil-nut Poison Frog (<i>Adelphobates castaneoticus</i>)	Caldwell and Araújo (1998)
White-banded Treefrog (<i>Boana albomarginata</i>)	Brazilian Coastal Treefrog (<i>Dendropsophus decipiens</i>)	Figueiredo-de-Andrade et al. (2012)
	Rio Verde Snouted Frog (<i>Scinax littoralis</i>)	Centeno et al. (2010)
Blacksmith Treefrog (<i>Boana faber</i>)	Canebrake Treefrog (<i>Aplastodiscus perviridis</i>)	Solé et al. (2004)
	Blacksmith Treefrog (<i>Boana faber</i>)	Bernarde and Machado (1999), Maffei et al. (2014)
	Rio Treefrog (<i>Dendropsophus meridianus</i>)	Figueiredo-de-Andrade et al. (2012)

(continued)

Predator	Prey	References
	Clay Robber Frog (<i>Haddadus binotatus</i>)	Leite et al. (2008)
	Argentine Snouted Treefrog (<i>Scinax granulatus</i>)	Solé et al. (2004)
	Ribeirão Branco Snouted Treefrog (<i>Scinax</i> aff. <i>perereca</i>)	Moura and Feio (2010)
Map Treefrog (<i>Boana geographica</i>)	Brown-bordered Snouted Treefrog (<i>Scinax fuscomarginatus</i>)	Domingos et al. (2018)
Semi-lined Treefrog (<i>Boana semilineata</i>)	Snouted Treefrog (species?) (<i>Scinax</i> sp.)	Guimarães and Woitovicz-Cardoso (2021)
Red-snouted Treefrog (<i>Scinax ruber</i>)	Miranda's White-lipped Frog (<i>Leptodactylus macrosternum</i>)	Santana et al. (2021)
Pepper Treefrog (<i>Trachycephalus typhonius</i>)	Picos Treefrog (<i>Dendropsophus soaresi</i>)	Loebmann (2013)
	Lesser Snouted Treefrog (<i>Scinax nasicus</i>)	Sugai et al. (2017)
Rabbit Burrow Frog (<i>Leptodactylus cunicularius</i>)	Rabbit Burrow Frog (<i>Leptodactylus cunicularius</i>)	Pirani et al. (2010)
Cerrado Oven Frog (<i>Leptodactylus furnarius</i>)	Brown-bordered Snouted Treefrog (<i>Scinax fuscomarginatus</i>)	Rolim et al. (2009)
South American Pepper Frog (<i>Leptodactylus labyrinthicus</i>)	Yellow-spotted Treefrog (<i>Boana albopunctata</i>)	Toledo et al. (2007)
	Blacksmith Treefrog (<i>Boana faber</i>)	Toledo et al. (2007)
	Guianan Dwarf Treefrog (<i>Dendropsophus minutus</i>)	França et al. (2004)
	South American Pepper Frog (<i>Leptodactylus labyrinthicus</i>)	França et al. (2004)
	Cuvier's Foam Froglet (<i>Physalaemus cuvieri</i>)	Diaz-Ricaurte and Marques (2021)
	Cuyaba Dwarf Frog (<i>Physalaemus nattereri</i>)	Silva et al. (2003), Vaz-Silva et al. (2003), França et al. (2004)
	Long-legged Swamp Froglet (<i>Pseudopaludicola saltica</i>)	França et al. (2004)
	Cochran's Snouted Treefrog (<i>Scinax</i> cf. <i>similis</i>)	França et al. (2004)
South American Spotted Grassfrog (<i>Leptodactylus</i> cf. <i>latrans</i>)	Leopard Treefrog (<i>Boana pardalis</i>)	Heitor et al. (2012)
	Porto Alegre Golden-eyed Treefrog (<i>Trachycephalus mesophaeus</i>)	Mira Mendes et al. (2012)
	Striped Toad (<i>Rhinella crucifer</i>)	Rojas-Padilla et al. (2018)
South American Spotted Grassfrog (<i>Leptodactylus latrans</i>)	Bella Vista Toad (<i>Rhinella fernandezae</i>)	Regnet and Loebmann (2017)
	Striped Toad (<i>Rhinella ornata</i>)	Bovo et al. (2014), Capela et al. (2020)
	Spix's White-lipped Frog (<i>Leptodactylus spixi</i>)	Figueiredo-de-Andrade et al. (2012)
	Weeping Frog (<i>Physalaemus biligonigerus</i>)	Regnet and Loebmann (2017)

Predator	Prey	References
	Brown-spotted Dwarf Frog (<i>Physalaemus marmoratus</i>)	Santos et al. (2021)
	Parker's Brazilian Dumpy Frog (<i>Stereocyclops parkeri</i>)	Figueiredo-de-Andrade et al. (2012)
Miranda's White-lipped Frog (<i>Leptodactylus macrosternum</i>)	White-banded Treefrog (<i>Boana albomarginata</i>)	Teixeira and Vrcibradic (2003), Toledo et al. (2007)
	Blacksmith Treefrog (<i>Boana faber</i>)	Haddad and Sazima (1992), Pombal (2007)
	Dwarf Treefrog (<i>Dendropsophus nanus</i>)	Carrillo et al. (2019)
	South American White-lipped Grassfrog (<i>Leptodactylus fuscus</i>)	Costa and Trevelin (2020)
	Cerrado Oven Frog (<i>Leptodactylus furnarius</i>)	França et al. (2004)
	Miranda's White-lipped Frog (<i>Leptodactylus macrosternum</i>)	Teixeira and Vrcibradic (2003), Kokubum and Rodrigues (2005), Toledo et al. (2007), Sousa et al. (2016)
	Amazonian White-lipped Frog (<i>Leptodactylus</i> aff. <i>mystaceus</i>)	Silva et al. (2010b)
	Speckled-bellied Frog (<i>Leptodactylus podicipinus</i>)	Carrillo et al. (2019)
	Pernambuco White-lipped Frog (<i>Leptodactylus troglodytes</i>)	Sales et al. (2015)
	Central Dwarf Frog (<i>Physalaemus centralis</i>)	Heyer and Giaretta (2009), Costa-Pereira et al. (2015)
	Crombie's Dwarf Frog (<i>Physalaemus crombiei</i>)	Teixeira and Vrcibradic (2003)
	Cuvier's Foam Froglet (<i>Physalaemus cuvieri</i>)	Santos (2009); Silva et al. (2010c), Queiroz et al. (2019)
	Cuyaba Dwarf Frog (<i>Physalaemus nattereri</i>)	Rodrigues and Oliveira-Filho (2004)
	La Plata Paradox Frog (<i>Pseudis platensis</i>)	Oda et al. (2016)
	Granular Toad (<i>Rhinella granulosa</i>)	França et al. (2004)
	Chaco Granulated Toad (<i>Rhinella major</i>)	Sousa et al. (2016)
	Lesser Snouted Treefrog (<i>Scinax nasicus</i>)	Queiroz et al. (2019)
	Venezuelan Snouted Treefrog (<i>Scinax x-signatus</i>)	Santos (2009)
Speckled-bellied Frog (<i>Leptodactylus podicipinus</i>)	Cope's Toad (<i>Rhinella diptycha</i>)	Ceron et al. (2018)
	Granular Toad (<i>Rhinella granulosa</i>)	Guimarães et al. (2004)
Northeastern Pepper Frog (<i>Leptodactylus vastus</i>)	Yellow-spotted Treefrog (<i>Boana albopunctata</i>)	Cardoso and Sazima (1977)
	White-banded Treefrog (<i>Boana albomarginata</i>)	Santana et al. (2012)
	Blacksmith Treefrog (<i>Boana faber</i>)	Neto et al. (2015)

Predator	Prey	References
	South American Spotted Grassfrog (<i>Leptodactylus latrans</i>)	Santana et al. (2012)
	Bubbling Frog (<i>Leptodactylus natalensis</i>)	Santos (2009)
	Northeastern Pepper Frog (<i>Leptodactylus vastus</i>)	Guimarães et al. (2015)
	Cuvier's Foam Froglet (<i>Physalaemus cuvieri</i>)	Santos (2009)
	Bahia Dwarf Frog (<i>Physalaemus albifrons</i>)	Teles et al. (2015)
	Granular Toad (<i>Rhinella granulosa</i>)	Cardoso and Sazima (1977)

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