Predation on Cope's Toad, *Rhinella diptycha* (Cope, 1862) (Anura: Bufonidae) by Roadside Hawk, *Rupornis magnirostris* (Gmelin, 1788) (Accipitriformes: Accipitridae)

Raul Afonso Pommer-Barbosa[1*], Jean Renato Esteves Neves[2], Cássia Caroline de Souza Saraiva[1 3], Ariel Adorno de Sousa[1 3]

1 Clube de Astronomia e Ciências de Rondônia, Universidade Federal de Rondônia, 76801-059 Porto Velho, RO, Brazil.
2 Instituto Armando Luvison, 78600-000 Barra do Garças, MT, Brazil.
3 Fundação Universidade Federal de Rondônia, 76815-800 Porto Velho, RO, Brazil.

* Corresponding author. Email: raulpommer@hotmail.com
DOI: 10.5281/zenodo.6533242

Anurans play an important role in the environment by acting as regulators of invertebrate populations or as a significant part of the diet of several species (Toledo et al. 2007; Costa et al. 2012; Delaix-Zaqueo et al. 2017; Jones et al. 2021). Although snakes are their main predators, birds also consume them (Beltzer 1990; Panasci & Whitacre 2000; Baladrón et al. 2011; Silva-Soares et al. 2016; Oliveira et al. 2017; Luciano et al. 2020). This paper reports the predation of *Rhinella diptycha* (Cope, 1862) by *Rupornis magnirostris* (Gmelin, 1788). There are few well documented reports on the consumption of bufonid anurans by birds.

Rhinella diptycha, popularly known as Cope's toad, is a large toad of the family Bufonidae. (Lavilla & Brusquetti 2018; Frost 2022). It occurs in Northeastern Brazil from Pará State (Municipality of Bujaru) and Maranhão States, to Piauí, Ceará, and Alagoas States, south of Rio Grande do Sul and Espírito Santo States, Brazil, inland through Paraguay to Amazonian and eastern Bolivia; and southwest to northern and central Argentina and northern Uruguay (Lavilla & Brusquetti 2018; Frost 2022).

At 15:48h on January 20, 2021, during field observations in the municipality of Baliza, Goiás, in the Cerrado biome (16.1916°S, 52.5484°W) a Roadside

Hawk, *Rupornis magnirostris* was observed preying on a *Rhinella diptycha* in the crown of a tree. The *R. diptycha* showed no resistance. The toad was held in the claws of *R. magnirostris* and was eaten (Fig. 1) for approximately 23 minutes. *R. magnirostris* used its beak to tear off pieces of *R. diptycha*'s back, including the parotoid glands. After 23 minutes, the *R. magnirostris* flew away carrying the remainder of the carcass. The episode was photographed and photos were deposited on the Wikiaves (Barbosa 2021) website under vouchers WA4557787 and WA4557785.

The Roadside Hawk, *Rupornis magnirostris*, occurs throughout Latin America, from Mexico to Argentina; in Brazil it is the most abundant hawk, found in every region of the country (Sick 1997). Known to be an excellent predator, the diet of *R. magnirostris* is quite diverse, opportunistic and generalist, consisting of large insects, some reptiles, amphibians, small snakes, and birds such as doves (*Zenaida auriculata*) and sparrows (*Passer domesticus*), and also bats in their daytime roosts (Haverschmidt 1962; Massoia 1988; Beltzer 1990; Sick 1997; Panasci & Whitacre 2000).

The diet composition of generalist raptors can vary spatially and seasonally according to prey availability (Thiollay 1994; Baladrón et al. 2011). In three studies, the diet of *R. magnirrostris* was analyzed quantitatively. Beltzer (1990) analyzed the stomach contents of 22 individuals in Argentina for one year and determined that they consumed mainly insects (orthopterans) with a proportion of approximately 77%. Panasci and Whitacre (2000) reported on the breeding-season diet in Guatemala by observing nests and found that the diet was composed 90% of small vertebrates (mainly lizards, frogs, and rodents). Baladrón et al. (2011) reported the predominance of small mammals in the diet in Argentina during the cold non-breeding season (April-September). This coincides with the period when rodent abundance increases (Baladrón et al. 2011).

Beltzer's (1990) study reported that amphibians are the second most important item in the diet of *R. magnirostris*. The batrachophagic habits of *R. magnirrostris* include *Rhinella granulosa* and *Boana* sp. in Valle Aluvial del Rio Parana Medio, Argentina (Beltzer 1990), *Leptodactylus troglodytes* in Paraíba State, Brazil (Arzabe & Almeida 1997), *Leptodactylus latrans* in Machadinho, Rio Grande do Sul State, Brazil (Souza et al. 2003), and *Boana pulchella* in Southeastern Pampas, Argentina (Baladrón et al. 2011) Our observation of the predation of *Rhinella diptycha* is the first reported for this Hawk.

Anurans of the family Bufonidae are known for a prominent parotoid venom glands located dorso-ventrally in the post-orbital region (Mailho-Fontana et

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al. 2013; Jolly et al. 2016; Abdelfatah et al. 2019), toads use these glands as a defense mechanism when they feel threatened, inflating their bodies and positioning their venom glands toward the aggressor (Mailho-Fontana et al. 2013).

Several chemical compounds have been identified as constituents of toad venoms, including peptides, proteins, amines (e.g., bufotenin, etc.), steroids, and different classes of alkaloids (Daly et al. 2004; Oliveira et al. 2017; Abdelfatah et al. 2019), the consequence of which can range from cardiotoxic, neurotoxic, and even anesthetic effects, and generally have cytotoxic effects by inhibiting predator cellular respiration, thus causing hemolysis and neuronal damage (Toledo & Jared 1995; Ferreira 2012; Jolly et al. 2016, Abdelfatah et al. 2019). Despite the chemical defense mechanism, there are records of predation on *R. diptycha* by *Paleosuchus palpebrosus* (Toledo et al. 2007), *Salvator merianae* (Toledo et al. 2007), *Xenodon merremi* (Aroztegui et al. 2008), *Guira guira* (Briso et al. 2013), *Ceratophrys aurita* (Silva-Soares et al. 2016) which eventually died by poisoning, and *Caiman latirostris* (Peixoto-Couto et al. 2020).

Although some animals feed on anurans opportunistically (Toledo et al. 2007; Delaix-Zaqueo et al. 2017), this record expands the knowledge about the feeding habits of *R. magnirostris* and the action of the venom of R. diptycha. We observed that despite the chemical defense of *R. diptycha*, *R. magnirostris* did not appear to undergo a poisoning reaction during the observation.

ACKNOWLEDGEMENTS

We thank the Instituto Armando Luvison for logistical support. We thank the Clube de Astronomia e Ciências de Rondônia for financial suport. We thank the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brazil (CAPES) for financial support.

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Editora: S. Mangia



Figure 1. Predation on *Rhinella diptycha* by *Rupornis magnirostris* in Baliza, Goiás.