






## NEW RECORDS OF AMPHIBIAN PREDATION BY SNAKES IN NORTHEASTERN BRAZIL

Inocência Martins Neto<sup>1</sup> , Mariluce Gonçalves Fonseca<sup>1,2</sup>  & Ronildo Alves Benício<sup>1\*</sup> 

<sup>1</sup>Universidade Federal do Piauí, Laboratório de Herpetologia e Parasitologia de Animais Silvestres, Rua Cícero Duarte, 905, Junco, CEP: 64607-670, Picos, PI, Brazil.

<sup>2</sup>Núcleo de Pesquisa em Ciências Naturais do Semiárido do Piauí, Universidade Federal do Piauí, Rua Cícero Duarte, 905, Junco, CEP: 64607-670, Picos PI, Brazil.

E-mails: [martinsinocencio19@gmail.com](mailto:martinsinocencio19@gmail.com); [marilucefonseca@ufpi.edu.br](mailto:marilucefonseca@ufpi.edu.br); [benicio.herpeto@gmail.com](mailto:benicio.herpeto@gmail.com) (\*corresponding author)

**Abstract:** Studies that address predator-prey relationships can provide important information about aspects of the ecology and natural history of the species involved. Despite this, predation events in nature are rarely observed and documented due to their fortuitous nature. Here, we present two records of predation events on *Boana raniceps* and *Scinax x-signatus* (Anura: Hylidae) by *Philodryas olfersii* and *Psomophis joberti* (Snakes: Colubridae), respectively, in the nature in northeastern Brazil. We also compare the diet with that of other congeneric species and briefly discuss the definition of ontogenetic variation in the diet of *Philodryas olfersii*.

**Keywords:** Anurans; Diet; Neotropical region; Trophic relation; Squamata.

Snakes represent a widely distributed group, considering their eating behavior, and they range from generalist species, which feed on a wide variety of prey types (Martins *et al.*, 2002; Sales *et al.*, 2020), to highly specialized species, which feed on specific animal groups (*e.g.* lizards) or prey types (*e.g.* eggs) (Nunes *et al.* 2010, Agudo-Padrón 2013). Once predator and prey are identified, predation events allow us to record the tactics and methods used to capture prey, as well as prey defense mechanisms associated with several behaviors (Gregory 2016, Smith & Atkinson 2017, Ferrante *et al.* 2022). Despite the importance of predator-prey relationships, predation events in the nature are rarely observed and documented.

*Philodryas olfersii* (Lichtenstein, 1823) is a medium-sized species (mean CRC = 640 mm; Mesquita *et al.* 2013) with a wide distribution that

occurs in Argentina, Bolivia, Brazil, Colombia, Guyana, French Guiana, Paraguay, Peru, Uruguay and Venezuela (Uetz *et al.* 2024). In Brazil, it occurs in all morphoclimatic domains, including the Atlantic Forest, Caatinga and Cerrado, with scattered records in the Amazon (Nogueira *et al.* 2019). It is a diurnal and semi-arboreal species that is active throughout the year, with relatively high abundance during the onset of rainy seasons (Hartmann & Marques 2005, Mesquita *et al.* 2013).

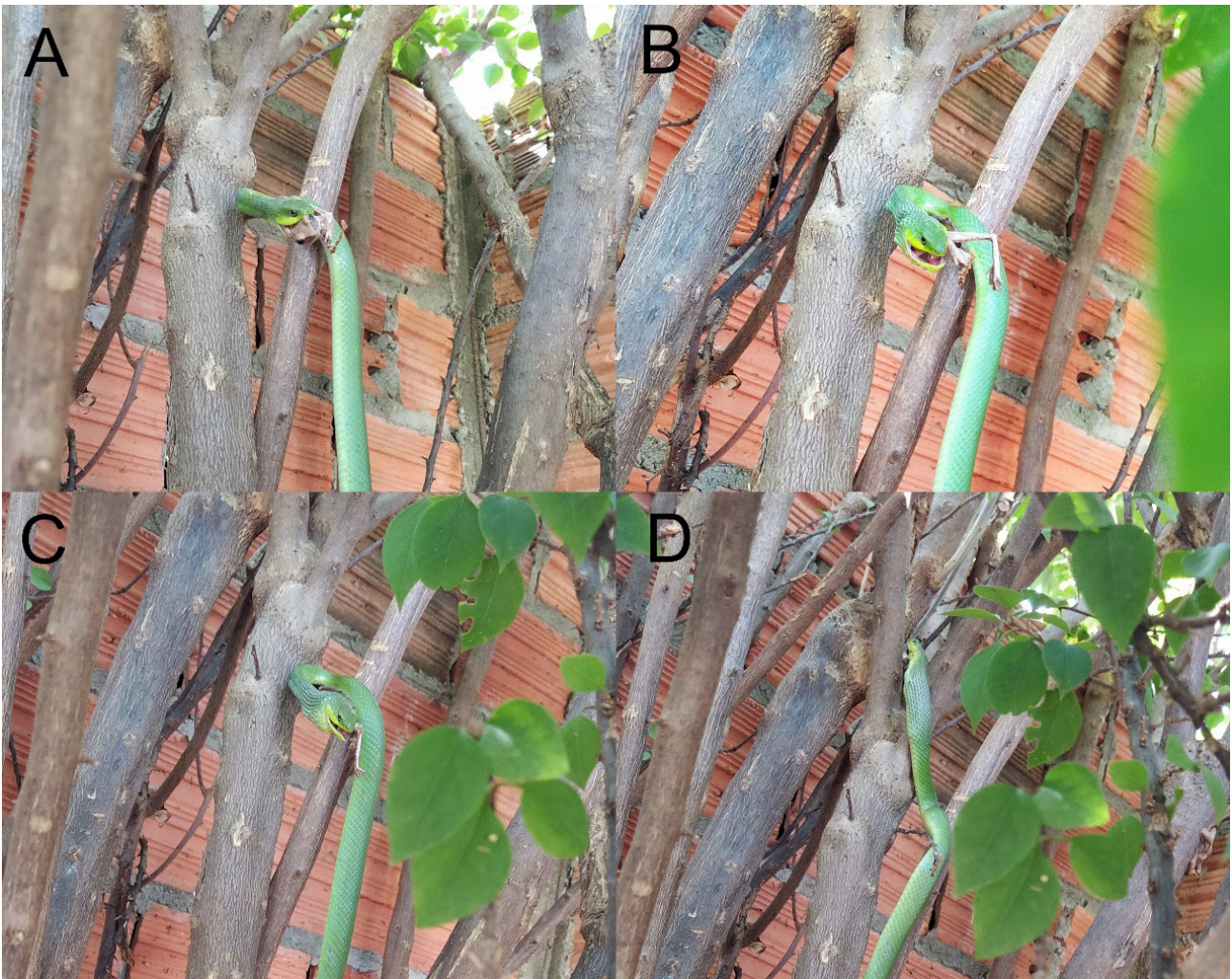
*Psomophis joberti* (Sauvage, 1884) is a small species (mean CRC = 365 mm; Mesquita *et al.* 2013). It is endemic to Brazil and recorded in the central and northeastern Cerrado and Caatinga domains, with marginal records in the Amazon and Atlantic Forest (Nogueira *et al.* 2019). It is diurnal and predominantly terrestrial (Mesquita *et al.* 2013).

In this study, we present two records of predation events on *Boana raniceps* and *Scinax x-signatus* (Anura: Hylidae) by *Philodryas olfersii* and *Psomophis joberti* (Snakes: Colubridae), respectively. Both records occurred within a residential area (4°15'12.87" S, 42°17'46.11" W) in the municipality of Barras, northern region of the state of Piauí, northeastern Brazil. During the predation events, both frog individuals vocalized intensely. After the predation, both snakes fled, moving to a wooded area outside the residential area.

The record on *B. raniceps* occurred on 26 September 2021 at 14:32 h. The individual of *B. raniceps* was observed to be predated upon by an individual of *Philodryas olfersii* on a tree branch, approximately 1.5 m high. The prey was bitten on the back of its body.

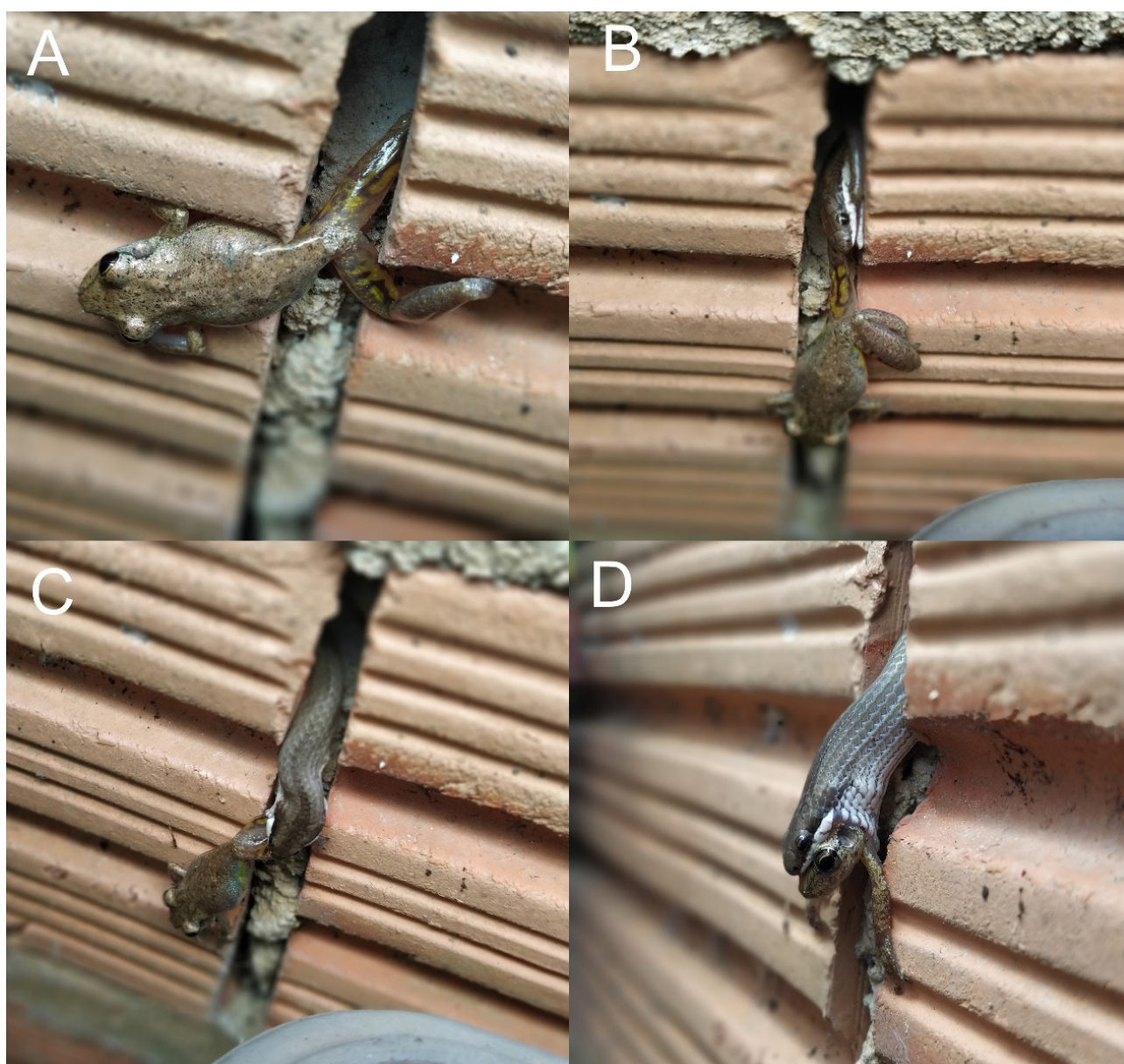
The snake quickly turned the amphibian around into its mouth to begin the ingestion process on the front of its body (Figure 1). This predation event lasted approximately five minutes.

The record of *Scinax x-signatus* occurred on November 24, 2021, at 16:14 h. The anuran was observed to have been preyed upon by the snake *Psomophis joberti*, between bricks. The prey was captured by the leg while still inside the bricks at a height of approximately half a meter above ground. Afterwards, the snake tried to pull the tree frog back into the bricks; then, the snake successfully bit the entire back of the tree frog and ingested it (posterior-anterior direction), while the prey still showed resistance (Figure 2). This predation event lasted approximately 15 minutes.



**Figure 1.** Record of *Philodryas olfersii* preying on *Boana raniceps* (5 minutes of duration). The individual of *B. raniceps* is bitten by the posterior part of the body (A); the snake quickly begins to rotate the amphibian inside its mouth (B) to start the ingestion process through the anterior part of the body (C); and finally, the amphibian is completely swallowed by the snake, which leaves (D).





**Figure 2.** Record of *Psomophis joberti* preying on *Scinax x-signatus* (15 minutes of duration). The individual of *S. x-signatus* is captured by the leg by the snake still inside the bricks (A); later the snake tries to pull the frog into the hole (B); then the snake successfully tries to bite the entire back of the tree frog (C); finally, the final ingestion process (posterior-anterior direction) begins with the frog still showing resistance (D).

The literature describes several predation events for *P. olfersii*, which involve the consumption of a wide variety of food items (Vitt 1980, Vitt & Vangilder 1983, Hartmann & Marques 2005, Leite *et al.* 2009), including amphibians, small mammals, bats (Barros *et al.* 2015), birds (Sazima & Marques 2007, Almeida & Santos 2011, Morton *et al.* 2012, Sazima 2015, Preuss *et al.* 2020, Mise *et al.* 2021, Ferreira *et al.* 2022a, 2022b), and other reptiles (Lauvers *et al.* 2016, Silva *et al.* 2019). Nine species of anurans are known as prey of *P. olfersii* (*Rhinella diptycha*, *Boana*

*lundii*, *B. raniceps*, *B. pulchella*, *Scinax fuscovarius*, *S. x-signatus*, *Leptodactylus fuscus*, *L. troglodytes* and *Leptodactylus* sp.) (Hartmann & Marques 2005, Mesquita *et al.* 2013, Nascimento *et al.* 2020, Fiorillo *et al.* 2021). To the best of our knowledge, this is the first record of predation in the nature for *B. raniceps* by *P. olfersii*.

According to the literature, the diet of *Philodryas olfersii* has been identified as generalist but with ontogenic variation, with juveniles feeding on amphibians and adults feeding mainly on mammals

and birds (Hartmann & Marques 2005). However, amphibians have been reported as the main prey of adults in the Caatinga biome (Mesquita *et al.* 2013). In this study, we also recorded an amphibian as prey of an adult *P. olfersii* (total length = approximately 1200 mm). In other congener species (e.g. *Philodryas aestiva*), adults also feed mainly on amphibians (Quintela & Loebmann 2019). Furthermore, even considering that it is one of the most widely distributed species in Brazil (i.e., *Philodryas nattereri*), its diet may vary across different ecoregions (Sales *et al.* 2020). Thus, the predominance of a certain type of prey in the diet or at a certain stage of life may be related to a set of factors, such as greater availability of a certain type of prey in the nature (seasonal fluctuations in prey availability), prey handling (in this case, amphibians in relation to birds, for example), absorbed caloric potential (mammals in relation to amphibians), predator size, and potential risks and injuries during predation (mammals in relation to amphibians), not just a species' food preference. Therefore, our data, which are supported by the literature, suggest caution in claiming that there is ontogenetic variation in the diet of *P. olfersii*.

In contrast, *Psomophis joberti* is considered a rare species (i.e., Mesquita *et al.* 2013, Filho *et al.* 2021), and the literature does not present much information about the prey consumed by this species. There is only one study recording the predation of *Scinax* sp. by *P. joberti* (Rodrigues *et al.* 2016). Therefore, this is the first record of *Scinax x-signatus* predated by *P. joberti*. In addition, the longer predation event (~ 15 minutes) may have occurred because the snake preyed on the amphibian in the posterior-anterior direction, in contrast with a previous study (Rodrigues *et al.* 2016), which probably allowed greater resistance by the amphibian individual (Figure 2).

Anecdotal records are important because they provide unprecedented information about the natural history of species, especially for rare events or those that are difficult to observe in nature, such as predator-prey interactions. In this report, we added more information about the diets of two snake species common in Brazil.

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