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SHORT NOTES

Citizen science contributions to understanding the predation behavior of *Philodryas nattereri* (Squamata: Dipsadidae): new prey species and second record of cannibalism

Aportes de la ciencia ciudadana para comprender el comportamiento de depredación de *Philodryas nattereri* (Squamata: Dipsadidae): nuevas especies de presa y segundo registro de canibalismo

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ABSTRACT

Philodryas nattereri is a dipsadid snake widely distributed in South America. Although it is a well-known species regarding its diet, only a small portion of the records are related to observations in the natural environment, resulting in a lack of information about its predatory behavior. The predation records were mainly obtained through the citizen science platform iNaturalist and investigated before inclusion. The results are consistent with other studies, corroborating that *P. nattereri* has a generalist diet. We have added three new prey-predator interactions for *P. nattereri*, as well as confirming for the second time its cannibalism. These records expand the knowledge on its ecology and predation behavior, with significant implications for understanding ecological processes in areas where *P. nattereri* occurs. Furthermore, the benefits of citizen science are emphasized as a valuable tool for gathering information about biodiversity, highlighting the role of citizens in contributing to the advance of biological scientific knowledge.

Keywords: diet, iNaturalist, natural observations.

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RESUMEN

Philodryas nattereri es una serpiente dipsádida ampliamente distribuida en América del Sur. Aunque es una especie bien conocida en lo que respecta a su dieta, solo una pequeña porción de los registros se relaciona con observaciones en el entorno natural, lo que resulta en una falta de información sobre su comportamiento de depredación. Los registros de depredación se obtuvieron principalmente a través de la plataforma de ciencia ciudadana iNaturalist y fueron investigados antes de su inclusión. Los resultados concuerdan con otros estudios, corroborando que *P. nattereri* tiene una dieta generalista. Agregamos tres nuevas interacciones presa-depredador para *P. nattereri*, además de confirmar por segunda vez su canibalismo. Estos registros amplían el conocimiento sobre su ecología y comportamiento de depredación, con implicaciones significativas para comprender los procesos ecológicos en las áreas donde *P. nattereri* está presente. Además, se enfatizan los beneficios de la ciencia ciudadana como una herramienta valiosa para obtener información sobre la biodiversidad, resaltando el papel de los ciudadanos en contribuir al avance del conocimiento científico biológico.

Palabras clave: dieta, iNaturalist, observaciones naturales.

Philodryas nattereri (Steindachner, 1870) is a medium-sized dipsadid snake with a wide distribution, occurring in open areas of Brazil, Bolivia, and Paraguay (Guedes *et al.* 2014, Wallach *et al.* 2014, Navarro-Cornejo and Gonzales 2020). It is a diurnal and terrestrial species that can also be found in shrubs and trees (Mesquita *et al.* 2011). Like other snakes in the genus, *P. nattereri* has a generalist diet consisting of small vertebrates such as amphibians, birds, lizards, mammals, Squamata eggs, as well as other snakes (Vitt 1980, Mesquita *et al.* 2011, Sales *et al.* 2020, Sousa *et al.* 2023), with cannibalism already been reported (Coelho-Lima *et al.* 2021).

The composition of snake diets is most commonly analyzed through examination of stomach contents from specimens held in collections (Vitt 1980, Pinto and Fernandes 2004, Sant'anna and Abe 2007, Mesquita *et al.* 2011), as observations of snake predation events in the wild are sporadic and limited to isolated situations involving a single individual in its natural environment (Araújo *et al.* 2013, Sobral and Mendes 2016, Guedes *et al.* 2018, Coelho-Lima *et al.* 2019). Therefore, records obtained through citizen science are of great importance and contribute with information that cannot be acquired from preserved specimens available in collections, such as predation behavior (Crnobrna *et al.* 2017). iNaturalist, as a citizen science platform, receives and disseminates records of any living organism made by the users. However, it is necessary to integrate citizen science with academic knowledge through the analysis, interpretation, and publication of these records in scientific outlets (Mesaglio *et al.* 2021, Messas *et al.* 2021, Oliveira and Costa 2022). That way, it is possible to increase our knowledge of natural history, behavior, and geographic distribution of species. In this paper, we analyze records available on iNaturalist related to predation events by *P. nattereri* obtained in the northeastern Brazilian states of Bahia, Paraíba, Ceará, and Rio Grande do Norte.

On 14 Dec 2019, at 9:28 (GMT -3), in Estrela, a district of the municipality of Barbalha, state of Ceará (7°16'52.0" South, 39°16'16.3" West, WGS84), an adult individual of *P. nattereri* was sighted on the ground by Alexandre C. Sampaio (Sampaio 2021), among dry leaves, preying on a green iguana, *Iguana iguana* (Linnaeus, 1758). The prey was consumed head-first (Fig. 1a). Lizards are a common dietary item of *P. nattereri* (Sales *et al.* 2020). However, the predation of *I. iguana* was recently recorded (Sales *et al.* 2020), our record being the second report.

On 23 Dec 2020, at 09:04 (GMT -3), in the municipality of Cabaceiras, state of Paraíba (7°25'33.0" South, 36°21'39.9" West, WGS84), Breno Farias sighted an adult individual of *P. nattereri* on the ground, preying on a conspecific juvenile (Fig. 1b; Farias 2021). The consumption of the prey began from its head. Cannibalistic behavior in *P. nattereri* has been recently reported, also involving a juvenile individual as prey (Coelho-Lima *et al.* 2021). Our current record represents its second cannibalism record. In the same municipality on 13 April 2025, at 17:18 (GMT -3), Breno Farias once again observed an ophiophagous event

involving *P. nattereri* (Farias 2025). On this occasion, the prey was a juvenile Caatinga Rainbow Boa, *Epicrates assisi* Machado, 1944 (Fig. 1c-d), which was consumed starting from the tail. Despite the considerable size of the prey, *P. nattereri* did not exhibit constriction — a behavior typically displayed by this species and previously observed during predation on other snakes (Coelho-Lima *et al.* 2019, Sousa *et al.* 2023). This is the first documented predator–predator interaction involving *P. nattereri* and *E. assisi*. On 18 Jan 2021, at 10:14 (GMT -3), in a rural area of the municipality of São João do Rio Peixe, state of Paraíba (6°49'17.8" South, 38°24'26.4" West, WGS84), an adult individual of *P. nattereri* was sighted by Heloísa M. Maciel and Elyonel Fernandes preying upon the Psittacidae Cobalt-rumped parrotlet, *Forpus xanthopterygius* (von Spix, 1824), on a wire fence (Fig. 1e; Fernandes and Maciel 2021). Despite bird predation being common, this is the first record of this species as prey for *P. nattereri*.

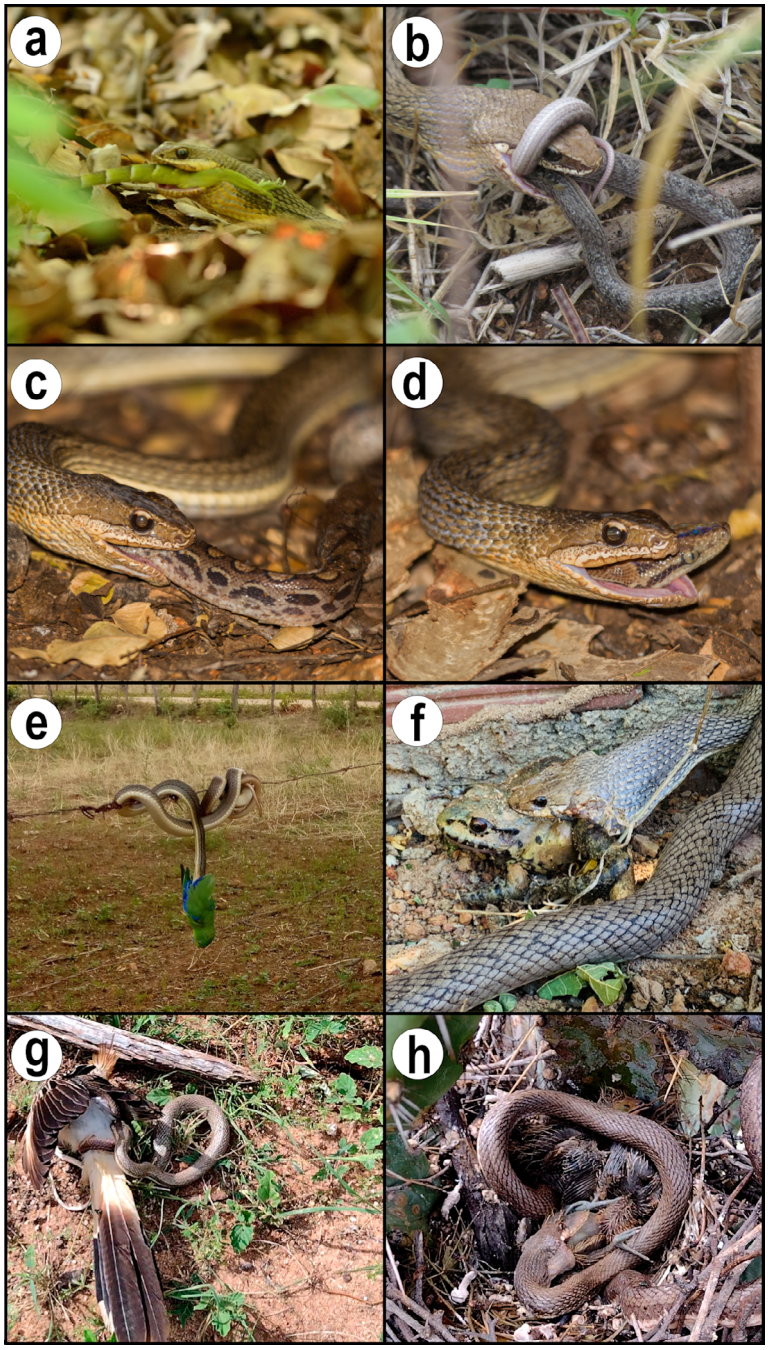

Figure 1. Predation events of *Philodryas* nattereri recorded in this study. a: *Iguana iguana*; b: juvenile of *P. nattereri*; c-d: juvenile of *Epicrates assisi*; e: *Forpus xanthopterygius*; f: *Leptodactylus vastus*; g: adult of *Guira guira*; h: nestlings of *Guira guira*.
Photos: a: Alex C. Sampaio; b-d: Breno Farias; e: Heloísa M. Maciel; f: Humberto T. A. de Carvalho; g-h: José R. do Nascimento.

On 18 Aug 2021, at 10:37 (GMT -3), in the municipality of Serra dos Pintos, state of Rio Grande do Norte (6°06'49.0" South, 37°57'16.4" West, WGS84), Humberto T. A. de Carvalho sighted an *P. nattereri* preying on a Pepper-frog, *Leptodactylus vastus* Lutz, 1930, in the backyard of his residence (Fig. 1f; Carvalho 2021). The event lasted in one hour and nine minutes and the prey were ingested from behind. This prey-predator interaction has already been reported to Cerrado ecorregion (Araújo *et al.* 2013). This is the second record of *P. nattereri* preying upon *L. vastus*, however, the first in the Caatinga ecoregion.

On 5 Jan 2023, at 14:45 (GMT -3) at Fazenda Lajes, a district of Juremal, municipality of Juazeiro, state of Bahia (9°44'25" South, 40°27'00" West, WGS84), José R. do Nascimento observed an individual of *P. nattereri* subduing an adult of Guira cuckoo, *Guira guira* (J. F. Gmelin, 1788) with body constriction on the ground, starting to ingest the bird (Fig. 1g). However, upon the observer's approach, the snake abandoned its prey, and both fled. Two days later, 7 Jan 2023, at 12:47, José R. do Nascimento observed another *P. nattereri* preying on newly hatched individual of *G. guira* in a nest (Fig. 1h). The snake climbed into the Guiras' nest, among the cactus branches, and consumed the nestling. During the predation, an adult of *G. guira* vocalized around, alerting the snake's presence. Videos of these two predation events are deposited at Fonoteca Neotropical Jacques Vielliard of Museu de Diversidade Biologica of Universidade Estadual de Campinas (FNJV-MDBio – UNICAMP) and are available online under vouchers ZUEC-VID 1336 and ZUEC-VID 1337.

The records reported herein add two new bird prey to the diet of *P. nattereri*: *F. xanthopterygius* and *G. guira,* and one snake species: *E. assisi*. We reinforce the generalist and opportunistic diet of *P. nattereri* (Sales *et al.* 2020, Sousa *et al.* 2023), with occurrence of cannibalistic events already reported in other studies (Coelho-Lima *et al.* 2021). Moreover, we expect to influence other researchers to value citizen science. Technological advancements and the ease of communication have facilitated the dissemination and appreciation of opportunistic records, leading to increase the knowledge of natural history data by any citizen, which greatly contribute to the understanding of the natural history of Brazil's megadiversity. Furthermore, this type of approach helps to mitigate the Eltonian shortfall, which refers to the knowledge gap about ecological interactions between species that influences other deficiencies, such as Darwinian shortfall – related to the gap of knowledge about the evolution of species and their traits (Diniz-Filho *et al.* 2013, Hortal *et al.* 2015).

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AUTHOR CONTRIBUTION

LDB collected citizen science data, gathered literature data, and wrote the text; ASJ gathered and organized literature data; DPM translated and formatted the text; JRN collected field work data; MRSP reviewed the manuscript; TSS gathered data together and reviewed the manuscript.

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