



Predation of *Boana raniceps* (Cope, 1862) (Anura: Hylidae) by *Leptophis ahaetulla* (Linnaeus, 1758) (Squamata: Colubridae)


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ABSTRACT

In this research, we report the predation of *Boana raniceps* (Cope, 1862) by *Leptophis ahaetulla* (Linnaeus, 1758) in the rural area of Candeias do Jamari municipality, Rondônia state, southwestern Brazilian Amazon. *Leptophis ahaetulla* is a diurnal arboreal snake that can be found in a variety of environments such as dryland forests, flooded forests, and plantations. Its diet consists mainly of anurans and may include lizards. *Boana raniceps* belongs to the *B. albopunctata* group. There are few well-described reports on the predatory behavior of anurans by *L. ahaetulla*, as studies are generally based on stomach contents and not on photographic records. There are also few reports on the defensive behaviors of *B. raniceps*. In this research, predation of *Boana raniceps* was by *Leptophis ahaetulla* lasted about 15 minutes until complete ingestion and occurred at 2:00 PM on July 05, 2020. During predation, *B. raniceps* performed the defensive behavior; making distress calls. Recording this predation is essential to improve knowledge about the natural history of the species described here.

Keywords: Predation; amphibian; behavior; diet; snakes.

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RESUMO

Nesta pesquisa, relatamos a predação de *Boana raniceps* (Cope, 1862) por *Leptophis ahaetulla* (Linnaeus, 1758) na área rural do município de Candeias do Jamari, estado de Rondônia, sudoeste da Amazônia brasileira. *Leptophis ahaetulla* é uma cobra arbórea diurna que pode ser encontrada em diversos ambientes, como florestas de terra firme, florestas inundadas e plantações. Sua dieta consiste principalmente de anuros e pode incluir lagartos. A *Boana raniceps* pertence ao grupo *B. albopunctata*. Há poucos relatos bem descritos sobre o comportamento predatório dos anuros por *L. ahaetulla*, já que os estudos são geralmente baseados no conteúdo estomacal e não em registros fotográficos. Há também poucos relatos sobre os comportamentos defensivos de *B. raniceps*. Nesta pesquisa, a predação de *B. raniceps* por *L. ahaetulla* durou cerca de 15 minutos até a ingestão completa e ocorreu às 14h00 do dia 05 de julho de 2020. Durante a predação, *B. raniceps* executou o comportamento defensivo, fazendo chamadas de socorro. O registro desta predação é essencial para melhorar o conhecimento sobre a história natural das espécies aqui descritas.

Palavras-chave: Predação, anfíbio, comportamento, dieta, serpentes.

Anurans represent an important item in the diet of Amazonian snakes, and there is an association of the foraging substrate of snakes with the activity of their prey (BERNARDE; ABE, 2010). Diet composition stands out as a fundamental part for the niche dimension of snakes in general (SANTOS et al., 2010). However, the record of the composition is often made through the investigation of animals deposited in collections due to the furtive nature and difficult monitoring in free life of the species (ALBUQUERQUE et al., 2007; SILVA et al., 2010). This information does not allow us to elucidate foraging and capture behaviors of the species. Occasional records of predation of anurans in the wild (e.g., RIBEIRO et al., 2014; GONZÁLEZ-SOLÓRZANO; ESCOBEDO-GALVÁN, 2015) fill this knowledge gap due to the unique opportunity to observe behavior.

Leptophis ahaetulla (Green Snake or Neotropical Parrot Snake) (Linnaeus, 1758) is a diurnal arboreal snake in which males can reach up to 1.5 meters and females 1 meter (FRAGA et al., 2013) that can be found in a variety of environments, such as dryland forests, flooded forests, and plantations (MESQUITA et al., 2013; MORATO et al., 2018). Its distribution extends from Veracruz in Mexico to Brazil and northeastern Argentina (GUTIÉRREZ-CÁRDENAS et al., 2019). Its diet is composed mainly of anurans, and may include lizards (ALBUQUERQUE et al., 2007; GÓMEZ-HOYOS et al., 2015). This species mainly uses the tree stratum for foraging but can also be observed on the ground feeding (OLIVEIRA et al., 2014; CHALOUPKA; RODRÍGUEZ, 2021).

Chaco Treefrog, *Boana raniceps* (Cope, 1862) belongs to the *B. albopunctata* group is the species with the largest geographic distribution of the group (FAIVOVICH et al., 2005; DUBOIS, 2017; BELTRÃO-MENDES et al., 2018). The distribution of this anuran includes the Brazilian, Colombian, and Venezuelan Amazon, French Guiana, eastern Brazil, Paraguay, northern Argentina, and

eastern Bolivia (BELTRÃO-MENDES et al., 2018; FROST, 2021). Males of this species usually vocalize at dusk on higher substrates, and at dusk they move to water bodies (GUIMARÃES; BASTOS, 2003; BELTRÃO-MENDES et al., 2018). They usually stay on branches of shrubs and vegetation, they also use the ground, sticks, trees, and rocks (GUIMARÃES; BASTOS, 2003; PROTÁZIO et al., 2014; LEITE-FILHO et al., 2015; BELTRÃO-MENDES, 2018). When captured by a predator, they may exhibit defensive behavior such as puffing-up the body, raise their heads and perform the open mouth behavior while making distress calls (GUERRA et al., 2018). The following will describe the researchers' observations of the predation event. The field observation was conducted in the rural area of Candeias do Jamari, Rondônia state, in the southwestern Brazilian Amazon. The observation site is a private farm (8°55'34.2 "S 63°29'21.1 "W), with many surrounding trees, about 50 km from the urban area. *Leptophis ahaetulla* preys on *Boana raniceps* at a height of about 2 meters, on a *Coffea canephora* tree (Figure 1).



Figure 1. Predation of *Boana raniceps* by *Leptophis ahaetulla*.

Predation of *Boana raniceps* was by *Leptophis ahaetulla* lasted about 15 minutes until complete ingestion and occurred at 2:00 PM

on July 05, 2020. During predation, *B. raniceps* performed the defensive behavior, making distress calls. The report of this defensive behavior has already been observed by Guerra et al. (2018). *L. ahaetulla* swallowed *B. raniceps* from the rear, which contrasts with the research of Albuquerque (2007), where about 87% of prey items of *L. ahaetulla* were consumed head-on. The species was not collected. After recording this predation event, we let the snake follow its natural flow.

The present record reinforces the preference of *Leptophis ahaetulla* for anuran hylids (ALBUQUERQUE et al., 2007; CABRERA-

GUZMÁN; VILLANUEVA, 2009; SOLÉ et al., 2010; MESQUITA et al., 2013; CLEGG, 2015). There are no previous records of *Boana raniceps* predation for the Amazon biome, with only one record in the Caatinga biome, in the state of Ceará (MESQUITA et al., 2013) (Figure 2). This record also highlights the participation of *B. raniceps* in the diet composition of *L. ahaetulla* throughout its geographical distribution, in addition to the majority importance of anurans in the snake diet (TOLEDO et al. 2007, CHALOUKPA; RODRÍGUEZ, 2021). The prey composition of *Leptophis ahaetulla* described in the literature previously can be seen in Table 1.

Table 1. Prey composition of *Leptophis ahaetulla* described in the literature.

| Prey taxa | Author |
|--------------------------------------------------------------------------------------|------------------------------|
| Amphibians | |
| <i>Bolitoglossa paraensis</i> (Unterstein, 1930) | |
| <i>Dendropsophus marmoratus</i> (Laurenti, 1768) | |
| <i>Dendropsophus melanargyreus</i> (Cope, 1887) | |
| <i>Dendropsophus minutus</i> (Peters, 1872) | |
| <i>Dendropsophus walfordi</i> (Bokermann, 1962) | |
| <i>Hypsiboas cinerascens</i> (Spix, 1824) | |
| <i>Hypsiboas multifasciatus</i> (Gunther, 1859 "1858") | |
| <i>Osteocephalus taurinus</i> (Steindachner, 1862) | |
| <i>Sphaenorhynchus</i> sp. | ALBUQUERQUE et al. 2007 |
| <i>Scinax</i> sp. | |
| <i>Scinax boesemani</i> (Goin, 1966) | |
| <i>Scinax rostratus</i> (Peters, 5 ² 0 7) | |
| <i>Scinax ruber</i> (Laurenti, 5 ¹ 0 2) | |
| Unidentifiable Hylidae | |
| Lizards | |
| <i>Gonatodes humeralis</i> (Guichenot, 1855) | |
| <i>Hemidactylus benguellensis</i> (Moreau de Jonnés, 5 ² 5 ²) | |
| <i>Thecadactylus rapicauda</i> (Houttuyn, 1782) | |
| Amphibian | |
| <i>Trachycephalus typhonius</i> (Linnaeus, 1758) | CLEGG (2015) |
| Lizards | |
| <i>Anolis</i> sp. | |
| Amphibians | |
| <i>Osteocephalus taurinus</i> (Steindachner, 1862) | |
| unidentified amphibian | MARTINS & OLIVEIRA (1998) |
| <i>Hyla</i> sp. of the minuta group | |
| <i>Scinax</i> sp. | |
| <i>Osteocephalus leprieurii</i> (Dumeril and Bibron, 1841) | |
| <i>Osteocephalus</i> sp. | |
| Amphibian | |
| <i>Osteocephalus cabrerai</i> (Cochran & Goin, 1970) | CHALOUKPA & RODRIGUEZ (2021) |
| Lizard | |
| <i>Polychrus gutturosus</i> (Berthold, 5 ² 89) | GOMEZ-HOYOS et al. (2015) |
| Amphibian | |
| <i>Corythomantis greeningi</i> (Boulenger, 1896) | OLIVEIRA et al. (2015) |
| Birds | |
| <i>Turdus leucomelas</i> (Vieillot, 1818) | RIBEIRO et al. (2014) |
| Amphibian | |
| <i>Osteocephalus oophagus</i> (Jungfer & Schiesari, 1995) | VIEIRA and GOMES (2014) |
| <i>Scinax ruber</i> (Laurenti, 1768) | |
| Amphibians | |
| <i>Hyla nana</i> (Frost, 1985) | |
| <i>Scinax</i> sp. | |
| <i>Scinax</i> aff. <i>acuminata</i> | |
| <i>Scinax nasicus</i> (Cope, 1862) | |
| unidentified Hylidae | |
| unidentified amphibian | LOPES et al. (2003) |
| Birds | |
| <i>Zonotrichia capensis</i> (Muller, 1776) | |
| <i>Coryphospingus cucullatus</i> (Muller, 1776) | |
| unidentified bird eggs | |
| unidentified vertebrate | |



Figure 2. Records of predation *Boana raniceps* (Cope, 1862) by *Leptophis ahaetulla* (Linnaeus, 1758) throughout its geographic distribution.

Leptophis ahaetulla is a typically diurnal snake (MESQUITA et al., 2013), while the recorded prey, *Boana raniceps*, is a nocturnal anuran and its activity occurs during the hours from 6 pm to 6 am (BONNEFOND et al., 2020), reinforcing the ability of this snake to locate and capture its prey even during its periods of inactivity (OLIVEIRA et al., 2014; VIEIRA; GOMES, 2016). There are few well-described reports on the predatory behavior of anurans by *L. ahaetulla*, as studies are generally based on stomach contents and not on photographic records. There are also few reports on the defensive behaviors of *B. raniceps*. Recording this predation is essential to improve knowledge about the natural history of the species described here.

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References

- ALBUQUERQUE, N. R.; GALATTI, U.; DI-BERNARDO, M. Diet and feeding behaviour of the Neotropical parrot snake (*Leptophis ahaetulla*) in northern Brazil. **Journal of Natural History**, v. 41, n. 17-20, p. 1237-1243, 2007.
- AMPHIBIAN SPECIES OF THE WORLD 6.0. Disponível em <http://research.amnh.org/vz/herpetology/amphibia/index.php>. 2021. (Acessada em 04/03/2021)
- BELTRÃO-MENDES, R.; CALDAS, F. L. S.; ROCHA, P. A. D.; SANTANA, D. O. Predation of *Boana raniceps* (Cope, 1862) by the common marmoset *Callithrix jacchus* (Linnaeus, 1758) in northeastern Brazil. **Herpetology Notes**, v. 11, p. 1069-1074, 2018.
- BERNARDE, P. S.; ABE, A. S. Hábitos alimentares de serpentes em Espigão do Oeste, Rondônia, Brasil. **Biota Neotropica**, v. 10, n. 1, p. 167-173, 2010.
- BONNEFOND, A.; COURTOIS, E. A.; SUEUR, J.; SUGAI, L. S. M.; LLUSIA, D. Climatic breadth of calling behaviour in two widespread Neotropical frogs: Insights from humidity extremes. **Global Change Biology**, v. 26, n. 10, p. 5431-5446, 2020.
- CABREA-GUZMÁN, E.; VILLAN-UEVA, A. C. *Leptophis ahaetulla praestans* (Green Parrot Snake). Predation Attempt. **Herpetological Review**, v. 40, n. 3, p. 356, 2009.
- CHALLOUPKA, S.; RODRÍGUEZ, C. Predation by *Leptophis ahaetulla* (Serpentes: Colubridae) on *Osteocephalus cabrerai* (Anura: Hylidae), with a description of its distress call. **Herpetology Notes**, v. 14, p. 209-213, 2021.
- CLEGG, J. R. (2015). *Leptophis ahaetulla marginatus* (Southern green parrot snake): Behaviour. **Herpetological Bulletin**, 131, 26-27.
- DUBOIS, A. The nomenclatural status of *Hysaplesia*, *Hylaplesia*, *Dendrobates* and related nomina (Amphibia, Anura), with general comments on zoological nomenclature and its governance, as well as on taxonomic databases and websites. **Bionomina** 11: 1-48, 2017.
- FAIVOVICH, J.; HADDAD, C.F. GARCIA, P.C., FROST, D.R., CAMPBELL, J.A., WHEELER, W.C. Systematic review of the frog family Hylidae, with special reference to Hylinae: phylogenetic analysis and taxonomic revision. **Bulletin of the American Museum of Natural History** v. 294, p. 1-240, 2005.
- FRAGA, R.; LIMA, A. P.; PRUDENTE, A. L. C.; MAGNUSSON, W. E. **Guide to the snakes of the Manaus region—central Amazonia**. Manaus: INPA, 2013.
- GÓMEZ-HOYOS, D. A.; ESCOBAR-LASSO, S.; SUAREZ-JOQUI, T.; VELASCO, J. A. Predation on the bush anole *Polychrus guttuosus* by the parrot snake *Leptophis ahaetulla*, with a new record of the bush anole for the Gorgona Island National Natural Park, Colombia. **Herpetology Notes**, v. 8, p. 297-301, 2015.
- GONZÁLEZ-SOLÓRZANO, M.; ESCOBEDO-GALVÁN, A. H. *Leptophis diplotropis*. Diet. **Mesoamerican Herpetology**, v. 2, n. 4, p. 524-525, 2015.
- GUERRA, V.; ANDRADE, M. S.; ANDRADE, S. P. DE.; RAMALHO, W. P.; BASTO, R. P. Defensive behaviour of *Boana raniceps* (Anura: Hylidae). **Herpetology Notes**, v. 11, p. 433-436, 2018.
- GUIMARÃES, L.D., BASTOS, R.P. Vocalizações e interações acústicas em *Hyla raniceps* (Anura, Hylidae) durante a atividade reprodutiva. **Iheringia, Série Zoologia** 93: 149-158, 2003.
- GUTIÉRREZ-CÁRDENAS, P.; RIVAS, G.; NOGUEIRA, C.; GAGLIARDI, G.; CATENAZZI, A.; GONZALES, L. 2019. *Leptophis ahaetulla*. The IUCN Red List of Threatened Species 2019: e.T197499A2491090. Disponível em <https://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T197499A2491090.en> (Acessada em 06/03/2021).
- LEITE-FILHO, E.; VIEIRA, W.L.S., SANTANA, G.G., ELOI, F.J., MESQUITA, D.O. Structure of a Caatinga anuran assemblage in northeastern Brazil. **Neotropical Biology and Conservation** n. 10, p. 63-73, 2015.
- LOPEZ M. S.; GIRAUDO A. R.; ARZAMENDIA V. *Leptophis ahaetulla marginatus* (Southern Green Parrot-Snake): diet. **Herpetological Review**, v. 34, p. 68-69, 2003.
- MARTINS, M.; OLIVEIRA, M. E. Natural history of snakes in forests of the Manaus region, Central Amazonia, Brazil. **Herpetol. Nat. Hist.**, v. 6, n. 2, p. 78-150, 1998.
- MESQUITA, P. C.; PASSOS, D. C.; BORGES-NOJOSA, D. M.; CECHIN, S. Z. Ecologia e história natural das serpentes de uma área de Caatinga no nordeste brasileiro. **Papéis Avulsos de Zoologia**, v. 53, n. 8, p. 99-113, 2013.
- MORATO, S. A. A.; FERREIRA, G. N.; TREIN, F. L.; OLIVEIRA, F. S.; PRUDENTE, A. L. C.; MASCHIO, G. F.; GALATTI, U.; SARMENTO, J. F. M.; CALISTO, P. O.; MENDES, L. R. L. P. (2018). Levantamento, distribuição e hábitos dos répteis da FLONA de Saracá-Taquera, Amazônia Central, estado do Pará, Brasil. In: MORATO, S. A. A.; FERREIRA, G. N.; SCUPINO, M. R. (Ed.). **Herpetofauna da Amazônia Central: Estudos FLONA de Saracá-Taquera**. Curitiba: STCP Engenharia de Projetos Ltda, 2018. p. 1-19.
- OLIVEIRA, C. R.; OLIVEIRA, H. F.; SILVA, M.C., OLIVEIRA, R.H., ÁVILA, R.W. *Leptophis ahaetulla* (Green Snake). Diet. **Herpetological Review**, v. 45, n. 3, p. 517, 2014.
- PROTÁZIO, A.S., ALBUQUERQUE, R.L., FALKENBERG, L.M., MESQUITA, D.O. Acoustic ecology of an anuran assemblage in the arid Caatinga of northeastern Brazil. **Journal of Natural History** v. 49, p. 1-20, 2014.
- RIBEIRO, M. M.; LIMA, G. S. T.; OLIVEIRA, C. V.; FREIRE, E. M. X. *Leptophis ahaetulla* (Parrot Snake). Diet. **Herpetological Review**, v. 45, n. 2, p. 339, 2014.
- SANTOS, M. B.; HUCKEMBECK, S.; BERGMANN, F. B.; TOZETTI, A. M. Comportamento alimentar aquático de *Liophis jaegeri* (Günther 1858) (Serpentes, Dipsadidae) em cativeiro. **Biota Neotropica**, v. 10, n. 4, p. 343-346, 2010.
- SILVA, M. V.; SOUZA, M. B.; BERNARDE, P. S. Riqueza e dieta de serpentes do Estado do Acre, Brasil. **Revista Brasileira de Zootecias**, v. 12, n. 2, p. 165-176, 2010.
- SOLÉ, M.; MARCIANO-JR, E.; DIAS, I. R.; KWET, T. Predation attempts on *Trachycephalus cf. mesophaeus* (Hylidae) by *Leptophis ahaetulla* (Colubridae) and *Ceratophrys aurita* (Ceratophryidae). **Salamandra**, v. 46, n. 2, p. 101-013, 2010.
- TOLEDO, L. F.; RIBEIRO, R. S.; HADDAD, C. F. B. Anurans as prey: an exploratory analysis and size relationships between predators and their prey. **Journal of Zoology**, n. 271, v. 2, p. 170-177, 2007.
- VIEIRA, B. P.; GOMES, F. B. R. *Leptophis ahaetulla* (Neotropical Parrot Snake). Diet. **Herpetological Review**, v. 47, n. 1, p. 147, 2016.