

HEAD-HIDING IN *XENOPHOLIS UNDULATUS* (DIPSADIDAE) IN CENTRAL BRAZIL

ESCONDER LA CABEZA EN *XENOPHOLIS UNDULATUS* (DIPSADIDAE) EN EL BRASIL CENTRAL

AFONSO SANTIAGO OLIVEIRA MENESES^{1,2}, MATEUS DE ALENCAR RAMOS FERNANDES^{2*}, ANTÔNIO GABRIEL TORRES CARDOSO² & REUBER ALBUQUERQUE BRANDÃO²

¹Laboratório de Herpetologia, Departamento de Zoologia, Museu Paraense Emílio Goeldi, Avenida Perimetral 1901, CEP 66040-170, Belém, Pará, Brazil.

²Laboratório de Fauna e Unidades de Conservação, Departamento de Engenharia Florestal, Universidade de Brasília, L3 norte, CEP 70297-400, Brasília, Distrito Federal, Brazil.

*Correspondence: mateusalencarf@gmail.com

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Resumen.— Las serpientes son muy diversas en el Neotrópico, pero muchas especies carecen de registros de historia natural. Aquí registramos el “ocultar la cabeza” como una nueva exhibición defensiva para *Xenopholis undulatus*. Este comportamiento, así como aplanar el cuerpo, cripsis y colores contrastantes, parece ser ventajoso para esta especie nocturna, terrestre y criptozoica.

Palabras clave.— América del Sur, Cerrado, comportamiento defensivo, neotropical.

Abstract.— Snakes are very diverse in the Neotropics, but natural history data is still scarce for several species. Here we report head hiding as a new defensive display for *Xenopholis undulatus*. This behavior, along with body depression, crypsis, and contrasting colors seems advantageous for this nocturnal terrestrial cryptozoic species.

Keywords.— Cerrado, Defensive behavior, Neotropical, South America.

Defensive mechanisms are very diverse among snakes and essential to avoiding detection, injuries, and death (Greene, 1988). Antipredatory displays and color patterns are often associated with other ecological traits (Greene, 1979), such as time of activity, microhabitat use, predatory behavior, or phylogenetic constraints (Martins et al., 2008).

Xenopholis Peters, 1869 is a Neotropical dipsadid genus of small snakes comprising three species: *Xenopholis scalaris* (Wucherer, 1861), *Xenopholis undulatus* (Jensen, 1900), and *Xenopholis werdingorum* Jansen, Álvarez and Kohler, 2009 (Gomes et al., 2021). *X. undulatus* is distributed across the Cerrado and Caatinga ecoregions in Brazil (Gomes et al., 2021), inhabiting gallery forests and riparian areas. It preys mainly upon amphibians and eventually on lizards (Cunha and Nascimento, 1993; Teles et al., 2018).

Reports about the natural history of *X. undulatus* are scarce, especially those concerning defensive behaviors (Marques et

al., 2015). Herein, we report two individuals of *X. undulatus* displaying head-hiding, which is a defensive behavior often displayed by snakes cornered by predators, consisting of hiding the head under the body or under body coils, likely confounding predators, or keeping this vital part of the body away from the attack (Greene, 1988; Caro, 2014).

The first individual was an adult (total length 273 mm), recorded on 18 May 1998 on an artificial island that was formed by the filling of Serra da Mesa hydroelectric dam reservoir (“island 34”, 13.83333° S, 48.316666° W, WGS84, 500 m a.s.l.). It was captured in a pitfall trap and handled while removed from the trap, measured, photographed, and released. The island (“Island 34”) was covered by typical cerrado vegetation, presenting denser vegetation and rocky outcrops in its slopes. Since at the time we were interested in assessing the effects of flooding and island formation on herpetofauna richness and abundance (see Brandão & Araújo, 2009), we did not collect the individual. During handling, the individual displayed cloacal



Figura 1. (A) El primer y (B) segundo individuo de *X. undulatus* escondiendo la cabeza debajo del cuerpo (fotos de RAB y MARF).

Figure 1. (A) The first and (B) second individual of *X. undulatus*, hiding the head under body coils (photos by RAB and MARF).

discharge and, when placed on the ground to be photographed, it displayed head-hiding (Fig. 1a).

The second individual (a juvenile male, total length 180 mm) was recorded on 9 April 2021, at 19:49 h in the front door of a house in the rural region of Brasília, Distrito Federal, Brasil (15.583333°

S, 47.733333° W, WGS84, 1006 m a.s.l.). The landscape of the area is composed of small rural settlements, “Cerradão” vegetation (a forest physiognomy of the Brazilian Cerrado vegetation mosaic), gallery forests, and dry forests over limestone outcrops. When handled, the individual displayed cloacal discharge and head-hiding (Fig. 1b).

Both individuals displayed the same behavior, possibly due to gradual stress levels and the adoption of an escalated defensive pattern (Tozzeti et al., 2021). When we handled the individuals for measurements or photos, they first attempted to flee with fast and erratic movements. The continuous stress caused the display of the second defensive behavior, cloacal discharge. Only after cloacal discharge, the individuals hid their heads under the coils of their bodies, becoming immobile for a few minutes.

Besides flattening the body and cloacal discharge, which was already recorded for *X. undulatus* (Marques et al., 2015), this is the first record of hiding the head for this species. These three defensive displays are common in terrestrial snakes (Greene, 1979; Martins et al., 2008), and have also been recorded in *X. scalaris* (Martins, 1996; Mira-Mendes et al., 2013). There are no published records of defensive behaviors regarding *X. werdingorum*.

Another possible defensive tactic is the contrasting color pattern, which could be useful for crypsis and camouflage, and is common in nocturnal terrestrial snakes, such as *Xenopholis* spp. (Martins et al., 2008). It is expected that small and poorly known snakes likely display a complex set of defensive behaviors (see Martins et al., 2008). Thus, further studies are necessary to understand the role of ecological and phylogenetic constraints in the defensive repertoire of the genus *Xenopholis* and other Neotropical dipsadid snakes.

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CITED LITERATURE

- Brandão, R.A. & A. Araújo. 2009. Changes in anuran species richness and abundance resulting from hydroelectric dam flooding in central Brazil. *Biotropica* 40:263-266.
- Caro, T. 2014. Antipredator deception in terrestrial vertebrates. *Current Zoology*. 60(1):16-25.
- Cunha, O.R. & F.P. Nascimento. 1993. Ofídios da Amazônia. As cobras da região leste do Pará. Belém. Boletim do Museu Paraense Emílio Goeldi série Zoologia 9:1-191.
- Gomes, D.F., J. Azevedo, R. Murta-Fonseca, S. Faurby, A. Antonelli & P. Passos. 2020. Taxonomic revision of the genus *Xenopholis* Peters, 1869 (Serpentes: Dipsadidae): Integrating morphology with ecological niche. *PLoS ONE* 15(12):e0243210.
- Greene, H.W. 1979. Behavioral convergence in the defensive display of snakes. *Experientia* 35:747-748.
- Greene, H.W. 1988. Antipredator mechanisms in reptiles. Pp. 1-152. En C. Gans & R.B. Huey (Eds.). *Biology of the Reptilia*. Alan Liss, New York, USA.
- Martins, M. 1996. Defensive tactics in lizards and snakes: the potential contribution of the Neotropical fauna. *Anais do XIV Encontro Anual de Etologia, Sociedade Brasileira de Etologia, UFU* 14:185-199.
- Martins, M., O.A.V. Marques & I. Sazima. 2008. How to be arboreal and diurnal and still stay alive: microhabitat use, time of activity, and defense in Neotropical forest snakes. *South American Journal of Herpetology* 3(1):58-67.
- Marques, O.A.V., A. Eterovick, C.C Nogueira & I. Sazima. 2015. *Serpentes do Cerrado*. Holos, Ribeirão Preto, São Paulo, Brasil.
- Mira-Mendes, C.V., R.M. Oliveira, D.S. Ruas, I.R. Dias & A.J.S. Argôlo. 2013. *Xenopholis scalaris* (Wucherer's Ground Snake). Defensive behavior. *Herpetological Review* 44(4):699.
- Teles, A., A.S. Santos & M.V. Ribeiro. 2018. Predation attempt of *Xenopholis undulatus* (Serpentes, Dipsadidae) on *Physalaemus cuvieri* (Amphibia, Leptodactylidae). *Herpetology Notes* 11:829-830.
- Tozzeti, A.M., S.A.A. Morato, R.S. Bérnils, D. Loebmann, L.F. Toledo, R. Gray & O.M. Entiauspe-Neto. 2021. Evolutionary dynamics shape two passive defensive mechanisms in Neotropical snake radiations. *Phyllomedusa* 20(1):3-13.

