



On the Defensive Behavior of the High-Andean Toad-headed Pitviper, *Bothrocophias myrringae* (Squamata: Viperidae), in Central Colombia

Ronald Díaz-Flórez¹ and Juan Timms-Rangel²

¹Independent researcher, Fómeque, Cundinamarca, Colombia (ronalddias_10@hotmail.com [corresponding author])

²Independent Researcher, Rotonda del Carrión, Madrid, Spain (juantimms@hotmail.com)

Snakes, throughout their evolution, have adopted different defensive strategies in response to predation (Brodie et al. 1991). Generally, these strategies are composed of a repertoire of chemical, acoustic, and visual behaviors, which can be exhibited together (Greene 1988). Knowledge about these strategies has increased with the records of new defensive behaviors in different groups of snakes (e.g., Assis et al. 2020; Díaz-Flórez et al. 2022a).

In vipers, these defensive strategies are variable among species, where behaviors such as tail-vibration (rapid and repetitive movement of the tail against the substrate), body coiling (retraction of the body and head, taking a circular or spiral attack posture), head- and neck-elevation (lifting off the substrate), dorsoventral body compression (dorsoventral flattening of the body), locomotor escape (some movement to flee the capture range), head-hiding (hiding the head under the body or under the substrate), gaping (opening the mouth and directing it toward the predator, which can be accompanied by body thrusts), and body thrashing (bending movements of the body in the face of capture) are exhibited (Greene 1988; Shine et al. 2002; Araujo and Martins 2006).

The recently described High-Andean Toad-headed Pitviper (*Bothrocophias myrringae*) is distributed only in the departments of Cundinamarca and Meta in Colombia, mainly in cloud forests, high Andean forests, and sub-paramo, although it can be abundant in areas, such as those devoted to agriculture and livestock, that have been altered by humans (Angarita-Sierra et al. 2022; Díaz-Flórez et al. 2022b). This snake has been poorly studied and no publications describe its natural history (Angarita-Sierra et al. 2022). Herein we describe defensive behavior of *Bothrocophias myrringae* in central Colombia.

We encountered two individuals in the Municipality of Fómeque, Cundinamarca, Colombia (4.4950 N, -73.8527

W). The first, a subadult female (Fig. 1A), was found at 0336 h on 25 November 2021 in a rural area at an elevation of 2,051 m asl. It was coiled (Fig. 1B) and, as we approached, it began to vibrate its tail (vertical oscillations) (Fig. 1C). Subsequently, when the snake was captured for relocation and photographic records, it performed contortions while continuing to vibrate its tail. The second, a juvenile male, was recorded at 1015 h on 26 November 2021 about 300 m from the first snake (4.4951 N, -73.8501 W) at an elevation of 2,102 m asl. It initially attempted to escape, however, sensing the close presence of observers, it assumed a partial coil and dorsoventral compression, accompanied by tail vibrations (Fig. 2). At the time of capture, it also performed contortions (thrashing) accompanied by white cloacal secretions prior to eversion of the hemipenes. Upon release, it assumed a coiled position and bit the venom-defender glove. After striking at us, it fled into nearby scrub.

Similar defensive behaviors have been reported in other vipers, including the Crossed Pitviper (*Bothrops alternatus*), Jararaca Lancehead (*B. jararaca*), Jararacussu Lancehead (*B. jararacussu*), Brazilian Lancehead (*B. moojeni*), Sao Paulo Lancehead (*B. pauloensis*) (Araújo and Martins 2006), South American Rattlesnake (*Crotalus durissus*) (Benicio and Martins 2018), and Meadow Viper (*Vipera ursinii*) (Mizsei and Üveges 2012). Some associated defensive behaviors we observed in *Bothrocophias myrringae*, such as tail-vibration and attempted bites, have been previously reported in other congeners, such as the Small-eyed Toad-headed Pitviper (*Bothrocophias microphthalmus*) (Valencia et al. 2016) and the Amazonian Toad-headed Pitviper (*Bothrocophias hyoprora*) (Neill 1966). Eversion of hemipenes and cloacal secretions are common defensive behaviors in viperids and many other snakes (Greene 1988).



Fig. 1. Defensive behavior in female *Bothrocophias myrringae*: Attack position (A–B), tail vibrations (C). Photographs by Ronald A. Diaz-Florez.



Fig. 2. Defensive behavior in male *Bothrocophias myrringae*: Attack position (A–B) and tail vibrations after cloacal segregation (C). Photographs by Ronald A. Diaz-Florez.

Acknowledgements

We thank Yahir Torres for his support and assistance with the snake records.

Literature Cited

- Angarita-Sierra, T., S.D. Cubides-Cubillos, and J.P. Hurtado-Gómez. 2022. Hidden in the highs: Two new species of the enigmatic toadheaded pitvipers of the genus *Bothrocophias*. *Vertebrate Zoology* 72: 971–996. <https://doi.org/10.3897/vz.72.e87313>.
- Araujo, M.S. and M. Martins. 2006. Defensive behaviour in pit vipers of the genus *Bothrops* (Serpentes, Viperidae). *Herpetological Journal* 16: 297–303.
- Assis C.L., J.J.M. Guedes, L.M.G. Jesus, and R.N. Feio. 2020. New defensive behaviour of the false coral snake *Oxyrhopus rhombifer* Duméril, Bibron & Duméril, 1854 (Serpentes, Dipsadidae) in south-eastern Brazil. *Neotropical Biology and Conservation* 15: 71–76. <https://doi.org/10.3897/neotropical.15.e48564>.
- Benicio, R.A. and M. Martins. 2018. Defensive behavior of a juvenile *Crotalus durissus* Linnaeus, 1758. *Herpetozoa* 30: 217–218.
- Brodie, E.D., Jr., D.R. Formanowicz, Jr., and E.D. Brodie III. 1991. Predator avoidance and antipredator mechanisms: Distinct pathways to survival. *Ethology, Ecology and Evolution* 3: 73–77. <https://doi.org/10.1080/08927014.1991.9525390>.
- Díaz-Flórez, R.A., F. Barrera, Y. Romero, A. Montes-Correa, M. Maldonado, J. Zúñiga-Baos, D. Alarcón-Naforo, S. Ayerbe-González, J.D. Jiménez, D. Santana, J. Calderón, R. Típon, C. Pinilla, L. Lastre, and Y. Vargas. 2022b. *Fauna ofídica colombiana: Vboras de Colombia. Guía de serpientes de Colombia*. Bogotá, Colombia. <<https://www.researchgate.net>.
- Díaz-Flórez, R.A., C. Brand and A. Montoya. 2022a. Defensive head-mimicry in coralsnakes, *Micrurus* spp. (Squamata: Elapidae): Three new records and a review of congeners exhibiting this behavior. *Reptiles & Amphibians* 29: 134–136. <http://dx.doi.org/10.17161/randa.v29i1.16324>.
- Greene, H.W. 1988. Antipredator mechanisms in reptiles, pp. 153–234. In: C. Gans and R.B. Huey (eds.), *Biology of the Reptilia. Vol. 16. Ecology B. Defense and Life History*. Alan R. Liss, Inc., New York, New York, USA.
- Mizsei, E. and B. Úveges. 2012. Novel defensive behaviours of both sexes of *Vipera ursinii graeca* (Serpentes: Viperidae). *Herpetology Notes* 5: 481–483.
- Neill, W.T. 1966. Notes on *Bothrops hyoprora* (Serpentes: Crotalidae). *Herpetologica* 22: 235–239.
- Shine, R., L. Sun, M. Fitzgerald, and M. Kearney. 2002. Antipredator responses of free-ranging pit vipers (*Gloydus shedaensis*, Viperidae). *Copeia* 2002: 843–850. [https://doi.org/10.1643/0045-8511\(2002\)002\[0843:AROFRP\]2.0.CO;2](https://doi.org/10.1643/0045-8511(2002)002[0843:AROFRP]2.0.CO;2).
- Valencia, J.H., K., Garzón-Tello and M. Barragán-Paladines. 2016. *Serpientes venenosas del Ecuador: sistemática, taxonomía, historia natural, conservación, envenenamiento y aspectos antropológicos*. Fundación Herpetológica Gustavo Orcés, Quito, Ecuador.