Herpetology Notes, Volume 18: 793–795 (published online on 12 August 2025)

Unusual defensive behaviour combination recorded in *Bufotes viridis* (Laurenti, 1768)

Daniel Jablonski[1,*] and Soran H. Ahmed[2]

Amphibians are commonly preyed upon by a wide range of predators (Toledo et al., 2007). In response, they have evolved a variety of defensive mechanisms and strategies. Among anurans alone, approximately 30 different defensive responses have been documented (Toledo et al., 2011). These mechanisms counteract various stages of the predation process such as detection, identification, approach, capture, ingestion, and digestion and can be categorised into two main types: primary defences, which are independent of the presence of the predator (e.g., immobility or cryptic colouration), and secondary defences, which are activated in the presence of the predator (e.g., toxin secretion from skin glands) (Toledo et al., 2011; Szkudlarek et al., 2025).

According to published literature, a wide range of defensive behaviours has been documented in the family Bufonidae, including toxin secretion, active escape or fleeing, phragmosis, body inflation (puffing up), stiff-legged posture, unken reflex, cloacal discharge, charging, headbutting, and death feigning (Hinsche, 1928; Toledo et al., 2011; Jablonski, 2017; Stawikowski and Lüddecke, 2019; Szkudlarek et al., 2025). Among these, the unken reflex (Szkudlarek et al., 2025) and partial body-raising (Hinsche, 1928) have specifically been observed in *Bufotes viridis* (Laurenti, 1768), a widespread toad ranging from Europe through the Middle East to the western edge of Central Asia (Dufresnes et al., 2019). Here, we report a novel antipredator behavioural observation for this species from the Kurdistan Region of Iraq.

During fieldwork on 28 March 2019, under cold and rainy conditions, an individual of *Bufotes viridis* (Laurenti, 1768) was found under a stone at 08:38 h in Kani Spika, Darbandikhan District, Kurdistan Region of Iraq (35.42849°N, 45.41665°E; 1009 m elevation). The toad was resting on moist soil (Fig. 1A) and, upon exposure, immediately adopted a distinct defensive posture. It elevated its body by fully extending its limbs, raising the trunk noticeably above the substrate while keeping the snout and head close to the ground (Fig. 1B–C). This posture, identified as partial body-raising with vertically stretched legs, closely resembles the behaviour described in *Bufotes pewzowi* (Bedriaga, 1898) by Jablonski (2017) and is well known among poisonous amphibians (Toledo et al., 2011). Shortly after assuming this posture, the toad began to secrete defensive skin toxins. Numerous small, white, milky droplets appeared on the dorsal surface, particularly along the back, shoulders, and flanks, and were especially prominent on the outer surfaces of the thighs and the parotoid glands (Fig. 1D–F). The secretion occurred without any direct physical manipulation, suggesting a voluntary release of toxins in response to a perceived threat. The droplets gradually accumulated, forming a visible layer of mucous across the toad's body. The entire sequence of behaviour from initial exposure to the cessation of response lasted approximately three minutes and concluded at 08:41 h, after which the animal remained motionless. To our knowledge, this is the first documented case of *B. viridis* exhibiting both partial body-raising and spontaneous skin secretion in combination.

According to Toledo et al. (2011), body-raising with vertically stretched legs is a defence mechanism commonly observed among poisonous amphibians. This behaviour has been recorded in other members of Bufonidae, including *Bufo bufo* (Linnaeus, 1758), *Bufotes pewzowi*, *Rhinella marina* (Linnaeus, 1758), and *Epidalea calamita* (Laurenti, 1768) (Hinsche, 1928; Toledo et al., 2011; Jablonski, 2017; Stawikowski and Lüddecke, 2019). True toads of the family Bufonidae possess specialised poison glands embedded in their skin, including prominent parotoid macroglands located

[1] Department of Zoology, Comenius University in Bratislava, Ilkovičova 6, 842 15 Bratislava, Slovakia.
[2] Department of Biology, University of Sulaimani, Kirkuk Road H9F6+6FC, 46001 Sulaymaniyah, Iraq.
[*] Corresponding author. E-mail: daniel.jablonski@uniba.sk

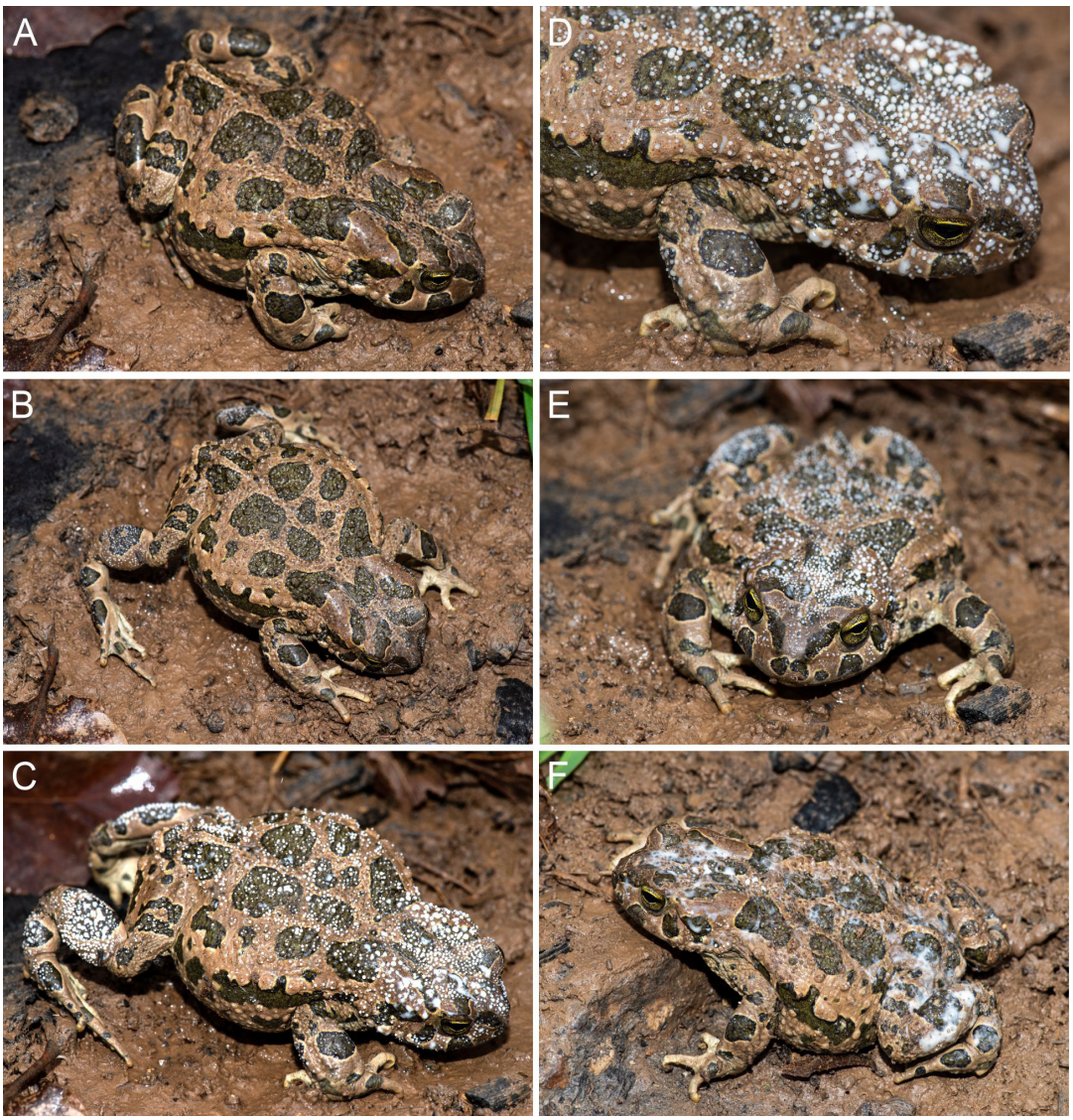

Figure 1. Defensive behaviour of *Bufotes viridis* observed in Kani Spika, Darbandikhan District, Kurdistan Region, Iraq. (A) Individual found under a stone at rest (08:37 h). (B–C) Partial body-raising posture with fully extended limbs elevating the trunk above the substrate; in (C), the first droplets of skin toxin are visible on the thighs and parotoid glands. (D–E) Secretion of white toxic droplets on the dorsal skin, flanks, thighs, and parotoid glands. (F) At 08:41 h, the toxin had lost its droplet structure and appeared spread across the body surface. Photo by Daniel Jablonski.

behind the eyes (Duellman and Trueb, 1994). Secretions from these glands contain high concentrations of cardiotoxic steroids that can cause severe intoxication in vertebrate predators. While toxin release typically occurs in response to mechanical pressure (e.g., during predation attempts), spontaneous secretion without physical contact has also been recorded in different members of the family Bufonidae, albeit rarely (Jared et al., 2011; Mailho-Fontana et al., 2014; Stawikowski and Lüddecke, 2019). Thus, in Bufonidae, defensive postures and skin toxin secretion may act synergistically or occur independently. Although similar combined responses have been described in the Palearctic toad *E. calamita* (Stawikowski and Lüddecke, 2019), this report constitutes the known instance of both spontaneous skin secretion and body-raising behaviour occurring

simultaneously in the European green toad *B. viridis*.

Preliminary factors potentially contributing to the observed behaviour may include low ambient temperature (see discussion in Jablonski et al., 2019), rainy weather, and the sudden disturbance of the individual in its shelter, which likely limited its ability to escape. Under this combination of conditions, the toad appeared to respond by increasing its apparent body size and releasing of huge volume of toxic secretions as a defensive strategy. It would therefore be valuable to investigate whether similar observations occur under comparable circumstances in other members of the family Bufonidae, to better understand the eco-physiological mechanisms underlying this behaviour.

Acknowledgments. We thank Elias Tzoras and Felipe Toledo for their helpful contributions to the manuscript. The first author is supported by the EU NextGenerationEU scholarship through the Recovery and Resilience Plan for Slovakia under the project No. 09I03-03-V04-00306.

References

Duellman, W.E., Trueb, L. (1994): Biology of amphibians. Baltimore, Maryland, USA, Johns Hopkins University Press.

Dufresnes, C., Mazepa, G., Jablonski, D., Oliveira, R.C., Wenseleers, T., Shabanov, D.A., et al. (2019): Fifteen shades of green: the evolution of *Bufotes* toads revisited. Molecular Phylogenetics and Evolution **141**: 106615.

Hinsche, G. (1928): Kampfreaktionen bei einheimischen Anuren. Biologisches Zentralblatt **48**(10): 577–617. [in German]

Jablonski, D. (2017): Two types of defensive behaviour recorded in *Bufotes pewzowi* (Bufonidae). The Herpetological Bulletin **140**: 40–41.

Jablonski, D., Tzoras, E., Drakopoulos, D. (2019): Defensive behaviour in *Rana graeca*. The Herpetological Bulletin **147**: 19–20.

Jared, C., Antoniazzi, M.M., Verdade, V.K., Sciani, J.M., Pimenta, D.C., Toledo, L.F., Rodrigues, M.T. (2011): The Amazonian toad *Rhaebo guttatus* is able to voluntarily squirt poison from the parotoid macroglands. Amphibia-Reptilia **32**: 546–549.

Mailho-Fontana, P.L., Antoniazzi, M.M., Toledo, L.F., Verdade, V.K., Sciani, J.M., Barbaro, K.C., et al. (2014): Passive and active defense in toads: the parotoid macroglands in *Rhinella marina* and *Rhaebo guttatus*. Journal of Experimental Zoology Part A: Ecological Genetics and Physiology **321**: 65–77.

Stawikowski, R., Lüddecke, T. (2019): Description of defensive postures of the natterjack toad (*Epidalea calamita* Laurenti, 1768) and notes on the release of toxic secretions. Herpetology Notes **12**: 443–445.

Szkudlarek, M., Jurczyk, K., Bury, S., Kolanek, A. (2025): Unkenreflex in anurans – new observations with a review of published records. Acta Ethologica **25**: 77–84.

Toledo, L.F., Ribeiro, R.S., Haddad, C.F. (2007): Anurans as prey: an exploratory analysis and size relationships between predators and their prey. Journal of Zoology **271**: 170–177.

Toledo, L.F., Sazima, I., Haddad, C.F. (2011): Behavioural defences of anurans: an overview. Ethology Ecology and Evolution **23**: 1–25.

Accepted by Frederic Griesbaum