

Unusual Behavior: A Fire-bellied Toad (*Bombina bombina*) Performs an Unkenreflex with its Intestines Expelled

Adnan Zimić

Herpetological Association in Bosnia and Herzegovina (ATRA), Sarajevo, Bosnia and Herzegovina
 (adnan.zimic@gmail.com)

Photographs by the author.

Increased amphibian road mortality and how it dramatically affects population abundance has become an increasingly important topic in the conservation of amphibians (e.g., Vogel and Puky 1995; Trombulak and Frissell 2000; Seiler 2001; Santos 2007; Wojdan 2010). Amphibians crossing roads are subject to accidental as well as intentional traffic-related deaths. Many are killed during spring migrations as they move toward wetlands to breed and during autumn migrations while moving to hibernation sites (e.g., Wojdan 2010). Additionally, many otherwise aquatic frogs and toads move considerable distances on land at night foraging for food or in search of other aquatic habitats. Nocturnal behavior is a consequence of increased humidity at night (AmphibiaWeb 2015) and increases the probability of avoiding some major predators, like birds (e.g., Jovanović et al. 2011).

All amphibians are vulnerable on roads, especially those that are: (1) Slow-moving, (2) small in size, and (3) not

inclined to move in a straight line (Jochimsen et al. 2004). An example of an amphibian that meets all three of these criteria is the European Fire-bellied Toad (*Bombina bombina* [Linnaeus 1761]), an aquatic, small, and slow-moving toad that sometimes moves on land at night (AmphibiaWeb 2015). Although these characteristics do not seem particularly adaptive, this species has developed defenses against terrestrial predators that include immobility (along with cryptic coloration), escape, inflating the body, aposematic coloration, and the production of toxins (Bajger 1980).

During field surveys on the northern plains of Bosnia and Herzegovina (Bosnian Posavina, Domaljevac; 45°01'N, 18°33'E; 82 m asl) on 26 May 2015 (2200 h), while observing increased nocturnal activity on land (81% humidity and 26 °C air temperature) in a large population of *Bombina bombina*, I noticed one male on the broken stone pavement (macadam) in the defensive posture known as an unkenreflex,

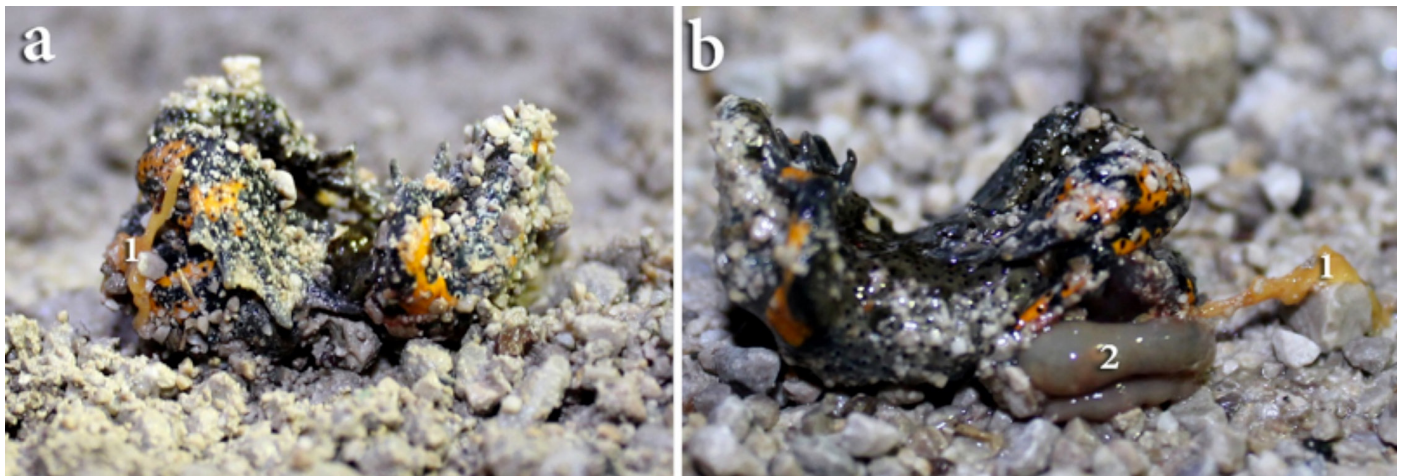


Fig. 1. Road-killed male *Bombina bombina* in full unkenreflex position: (a) Left lateral view showing the expelled part of the urogenital tract (1. fat bodies); (b) right lateral view showing expelled portions of the digestive and urogenital tracts (1. some remains of fat bodies; 2. stomach and colon).

during which the body is contorted to reveal aposematic coloration on the venter. It did not react to my presence and was covered in dust and sand from the macadam. Closer observation revealed expelled portions of its urogenital (Fig. 1a,b) and digestive tracts (Fig. 1b). Although it initially appeared to be dead, buccal pumping indicated that the toad was still alive. So, despite having been run over by a car, it was engaging in defensive behavior. After it was manipulated to a normal posture, the toad again resumed the unkenreflex. This behavior was observed for 20 min, suggesting that the individual remained in this pose until it died or was killed and eaten by a predator. Other individuals observed that night (N = 16) did not employ the unkenreflex but used escape (70%) or immobility (30%) instead.

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