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Unken reflex in *Mesotriton alpestris*

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Resumen: Describimos la exhibición de un comportamiento defensivo estereotipado, el "unken reflex", en el tritón alpino, *Mesotriton alpestris*. Al notar nuestra presencia en el caso terrestre, y al ser manipulado en el caso acuático, los ejemplares frecuentemente mostraron una postura rígida arqueando el cuerpo entero, elevando la cola y la cabeza, extendiendo las extremidades y mostrando la coloración ventral naranja.

Defense against predators is an important element in animal life, as it may influence their survival. Urodeles exhibit a variety of morphological adaptations and behaviors that protect them from predators (Duellman & Trueb, 1994; Stebbins & Cohen, 1995). Besides, these defensive responses often interact synergistically increasing their efficiency (Brodie, 1977).

The position of the body is often important in defense (Brodie III, 1989; Ducey & Brodie, 1991). Certain postures can create an impression of larger body size, imitate aggressive predators, exhibit no vital body areas or expose body surfaces having high concentration of toxic substances to protect vital body areas (Duellman & Trueb, 1994). One of the defensive behavior described in urodeles is the "unken reflex" described by Hinsche in 1926. The "unken reflex" is a stationary display adopted by anurans and urodeles bearing aposematic coloration, in an attempt to show their warnin g signals to the best advantage (Beebee, 1996). This position typically includes arching the whole body so the head and tail rise, legs stretch and ventral parts are displayed. This stereotyped behavior is often associated with striking and aposematic ventral coloration and poisonous skins (Griffiths, 1995). The aposematic colorations are associated by predators to irritable and unpleasant tastes or touches, caused by the toxins present in the amphibian skin (Johnson & Brodie, 1972; Griffiths, 1995). "Unken" is the common name in german for the European fire-bellied toad *Bombina bombina* (Hinsche, 1926), the first species in which the conduct was described. This behaviour shows individual presence/absence variation (Löhner, 1919) and variation in the extent to which it is displayed (Bajger, 1980; Toledo *et al.*, 2011).

This defensive strategy has subsequently been described in some genres of newts belonging to the family Salamandridae and showing aposematic ventral colorations, as *Cynops*, *Hypselotriton*, *Notophtalmus*, *Paramesotriton*, *Salamandrina*, *Triturus* and *Taricha* (Lanza, 1967;Brodie, 1977; Denton, 1990; Vitt & Caldwell, 2009). The

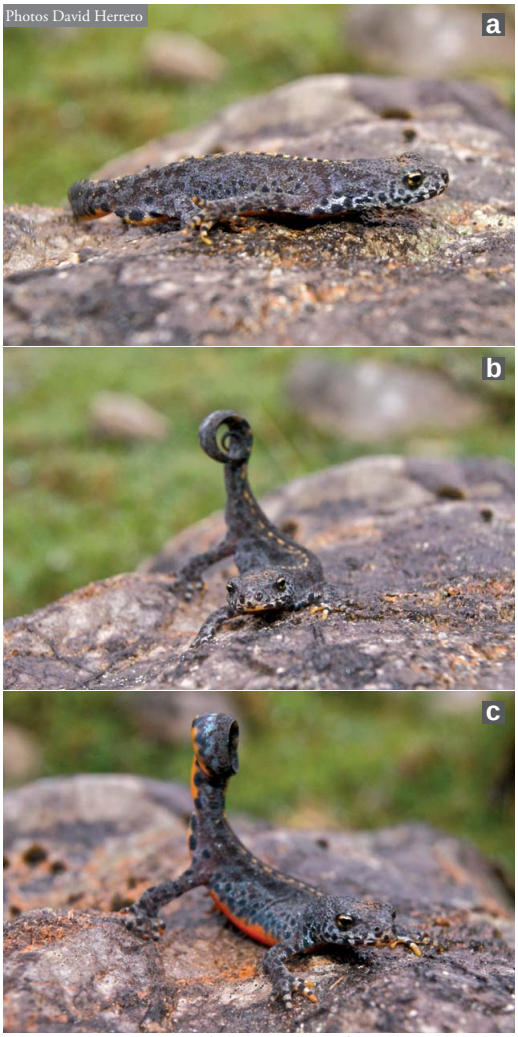

Figure 1: Sequence of the "unken reflex" displayed by a specimen of *M. alpestris*: (a) male in normal position; (b) the male arched its body; (c) the male showed the orange ventral coloration and raised its tail. It remained in this position for several minutes.

Figura 1: Secuencia del "unken reflex" exhibido por un ejemplar de *M. alpestris*. (a) macho en posición normal; (b) el macho arqueó su cuerpo; (c) el macho mostró la coloración ventral naranja y elevó su cola. Permaneció en esta posición durante varios minutos.

Figure 2: Partial "unken reflex" displayed by a specimen of *M. alpestris* from Bosnia and Herzegovina: (a) female in normal position; (b) the female arched its body after being touched with a hand, and showed the orange ventral coloration and raised its tail; (c) female remained calm after turning over on his back.
Figura 2: "Unkenreflex" parcial exhibido por un ejemplar de *M. alpestris* de Bosnia y Herzegovina: (a) hembra en posición normal; (b) la hembra arqueó su cuerpo, después de ser tocada con una mano, y mostró la coloración ventral naranja y elevó su cola; (c) la hembra permaneció en calma después de darse la vuelta sobre su espalda.

"unken" position has been described in *Mesotriton alpestris*, *Triturus cristatus*, *Lissotriton vulgaris*. *Lissotriton helveticus* (Brodie, 1977) and *Lissotriton boscai* (Marco & Leguía, 2001). The urodeles can modify their antipredator behavior depending on the type and behavior of the predator (Ducey & Brodie, 1983). Amphibian species that exhibit the "unken reflex" usually shows dorsal camouflage colorations, while defensive striking coloration (red, yellow, orange) are usually hidden in ventral areas, which are suddenly displayed when amphibians are attacked (Stebbins & Cohen, 1995). Specifically for the species, we can read that on land, adults can adopt the "unken reflex". The belly has aposematic orange coloration that predators associate with irritating or unpleasant stimuli caused by toxic substances present in the glands of the skin. This position is often displayed against attacks of birds and carnivorous mammals and is unusual in presence of other predators such as snakes (Brodie, 1977; Diego-Rasilla, 2009; Diego-Rasilla & Ortiz-Santaliestra, 2009). In this article, we cite this defensive behavior in the Alpine newt (*M. alpestris*), a species for which there are few cases described in the literature.

The first record was observed near to the Ercina lake in Covadonga (Asturias, Spain) (43.264378 / -4.982551; 1108 masl) on the 9th of October 2011. Air temperature was 8 ºC and the day was rainy. The observed terrestrial male quickly adopted the defensive posture, a complete "unken reflex" (Figure 1c). This defensive behavior lasted for several minutes. During the "unken reflex", when we touched the newt, it elevated more the tail and showed us more ventral coloration.

The second record was observed in the Natural Monument of "Vrelo Bosne" (Bosna river spring; Sarajevo; Bosnia and Hezegovina) on the 29th of September 2014 (43. 819261 / 18. 268981; 500 masl). Air temperature was 12 ºC and the water temperature 9 ºC. The

observed female also quickly adopted defense posture (also for several minutes). It was provoked by catching newt from water, dropping it on the ground, and touching it with fingers. The behavior interacted synergistically with the production of toxins: after the release of the newt in the place where it has been taken, it was experienced a very severe itching in the eye (for about 10 minutes) after accidentally touching it after holding newt in the hand (E. Šunje, personal communication).

It is important to note that *M. alpestris* is a rare species in the Natural Monument "Vrelo Bosne" and that it suffers anthropogenic impacts as well as a high level of predation by many animals (Zimić, 2014). This may be the reason for preferring this defensive mechanism over escaping.

It is also important to say that *M. alpestris* does not make the mechanism of flipping onto the back, as can be shown in picture (Figure 2c). That pose can be a result of accidental rotation of individuals or deliberate rotation by humans (like in this case). Flipping onto the back mechanism is an ability of deliberately jumping-rotation by animal (Williams *et al.*, 2000; Toledo *et al.*, 2011). Other amphibians who made "unken reflex" (like *B. bombina* and *B. variegata*) remains motionless after deliberately flipping onto back for fulfilling the goal of displaying the ventral coloration (A. Zimić, unpublished data).

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