

Attempted predation of a cave olm *Proteus anguinus* by a dice water snake *Natrix tessellata*, in Bosnia and Herzegovina

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The blind European cave salamander or olm *Proteus anguinus* is a large and slender neotenous salamander, only found naturally in the western Balkans (Speybroeck et al., 2016). Their maximum length varies according to which river basin they inhabit but is typically 25–55 cm. They are characterised by their pinkish-white colouration, paddle-like tail, and reduced number of digits on all four limbs. The species inhabits both flowing and stagnant subterranean waterbodies in karstic limestone formations throughout their range, as long as these are chemically unpolluted waters, with a stable temperature range of 8–15 °C. *Proteus anguinus* are almost always observed in caves, for which they have a number of adaptations to allow them to survive such a challenging environment (Hervant et al., 2001; Issartel et al., 2009; Balázs et al., 2020). Due to their specialised adaptations to subterranean life, *P. anguinus* are particularly vulnerable to changes to the karst ecosystems they inhabit, such as contamination from anthropogenic sources (Kolar, 2019). The European cave salamander also has no known predators within its natural underground habitats.

The dice snake *Natrix tessellata* is a semi-aquatic species that may grow to over a metre in length and is found throughout most of central and south-eastern Europe (Speybroeck et al., 2016). *Natrix tessellata* is typically olive-green or brown in colour with four rows of square-like black blotches along the body, although not all individuals are marked in this way. The species feeds primarily on fish and amphibians (Hutinec & Mebert, 2011; Weiperth et al., 2014), and inhabits both freshwater and saltwater environments such as lakes and shorelines (Speybroeck et al., 2016).

On 4 July 2021, a *P. anguinus* was observed near the town of Trebinje (Bosnia and Herzegovina) swimming in a small stream after inadvertently straying out of a nearby cave system (Fig. 1). While seeking shelter under nearby boulders, the *P. anguinus* was dislodged by a juvenile *N. tessellata*, which latched onto the tail (BHS video, 2023). The *N. tessellata* was far too small to be able to consume the *P. anguinus*, and may have mistaken the tail for a smaller prey item. Unfortunately, the *P. anguinus* later died as a likely consequence of being flushed into sub-optimal conditions in the strong flow of the adjacent Trebišnjica River. The individual was some 36 cm in length and so

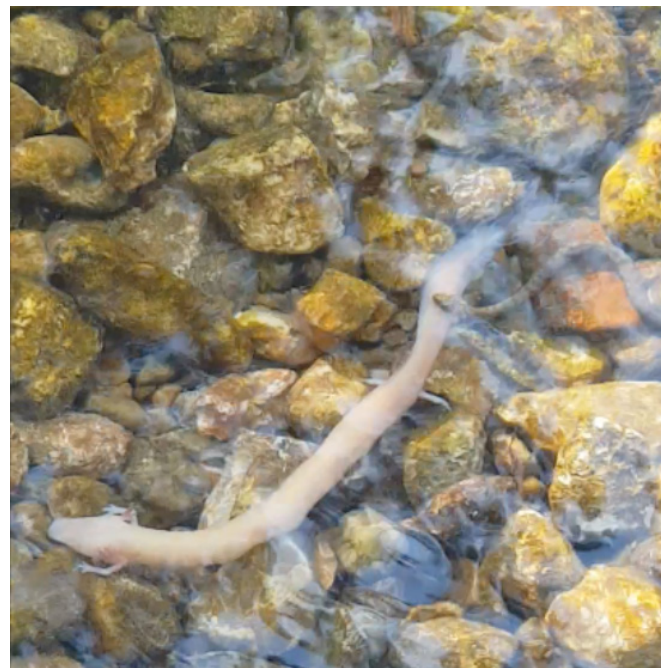


Figure 1. The dice snake *Natrix tessellata* can be clearly seen wrapping its jaws over the underside mid-tail area of the stray olm *Proteus anguinus*

almost certainly a fully mature adult *P. anguinus*. The *N. tessellata* is gauged to be approximately 54 cm long. These body-length measurements were estimated against those of the easily recognisable rocks in the video recording, and were accurately measured at a later date. A few minutes after the start of the confrontation, both animals were washed out into the strong flow of the surface river, and not observed again.

In Bosnia and Herzegovina, this iconic amphibian is endemic to certain parts of only five river basins, where they live in many cave ecosystems of the Dinaric Karst. During periods of exceptionally high rainfall, *P. anguinus* can be washed out of their underground aquatic habitats into the adjacent surface waterways such as the observation we report here, although such observations have rarely been reported in the local media. The species has exceptionally good survival strategies including that of naturally swimming upstream (positive rheotaxis) (Durand & Parzefall, 1987;

Lewarne & Balázs, 2019). Occasionally, during low-flow underground conditions, individuals may also inadvertently stray out of their safe cave environment into the adjacent surface waterways. For whatever reason they appear on the surface, *P. anguinus* cannot survive long in the aquatic environment away from the cave systems, due to exposure to threats such as encounters with potential predators.

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