



The olm (*Proteus anguinus*) and cave life

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Introduction. The olm (*Proteus anguinus*), also known as the "human fish" (Figure 1) is a remarkable and unusual creature adapted to cave environments. It is the only species in the genus *Proteus* of the family Proteidae. This aquatic salamander is primarily found in the subterranean waters of the Dinaric Alps in Europe, dwelling in dark cave systems (Kostanjsek et al 2023). Several features make the olm a fascinating example of cave adaptation.

Sensory adaptations. Living in perpetual darkness, the olm has developed extraordinary sensory adaptations (Tesařová et al 2022). Its eyes are undeveloped and covered by a layer of skin, rendering them functionally blind. Instead, the olm relies on other heightened senses, such as a keen sense of smell and hearing, and specialized sensory cells on its skin to detect changes in water pressure and currents (Tesařová et al 2022).



Figure 1. Two olms (*Proteus anguinus*), in Postojna Cave, Slovenia (wikipedia.org - photo credit: Boštjan Burger).

Longevity. The olm is known for its remarkable lifespan, with some individuals living up to 100 years (Balázs et al 2020). This longevity is partially attributed to its slow metabolic rate and the ability to survive extended periods without food (Holtze et al 2017).

Paedomorphism. The olm exhibits paedomorphism, retaining juvenile characteristics throughout its life (Tesařová et al 2022). Unlike most salamanders, the olm retains gill

slits and feathery external gills even as it reaches maturity, allowing it to respire underwater.

Diet and feeding behavior. In the nutrient-limited cave environment, the olm has adapted to a frugal diet. It primarily preys on small invertebrates and aquatic organisms. Its slow metabolism and ability to go without food for extended periods contribute to its survival in environments where food resources may be sporadic (Fišer 2019).

Morphological adaptations. The olm's elongated, slender body and reduced pigmentation contribute to its streamlined form, well-suited for navigating through the cave's narrow passages. Its pale pinkish skin serves as a camouflage in the dark, nutrient-poor waters.

Reproductive strategies. Olms have adapted unique reproductive strategies to cope with the challenges of cave life. Females lay a relatively small number of large eggs, and the parental care provided by the female ensures the survival of the offspring in the challenging cave environment (Vági et al 2022).

Conclusions. The olm represents an intriguing example of adaptation to life in dark and nutrient-poor cave environments. Its specialized features, including sensory adaptations, paedomorphism, and longevity, showcase the remarkable ways in which organisms can evolve to thrive in extreme ecological niches.

Conflict of interest. The author declares that there is no conflict of interest.

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