

Caves as evolutionary dead end? The journey of the stygobiont isopod *Monolistra pavani* toward sunlight

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Abstract

Monolistra are stygobiont isopods spread in numerous karst areas from the south-eastern parts of Dinaric karst to south-eastern Switzerland. They inhabit different typologies of groundwater habitats from lentic to lotic ones where they can be particularly important in terms of biomass. *M. pavani* is a steno-endemic species that was reported only for a single cave system in Lombardy (Italy).

From October 2018 to March 2022, we performed multiple surveys in the subterranean system and in its surrounding springs recording abundance and distribution of the species. In December 2018 we discovered three spring populations/subpopulations of *M. pavani* in which pigmented individuals also occurred. We performed UV and infrared spectroscopy to evidence potential differences in the signals related to C-C bonds of the aromatic ring of the melanin molecules between cave and spring individuals. In 2020, we also compared circadian rhythm and responses to light stimuli of cave and spring individuals.

Occurrence of *M. pavani* in springs was regular and associated to specific spring microhabitats; individuals were active both during day and during night. Nor spring and cave individuals avoid light stimuli. Circadian rhythm analyses revealed that individuals from springs are more active than those from cave, showing higher activity during day than during night. The 20% of spring individuals are pigmented, and eumelanin occurs in dark individuals.

Our results suggest the possible ongoing adaptation to surface habitats at the border with groundwater in a species considered as a strict stygobiont. Molecular analyses on the population relationships are currently ongoing.

Keywords

isopod; subterranean; spring; adaptation; pigmentation

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Presented at

Proceedings of the 25th International Conference on Subterranean Biology (Cluj-Napoca, 18-22 July 2022)

Conflicts of interest