Rhythmic response of cave animals to external cycles

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# ABSTRACT BOOK

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# Rhythmic response of cave animals to external cycles

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Organisms inhabiting caves are usually described as lacking biological cycles, since they exploit environments with largely constant conditions. However, recent evidence is emerging on the rhythmicity of cave-dwelling animals, with experimental, observational and genetic analyses. There are still many uncertainties, as some organisms may have regular or irregular rhythms, and some others seem to lack them. In this study, we analysed the activity of two groundwater-dwelling species: the European cave salamander (*Proteus anguinus*) and the crustacean isopod *Monolistra pavani*. Both species are usually thought to be arhythmic and exclusively found in caves; however, for the cave salamanders, recent studies have described the non-random activity in surface freshwater springs. We used GLMMs and N-mixture models to test the relationship between abundance and detection probability of cave species and both external cycles (circadian, lunar, and seasonal) and flooding events (upstream cumulated rain), analysing in two different models the surface and underground sites. We found that cave salamanders are generally more abundant during the night. Their detection probability in springs was higher during the night, with higher moon illumination (i.e., full moon) and after upstream rains; in caves, detection probability was higher during winter. For isopods, the detection probability was higher in early summer and in the evening. Our results suggest that depigmented cave-dwelling organisms are vulnerable to sunlight and tend to avoid it, exploiting the spring environment during the night, when ecological conditions are more similar to caves. Higher activity in springs may as well be related to food availability, as floods may foster it. Future studies to clarify these patterns are needed, and a molecular approach may be necessary to finally disentangle the role of adaptations and plasticity. These results are in accordance with previous studies on cave-dwelling invertebrates. In conclusion, cave animals may exhibit a rhythmic behaviour both in springs and in caves.