Convergent behaviours in subterranean species

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Abstract

The specialised subterranean fauna is often described as an iconic example of convergent evolution driven by environmental constraints, representing therefore an ideal model system for eco-evolutionary studies. During the colonization of subterranean environments, behavioural plasticity likely plays a fundamental role, as the quick behavioural response of individuals to the new environment is a key process enabling their long-term establishment. However, scientific research on the behavioural adaptations of subterranean organisms has lagged behind and is mostly biased towards a few model species. By reviewing the available literature, we aim to assess whether a convergent evolution of behavioural traits among subterranean species exists. We considered four different types of behaviour that are commonly studied in subterranean species: the explorative behaviour (i.e., how much individuals move), the diet (i.e., the variability of consumed prey), the social behaviour (i.e., type of intraspecific interactions) and the anti-predator response (i.e., if individuals adopt specific behaviours to reduce predation risk). We analysed >130 papers (both scientific and grey literature) published in the period 1909–2021, in which these four specific behaviours were described. We attributed species to one of the three main ecological classifications for subterranean species [(stygo-)trogloxene, (stygo-)troglophile and (stygo-)troglobite] according to the information reported in the literature. We collected data on the behaviour of more than 135 species belonging to > 75 different taxonomic families, including both vertebrates and invertebrates. From our preliminary analyses, we observed a lower movement in trogloxenes. We detected a significant increase in the trophic spectrum in troglophile species, while trogloxenes showed the narrowest trophic niche. We observed a higher occurrence of anti-predatory behaviours in trogloxenes, as well as an increase in intraspecific antagonistic interactions.

Keywords

Adaptation; cave; explorative behavior; plasticity

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Conflicts of interest

None declared.