

Life-history strategies in freshwater macroinvertebrates

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Abstract

1. Explaining spatial and temporal differences in species assemblages is a central aim of ecology. It requires a sound understanding of the causal mechanisms underlying the relationship of species with their environment. A species trait is widely acknowledged to be the key that links pattern and process, although the enormous variety of traits hampers generalisation about which combination of traits are adaptive in a particular environment.

2. In three steps, we used species traits to match species and environment, and chose lentic freshwater ecosystems to illustrate our approach. We first identified key environmental factors and selected the species traits that enable the organism to deal with them. Secondly, we investigated how investments in these traits are related (e.g. through trade-offs). Thirdly, we outlined thirteen life-history strategies, based on biological species traits, their interrelations known from life-history theory and their functional implications.

3. Species traits and environmental conditions are connected in life-history strategies, with different strategies representing different solutions to particular ecological problems. In addition, strategies may present an integrated response to the environment as they are based on many different traits and their interrelations. The presence and abundance of (species belonging to) different life-history strategies in a location may therefore give direct information about how a particular environment is experienced by the species present.

4. Life-history strategies can be used to (i) explain differences in species assemblages either between locations or in different periods, (ii) compare water bodies separated by large geographical distances, which may comprise different regional species pools or span species distribution areas and (iii) reduce often very complex, biodiverse assemblages into a few meaningful, easily interpretable relationships.

Keywords: Species traits; Adaptations; Functional groups; Reproductive tactics; Predictive framework

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