Stoichiometric Traits: a relevant approach for relating nutrient availabilities to community structures and ecosystem functioning?

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Abstract

To investigate the relationships between community structures and ecosystem functioning in response to environmental changes, the use of functional traits has often been proposed as a pertinent approach. While often successfully predicting some general ecosystem processes, trait-based approaches often lack accuracy for precisely relating communities and biogeochemical cycles.

Ecological stoichiometry (ES), a conceptual framework focusing on how proportions of elements in resources and consumers (mainly C, N, and P) affect organisms and ecosystems, might represent a complementary approach for answering these questions. In particular, elemental imbalances between resources elemental content and consumers' requirements will ultimately impact consumers' life history traits (e.g. reduced growth rates and survival) and affect consumer-driven nutrient recycling in a predictable way. While commonly applied to single organisms or species, ES has rarely been studied at the community scale. The integration of stoichiometric traits (e.g. organisms' C:P or N:P ratios) in the general framework of trait-based community ecology might represent a promising way for enlarging ES results from organisms' physiology and individual-based approaches to communities and ecosystem functioning.

In this presentation, the main principles of ES will be briefly summarized. Then, I will present what biological parameters could be proposed as pertinent stoichiometric traits, discussing their main advantages and drawbacks. Finally, first results aimed at testing the influence of headwater stream nutrient (mainly N and P) availability on the community structure of macroinvertebrates will then be briefly shown, before presenting a non-exhaustive list of research perspectives using the stoichiometric traits approach.

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