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RNA/DNA ratio as biomarkers for periphyton and macroinvertebrate growth

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A biocenosis is a complex assembly of organisms driven and shaped by numerous processes and interactions. Yet, in order to describe the biocenosis of a stream often only state variables, such as algal biomass or invertebrate diversity and abundance, are measured. But these variables fail to provide much needed information on those driving processes. Because processes such as growth of periphyton and invertebrates can hardly be measured directly in the field, the use of biomarkers is a promising approach to quantify biological rates under natural conditions.
Periphyton represents the main food source for invertebrate grazers and periphyton growth rate rather than standing stocks alone allows the estimation of the availability of this resource. A linear relationship of RNA/DNA ratios and growth rate has previously been established for single species cultures of algae and bacteria but not for naturally occurring freshwater periphyton assemblages. In this study it could be shown that linear relationships of RNA/DNA ratios and growth rate are also valid for naturally occurring freshwater periphyton assemblages and can be used as biomarkers for periphyton growth rate. Moreover, recent results indicate that the RNA/DNA ratio might also be used as biomarker for invertebrates, because high-quality food was observed to increase the RNA/DNA ratios of the freshwater amphipod Dikerogammarus villosus.
These are very promising results with regard to the usefulness and applicability of biomarkers ecosystem analysis in running waters. Additional biomarkers allowing the analysis of further processes and interactions within the food web such as PLFAs (phospholipid-fatty acids), neutral lipids and PUFAs (polyunsaturated fatty acids) are to be tested for their applicability in stream ecosystems.