

USE OF DIATOM ECOLOGICAL GUILDS AS INDICATORS OF LAND USE IN HEADWATER STREAMS

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Changes in diatom assemblages in headwater streams differing in the degree of land use in Luxembourg were evaluated with respect to the applicability and sensitivity of diatom ecological guilds as an assessment tool. With the objective of simulating the effect of global warming, two pairs of headwater streams differing significantly in their watershed land use (mostly forested or agricultural) were sampled along their longitudinal gradient. In order to maximize the differences in the land use and to eliminate the influence of other environmental parameters, the selected streams had similar geology, granulometry, mineralization and catchment size and basically represented either forested unimpacted sites with no human alterations or open impacted sites without riparian vegetation. The results were evaluated in terms of diatom composition, diatom indices and diatom ecological guilds. Diatom ecological guilds were assigned to all diatom taxa reaching sufficient abundance in the sample according to their growth form: low-profile, high-profile and motile guilds.

The statistical analysis showed that unimpacted forested sites were mostly dominated by the low profile diatom guild indicating high physical disturbance and limited access to light and to nutrients whilst the diatoms at impacted sites showed much higher variability with a significant proportion of high profile or motile guilds. The ecological guilds were significantly correlated with temperature, conductivity, oxygen, phosphates, nitrites and ammonium. The low profile and motile guilds were furthermore significantly correlated with the Specific Polluosensitivity Index (IPS), which also clearly differentiated between the shaded and unshaded sites.

This trend was also confirmed by evaluating the community structure. Multivariate analyses indicated that the diatom community structure at unshaded sites was much more influenced by seasonal changes and varied along the longitudinal gradient whilst these factors appeared much less relevant at shaded sites. This is probably due to the high natural disturbance of unimpacted sites, with low light and nutrient availability that affects diatom composition regardless of season or stream order, whilst at impacted sites the physical disturbance is low due to high accessibility to resources such as nutrients and light.

These results show that ecological guilds prove useful as an additional tool to reflect changes in freshwater aquatic environments related to anthropogenic influence such as land use.