MORPHOLOGICAL DIVERSITY WITHIN THE *ACHNANTHIDIUM MINUTISSIMUM* SPECIES COMPLEX

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During a survey of benthic diatoms sampled in watercourses from Mainland Portugal, several *Achnanthidium* populations morphologically ascribable to the *A. minutissimum* complex have been found. They clearly belong to the genus *Achnanthidium* on the basis of the valve outline, radiate striae, uniseriate, wider spaced striae in the centre of the valve and cells shallow-V-shaped in girdle view. The raphe valve has a straight central raphe hardly expanding at the centre and a row of elongated areolae in the mantle. Within the genus *Achnanthidium* these morphotypes belong to the complex of *A. minutissimum* (Kützing) Czarnecki, due to their straight terminal raphe fissures, in opposition to the species with terminal raphe fissures clearly deflected on the same side of the valve.

Since these individuals were abundant in numerous sites, especially in the Centre and North of Portugal, a more detailed examination was performed by means of light (LM) and scanning electron microscopy (SEM). Furthermore, the examination of the environmental characteristics of the sites where they have been sampled allowed us to gather sufficient information on the ecological preferences of the different taxa.

The main features that allow the separation of these taxa among each other and from all the other known *Achnanthidium* species are the different valve outline and dimensions, the size and shape of the central area, the apices shape and the density of the striae throughout the valve and near the apices.

The LM and SEM analyses of the type materials of *Achnanthidium microcephalum* Kützing, *Achnanthes minutissima* Kützing and *A. minutissima* var. *cryptocephala* Grunow in Van Heurck have been done in order to help to clarify the taxonomy of this group. A comparison with the literature on *Achnanthidium minutissimum* species complex was performed, but the new Portuguese *Achnanthidium* taxa present a set of distinct morphological and ecological features that separate them well from all other similar species. Furthermore, two of these taxa have already been recorded from French watercourses with similar environmental characteristics.

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.