Taxonomic resolution of river diatoms: structuring impact of environmental parameters and implications for biomonitoring

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Abstract

Benthic diatoms are routinely used to assess river pollution. Most of the tools based on these organisms exploit the differences of pollution sensitivity between species; therefore species identification is required. Determination of diatom species requires a lot of experience due to the extreme diversity of the group. The level of taxonomic resolution is rarely questioned in diatom bioassessment. The objective of this study was to test, using a database, the impact of taxonomic resolution on information loss. Our final datasets, comprising 1967 diatom samples carried out in the framework of biomonitoring rivers in the French basins, combined three kinds of data for each sample: (a) taxa abundance, resolved to the species, genus, family, order, class or subdivision resolution separately; (b) chemical characterization; (c) river typology. It appeared that all the arrays describing diatom assemblages at the different taxonomic resolutions were significantly correlated (except for subdivision). Other tests between chemical parameters and diatom communities show that there was an increase in correlation from subdivision to genera resolution. Species and genus resolution showed equivalent correlations with chemical parameters. Finally, based

on corrected Rand indices, we observed that the more precise the taxonomic resolution, the better the correspondence with hydro-ecoregion classification.

These results led us to wonder if very precise taxonomic resolution is necessary to assess classical pollution (nutrients, organic matter). Hypotheses to explain such results are that: (1) many species are too rare to establish their ecological requirements with certainty; (2) more environmental descriptors are necessary to explain the presence of some species; (3) the dataset is surely marred by identification errors, particularly at the species level. On the other hand, it seems important to keep a species level identification for biogeographical purposes and to know the ecoregional membership of the diatom community.