

A method based on benthic diatoms for the evaluation of lake ecological quality in Italy

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Benthic diatoms are routinely used in river monitoring for the evaluation of general or organic pollution and trophic status. However, in Italian deep lakes existing indices resulted poorly correlated to the mean epilimnetic total phosphorus concentration (TP). Even if most correlations resulted significant, existing indices were not able to clearly distinguish reference lakes from the water bodies with higher trophic status. For this reason, we designed a specific index aimed to the evaluation of the trophic status of Italian lakes (EPI-L), using a weighted averaging formula calibrated on logTP, as a proxy for lake eutrophication. The calibration data set cover both Alpine and Mediterranean ecoregions and includes 110 samples from 75 lakes. Among them, 36 lakes have mean depth larger than 15 m, such as the deep lakes South of the Alps and the volcanic lakes in Central Italy. Cross-validation was used to compare the performance of EPI-L with other existing indices. The correlation between EPI-L and logTP is only marginally influenced by lake depth and the difference between the EPI-L values for oligotrophic and eutrophic lakes resulted statistically significant. Benthic diatoms resulted to be useful indicator of the trophic status of both deep and shallow lakes, but the lists of trophic scores and indicator values must be adapted to the trophic niches of benthic diatoms in lakes. Finally, the use of a multivariate regression tree and the inclusion of our data into an international intercalibration exercise allowed us to define the EPI-L boundaries for lake quality classes.