

## From eutrophic towards hypertrophic – the story of southern Finnish lakes

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Eutrophication continues to be a major environmental problem worldwide. The reference state of a lake (i.e. prior to human disturbance) is a crucial piece of information in lake management as some lakes are naturally nutrient-rich and some are not. Paleolimnology is a valuable tool in determining these reference states and quantifying the change between pre-disturbance and present-day conditions. The use of a paleoecological transfer function together with a top-bottom approach is a particularly effective way of examining several lakes simultaneously.

We used the top-bottom approach and a diatom-total phosphorus (TP) transfer function to study the diatom assemblages of modern (i.e. surface sediment) and pre-disturbance samples from 19 lakes in the clayey catchments of southern Finland. The pre-disturbance samples were selected based on the magnetic susceptibility profiles of the sediment cores and their age was estimated with radiometric dating. The transfer function is targeted for naturally eutrophic lakes but its calibration set consists of eastern Finnish lakes from till-dominated catchments. Therefore, our other aim was to examine the applicability of the transfer function to the southern Finnish lakes that have similar water quality but different catchment geology.

According to the results, the lakes can be divided into two distinct groups based on their pre-disturbance samples. One group has notably higher diatom diversity and generally lower diatom-inferred TPs (DI-TP) than the other group (mean 28  $\mu\text{g l}^{-1}$  and 56  $\mu\text{g l}^{-1}$ , respectively). Till-dominated catchments are common in the former group and clayey catchments in the latter one. A majority of the lakes have suffered from further eutrophication via human-induced nutrient loading, which can be seen as a clear shift in the diatom assemblages and an increase in the DI-TP from pre-disturbance to modern samples. Furthermore, the eastern Finnish model works rather well for the naturally eutrophic southern Finnish lakes despite the difference in the catchment geologies and land use histories of the two areas.