THE RESPONSE OF BENTHIC DIATOM ASSEMBLAGES AND METRICS TO DETECT HUMAN-INDUCED CHANGE

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English summary

To improve and develop the current diatom indicators we studied the response of benthic diatom assemblages and metrics to detect human-induced change. We found that Swedish diatoms respond mainly to pH and nutrient gradients, and that the current metrics respond as anticipated.

This was shown in the deliverable D4.3-2, which is made up of four manuscripts all dealing in parts of the response of benthic diatoms to stress: Besides the two manuscripts of D4.3-1, also D 4.3-2a focusing on the comparison of the response of benthic diatoms of streams and lakes, and D 4.3-2d focusing on the detection of thresholds in the response of stream diatoms to stress.

D 4.3-2a is dealing with "Differences in benthic diatom assemblages between streams and lakes in Sweden and implications for ecological assessment". Kahlert M. & Gottschalk S. (2014). Freshwater Science 33(2): 655-669. We found that despite differences in taxonomic composition between streams and lakes, the diatom assemblages in both habitats were related mainly to pH and nutrients, and the studied diatom metrics responded similarly to the main environmental gradients in both habitats, enabling use of the same diatom indices in both habitats.

D 4.3-2d focusses on the "Diatom community turnover along environmental gradients in streams" (Kahlert & Trigal, manuscript).

Overall, diatom community changed gradually along most environmental gradients (20 were studied). pH was the most important driver of diatom community changes, followed by total phosphorus. Land cover and local physical factors were less important. Abrupt changes were also noted, for pH the largest change of community structure was at pH 5–6 and around 7.5, and for total phosphorus (TP) at concentrations about 75 µg l-1. The analyses, performed with 'Gradient forest', were run on both relative abundance and presence/absence data of dia-tom species. Changes were more gradual for the presence/absence than for the abundance model, but the main drivers and tipping points were the same for both models.

As a consequence for management, we expect significant changes of benthic diatom assemblages will be mainly related to any changes in pH, followed by changes in TP. A reduction of nutrients, i.e. phosphorus, will best be detected via diatom monitoring around thresholds of about 25.6 µg TP l-1 (D4.3-1) and 75 µg TP l-1. pH changes will best be detected at pH 5–6 and again at ~pH 7.5. Benthic diatoms sampled according to Swedish standards, and the metrics calculated from them, are mainly indicating changes in water chemistry and there mainly pH followed by pH. Factors such as land cover or local physical factors have less importance in structuring diatom as-

semblages. Thus, if reductions in nutrient load or acidification are to be monitored, benthic diatoms are the choice of the method. Furthermore, as diatom assemblages of lakes re-spond to environmental stress in a similar way as for streams, the current stream metrics can be used in lakes as well.