

Quality control of biological indices: a first exercise for an index assessing ecological status of river phytoplankton in Flanders (Belgium)

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Abstract: The European Water Framework Directive (WFD) requires that every member state assesses the ecological status of its water bodies relative to near-pristine reference conditions. In surface waters, distance to target needs to be measured by Ecological Quality Ratios for a number of relevant biological quality elements. The newly developed PISIAD index assesses phytoplankton for rivers and lakes in Flanders (Belgium) using the proportions (P) in relative abundance of impact-sensitive (IS) and impact-associated (IA) diatoms (D). Compliance to WFD requirements and successful intercalibration at the relevant biogeographical level allow its use in regulatory monitoring by the Flemish Environment Agency. Using initial data from this monitoring programme, we evaluated the properties of PISIAD.

We first investigated the numerical and statistical behaviour of the index, showing that a slight adaptation would increase its stability and robustness near values that are critical to the possible triggering of remedying measures. Simulations provided more insight into the number of diatom valves that need to be counted to obtain reliable outcomes. The quality of species identifications was assessed by independent assessment of documentary records, also allowing recommendations for future improvement.

Next, the general response of the PISIAD index for rivers to measure physical-chemical water quality and its relation to other biotic indices was explored. The metric responded primarily to organic loading and oxygen conditions. It related only weakly to indices for fish, macrophytes or phytoplankton, suggesting significant complementarity. However, data limitations prevented definitive conclusions. Variability of results at water-body level also indicated a need for further scrutiny. Only a more appropriate overall sampling scheme and tailored investigations would allow to elucidate such questions economically.

This first quality control exercise proved fruitful to suggest adjustments as well as future research needs. It is strongly recommended that similar exercises are routinely included in official monitoring programmes.