

Method for setting of class boundaries for assessment of marine benthic invertebrates

Mats Blomqvist, Kjell Leonardsson och Rutger Rosenberg

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English summary

During the Waters project we developed new methods for the setting of the boundaries to be used in assessment of benthic fauna on the Swedish west coast with a modified index of benthic quality (BQI2015; Leonardsson et al. 2016) and on the Swedish east coast with a new probability based index (pBQI; Blomqvist & Leonardsson 2016) according to the WFD and the MSFD in Sweden. Despite the fact that we propose different indicators for the east and the west coast waters, the method for defining class boundaries follows a similar procedure. A brief description of aspects related to defining class boundaries are outlined below, but the details as well as more comprehensive descriptions of assessment methods are described in Leonardsson et al. (2016) and Leonardsson & Blomqvist (2016).

The approach for determining class boundaries focus on the most important class boundary, i.e. that between good and moderate status (the GM-boundary). During the work baseline data considered to represent good or high ecological status and good environmental status were selected. These data originate from areas which are not impacted by local pressures and hence are in a state without the need for measures to improve status. Based on this view we define the GM-boundary as the limit below which the mean index value of an assessment unit is significantly lower than what is expected from the baseline data. Thus, according to this approach, defining the GM-boundary reduces to finding the lower one-tailed 95% confidence limit of the baseline data. Subsequently, the assess-

ment of status in a particular assessment unit is done by comparing observed values to the boundary defined according to the approach above. That is, if the mean of the five measurements used in the assessment (see below) is significantly below the GM-boundary, as determined by a statistical resampling procedure (bootstrap), then the status is classified as less than good.

The Swedish assessment criteria for benthic invertebrates require a minimum of five samples from different stations to account for spatial variation within an assessment unit. The GM-boundary should account for this minimum number of samples. Baseline data can also be spatially and temporally unbalanced which needs to be adjusted for. We do this by using a spatially and temporally nested resampling procedure in which we randomly draw five samples from the baseline dataset. The average index values of these five samples are stored and the procedure is repeated a large number of times (typically $\geq 10\,000$ times). The GM-boundary is found at the 5th percentile among the stored average index values. The same principle can also be followed for the HG-boundary (boundary between high and good status), i.e. from the 95th percentile of the stored average index values. For the boundaries below the GM-boundary we lack knowledge on how to set the boundaries. Our suggestion is therefore to follow the same rule as that used for the original BQI, i.e. to separate the distance from 0 to the GM-boundary in three equidistant parts.

In the reports we give examples on setting of boundaries and assessments with uncertainties using these boundaries. Since the Swedish national and regional monitoring program currently is under revision (Leonardsson & Blomqvist 2015) we recommend that new boundaries are calculated, based on data from the new monitoring program with higher spatial resolution, before the revision of the regulations for assessment according to the WFD and the MSFD in Sweden.

References

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