



## Which benthic ecosystem assessment tool is best?

**Populations of organisms** that live on the bottom of an aquatic ecosystem, the benthic community, can be assessed to determine the health of the ecosystem. New research explores the many existing methods for assessing benthic communities to ensure that the most appropriate and useful tests are used under the Water Framework Directive (WFD).

**Scientists in the EU-funded WISER<sup>1</sup> project** tested the ability of 21 benthic assessment methods, of varying complexity, to detect differences within five transitional and coastal water bodies across Europe, arranged in order of increasing human impact.

The study provides a timely review of the techniques likely to be the most reliable for classifying the health of Europe's valuable aquatic environments under the WFD<sup>1</sup>. It is the first to investigate the responses of existing assessment tools across a wide range of human-induced pressures.

The test locations spanned five types of aquatic environment: a coastal lake and a bay (in Bulgaria), a lagoon (in Italy), an estuary (in Portugal), a coastal area (in Spain) and a fjord (in Norway). Human-induced stress factors included boat traffic, pollution, bottom trawling (fishing on the seafloor with a net), human and industrial wastewater run-off, harbour dredging and eutrophication.

In the 13 'single-metric' benthic assessment methods, where a single parameter (for example, abundance, number of taxa or biomass) was used to assess the ecosystem, the scientists found poor environment quality tended to correspond with high human-induced pressure. However, the sensitivity of some methods was limited to specific types of environment.

Increasingly sophisticated techniques, known as 'multi-metric' methods, condense a large number of benthic health parameters into a single index. Generally, these performed better in the study than the single-metric methods and statistically, strong similarities were found between three of these indices and the level of human-induced pressure. Poor results with some of the other multi-metric methods could be because data was lacking on healthy ecosystems, which were needed as a comparison for the collected data. This indicates that ecosystems could be misevaluated if there is a lack of knowledge about what constitutes a healthy ecosystem.

Transitional water bodies (estuaries and lagoons) also presented a problem. For other types of water body, sharp salinity changes, periods of low oxygen and low species diversity are recognised stressors and can often indicate a disturbed ecosystem. However, these conditions occur naturally in a healthy transitional environment, which many assessment methods are not designed to allow for.

Overall, the scientists pinpointed the most suitable multi-metric benthic assessment methods in terms of performance and sensitivity for use in both coastal and transitional environments. The selected methods were therefore shown to be independent of habitat type and geographic location.

The WFD has an on-going commitment to researching and implementing the most up-to-date and accurate means of assessing water quality and ecosystem health in Europe. In this context, the most informative evaluation and quantification of the available tools presented in the study should be a core component of a successful management strategy.

1. WISER (Water bodies in Europe: Integrative Systems to assess Ecological status and Recovery) is supported by the European Commission under Seventh Framework Programme. See: [www.wiser.eu](http://www.wiser.eu)
2. See: European Water Framework Directive (WFD) [http://ec.europa.eu/environment/water/water-framework/index\\_en.html](http://ec.europa.eu/environment/water/water-framework/index_en.html)
- 3.

**Source:** Borja, A., Barbone, E., Basset, A. *et al.* (2011). Response of single benthic metrics and multi-metric methods to anthropogenic pressure gradients, in five distinct European coastal and transitional ecosystems. *Marine Pollution Bulletin*. 62: 499-513.

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