

# Choose your biodiversity index wisely when doing an ecosystem impact assessment!

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Biodiversity indices are widely used by scientists to measure and monitor ecosystem biodiversity, and to communicate information about the status of an ecosystem or the impact of human activities in a simple way. Ecosystem assessments are a high-level objective for marine policy, related for example to the Marine Strategy Framework Directive or the UN Convention on Biological Biodiversity. However, diversity is not always considered in the ecosystem assessment algorithms and diversity is calculated in various forms or indices, which hampers the comparison between different assessments. In this contribution, we illustrate the pros and cons of using different biodiversity indices to assess the benthic ecosystem, based on running EU benthic indicator work (E.g. ICES Benthos Ecology working group, benthic indicator intercalibration).

A large set of indicators has been defined to assess different structural and functional aspects of benthic ecosystems (compiled in the Devotool and the MARMONI and WISER databases). Forty-six benthic indicators are listed, of which 48 % are related to biodiversity, at least to a certain degree. These benthic indicators consist of different algorithms, be it direct measurements or based on single, multi-metric or multivariate analyses. Benthic biodiversity is usually assessed as the 'number of species' or the 'Shannon Wiener' diversity index. The literature on benthic diversity indicators showed that the relationship between benthic diversity and human pressure is not always straightforward. For example, for the Belgian part of the North Sea it was shown that the diversity responses to sand extraction, dredge disposal and offshore wind energy exploitation were not univocal. In some coastal areas in the Mediterranean region no biodiversity response to the existing pressures could be illustrated at all. On the other hand, the pressure-response relation between a chemical pollutant gradient and benthic indicators in the North Atlantic was quite clear.

All these studies show that biodiversity responses are case specific, depending on the study area, data type, and type of impact. Therefore, biodiversity indices have often been excluded from ecosystem impact assessments. However, the intercalibration work within the EU also showed that the strength of the biodiversity response also depend on the diversity index that has been used. Diversity indices based on 'number of species' showed a more direct and rapid response to different pressures than other indices (e.g. Simpson index). So, if diversity indices are included, an adequate definition of the assessment settings (e.g. data, pressure window, index boundaries) needs to be given to ensure a reliable and comparable impact assessment. Moreover, the appropriate benthic biodiversity index should be selected for each ecosystem impact assessment, taking into account the strengths and weaknesses of each index.

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