

# Science for Environment Policy

## Fish communities respond to environmental changes at a local scale in the Baltic Sea

**Researchers have shown that in the Baltic Sea the abundance of common fish species, used as an indicator of ecosystem health, is influenced by climate-related oceanic conditions at a local scale, such as sea temperature.** The researchers suggest, therefore, that the environmental status of coastal fish communities in the region should be assessed and managed at a local scale.

**Understanding the environmental impact of human activities is important, especially in coastal areas, which are heavily exploited.** Indicators of environmental status are increasingly significant in implementing and evaluating management objectives for marine ecosystems. The [Water Framework Directive](#) (WFD) and the [Marine Strategy Framework Directive](#) (MSFD) outline indicator-based assessments for marine areas in the EU. The MSFD uses 11 descriptors of environmental status, which are associated with indicator-based assessments, the outcomes of which are used to determine whether management measures are required to achieve or maintain good environmental status. In order for indicators to be effective, they must represent key features of ecosystems and also show predictable responses to human activities.

Marine and coastal waters are large-scale ecosystems, meaning indicators under the MSFD need to reflect fish communities over wide areas. In the Baltic Sea, indicators vary depending on human pressures; for example, they can reflect nutrient enrichment (which causes [eutrophication](#)) or fishing pressure. Indicators are also needed for wider environmental changes, such as [climate changes](#).

This study assessed seven suggested indicators of coastal fish communities in the Baltic Sea proposed for the MSFD (under descriptor 1 — biodiversity). Indicators comprised the abundance and [diversity](#) of key fish species in the region (such as perch and other large fish-eating species) in order to assess the status of coastal fish communities. The study used 11 reference monitoring sites of representative fish habitats along the Swedish east coast which have little direct human use.

The analysis attempted to understand changes in the populations of these indicator species in relation to each other, between 2002 and 2013. At three sites the researchers also modelled the abundance of indicator species in relation to different environmental conditions over a 25-year period, using monitoring data of fish communities from 1989 to 2013. Environmental variables were also included in the models, including temperature, transparency, salinity of the water column (hydroclimatic drivers) and the Baltic Sea Index (BSI). The BSI reflects regional oceanic conditions in terms of wind direction and water temperature. Environmental drivers related to human activity, such as nitrogen and phosphorus levels in the water due, for example, to local fishing pressure (based on commercial catches of fish registered in ports), were also considered.

*Continued on next page.*



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The study demonstrated that changes in fish-community indicators were mainly linked to climate-related hydrological variables, although nutrient-related variables were also important in the northern Baltic Sea. Fishing catches showed no association with any indicator. Variation in the indicators over time reflected changes in local environmental conditions and differed between the sites. However, over the large scale of the study area, many of these indicators, i.e. perch, and fish-eating species (including non-perch species), showed similar trends. The researchers point out that the indicators used are generic, meaning that species-specific variation may have been missed. However, such generalisations are necessary in order to describe the overall status of fish communities in the region.

The results demonstrate that the environmental status of coastal fish communities in the Baltic Sea should be managed at a local scale, as the main drivers of fish-community indicators differed between coastal areas in this study. The study also found that hydroclimatic factors and population processes (e.g. reproduction) were more important than human activities for predicting changes in fish-community indicators over time. However, the researchers say this may have been due to relatively low human activity at the reference sites. Nonetheless, understanding the impact of variations in environmental conditions, such as salinity and temperature, is important when assessing the status of coastal fish communities and designing management efforts in relation to human activities. The researchers also say that studying a larger network of monitoring sites gives a more effective assessment of coastal fisheries than intensively studying a few sites, as this better reflects local variation.

