

A trait-based assessment towards understanding long-term changes in ecosystem functioning: the Central Baltic Sea as a case study

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Abstract

Marine scientists, managers and the general public are rightly concerned that the structure, functioning and services of marine ecosystems are threatened by natural and anthropogenic pressures, e.g., eutrophication, overfishing and climate change. In order to understand pronounced ecosystem changes (i.e., regime shifts), assessing long-term trends in ecosystem components and their response to natural and anthropogenic pressures is a key part of *Integrated Ecosystem Assessments* (IEAs) and ecosystem-based management approaches. In this study, we apply previously developed concepts for IEA in the Baltic Sea, but extend it beyond considering changes in abundances of dominant species, to account for community-wide changes in a number of key traits across multiple trophic levels. The underlying rationale is that these traits, either separately, or in combination, represent ecosystem functions which are key to providing important ecosystem services. By investigating temporal changes in the community weighted mean (CWM) traits of phytoplankton, zooplankton, zoobenthos and fish we demonstrate whether or not functional changes have occurred in the Baltic Sea as a result of the pronounced changes in species composition (regime shift) in the late 1980s. To that end, our trait-based approach not only strives to highlight and answer some fundamental ecological questions regarding the functioning of marine ecosystems and the underlying processes of regime shifts, but places the findings in a framework that can provide guidance and advice to ecosystem-based marine management.

Keywords: traits, trait-based approach, ecosystem functioning, regime shifts, integrated ecosystem assessments, ecosystem-based management

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