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TITLE: Four decades of functional community change reveals gradual trends and low interlinkage across trophic groups in a large marine ecosystem

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ABSTRACT:

The rate at which biological diversity is altered on both land and in the sea, makes temporal community development a critical and fundamental part of understanding global change. With advancements in trait-based approaches, the focus on the impact of temporal change has shifted towards its potential effects on the functioning of the ecosystems. Our mechanistic understanding of and ability to predict community change is still impeded by the lack of knowledge in long-term functional dynamics that span several trophic levels. To address this, we assessed species richness and multiple dimensions of functional diversity and dynamics of two interacting key organism groups in the marine food web: fish and zoobenthos. We utilized unique time series-data spanning four decades, from three environmentally distinct coastal areas in the Baltic Sea, and assembled trait information on six traits per organism group covering aspects of feeding, living habit, reproduction and life history. We identified gradual long-term trends, rather than abrupt changes in functional diversity (trait richness, evenness, dispersion) trait turnover, and overall multi-trait community composition. The linkage between fish and zoobenthic functional community change, in terms of correlation in long-term trends, was weak, with timing of changes being area and trophic group specific. Developments of fish and zoobenthos traits, particularly size (increase in small size for both groups) and feeding habits (e.g. increase in generalist feeding for fish and scavenging or predation for zoobenthos), suggest changes in trophic pathways. We summarize our findings by highlighting three key aspects for understanding functional change across trophic groups: (a) decoupling of species from trait richness, (b) decoupling of richness from density and (c) determining of turnover and multi-trait dynamics. We therefore argue for quantifying change in multiple functional measures to help assessments of biodiversity change move beyond taxonomy and single trophic groups.

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