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How is ecosystem function in the Barents Sea responding to a warming Arctic?

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Abstract

Warming waters are rapidly changing species composition and the structure of fish communities in the Barents Sea. It is crucial to understand how this change in species composition is affecting the functioning of Arctic ecosystems as well. We used demersal fish abundance data from ecosystem surveys conducted between 2004 and 2012 at every 40km and covering the entire Barents Sea, totalizing nearly 4000 stations. The 54 fish species present in our data were characterized by a set of 30 different functional traits that give information on different aspects of fish biology and ecology. These include: information on habitat and diet preferences, body size and fecundity, and foodweb-derived characteristics of each species, among others. Across the Barents Sea, fish functional composition ranged from (1) more pelagic communities showing high foodweb connection to several prey and predator species, and more piscivorous diets to (2) more benthic communities with lower foodweb connection to both prey and predators, smaller sizes, and more benthivorous diets. In 2004, the more pelagic communities were mostly located in the southern areas of the Barents Sea. However, following a peak in average water temperature in 2006, and the extension of Arctic and boreal mixed waters, the pelagic communities have expanded northwards. As a consequence, the previously northerly widespread Arctic benthic communities have been reduced to fewer areas in the northeast. A change in community composition along with changes in its functional composition is already affecting how Arctic ecosystems function, with large implication for its ecosystem properties and fishing potential.

Keywords: fish functional composition, functional traits, Barents Sea, warming waters

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