The role of zooplankton in multispecies dynamics in the Barents Sea

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Ecosystem dynamics depend on a complex interplay between bottom-up and top-down effects, the relative importance of which may vary spatially and temporally. The high-latitude Barents Sea ecosystem is characterized by relatively low biological diversity and strong species interactions. The key planktivore fish, capelin, appear to have strong top-down effects on mesozooplankton biomass in the central and northern Barents Sea. At the same time, zooplankton have bottom-up effects on fish populations. Competition for zooplankton food is, for example, a likely cause of the density dependent regulation of survival and maturation in capelin. Quantitative knowledge on the role of zooplankton in multispecies dynamics in the Barents Sea is, however, scarce. To understand these dynamics better, there is a need for statistical models that describe the past fluctuations of key fish populations and zooplankton groups parsimoniously. We here analyse time series of zooplankton biomass and capelin abundance- and weight-at-age using a Bayesian state-space approach. In this way we estimate bottom-up and top-down effects jointly and subsequently assess implications for multi-year dynamics. A particular focus is on predation-caused changes in zooplankton biomass or composition that have delayed feed-back effects on the predators, as such delayed density dependent effects can have large influence on ecosystem dynamics.

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