Quantitative models link declining sea ice to pan-Arctic benthic diversity and ecosystem functioning

Sea ice is declining in the Arctic Ocean (Fig. 1). This has a profound impact on Arctic marine food webs, influencing their structure, function and biodiversity (Fig. 2). Yet, Arctic research thus far focused on “footprints” in terrestrial systems and threats to marine mammals\(^1\). Therefore, knowledge is virtually lacking regarding benthic systems in the Arctic Ocean\(^1\).

**AIM**

**Offer more insight in the distributions and abundance of macrobenthic species in Arctic seascapes.** Scaling-up pan-Arctic community data based on more than 7000 locations (Fig. 3)\(^5\), we will employ recent quantitative models. These enable assessing spatial diversity patterns and link community organisation and ecosystem functioning. This is complementary to planned initiatives that target the pelagic system, such as MOSAIC.

**Quantitative models**

**Multi-species distribution models**\(^6\)
Bayesian models that allow for species distributions and co-occurrences to be organised by ecological mechanisms, such as competition, as well as sea ice parameters.

**Trait-based distribution models**\(^6\)
Hierarchical models that analyse information contained by species occurrences as a function of sea ice variables, species traits, and their interactions. These enable assessing which traits are particularly vulnerable to climate change.

**Structural equation models**\(^7\)
Whether benthic Arctic systems will exhibit intrinsic dynamics or simply track environmental forcing is unknown. Structural equation models (1) assess the potential for these types of interactions to exist and (2) evaluate the potential for changes across environmental gradients.

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**References**

1. Department of Functional Ecology, AWI, Germany