

Abstract 1

Ecosystem Based Management in the Arctic: from definition to action.

Jørgensen L.L, Mundy P. R., Hoel A.H., Skjoldal H. R., Hallfredsson E., Ottersen G., Arneberg P.

The dramatic reduction in the Arctic sea ice coverage has made vast areas newly accessible to increased human activity. Increased human activities in the newly exposed areas are likely to bring increased pressures throughout vulnerable Arctic marine ecosystems, which in turn present new challenges for sustainable management of the Arctic. Implementing the ecosystem approach to management (EA) in the Arctic during a time of profound climate change creates a heavy demand for all types of information that can guide the managers responsible for controlling and mitigating impacts of human use.

Responding to the increased information demands, Norway developed the Strategic Initiative Arctic (SI Arctic) which aims to increase the scientific knowledge base, explore options for providing ecosystem-based advice, and establish long-term monitoring programs. SI Arctic addresses critically important areas of the High Arctic which are within Norwegian jurisdiction. The High Arctic, which is the focal area of this talk, makes up the northern part of the Barents Sea Large Marine Ecosystem (LME) and the southern part of the Central Arctic Ocean LME. The SI Arctic area encompasses Fram Strait which is the main oceanic gateway to the deep Arctic Ocean, channeling the major part of oceanic heat brought to the region by the warm Atlantic inflow. Monitoring this heat flow is particularly important because any changes could have profound implications for the marine environment, especially ice conditions, and consequently for the marine life in the Arctic Ocean.

The talk will present ongoing work within SI Arctic and relevant work within the International Council for the Exploration of the Sea (ICES) to evaluate the use of the ecosystem approach to management (EA) as a guide for developing ecosystem-based advice from a scientific monitoring program. We will 1) describe the LME-subarea under consideration, 2) describe the ecological conditions, and existing and anticipated future human activities, 3) consider potential ecological objectives and the data collection needed to monitor that they are met, 4) introduce comparable efforts of the ICES working group on integrated assessment of the Barents Sea (WGIBAR) which is exploring means of separating human footprints from natural fluctuations through the approach of Integrated Assessment (IA) and 5) examine the ability to provide ecosystem-based advice from the scientific results of the monitoring that is relevant to implementing the ecosystem approach to management in the Arctic.

Abstract 2:

Effects of Multiple Stressors on The Benthic Ecosystem in the Barents Sea

Jørgensen LL, Primicerio R., Fossheim M., Anisimova N., Ljubin P.

Arctic marine environments are experiencing many human-induced and natural pressures, including climate change, harvest, introduced species, pollution from ship traffic, fossil fuel exploitation, etc. The size and complexity of the Arctic benthos poses many challenges to predict how these potential cumulative pressures affect benthic species and to detect biodiversity changes. The Barents Sea, one of the shelf oceans in the Arctic, represents a transition from warm Atlantic to cold Arctic waters and consequently an area for climate change studies. Since 2007, the Norwegian-Russian annual ground fish surveys in the Barents Sea, were added benthic taxonomists and a still developing standardized monitoring of invertebrates from the fish trawls. The intension is to develop a time and cost efficient method with simple and transparent analyze tools that easily can be adopted by other national ground fish surveys. The data base, including 3073 stations, 23 Phyla, 49 taxon groups, 590 species, abundance and biomass, are continuously developing and improving and presented a baseline map (Jørgensen et al 2014). Coding species vulnerability toward trawling (Jørgensen et al, accepted and in pres), temperature affinity, and preference to invasive top-predators can indicate geographical areas of particular concern where these factors act solely or as multiple impact factors. Developing environmental considerations that balance the fishing industry need for the Barents Sea resource services are particularly demanding in geographical areas with multiple impact factors acting simultaneously in a continues natural fluctuating and dynamic Barents Sea. We will present the benthic Norwegian-Russian baseline map and possible indicators to follow effects from climate, trawl and invasive species in the Barents Sea.

Jørgensen L.L, Ljubin P, Skjoldal HR, Ingvaldsen RB, Anisimova N, Manushin I. (2014).

Distribution of benthic megafauna in the Barents Sea: baseline for an ecosystem approach to management. *ICES Journal of Marine Science*; doi:10.1093/icesjms/fsu106

Jørgensen L.L, Planque B, Thangstad TH, Certain G (in pres). Vulnerability of megabenthic species to trawling in the Barents Sea. *ICES Journal of Marine Science* (accepted 17.05.2015)