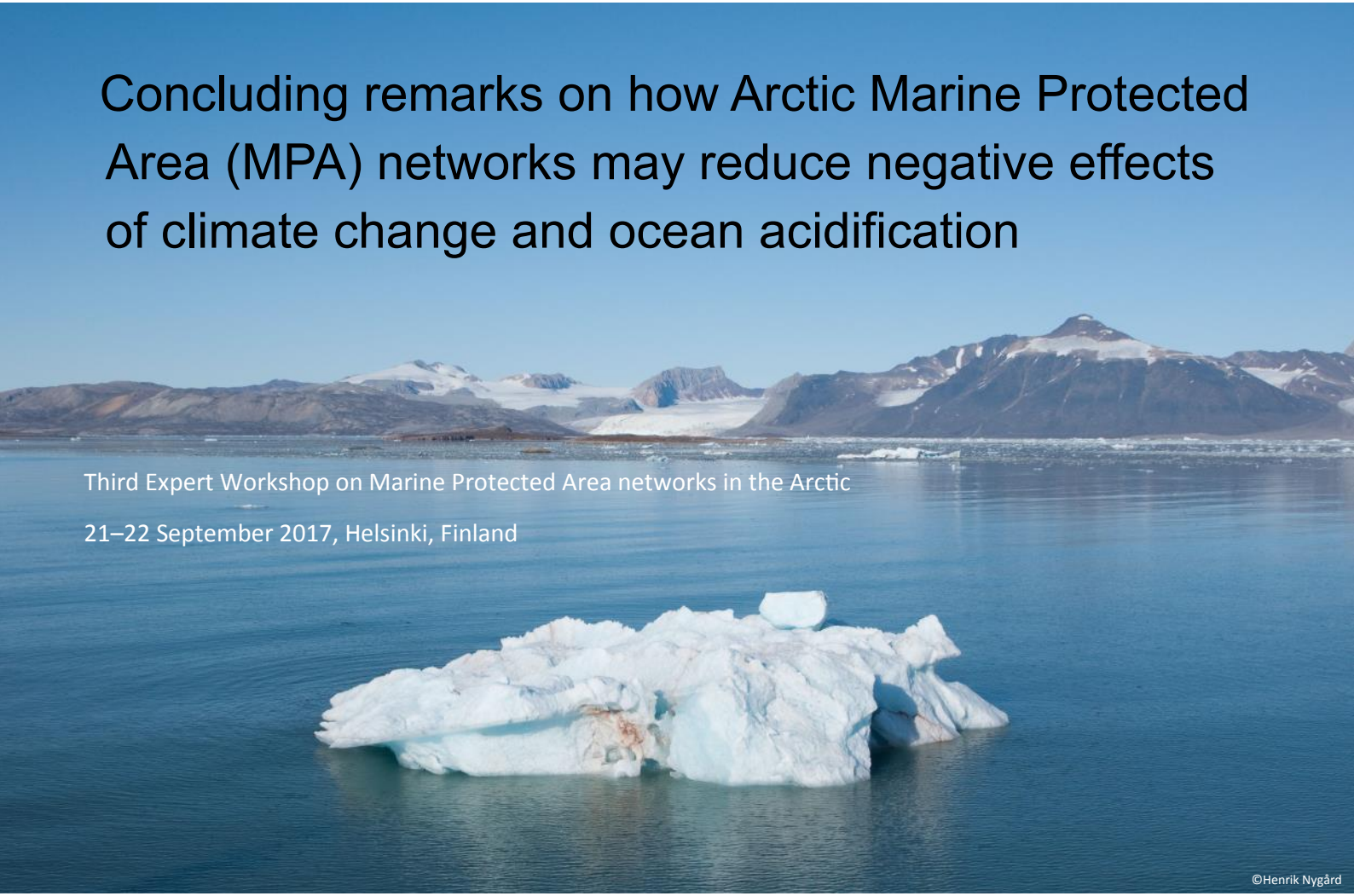
Concluding remarks on how Arctic Marine Protected Area (MPA) networks may reduce negative effects of climate change and ocean acidification



Third Expert Workshop on Marine Protected Area networks in the Arctic

21–22 September 2017, Helsinki, Finland

©Henrik Nygård

Rapid environmental changes in the Arctic

Climate change and ocean acidification

Global climate change and ocean acidification change the habitats of the cold-adapted organisms living in the Arctic, with the risk of exterminating unique biodiversity. Human-induced emissions of greenhouse gases affects the balance between energy entering and leaving the Earth's system resulting in global warming, melting of sea-ice (which increases heat absorption by the Arctic Ocean), and associated climate change.

Approximately 27 % of the carbon dioxide released to the atmosphere every year is absorbed by the oceans. This keeps the atmosphere from warming as much as it otherwise would, but creates ocean acidification. In the Arctic region climate change and ocean acidification take place 10-100 times faster than at any time in the last 65 million years.

Effects on the environment

Climate change and ocean acidification, combined with regional and local environmental stressors affects Arctic species, habitats, and ecosystems. Arctic marine species and ecosystems are undergoing pressure from cumulative changes in their physical, chemical and biological environment. Changes in biodiversity will change food webs as food resources are being lost for many marine Arctic species (Fig 1).

Intention of the workshop

The scientific basis of how MPA networks may reduce negative effects of climate change and ocean acidification in the Arctic region was discussed during this third expert workshop. Workshop participants were mainly scientists with expertise on Arctic marine ecosystems, climate change, ocean acidification and/or MPAs.

The intention of the workshop was not to reach consensus and provide a fixed list of recommendations, but rather to summarize:

(1) the best available knowledge that can already be applied to the planning of a pan-Arctic MPA network, and

(2) the primary uncertainties and, hence, what necessary scientific knowledge is still lacking.

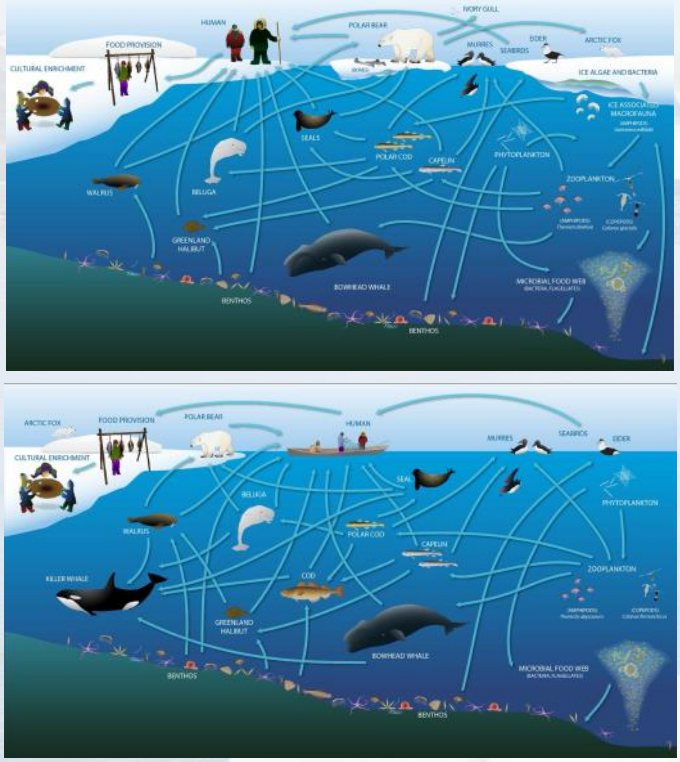


Fig. 1a. Current food web in the Arctic 1b. Expected changes in the Arctic marine food web. Images: © CAFF (2017) adapted from Darnis et al 2012 and Inuit Circumpolar Council – Alaska (2015)

Major measures to support the development of cohesive and integrated MPA Network in the Arctic

A paradigm shift for establishing MPAs is necessary

The current paradigm of creating MPAs only when direct regional or local threat is proven should be shifted towards one that establishes MPA networks to protect what is valued and cherished before it is harmed. This calls for applying the precautionary principle and creating Arctic MPA networks that will support resilience of biodiversity and ecosystem services. General ecological principles and additional experience from other regions provide sufficient basic understanding to start designing a robust pan-Arctic MPA network already now and to develop and implement the necessary connected management measures.

Existing MPA criteria need be adapted to Arctic conditions

Creating an MPA network for the Arctic will require adaptation of established criteria to the unique, and rapidly changing, character of the region. Optimal locations for some MPAs in the Arctic Ocean may not be stationary in space and time. In order to account for the migration of species with moving physico-chemical conditions creating dynamic MPAs along oceanographic and climatic gradients may be a feasible and effective approach. Such focus on ocean features, the integration of other effective area-based measures next to MPAs, as well as the systematic integration of traditional and local knowledge (TLK), will be essential in the process of designating MPA networks.

Arctic MPAs should be located in areas that are expected to become refugia

A key aspect is how to identify the location of prospective MPAs within a network. It would be recommended to protect habitats that will act as refugia for Arctic biodiversity. The 18 Arctic large marine ecosystems (LMEs) reflect the marine ecosystem variability in the region, and should be used to draft plans for MPA networks to more effectively consider representativeness.

Additional stresses should be targeted

It is possible to lessen the total stress burden and increase the resilience of biodiversity to the impacts of climate change and ocean acidification by mitigating stresses from direct anthropogenic pressures through establishing MPA networks.

The scientific knowledge basis must be improved

There is a need for a dedicated group to compile relevant geophysical and biological data for the purpose of MPA network planning. There is a vast amount of data available but this information is highly scattered and needs to be collated, harmonized and made spatially explicit.

Identification of research priorities

Gaps in knowledge mainly concern the winter season, the vulnerability and resilience of the Arctic marine ecosystems and the need to support sustainable development. With respect to climate change much more is known about species higher up in the food web (seabirds, marine mammals, some fish) than about species lower in food web. The ecosystems of the Arctic Ocean, and especially the Central Arctic Ocean, face critical changes, which will be large and unprecedented, and that there is an urgent need for food-web studies and ecosystem modelling to inform the establishment of marine protection regimes in the Arctic.

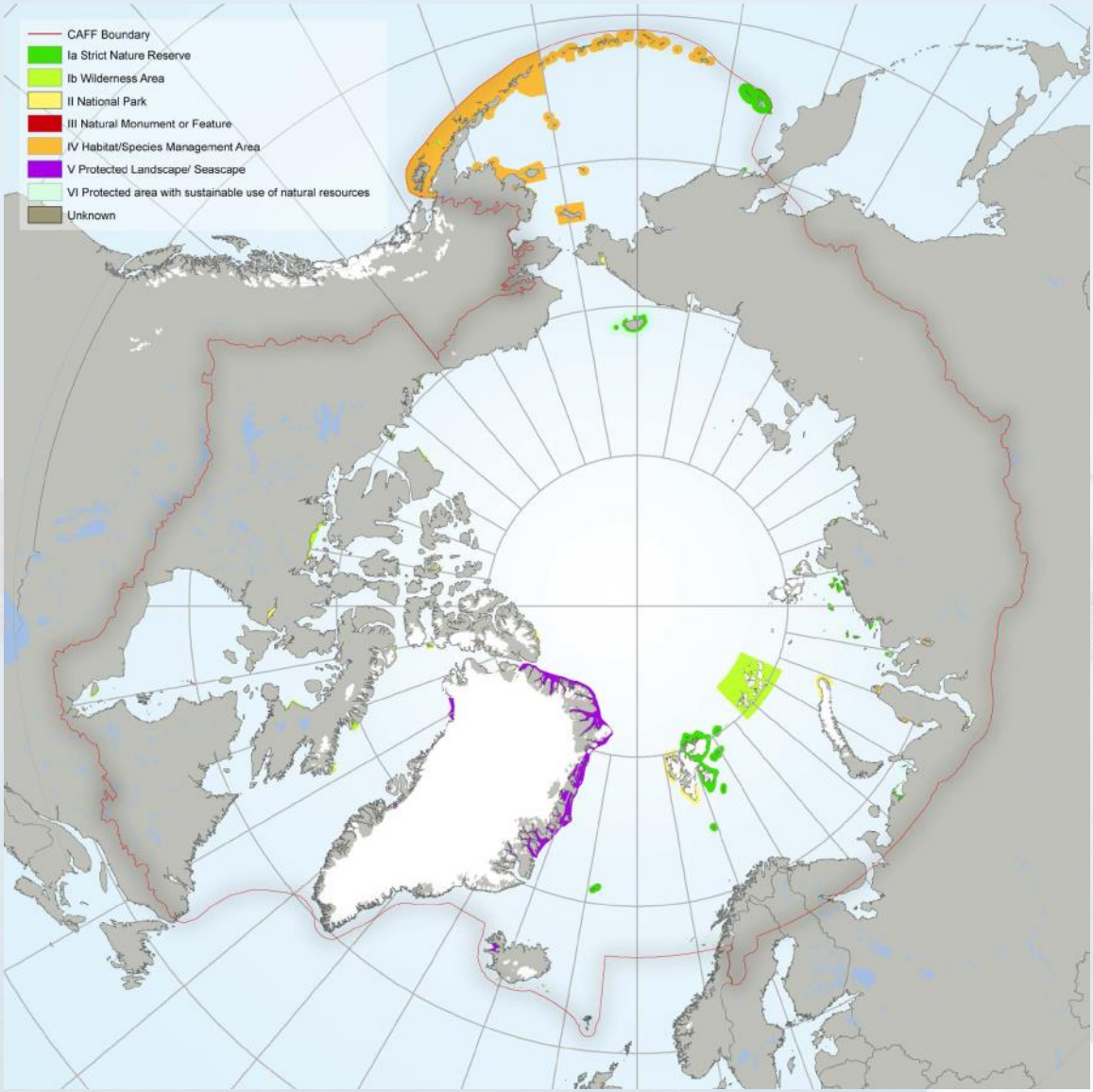


Fig. 2. Existing marine protected areas in the Arctic within the area considered the arctic region by the Arctic Council (indicated by the red line), except for Canada's newest MPA. The network of MPA's should be further developed to ensure e.g. ecological coherence. Image: © NaturalEarth, CAFF and PAME (2017)

This visualisation is based on the content of Scientific considerations of how Arctic Marine Protected Area (MPA) networks may reduce negative effects of climate change and ocean acidification, Report from the Third Expert Workshop on Marine Protected Area networks in the Arctic, organised by Sweden and Finland under the auspices of the PAME working group of the Arctic Council in Helsinki, Finland, 21-22 September 2017. The report was edited by Jessica Nilsson, Pauline Snoeijs-Leijonmalm, Jon Havenhand, and Per Nilsson.

The expert workshop was organized jointly by Sweden and Finland. The coordinating national authorities were the Swedish Agency for Marine and Water Management (Jessica Nilsson), the Finnish Environment Institute (Kirsi Kostamo and Leena Laamanen), the Finnish Ministry of the Environment (Kristiina Isokallio and Jan Ekebom), and Parks & Wildlife Finland (). The scientific content of the workshop was supported by Jon Havenhand, Per Nilsson (University of Gothenburg, Sweden), and Pauline Snoeijs-Leijonmalm (Stockholm University, Sweden).

Acknowledgements

The workshop received financial support from the Governments of Finland and Sweden and the Nordic Council of Ministers Arctic Cooperation Programme . The Swedish Embassy in Helsinki and the National Library of Finland kindly provided excellent hospitality during the workshop.

Website

http://pame.is/index.php/projects/marine-protected-areas

References

CAFF (2017) State of the Arctic Marine Biodiversity Report. Conservation of Arctic Flora and Fauna International Secretariat, Akureyri, Iceland. 198 pp.

CAFF and PAME (2017). Arctic Protected Areas: Indicator Report, 2017: Conservation of Arctic Flora and Fauna and Protection of the Arctic Marine Environment, Akureyri, Iceland. 11 pp.

Swedish Agency for Marine and Water Management (2017) Scientific considerations of how Arctic Marine Protected Area (MPA) networks may reduce negative effects of climate change and ocean acidification, Report 2017:38