

Memorandum 2/11/2018

AS10: From individual stressors to cumulative impacts: improving knowledge in the Arctic marine environment

This memo provides a summary of reports submitted on the session AS10 organized at the Arctic Biodiversity Session in Rovaniemi, Finland, October 9-12 organized by the US Bureau of Ocean Energy Management (BOEM).

Attendance: 40

Arctic Biodiversity Assessment recommendation themes most prominently addressed in the session:

- Climate change
- Addressing stressors
- Improving knowledge and public awareness
- Ecosystem-based Management

Key points raised in the session that were important to note:

- Identifying stressors comes at multiple scales but may be global importance, examples were provided from pollution, contaminants, industry, climate change, and invasive species.
- Finding relevant partners or information users is key to provide information of these stressors to a broad set of stakeholders.
- Maps are a good way to disseminate information.
- Industry often wants to share its environmental information.
- Plastics are affecting even small features in the ecosystem.
- Economics can have a role in invasive species if it's on a commercially viable species e.g. crab.
- Mercury: it is necessary to determine the species and populations most exposed to mercury pollution in the Arctic. Although Arctic seabirds are in general at low risk, some populations may be more exposed to it in further locations during the non-breeding season, whereas differences across species and populations exists. Current and forecasted hotspots for mercury pollution must be adequately identified.
- Arctic reefs: In Arctic reefs, Rhodoliths act as ecosystem engineers. These important but sensible ecosystems are at risk from climate change due to acidification, increased sediment runoff, glacier melting, and microplastics.
- Invasive crab species in the Barents Sea: Red King Crab and Snow Crab have important economic implications. Valuable invasions crossing borders create complex economic incentives that change not only with ecological conditions but with economic cooperation between nations, socio-economic investment incentives and prospects, and fisheries management.
- Environmental impacts of drill cuttings deposition on sea floor biodiversity in the Barents Sea: In the Barents Sea, drill cutting deposition seems not to have ecosystem-scale impacts. Monitoring is abundant due to regulatory requirements and has huge potential for contributing to pan-Arctic biodiversity initiatives.

- Building an ecological Atlas: the process underwent three phases: data gathering, data synthesis, and design. It used multiple data sets, including census, survey transects, telemetry, and expert advice, paying attention to the reliability of the metadata.

Recommendations/actions identified for how to deal with the issues raised in the session:

- simple ways to report complex information is key, maps, red yellow green indicators for decision makers.
- Incorporating indigenous or community knowledge is important early and often.
- Pan Arctic sampling and collaborations is important to support.
- Conducting benchmark reporting on pollutants, contamination and invasive species is important to have the background information prior to a tipping point occurs.
- **Mercury:**
 - Importance of a coordinated large-scale monitoring of the seabird community.
 - Increase knowledge of mercury exposure out of the breeding season.
 - Use the existing network to monitor temporal changes of mercury in Arctic seabirds and marine food webs at the pan-Arctic scale.
 - Arctic reefs: increase knowledge on stressors and distribution.
 - Environmental impacts of drill cuttings deposition on sea floor biodiversity in the Barents Sea: monitoring data from these activities has huge potential for contributing to pan-Arctic biodiversity initiatives.
 - Building an ecological Atlas: The next step will be to identify patterns, as well as assessing vulnerability from stressors such as commercial fishing, hunting, shipping, and pollutants.

Take home message from the session:

- Cumulative impacts are complex, they are based on individual stressors but how those are summarily addressed differ across regional national and global scales. Both top down and bottom up information exchange is important.
- Conferences such as the Arctic Biodiversity Congress make a huge difference for networking and sharing science and ways to better communicate science into policy.
- Knowledge on stressors and impacts across the Arctic has largely increased over the past decades. However, there are still noticeable knowledge gaps important for the management of natural resources, and there is a need to better integrate and increase the availability of monitoring data.