

Memorandum 2/11/2018

IAB7: Bowhead whale conservation and future research cooperation

This memo provides a summary of reports submitted on the session IAB7 organized at the Arctic Biodiversity Session in Rovaniemi, Finland, October 9-12 organized by WWF and the Ice Whale Foundation.

Attendance: 45

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

- Climate change
- Addressing stressors
- Ecosystem-based Management
- Identifying and safeguarding important areas

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

- The world population of Bowhead whales is estimated at more than 25,000 animals with a 'Least Concern' IUCN-status. There are four subpopulations: 1) Bering – Chukchi – Beaufort Seas: >16,000, 2) East Canada – West Greenland: >4,000, 3) Okhotsk Sea: 100 – 200, and 4) East Greenland – Spitsbergen/Svalbard – Barents Sea: 200 – 300. Indications are that reproduction is limited to within these subpopulations, rendering all of them endangered, in particular the three smallest subpopulations.
- All scientific presentations together provided a multidimensional perspective on the four subpopulations. Some presented Bowhead whale behaviour in relation to killer whales and to ice cover. Others looked at group composition, genetic diversity and individual markers. A common theme was to compare research methods, including among others fixed hydrophone arrays, GPS tracking, aerial observation, photo-ID and the collection of whale-DNA through biopsies and water samples. One shorter presentation was about the design and planned realization of a small research vessel 'MARVEL', dedicated to study Bowhead whale behaviour in the Fram Strait in the polar night.
- The most pressing obstacles for Bowhead whale research were identified to be 1) ship time including platforms for helicopters or a new generation of drones, and 2) manpower for analysis of acoustic recordings from hydrophones.
- The Norwegian Polar Institute's Northwest Atlantic population surveys in the Fram Strait (1980-2017) shows some recovery, probably numbering 100's of animals.
- Breeding and wintering grounds are in the Fram Strait, and the animals migrate South in the summer.
- Killer whales are an important predator on the NW Atlantic population
- The Dutch plan for a Arctic Drift Multidisciplinary Icewhale Research Expeditions will focus on specifying Spitsbergen's Icewhale populations, environmental drivers and human impact. Will make use of a special designed vessel.

- Frontiers Arctic Monitoring (FRAM) explore using passive acoustic monitoring. So far showing the Bowheads mainly use the Fram Strait from October while most of the other species are there in summertime.
- East Canadian - Western Greenland (ECWG) has plausible estimates of carrying capacity of 18000 animals, but hasn't shown exponential Growth: 1) carrying capacity has changed due to climate change, 2) Killer whale predation, and 3) severely altered ecosystem due to anthropogenic commercial harvesting and cannot return to the original system equilibrium.
- 2017 surveys in Northwest Waters of Greenland gives basis to estimate a population of 263 animals.
- Okotsk population lives in ice-free conditions during summer up to 250 days. Killer whale predation is serious in this area, mainly on calves but also animals up to 10 m length. Salmon farms are also a stressor.
- Environmental DNA (e-DNA) is being testing in the Disko Bay (Greenland). This Method may have a huge potential for future monitoring, but still needs a lot of testing

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

- As ship-time is the most expensive element of Bowhead whale research, the major challenge for scientists is access to ship-time and the associated budget. Silent vessels – that are scarce - and high-flying aircraft as well as state-of-the-art drones launched from the shore or far-away ships do far better in locating Bowhead whales than noisy ships. Passive Acoustic Monitoring (PAM) with fixed hydrophones is another proven method that has resulted in remarkable findings but requires a lot of manpower for data gathering and analysis.
- Three-dimensional PAM with fixed atomic-clock-hydrophones that can be triangulated to determine the position of Bowhead whales relative to each other is a promising new approach. PAM does not disturb whales, but luck is needed for them to come into range. It will take a few years before the first data of 3D PAM can be collected and analysed by hand or semi-automatically, so the results remain to be seen.
- Environmental (e)DNA could serve as a complementary methodology if whale presence has been very recent and if sampling takes place in its 'footprint'. Biopsy sampling from helicopters is a proven method to obtain DNA.
- Cooperation between researchers is currently organized in an informal but adequate way within a consortium of seven countries that has been active for many years. This cooperation is open for additional organizations that work on Bowhead whale research. It avoids unnecessary research duplication and competition for funding and allows for joint fundraising in different alliances.
- Apart from the no-regret option of taking water samples for eDNA analysis, the utility of MARVEL (the planned Modular Arctic Research Vessel) sparked a discussion on the incentives for Bowhead whale research, with arguments in favor of fundamental curiosity driven science on one hand, and of applied research on the other, the latter with a view, among others, on advising the oil industry for which eDNA identification and acoustic monitoring may become promising methods to detect animals in close proximity.
- While in principle the application of PAM from a silent drifting MARVEL would allow for large areas of the dynamic drift ice zone to be searched for Bowhead whales, doubts were raised whether MARVEL would be able to locate Bowhead whales more successfully than the already proven PAM with fixed hydrophones.

Take home message from the session:

- Former Commercial whaling led the Atlantic population close to extinction making it reasonable to use time and resources to survey the population to day, even it might be rather costly
- Comparative costing analysis between the MARVEL and PAM network options is needed. MARVEL may be too vulnerable to the environmental conditions, including polar bear attacks – let alone the social challenges of sailing in the dark winter with a small crew. While the technical feasibility of MARVEL to navigate and withstand ice- and weather in the Polar winter had been positively calculated according to ISO standards, certainly other, non-technical major challenges (e.g. psychological strain of a small crew) were probably be as big, or bigger.