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Monitoring Svalbard's environment and cultural heritage through citizen science by expedition cruises

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Why expedition cruise monitoring is important for Svalbard. The Arctic environment is changing fast, largely due to increasing temperatures and human activities. The continuous areas of wilderness and the cultural heritage sites in Svalbard need to be managed based on a solid understanding.

The natural environment of Svalbard is rich compared to other polar regions. Historical remains are plentiful. The Svalbard Environmental Protection Act aims at regulating hunting, fishing, industrial activities, mining, commerce and tourism. Expedition cruises regularly reach otherwise rarely visited places.

Steps taken to improve environmental monitoring. A workshop for enhancing the environmental monitoring efforts of expedition cruise ships was held in Longyearbyen in 2019, facilitated by the INTAROS project and the Association of Arctic Expedition Cruise Operators (<https://intaros.nersc.no/content/cruise-expedition-monitoring-workshop>) with representatives of cruise operators, citizen science programs, local government and scientists. They agreed on a pilot assessment of monitoring programs during 2019.

Results show the importance of cruise ship observations. The provisional findings of the pilot assessment suggest that expedition cruises go almost everywhere around Svalbard and gather significant and relevant data on the environment, contributing for example to an improved understanding of the status and distribution of wildlife. Observations are often documented with photographs. More than 150 persons contributed observations during 2019 to eBird and Happywhale. iNaturalist, not part of the pilot assessment, also received many contributions. The pilot assessment was unable to establish a useful citizen science program for testing monitoring of

cultural remains.

Conclusions relevant for monitoring and environmental management. Cruise ships collect environmental data that are valuable for the scientific community and for public decision-makers. The Governor of Svalbard is responsible for environmental management in Svalbard. Data on the environment and on cultural remains from expedition cruises can be useful for the Governor's office. Improved communication between citizen science programs and those responsible for environmental management decisions is likely to increase the quantity of relevant information that reaches public decision makers.

Recommendations for improving the use of cruise ship observations and monitoring.

- 1) All cruise expedition ships should be equipped with tablets containing the apps for the same small selection of citizen science programs so that they can easily upload records.
- 2) Evaluation of data that can be created and how such data can contribute to monitoring programs, to ensure that data is made readily available in a form that is useful for institutions responsible for planning and improving environmental management.
- 3) Clear lines of communication between citizen science program participants, citizen science program organizers, the scientific community and decision makers should be further developed.
- 4) Developing expedition cruise monitoring is of high priority in Svalbard, but is also highly relevant to other polar regions.
- 5) Further work is necessary to fully understand the feasibility and potential of coordinated expedition cruise operator based environmental observing in the Arctic.