Update: Managing the Effects of anthropogenic noise in the Antarctic – Steps towards the development of an underwater noise protection

concept for Antarctica

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**Information Paper submitted by Germany**

Introduction

One of the key pollutants created by human activities in the Antarctic is underwater noise, which is primarily caused by ship traffic, but also by research activities (e.g. seismic surveys) or logistic activities. Concern about potential impacts of anthropogenic noise in the Southern Ocean was first raised at the ATCM in 2000. However, the Committee for Environmental Protection (CEP) has not discussed impacts of underwater noise in Antarctic waters since 2007 (see ATCM XXIX WP 41, *SCAR Report on Marine Acoustics and the Southern Ocean* or ATCM XXX IP 80, *Taking Action on Marine Noise in the Southern Ocean*), though SCAR provided Updates on Anthropogenic Sound in the Southern Ocean in 2012 (ATCM XXXV IP21) and 2019 (ATCM XLII WP 68 and BP 03, also published as SCAR Bulletin 204 (2021).

The Protocol on Environmental Protection to the Antarctic Treaty (the Protocol) provides for comprehensive protection for native birds and mammals (Article 3 Annex II to the Protocol) and specifies that the impacts of activities must undergo a prior assessment according to Annex I of the Protocol (Article 8 para. 1 of the Protocol). New tools such as the Animal Audiogram Database can aid this assessment process (see also ATCM XLIII, BP 06). Nevertheless, gaps in knowledge on the effects of anthropogenic underwater noise on Antarctic marine mammals make the assessment of such activities difficult and it is still unresolved which noise exposure limits and noise mitigation measures need to be used for Antarctic marine mammals and birds in order to ensure the full level of protection pursuant to the Protocol. Further, there is no one standard on how to implement the Protocol by each of the Treaty Parties when evaluating activities in the Antarctic organised in their country or proceed from their territory, leading to different assessment methodologies of such activities.

The SCAR Antarctic and Southern Ocean Science Horizon Scan undertaken in 2014 identified "*How will organism and ecosystems respond to a changing soundscape in the Southern Ocean?*" as one of the 80 most pressing questions regarding the future of Antarctica. In its recent update on Anthropogenic Sound in the Southern Ocean (ATCM XLII BP 03 and SCAR Bulletin 204 (2021): ‘*Anthropogenic Noise in the Southern Ocean: an Update’*), as a first step of a qualitative assessment of the state of knowledge, SCAR polled a committee of experts on the current status of underwater noise. According to the SCAR-experts, the state of knowledge of potential impacts on cetaceans (and marine mammals in general) and the understanding of the sources and types of anthropogenic noise present in Antarctic marine waters is fair to good.

Germany reported in ATCM XLIII, IP 19 on a research project commissioned by the German Environment Agency (UBA) with funding from the Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection that will run from January 2020 to May 2023. This project was based on a 2018 workshop that aimed to determine the current state of knowledge on the effects of noise on marine mammals in Antarctica (results presented in ATCM XLII IP 31 and Erbe et al. 2019). The participating international experts on marine mammals highlighted a variety of research and management needs. The management need with the highest score was a refinement of noise exposure criteria for the Antarctic: the participating experts recommended that a series of focused international expert workshops should be held in order to develop a criteria matrix specifically for Antarctic marine mammal species and the main anthropogenic sound sources as the basis for an underwater noise protection concept for Antarctica.

Short Project Overview

The objective of the current project “Managing the Effects of anthropogenic noise in the Antarctic – Steps towards the development of an underwater noise protection concept for Antarctica” is to develop a criteria matrix that specifically addresses the 24 native Antarctic marine mammal species and the three main sources of anthropogenic underwater noise: seismic airguns, hydroacoustic research equipment and vessels.

To achieve this, a series of short studies and three workshops will be conducted, two of which will aim to identify maximum sound exposure values that will prevent 1) auditory injury and 2) harassment by anthropogenic sound. However, the large number of species and sound sources constitute a considerable challenge, as there are still several uncertainties involved that might not be solved in the short-term. The project will therefore approach this task using the process of Expert Elicitation (EE).

EE is a heuristic process typically used in situations with a scarcity of empirical data but a need for conservation or management decisions (Martin et al. 2012). It should build on and use the best available research and analysis. It should be undertaken only when the state of knowledge will remain insufficient to support timely informed assessment and decision making (Morgan 2014). The outcome of EE will be a probabilistic distribution that reasonably represents the opinion of an external observer, based on the estimate and the confidence of the estimate from all experts participating in the EE. It quantifies scientific uncertainty and minimizes inadvertent bias in the elicited information.

Short studies detailing the sound sources to be considered, the distribution of marine mammals in the Antarctic, current knowledge of auditory injury and behavioural response to noise will support the EE process.

The two 3-day EE workshops are running from 20th to 22nd April (auditory injury) and 3rd to 5th May 2022 (behavioural response) in Berlin, Germany. For each workshop, eight international experts are invited to participate. In two preceding webinars, participants were introduced to the expert elicitation process and the topics, and the relevant definitions, scenarios and questions were outlined and discussed. It was decided that in order to develop a criteria matrix, marine mammal species will be divided into groups of similar hearing abilities and sensitivities and considered in hearing groups similar to those proposed by Southall et al. (2019), and evaluated against the following sound sources: vessel, seismic airguns and hydroacoustic research equipment. Noise thresholds will then be elicited for:

1. auditory injury being defined as “significant damage to the physical integrity or health of an animal, which can be a temporary/reversable impairment”, and
2. harassment defined as “all actions and activities that either have an impact on individual fitness, a physiological impact or result in disruption to or interference with an organism’s behavioural pattern or life processes, or that have a negative impact on the psychological well-being of the animal”.

In a third workshop, an evaluation matrix for mitigation measures will be determined. The aim will be to make recommendations on which mitigation measures are most suitable for various Antarctic regions (e.g. coastal waters, offshore) and the marine mammal species inhabiting these regions. This workshop is in planning and will run shortly after the EE workshops, with around 15 invited experts. The final results of the workshops will be summarised in reports and presented in a closing conference in November/December 2022 in Berlin and at ATCM XLV.

The results of the project are also intended to inform the evaluation of activities within the framework of the German permitting procedures and for presentation at future ATCMs.

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