

SC-CCAMLR XXIII-BG...
October 20, 2004
Original: English
Agenda Items 9 (i) and (ii)

Noise Pollution in the Southern Ocean

The Antarctic and Southern Ocean Coalition

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ASOC Information Paper
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I. Introduction

Since ATCM XXVII there have been a number of important developments in the field of noise pollution. ASOC welcomes the initial efforts made by the SCAR Action Group on Noise Pollution and Acoustic Impacts to the Marine Environment, including both the presentation of an Information Paper to ATCM XXVII and SCAR's involvement in the International Policy Workshop on Sound and Marine Mammals held in London in September 2004.

We welcome discussions regarding the mitigation measures that are necessary to minimise the negative impacts of noise pollution impacts, as well as about the opportunity to establish a global baseline for noise pollution in the Antarctic. We will outline these in this paper, and offer an explanation of their importance to the development of suitable mitigation measures to protect cetaceans from the impacts of noise pollution in the Southern Ocean.

II. Baseline Research To Investigate Impacts Of Noise Pollution

The SCAR Action Group presented its 'SCAR Report on Marine Acoustic Technology and the Antarctic Environment' (IP 078) to ATCM XXVII. This report documented that the "low levels of anthropogenic noise in the Antarctic could offer the opportunity to establish a global baseline for noise pollution of marine systems." **Should this baseline research to investigate the potential impacts of noise pollution on cetacean be benign, ASOC believes this to be a vital area of future research. It will certainly help inform our long-term concerns about noise pollution. However, we do have some reservations about the nature of the proposed work. In particular, ASOC is aware of proposed cetacean research in the Antarctic region that includes invasive research, to tag large numbers of baleen whales.**

Precisely because there is less military, seismic and shipping activity in the Antarctic region than elsewhere, marine life in the Antarctic generally is exposed to lower levels of introduced noise pollution, and therefore lower levels of background noise. **If the SCAR work plan includes efforts to intentionally expose Antarctic cetaceans to intense sounds in order to compare their responses with those of animals from other regions that regularly experience noise pollution from intense levels of shipping and other sources of noise, ASOC would oppose those activities.** Dolman and Simmonds (2004) present a discussion of the welfare and management concerns associated with such studies, commonly known as "Controlled Exposure Experiments".

Given our lack of knowledge of the distribution and population structure of the many cetacean species that are found in the Southern Ocean, as well as the reality that several species remain highly endangered or threatened - remaining at tiny fractions of their original stock sizes - we have serious reservations about the use of studies that may negatively impact individuals and populations. **We believe that the**

introduction of a benign and coordinated research project would be the best way to pursue the aim stated in the SCAR paper. ASOC would welcome a dialogue about the nature of such a research program.

III. Mitigation Requirements in the Southern Ocean

At its 2004 meeting, the Scientific Committee of the International Whaling Commission (IWC) made a special review of the anthropogenic effects of noise on marine mammals. Several invited experts contributed to this review and its conclusions and recommendations were reviewed and endorsed by the full Scientific Committee (IWC, 2004).

Potential impacts resulting from chronic or acute exposure to loud noise were discussed, including those resulting from the increasing use of powerful sound sources such as seismic airgun arrays and military sonars, as well as increasing levels of ambient noise from shipping. The spatial and temporal scales over which impacts may occur can differ by several orders of magnitude. For example: low frequency (<1000 Hz) ambient noise levels have increased in the northern hemisphere by two orders of magnitude over the last 60 years, thereby reducing the potential for long-range communications in baleen whales. Attention was also drawn to the relationship between beaked whale strandings and military sonar since the introduction of that technology in the 1960s. The IWC Scientific Committee agreed that ‘there is now compelling evidence implicating military sonar as a direct impact on beaked whales in particular’.

The IWC Scientific Committee also agreed that the evidence of increased sounds from other sources, including ships and seismic sources, were ‘cause for serious concern’ and commented: ‘whilst noting that there is considerably more scientific work needed (...) measures to protect species and habitats cannot always wait for scientific certainty, as encoded in the precautionary principle. This is especially true for cases involving the exclusion of an endangered population from its habitat.’ In an example of disruption to feeding activities of western gray whales off North-Eastern Sakhalin Island, Russia, Ivashchenko *et al.* (2003) state that such activities had the result of limiting access to important feeding grounds for most whales. They noted that disruption of feeding in preferred areas could have major negative effects (both short-term and cumulative) on individual whales, their reproductive success and the population as a whole. The Antarctic marine environment can only be described as habitat that is critical to the survival of many cetacean species and therefore such impacts are unacceptable.

The SCAR Report on Marine Acoustic Technology and the Antarctic Environment (IP 078 to ATCM XXVII) made two important statements about mitigation measures for the Southern Ocean, which are reproduced in Annex A.

In addition to agreeing that noise impacts should remain a ‘standing priority item’ on the IWC agenda, the IWC Scientific Committee also endorsed a series of recommendations related to military sonar, seismic operations and anthropogenic noise impacts in general. These recommendations echo those made in the SCAR Acoustic Report, and they are reproduced in Annex B.

ASOC submits that coordinated efforts by CCAMLR and the Committee on Environmental Protection of the ATCM should be made to implement these

measures by the SCAR Action Group before ATCM XXVIII, with the aim of reporting back to the ATCM on progress made. We urge CCAMLR's Scientific Committee and Member States to endorse both sets of recommendations from the IWC and from SCAR, and to commit some CCAMLR-related resources to this joint effort.

IV. Beaked Whales

A number of stranding events have been linked to intense noise sources in recent decades (for example, Simmonds and Lopez-Jurado, 1991; Fernández *et al.* 2003; Martin *et al.* 2004; Freitas, 2004; Frantzis, 2004). A mass stranding event in the Bahamas during 2000 brought these concerns sharply into focus with the stranding and subsequent death of a number of animals of different species, during a military exercise involving several sources of active sonar (Balcomb and Claridge, 2001; Evans and England, 2001).

Since this event, significant efforts to begin to answer questions about the mechanisms that led to the stranding event, and ultimately, to the animals' deaths, have been made (see, for example, Evans and Miller, 2004; Evans *et al.* 2002). Most recently, the Beaked Whale Technical Workshop (report in preparation) that was held by the Marine Mammal Commission in the US during the past summer (2004) dealt with this issue by bringing together most of the world's leading experts on beaked whales. The goals of the Beaked Whale Technical Workshop were to: (1) assess current knowledge of recent stranding events involving beaked whales and their biology and ecology; (2) identify and characterize factors that may have caused those strandings; (3) identify data needed to investigate possible cause-and-effect relationships; and (4) recommend research, management, and mitigation strategies specific to beaked whales and acoustic impacts.

The Southern Ocean is an important area of critical habitat for up to 13 species of beaked whale (Van Waarebeek *et al.* 2004). These species are listed in Annex C. It is therefore vital to consider mitigation measures in terms of beaked whale protection.

The SCAR Report focuses its attention on auditory impacts. However, at the 3rd meeting of the US Advisory Committee on the Noise Impacts on Marine Mammals, a presentation was made that highlighted the probability that the beaked whales involved in the Bahamas stranding were exposed to levels that were lower than have been shown to cause "Temporary Threshold Shift" (TTS). This has serious consequences for the assumption that physical injury, and death, occur only at levels higher than TTS. On the one hand, TTS has largely been promoted as a threshold from which a full recovery could be made. On the other hand, deaths may be occurring before the received level proposed to induce TTS is reached, at least in some cases. **The full implications of this possibility for beaked whale protection from intense noise pollution are not yet clear, but it can be concluded that current mitigation measures are almost certainly insufficient to protect beaked whales in all circumstances.**

Following a report by Jepson *et al.* (2003) on potentially noise-induced lesions similar to those produced by "decompression sickness" (DCS) in a sample of cetaceans from around the UK, Fernández *et al.* (2004) noted that should a cetacean suffer sub-lethal bubble formation, it might continue diving for days, weeks or months afterwards,

unless death or stranding intervened. It was also noted that, while the symptoms seen in the pathology studies in the UK appeared atypical of DCS in humans and some experimental animals, the behavior, anatomy and physiology of cetaceans are significantly different and this might affect the nature of the lesions induced.

Although the relationship between possible behavioural responses and the onset of physical damage cannot currently be determined, the lack of an obvious or measurable response does not necessarily mean that there is no physiological impact. Further, interpretation of behavioural or physiological changes looks likely to remain fraught for sometime, given the current general lack of knowledge about normal behaviour and physiology of the range of cetacean species likely to be exposed to loud noise in the marine environment.

V. National Legislation

Many countries are currently actively involved in marine science activities in the Antarctic. Some of these countries apply national environmental legislation that already include measures to mitigate the potential impacts of noise pollution. For example, Australian legislation - *Environment Protection and Biodiversity Conservation Act, 1999* – required the Southern Ocean Profiling Project to obtain a cetacean permit for seismic activities . However, many other nations operating in the Southern Ocean are still not required to apply such mitigation measures.

ASOC recommends that both CCAMLR and the Committee on Environmental Protection to the Antarctic Treaty Consultative meeting request all countries operating in the region to report on what rules and mitigation strategies they are using in terms of limiting impacts of noise pollution on the marine environment, and to compile a joint report for both bodies.

In this connection, ASOC submits that a reasonable next step for the SCAR Action Group would be to focus its efforts on introducing standardised mitigation measures for all activities involving intense noise pollution in the Southern Ocean.

VI. Conclusion

Given the synergy of the recommendations put forward by SCAR and the Scientific Committee of the IWC, ASOC recommends that efforts made by SCAR to date continue to be pursued, and that noise pollution continues to be featured on the agendas of both CCAMLR and ATCM meetings. Also, a joint Working Group of some sort should be established, drawing on the expertise of the two bodies, which can work with SCAR and other interested Observers and Experts.

The SCAR report documented the opportunity to establish a global baseline for noise pollution of marine systems in the Antarctic. ASOC strongly supports a benign and coordinated research project as the best way to pursue this aim. The research aims and protocols of such work should be considered on a coordinated basis within the Antarctic Treaty System, and its evolving work should be reported on to the IWC on a regular basis. **The SCAR Action Group should work to produce standardised mitigation methods for all countries involved in activities producing intense levels of noise pollution in the Southern Ocean. These should be produced with**

involvement of those interested in such activities and with the full and transparent consultation and participation of all observers, experts and others who participate in the Treaty System's meetings.

VII. References

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Annex A

Excerpt from SCAR Report on Marine Acoustic Technology and the Antarctic Environment IP 078 to ATCM XXVII

MITIGATION MEASURES

14. Although the meeting concluded that the risks from scientific instruments were generally low, uncertainties were such that mitigation measures similar to those suggested in the first SCAR report should be used for individual surveys using higher risk equipment such as large airgun arrays. These measures should be modified to take into account developments in methods of monitoring the presence of marine mammals and increased knowledge of the distribution of animals in the Antarctic.
15. To mitigate against unknown, long term, cumulative effects, the conclusion of the first workshop that higher risk surveys should not revisit areas in consecutive seasons was also supported.

Annex B

Recommendations from the 2004 meeting of the Scientific Committee of the International Whaling Commission

A. Recommendation relating to Military Sonars

1. a full review of typical and atypical strandings, including beaked whales and other species that strand at the same time. (It was noted that a ‘mass stranding is an event where two or more animals but not a female-calf pair strand simultaneously in the same location. When whales mass strand at the same time but not in the same location, these strandings are considered atypical. In the case of Cuvier’s beaked whales no typical or atypical mass strandings are recorded before the introduction of mid-frequency sonars in the early 1960s.)
2. a full analysis of stranding data relative to military activities;
3. thorough, standardised *post mortems* of entire animals at mass strandings;
4. standardised responses and protocols for documenting and understanding mass stranding events;
5. an investigation of the correlation of natural sounds (e.g. earthquakes, typhoons) with the mass strandings of beaked whales;
6. surveys for Cuvier’s beaked whales off the Pacific coast of Japan where these whales were hunted and have mass stranded.

B. Recommendations relating to Mitigation and Monitoring of Seismic Operations

1. effort be expended on the global identification and monitoring of critical habitats for cetaceans. (For example, important areas for breeding, calving and feeding.)
2. access be given to information on timing, distribution, extent (nautical miles or kilometres for 2D surveys, or square nautical miles or square kilometres for 3D surveys), sound source and sound source characteristics for past and planned seismic surveys carried out within the range of critical habitats or potential critical habitats;
3. descriptions and results of any marine mammal observer programmes or other faunal observation programs carried out in conjunction with previous seismic surveys are provided;
4. the continuous acoustic monitoring of critical habitats on sufficient temporal and spatial scales in relation to pre- and post-seismic activity;
5. the independent monitoring of critical habitats (from survey vessel and independent platforms) to evaluate displacement from critical habitat and/or disruption of important cetacean behaviours in the critical habitat;
6. increased effort to monitor strandings that occur at times and in places where seismic is conducted;
7. that seismic operators seek to mitigate their potential impacts (e.g. to reduce the power of their sources).

In addition, the Scientific Committee ‘strongly recommended’:

1. the current protection afforded to the Abrolhos Bank, Brazil, should be made permanent, due to its vital importance as a breeding ground for humpback whales in the western South Atlantic Ocean (changes in humpback distribution and an increase in strandings were correlated with seismic testing in this important breeding area in 2002);
2. all seismic surveys in areas that could have significant adverse demographic consequences for large whales should be planned so as to be out of phase with the presence of whales;
3. in cases when seismic survey do occur in a critical habitat (e.g. western gray whale feeding area off Sakhalin Island), additional guidelines for seismic surveys and independent scientific monitoring should be developed, and a strict monitoring and

- mitigation programme should be implemented – this should include independent and highly experienced shipboard marine observers and a monitoring system and platform that are independent of the seismic source vessel and the seismic support vessels;
4. in situations when displacement of whales could have significant demographic consequences, seismic surveys should be stopped.

C. General Recommendations Relating to Anthropogenic Noise

1. The convening of a workshop on the impacts of seismic exploration (including both industrial and academic activities) at its 2006 meeting;
2. the integration and coordination of international research projects to study and describe acoustic ecologies;
3. the establishment of a working group to derive a series of hypotheses to test for synergistic impacts on cetaceans;
4. the inclusion of anthropogenic noise assessments and noise exposure standards within the framework of national and international ocean conservation plans (e.g. consideration during designation of critical habitats, marine protected areas and ocean zoning);
5. support for multinational programmes to monitor ocean noise (e.g. IOOS the Integrated Ocean Observing System) and the development of basin-scale, regional and local-scale underwater noise budgets.

IWC 2004. Report of the Scientific Committee IWC/56/Rep 1: 43-45.

Annex C

Hyperoodon planifrons

Berardius arnuxii

Ziphius cavirostris

Tasmacetus shepherdi

Mesoplodon layardii

Mesoplodon traversii

Mesoplodon grayi

Mesoplodon bowdoini

Mesoplodon hectori

Mesoplodon peruvianus

Mesoplodon densirostris

Mesoplodon mirus

Mesoplodon ginkgodens