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Taking Action on Marine Noise in the Southern Ocean

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Information Paper Submitted by ASOC¹ to ATCM XXX (CEP Agenda Item 8c)

1. Introduction

ASOC welcomes the ongoing engagement on noise pollution within the CEP. We look forward to the results of COMNAP's work on the further investigation of possible effects of noise on marine mammals, as stated in the Report of CEP IX. ASOC also welcomes IAATO's initiative from CEP IX to provide detailed information on its members' vessels' routes and equipment and to contribute this information to the discussions. We look forward to the presentation of this valuable information.

Based on the evidence outlined below, and that submitted in previous papers on marine noise pollution by ASOC, SCAR, Spain and others, ASOC makes the following recommendations to CEP X:

- There should be a requirement to assess potentially significant marine acoustic impacts in any IEE and CEE relating to marine activities.
- Appropriate seismic guidelines to mitigate harm should be required for all vessels in the Antarctic that are conducting active seismic research.
- Reports on utilization of such measures and guidelines should be reported back to the CEP.
- The CEP and SCAR should establish a small working group of people with relevant expertise on acoustic impacts from various countries and disciplines, to share information, advance sound impact research, and develop appropriate tools for mitigating harm from intense sound emissions in the Antarctic.

2. Imminent Conferences on Marine Noise Pollution

As the issue of noise pollution continues to gain momentum, a series of international conferences and workshops are planned in coming months. Of particular relevance to the Antarctic community is the NOAA shipping symposium on "Potential Application of Quieting Technology on Large Commercial Vessels" currently underway (1-2 May 2007) at the National Oceanic and Atmospheric Administration (NOAA) in Silver Spring, Maryland (<http://www.nmfs.noaa.gov/pr/acoustics/>). In August 2007, the international conference on "Effects of Noise on Aquatic Life" takes place in Nyborg, Denmark (<http://www.NoiseEffects.umd.edu>).

3. Recent IWC and ACCOBAMS Developments

Several important meetings have occurred since last year's ATCM. ASOC looks forward to presentation by the German Government on results from the International Workshop "Impacts of seismic survey activities on whales and other marine biota" that took place in Dessau in September 2006. In addition, substantial discussions on this issue were held at the Scientific Committee meeting of the International Whaling Commission (IWC) in St. Kitts, West Indies in May 2006 at its pre-meeting on "Seismic Surveys and their potential Impacts to Cetaceans". The report of the IWC Seismic Workshop and the Scientific Committee is to be presented at this year's ATCM meeting.

¹ ASOC thanks Sarah Dolman for initiating this paper.

ASOC would like to draw attention to the set of overarching recommendations from that Workshop for member governments permitting seismic surveys:

- Implement seismic survey monitoring programs – i.e. set up onboard observation programmes for research or other vessels operating seismic equipment.
- Develop and/or evaluate nationally relevant mitigation procedures. Where onboard observation programmes exist, these should be evaluated and where onboard observation programmes do not exist, they should be implemented.
- Identify and facilitate research, monitoring, and mitigation procedures that address the recommendations detailed in the report.

The IWC Seismic Workshop report states:

In light of the uncertainty over the potential impacts of seismic surveys, and the fact that seismic surveys may be repeated throughout the life of an oil field, the IWC specialist group recommended the earliest possible establishment of long-term monitoring programs for vulnerable species in areas of concern.² The design of such long-term monitoring should take into account the likely size of any effect and the probability of detecting it within a reasonable time span.

The workshop explicitly included discussions of seismic surveying for research purposes as well as for oil and gas exploration. The areas of concern that were identified are clearly applicable in the Southern Ocean.

Acoustic guidelines were developed and endorsed by the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS) Scientific Committee at its 4th meeting in Monaco in November 2006 (SC4/Doc 18). Recommendation SC4.3 of the SC report, regarding Anthropogenic Noise, further encouraged the development of quieter and environmentally safer acoustic technologies and the use of best available control technologies and other mitigation measures in order to reduce the impacts of man-made noise sources in the Agreement area.

4. Recent Scientific Developments

4.1 Seismic Surveys

There have been a number of recent studies of significance to the issue of marine noise pollution in the Southern Ocean. Goold and Coates (2006) demonstrated that the output of air-guns cover the entire frequency range known to be used by cetaceans and pinnipeds, and do so at substantial energy levels. This study supports that by Madsen *et al.* (2006), previously reported by ASOC, where arrival of airgun pulses at sperm whales, *Physeter macrocephalus*, contained much energy between 0.3 and 3 kHz, a frequency range well beyond the normal frequencies of interest in seismic exploration.

DeRuiter *et al.* (2007) illustrated that in many cases airgun received levels will not decrease monotonically with increasing range, so that a simple spherical or cylindrical spreading law will not accurately predict the observed pattern of received levels. Thus, sound levels at 12 km distance from the seismic array may equal those at only 2 km distance. Regulations defining allowable ranges (stand-off distances) between airgun array sound sources and marine species must take into account the potentially complicated relationship between source-receiver range and depth, acoustic frequency, and received sound level (DeRuiter *et al.*, 2007).

Also, there was no evidence of horizontal avoidance of seismic airguns in the Gulf of Mexico sperm whales, perhaps because of the more complex transmission loss (vertical avoidance may be more effective at avoiding high sound levels), which casts into doubt the utility of stand-off distances or ramp-ups. A 19%

² Areas of concern: restricted migratory routes, feeding grounds, breeding/nursing grounds, resting areas, refuges, designated protected areas as appropriate. Areas of concern will vary from species to species as well as in spatial scales.

reduction in creek rate (a proxy for foraging success) with seismic and decrease in fluking effort were also reported (Miller et al. 2006) in a submission to the 2006 IWC Scientific Committee.

Examination of effects of large airgun arrays (79-110 l) on a variety of marine mammal species in the waters of British Columbia and Washington identified behavioural changes at long distances (> 70 km). Scheduling surveys around seasonal distribution of species of concern, limiting periods of exposure (by limiting the duration of the survey), and routing airguns to ensure that marine mammals are not driven ashore may be as important as monitoring safety zones in preventing injuries and death (Bain and Williams, 2006). That two Phocoenidae species (harbor porpoise, *Phocoena phocoena*, and Dall's porpoise, *Phocoenoides dalli*) with similar audiograms showed drastically different responses is of interest. This calls into question the utility of looking strictly at hearing sensitivities to gauge noise impacts.

Clark and Gagnon (2006) provided evidence of the spatial and temporal scales of seismic survey activities in the North Atlantic. Large portions of a fin whale, *Balaenoptera physalus*, population were exposed for considerable periods of time at received levels that could collectively be considered chronic. Fin whales would stop singing when a seismic survey was operating and did not resume singing within hours to days after the survey stopped. The biological significance of such a response (e.g. 250 male fin whales collectively not singing for three weeks during the fall, or collectively leaving an upwelling area of high food resource value) is not known. If one assumes that such intrusions of anthropogenic sounds into an animal's acoustic ecology are stressful, then these observations should be further considered within the context of synergistic effects from multiple stressors (Clark and Gagnon, 2006).

Parente *et al.* (2007) reported a potential link between the reductions in diversity of cetaceans off the coast of Brazil in response to an intensification of seismic surveys, and also called for further studies to be undertaken in the continental shelf region of Brazil for further investigation.

Of particular interest perhaps is the multi-disciplinary research programme, BATHOLITHS.³ The geological mapping of the inland waters of the Coast Mountains of British Columbia was scheduled to take place from the new US research vessel, the *R/V Langseth*. A number of monitoring and mitigation measures for the protection of marine mammals have been proposed for use, including the use of geographic exclusions, dedicated observers, passive acoustic monitoring, and ramp-up and shut-downs for endangered and threatened species (LGL, 2006). As of late March 2007, it appears that the survey may be cancelled due to concerns from the Canadian Department of Fisheries and Oceans, but ASOC hopes that the proposed mitigation measures will become minimum standards on-board Southern Ocean geophysical surveys in future.

4.2 Shipping Noise

A novel incident with a single Cuvier's beaked whale, *Ziphius cavirostris*, in the Ligurian Sea provided information of changing dive and foraging behaviour in response to localised shipping noise (Aguilar Soto *et al.*, 2006). This study, while based on a single animal, recognised that large ships have high-frequency components that are capable of impacting a wider range of cetacean species than baleen whales alone, which tend to be low-frequency specialists. Given the increasing number of vessels in the Southern Ocean, for purposes including scientific research, logistics, tourism, fisheries and whaling activities, this is an area of research that warrants further investigation.

4.3 Marine Protected Areas

As outlined in our separate paper on Marine Protected Areas (MPAs), ASOC welcomes the steady progress being made by the ATCM and CCAMLR towards creation of MPAs within the Southern Ocean. One tool that this paper would like to highlight is creation of ecosystem-based MPAs designed to address highly mobile species. This approach would provide one of the most effective ways to protect cetaceans and their habitat from the cumulative and synergistic impacts of anthropogenic noise and other stressors (Weilgart, 2006). Environments that support highly mobile species or are especially vulnerable to damage should

³ www.eos.ubc.ca/batholiths - accessed on 11th March 2007.

warrant larger MPAs (Roberts *et al.*, 2006). Management schemes should ideally encompass whole ocean basins and global networks of MPAs must be well designed to ensure ecological connectivity between individual MPAs (Weilgart, 2006).

5. ASOC Recommendations to the ATCM

ASOC is unaware of any concrete developments regarding acoustic pollution within the Antarctic community since the last ATCM. Therefore, ASOC makes the following recommendations to CEP X and the ATCM:

- Require that assessment of potentially significant marine acoustic emissions must be considered a significant factor in any IEE and CEE relating to marine activities. Emissions should also be taken into account in the identification and creation of MPAs within the Southern Ocean.
- Noting that the CEP's recent exercise to develop a 5-year plan did not elevate noise issues to the highest level but did include it on the list, ASOC submits that those Parties with expertise on the subject should set up a small working group of the CEP on acoustic impacts, ideally joined with SCAR's acoustic expert group. Such a group could share information, advance acoustic impact research, and develop appropriate tools for mitigating harm from acoustic impacts in the Antarctic.
- Developing appropriate seismic guidelines to mitigate potential harm should be a priority in terms of doing something concrete. In ASOC's view, adherence to such guidelines should be required for all vessels in the Antarctic that are conducting scientific research involving intense sound emissions.
- The CEP should request regular reports on utilization of such measures and guidelines.

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