

MARINE ACOUSTIC TECHNOLOGY AND THE ENVIRONMENT

Introduction

1. At XXIII ATCM there was some discussion about the potential impacts of marine acoustic equipment on marine animals, and to what extent there were mitigation strategies available to reduce these effects. Some Parties expressed an interest in knowing what the level of current scientific knowledge was in this field to guide them in permitting procedures.
2. At XXVI SCAR in Tokyo it was decided to convene an international workshop to assess the extent of knowledge on acoustic impacts. The meeting was convened in Cambridge and the final draft of the report is out for review at present. The current draft is provided to delegates as an Information Paper.
3. A further meeting on this topic has since been held in Berlin but the report of this is not yet available.
4. At Tokyo it was recognized that various nations were treating the assessment of the environmental impact of marine acoustic equipment in research programmes. Some national approval agencies regarded the impacts as minor or transitory but others demanded full assessments of all acoustic equipment, not just the higher powered systems such as seismic airgun arrays.
5. The group charged with preparing the report was constituted from the Working Groups on Geosciences and Biology. The group sought out people with expertise in the acoustic response of wildlife, knowledge of the distribution of Antarctic wildlife and knowledge of the various survey equipment. They also sought people with recognized expertise in the field to review the draft report. This report cannot hope to cover comprehensively a large field that is the subject of active, multidisciplinary research. Rather, it seeks to review the literature, provide pointers to the major works that cover topics in greater detail and provide guidance as to how the available knowledge applies to Antarctica.

Conclusions from the workshop

6. Equipment using sound waves to investigate the sea bed and the water column are essential to the understanding of the Antarctic marine environment. At the same time, there is active research into the effects of such technology on marine animals, particularly cetaceans. The potential risks posed by equipment are a combination of source level, frequency and local effects that define the likelihood of interacting with animals. Many acoustic instruments are of such low power and high frequency as to pose a minor risk to the environment. The equipment with the highest risk potential are airgun arrays and low frequency, high power transducers with wide beam angles.

7. Cetaceans have been observed avoiding powerful, low frequency sound sources. There is one documented case of injury to whales from multiple, mid-frequency (2.6–8.2 kHz) military echo-sounders. However, the level of acoustic noise in this instance was exceptionally high and there was no evidence of damage to hearing, simply that avoidance of the noise had caused the whale to beach. At the same time, some whale populations co-exist with commercial seismic exploration surveys. In the case of other animals, there is some evidence for short-term displacement of some seals and fish by seismic surveys but there is little literature available.
8. The working group felt that the evidence available did not justify a ban on seismic surveys or scientific echo-sounders in Antarctic waters. However, surveys should be examined on a case by case basis and mitigation strategies should be used to reduce the risk to Antarctic wildlife from high power, low frequency sources.
9. Acoustic releases and similar low power, occasional sources were not considered any threat to wildlife.
10. Mitigation strategies should be investigated to evaluate their effectiveness and there should be a regular review of mitigation strategies and the progress of research in the field to ensure that new research findings will be available to the Antarctic community. Those available at present include:
 - a. Use of the minimum source level to achieve the intended scientific result;
 - b. Use of “soft starts” whereby power is increased gradually over periods of 20 minutes or more;
 - c. Care should be taken with line lay-outs to avoid restricting animals’ ability to avoid the source;
 - d. Equipment should be shut down if cetaceans are observed within a potentially harmful distance of the vessel defined by the source power, directionality and propagation characteristics;
 - e. Surveys should be planned to minimize repeated surveying of areas in consecutive years with high risk equipment; and
 - f. Care should be exercised to minimize impacts in known biologically sensitive areas and times.
11. Research into the hearing and reaction to noise of Antarctic animals and into sound propagation conditions around Antarctica should be encouraged.
12. Records of the locations, timing, duration, frequency, and nature of hydroacoustic and other activities should be maintained to permit retrospective assessment of the likely causes of any future observed changes in the distributions, abundance, or productivity of the potentially affected species and populations.
13. Further research is needed to assess how well measures work and to monitor better the proximity of wildlife to a vessel. The Antarctic community and permitting agencies will need to monitor research progress to ensure practices are up-to-date.