CONTENTS

Anthony Hawkins, Arthur N. Popper and Magnus Wahlberg 1
Introduction: International Conference on the Effects of Noise on Aquatic Life

PART 1: General and Introductory

Anthony Hawkins 7
Effects of Noise on Aquatic Life: the Key Issues

Donald Henderson 10
Creation of Noise Standards for Man: 50 Years of Research

W. John Richardson 13
Effects of Noise on Aquatic Life: Much Known, Much Unknown

PART 2: Ambient Noise

Olaf Boebel, Holger Klinck, Lars Kindermann and Saad El Din El Naggar 19
PALAOA: Broadband Recordings of the Antarctic Coastal Soundscape

Douglas H. Cato 21
Ambient Noise and Its Significance to Aquatic Life

Antonio Codarin, Maurizio Spoto and Marta Picciulin 24
One-Year Characterization of Sea Ambient Noise in a Coastal Marine Protected Area: a Management Tool for Inshore Marine Protected Areas

Craig A. Radford, Andrew G. Jeffs, Chris T. Tindle and John C. Montgomery 26
Ambient Noise in Shallow Temperate Waters around Northeastern New Zealand
from electronics experts on the choice and calibration of transducers for monitoring natural, biological, and anthropogenic sound sources, from physical acousticians to process signal/information provided by the ESONET NoE, from marine biologists to identify species sound-related behaviour and seasonality and large-scale data, from psychoacousticians to assess species-related hearing sensitivities, and from statisticians for the initial design, data analysis, and presentation.

ACKNOWLEDGMENTS

This work is supported by EC FP6 in the specific research and technological development programme Global Change and Ecosystems (Contract 036851 Project ESONET).

RISK ASSESSMENT OF SCIENTIFIC SONARS

ELKE BURKHARDT, OLAF BOEBEL, HORST BORNEMANN, AND CHRISTOPH RUHOLL

Alfred Wegener Institute for Polar and Marine Research, P.O. Box 120161, 27515 Bremerhaven, Germany. Elke.Burkhardt@awi.de

INTRODUCTION

Scientific sonars are an important asset for conducting oceanographic, geophysical, and biological research and are hence installed on many research vessels. Multibeam deep-sea echosounders map the sea-floor topography at high resolution, whereas sediment echosounders serve to explore the upper sediment layer stratification. Scientific fish finders map the fish and krill distribution over large areas. To achieve a high spatial resolution and full ocean depth coverage, scientific sonars emit high-intensity, mid- to high-frequency pings of high downward directivity and short duration. This study analyses the respective sound fields and discusses the potential risks of these echosounders’ usage with special emphasis on true Antarctic cetaceans.

METHODS

The study uses the scientific sonars’ source levels, pulse lengths, and beam patterns to determine the respective acoustic fields. Based on this information, injury criteria (http://www.mmc.gov/sound/plenary2/pdf/gentryetal.pdf), the latest information on beaked whale strandings
(Cox et al. 2006), and a proposed definition of biologically significant effects (http://www.mmc.gov/sound/plenary4/pdf/wartzok.pdf), this study discusses three possible impact scenarios: risk of injury due to immediate acoustic effects, risk of injury due to behavioural response, and risk of biologically significant effects due to impacts on the habitat.

RESULTS

The study quantifies that for a steaming ship, the risk of injury due to (multiple) ensonifications with pings from scientific sonars is estimated to be less than 2% of the risk of a collision between ship and whale. For both, steaming ships and ships on station, the risk of injury caused by behavioural responses appears unlikely due to the scientific sonars’ characteristics and the physiological and behavioural characteristics of true Antarctic species. Risk of biologically significant effects due to impacts on the habitat appear unlikely due to the relatively short exposure periods.

DISCUSSION

Because of the significant lack of knowledge on marine mammal audition and behaviour, assumptions unavoidably had to be made. Following the precautionary principle, these were chosen conservatively.

Figure 1. Silhouette of R/V Polarstern and water volume ensonified by multibeam echosounder within which injury criteria are exceeded if the whale is exposed to 5 or more pings. Axis labels in metres.
throughout. Even under these stringent requirements, the risks resulting from the usage of scientific sonars appear significantly smaller than the risk of collision. Only for ships on station does the risk of acoustic injury become a matter of concern. To mitigate possible negative effects, the Alfred Wegener Institute minimizes acoustic emissions by reducing the source levels of sonars onboard the R/V Polarstern to the extent scientifically feasible and shuts off its sonars when whales are observed within a critical radius during times when the ship is on station.

ACKNOWLEDGMENTS

This study benefited from many discussions, with and support by our AWI colleagues M. Breitzke, S. El Naggar, L. Kindermann, H. Klinck, J. Plötz, and H.-W. Schenke as well as Atlas Electronics and B. Werner (WTD 71).

REFERENCES


CANADA’S APPROACH TO MITIGATION OF SEISMIC SOUND IN THE MARINE ENVIRONMENT

BRUCE CAMERON1, CAMILLE MAGEAU2, AND RON SMYTH3

1Department of Energy, 5151 George Street, Suite 400, Halifax, Nova Scotia B3J 3P7, cameronb@gov.ns.ca
2Oceans Policy and Planning, Planification et Politiques des Oceans, 200 Kent St., Ottawa, Ontario K1A 0E6, Canada. mageauc@dfo-mpo.gc.ca
3Offshore Oil and Gas Branch, Ministry of Energy, Mines and Petroleum Resources, 250-1675 Douglas St., Victoria, British Columbia V8W 9N2, Canada. Ron.Smyth@gov.bc.ca

Seismic surveys in Canada are conducted in the Atlantic, Pacific, and Arctic Oceans in waters with very diverse biological, oceanographic, and geomorphic characteristics. They are subject to review and