Arctic Regional Hydrographic Commission (ARHC) Extraordinary Session Monaco, April 26, 2017

Interim report of the OTWG

Submitted by:

United States of America

Executive Summary:

This summary provides an update of information related to topics of

possible interest to the ARHC from the Operations and Technology Working Group. The OTWG invites

guidance at the intersessional session of the ARHC in anticipation of preparations for ARHC-7 meeting.

Related Documents:

See text of report

Related Projects:

See text of report

Introduction/Background

The OTWG Terms of Reference notes the following objectives of the Working Group:

1. To provide a core of expertise on hydrographic operations in the Arctic
2. To develop and maintain documented best practices, lessons learned, and advances in training and technology.

ARHC-6 identified a total of 28 action items of which the following three are directed specifically to the OTWG:

|  |  |  |  |
| --- | --- | --- | --- |
| Action Nr. | Actions | Responsible | Deadline/Status |
| ARHC6-12 | OTWG to provide ARHC7 with a discussion paper on autonomous vehicles vis-à-vis Arctic applications. | c/OTWG | ARHC7 |
| ARHC6-13 | OTWG Chair to validate OTWG membership list and update, as necessary. | c/OTWG | 2017-04-01 |
| ARHC6-14 | OTWG Chair (US) to review ARHC tasking list and other suggestions to determine priorities to update/finalize the OTWG work plan. | c/OTWG | 2017-04-01 |

Activities and Informational Update

1. *Arctic Council Protection Arctic Marine Environment PAME-I (2017)*

PAME has created *an Arctic Shipping Best Practices Information Forum* (“Forum”) to support implementation of IMO’s Polar Code. The Forum, composed of representatives of Arctic States, Arctic Council Permanent Participants and Observers, relevant intergovernmental organizations (e.g., ARHC) and other bodies (e.g., the International Chamber of Shipping) will create a web portal of links to

information that supports safe and environmentally sound Arctic navigation. The IMO Polar Code table of contents is provided in Annex A.[1](#_bookmark0)

PAME invites a representative of the ARHC to attend the First meeting of the Forum taking place June 5- 6 in London at Lloyd's Register.

Discussion Point: Does the ARHC wish to offer any support in this effort, in part or in light of previous efforts in developing the Arctic Voyage Planning Guide(s) and other efforts? Are there steps the ARHC wishes to take to reach out to the PAME Secretariat to offer any assistance in this regard?

Reference Documents:

* + PAME I 2017 Report and Record of Decision[2](#_bookmark1)
	+ ARHC4-3.3 “Harmonization of Arctic Voyage Planning Guides for Pan Arctic Coverage”
	+ ARHC5-C3 “Status Report on AVPG Project and Proposal for an ARHC AVPG Portal”
	+ Forum's Terms of Reference[3](#_bookmark2)
	+ Forum’s draft agenda and logistical information[4](#_bookmark3)
1. *Chart Adequacy Assessment*

The OTWG remains interested to support completion of the coverage of the ARHC Chart Adequacy Assessment and is exploring options to acquire necessary shape files to complete the assessment per ARHC. The Chair hopes to provide an updated product for review at ARHC-7.

The U.S. invites Denmark to provide shape files to include additional areas of Greenland of interest beyond the bounds of Region N to be included in the updated of the assessment.

The Chair is exploring options with the hydrographic office of the Russian Federation to acquire CATZOC-attributed data to test the prior assessment methodology to include in an updated Chart Adequacy Assessment report to ARHC-7.

If an update can be completed, the report may be shared with the PAME for their information at the PAME-II (2017) (September; Helsinki, Finland) meeting.

Reference Documents:

* “A Risk-based Methodology of Assessing the Adequacy of Charting Products in the Arctic Region: Identifying the Survey Priorities of the Future” [5](#_bookmark4)
* ARHC Extraordinary Session 2016-2 Report[6](#_bookmark5)

1<http://www.imo.org/en/MediaCentre/HotTopics/polar/Documents/POLAR%20CODE%20TEXT%20AS%20ADOPTE>

D.pdf

2 <http://www.pame.is/index.php/document-library/pame-reports>

3 <http://www.pame.is/index.php/projects/arctic-marine-shipping/the-arctic-marine-shipping-best-practices-> information-forum

4 <http://pame.is/index.php/fundur1/the-arctic-marine-shipping-best-practices-information-forum>

5 <http://www.hypack.com/ushydro/2015/papers/pdf/USHydro_Risk_based_Methodology_Gonsalves.pdf>

6 <http://iho.int/mtg_docs/rhc/ArHC/ArHC_Extraordinary_IRCC8/2016-05-> 31%20ARHC%20Extraordinary%20meeting%20minutes%20-final.pdf

1. *Acoustic Effects on Marine Mammals/Marine Mammal Interactions*

IHO member states need expanded hydrographic data to improve existing chart coverage for the Arctic region. However, hydrographic data collection (e.g., echo sounder use) has the potential to adversely affect marine mammals. ARHC4-3.2 identified this concern as an area of interest to the ARHC for the OTWG. At ARHC-6, Canada shared ARHC6-25A “Effects of Noise on Marine Mammals.”

Central to determining the nature and extent of these effects from hydrographic surveys, IHO states must have a thorough understanding of the circumstances under which marine mammals receive sound emitted from active acoustic sound sources, and the manner in which the animals may be affected.

NOAA’s National Marine Fisheries Service (NMFS) Office of Protected Resources offers the following supplemental information on the circumstances under which marine mammal species in the U.S. Arctic can perceive the sounds emitted in a hydrographic survey, and the ways in which they might respond. This information is provided as a contribution to the body of knowledge for the hydrographic offices of ARHC.

* 1. *Marine Mammal Species Affected*

Primary factors in whether an animal will receive/perceive a signal and therefore potentially respond to it include the following: (1) whether an animal is present in the area of interest; (2) whether an animal can sense signals at the frequency used; and (3) duration of a survey in a given area and beam pattern of the signal used.

For Table 1 below, the U.S. Arctic is defined as all U.S. waters north of 66° 33’. The listed species are those marine mammal species with a distribution overlapping the U.S. Arctic (as shown at <https://alaskafisheries.noaa.gov/mapping/esa/>). More information about these species is available at  [http://www.nmfs.noaa.gov/pr/species/mammals/.](http://www.nmfs.noaa.gov/pr/species/mammals/)

Frequency hearing range data is from NMFS 2016.

# Table 1 – Frequency Hearing Ranges of Marine Mammals found in the U.S. Arctic

|  |  |
| --- | --- |
| **U.S. Arctic Marine Mammal Species1** | **Generalized Hearing Range (kilohertz, kHz)** |
| Harbor porpoise (*Phocoena phocoena*) | 275 Hz – 160 kHz |
| Beluga whale (*Delphinapterus leucas*) | 150 Hz – 160 kHz |
| Narwhal (*Monodon monoceros*) |
| Killer whale (*Orcinus orca*) |
| Bearded seal (*Erignathus barbatus*) | 50 Hz – 86 kHz |
| Ribbon seal (*Histriophoca fasciata*) |
| Ringed seal (*Phoca hispida*) |
| Spotted seal (*Phoca largha*) |
| Bowhead whale (*Balaena mysticetus*) | 7 Hz – 35 kHz |
| Gray whale (*Eschrichtius robustus*) |
| Minke whale (*Balaenoptera acutorostrata*) |
| Humpback whale (Megaptera novaeangliae) |

As noted by Canadian Hydrographic Service, certain species (i.e., seals and baleen whales) are not able to hear acoustic sources operating at the frequencies typically employed during a hydrographic survey (i.e., 100 kHz and above). However, smaller cetaceans such as the harbor porpoise, beluga whale, and killer whale can hear very well at frequencies above 100 kHz, and could therefore perceive signals used in hydrographic data collection.

The longer a survey operates in a given area, the more likely it is that animals that may be present in that area will be exposed to signals from the acoustic sources used. Similarly, it is more likely that an animal would be exposed to a signal produced by an omnidirectional source, with the likelihood of exposure decreasing as beamwidth decreases.

* 1. *Marine Mammal Response to Echo Sounders as Used in Hydrographic Surveys*

The nature and intensity of an animal’s response is a function of

* the frequency of the sound emitted,
* the power level of the sound emitted, and
* the distance between the sound source and the receiving animal.

For an animal capable of perceiving the sound frequencies emitted during a hydrographic survey, the response or effect may be more severe when the emitted signal is in the animal’s frequency range of best hearing (versus generalized hearing), is of higher power, and when the source is closer to the animal. It is also important to note that, when discussing marine mammals in the Arctic generally, the relative lack of human activity compared with more temperate locations may mean that animals are more sensitive and thus potentially be more susceptible to disturbance than would an animal exposed to the same signal in an area of greater human activity.

An animal may have no response to a detectable signal, or may have an unobserved physiological response (e.g., stress responses). It is also possible that an acoustic signal may mask a signal of interest to an animal (e.g., those used for intraspecific communication and social interactions, prey detection, predator avoidance, navigation). Alternatively, the sound may provoke a measureable behavioral response, which may or may not constitute a potential disruption to the animal’s behavioral patterns (e.g., affecting migration, breathing, nursing, breeding, feeding, or sheltering). Behavioral responses can include a variety of effects, including subtle changes in behavior (e.g., minor or brief avoidance of an area or changes in vocalizations), more conspicuous changes in similar behavioral activities, and more sustained and/or potentially severe reactions, such as displacement from or abandonment of high- quality habitat. Behavioral responses to sound are highly variable and context-specific and any reactions depend on numerous intrinsic and extrinsic factors (e.g., species, state of maturity, experience, current activity, reproductive state, auditory sensitivity, time of day), as well as the interplay between factors. A disruption of behavioral patterns may or may not lead to a reduction in fitness for an individual animal.

At higher power levels and/or shorter distances, the effects of signals emitted within an animal’s range of best hearing can be more severe, potentially damaging the hearing of an animal temporarily or permanently. These effects are referred to as temporary threshold shift (TTS) or permanent threshold shift (PTS), respectively (*Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing*, NMFS 2016). Many acoustic sources typically investigated in a context of potential threshold shift produce signals that are either much lower frequency and/or higher total energy than do

those used typically for hydrographic surveys. PTS, or auditory injury, is considered an unlikely outcome related to use of the sources common to hydrographic surveys.

On the basis of available information on hearing and potential auditory effects in marine mammals, high-frequency cetacean species (i.e., porpoise) would be the most likely to potentially incur temporary hearing loss from a vessel operating high-frequency sonar sources. Even for high-frequency cetacean species, individuals would have to make a very close approach and also remain very close to vessels operating these sources in order to receive multiple exposures at relatively high levels, as would be necessary to cause a threshold shift. Additionally, given that behavioral responses typically include the temporary avoidance that might be expected, the potential for auditory effects considered to be physiological damage (injury) is considered extremely low in relation to realistic operations of these devices. Given the fact that hydrographic survey vessels are moving, the likelihood that animals may

avoid the vessel to some extent based on either its physical presence or due to aversive sound (vessel or active acoustic sources), and the intermittent nature of many of these sources, the potential for threshold shift is probably low for high-frequency cetaceans and very low to zero for other species.

Most of these sources may be detected by odontocete cetaceans (and particularly high-frequency specialists such as porpoises) but are unlikely to be audible to baleen whales (i.e., low-frequency cetaceans) and most pinnipeds. While low-frequency cetaceans and pinnipeds have been observed to respond behaviorally to low- and mid-frequency sounds, there is little evidence of behavioral responses in these species to high-frequency sound exposure. If a marine mammal does perceive a signal from an active acoustic source, it is likely that the response would be, at most, behavioral in nature. Behavioral reactions of free-ranging marine mammals to scientific sonars are likely to vary by species and circumstance. As described above, behavioral responses of marine mammals are extremely variable, depending on multiple exposure factors, with the most common type of observed response being behavioral avoidance of areas around aversive sound sources.

Reference Documents:

* ARHC6-25A Effects of Noise on Marine Mammals
* <http://www.nmfs.noaa.gov/pr/species/mammals/>
* Boebel, O., P. Clarkson, R. Coates, R. Larter, P.E. O'Brien, J. Ploetz, et al. 2005. Risks posed to the Antarctic marine environment by acoustic instruments: A structured analysis. Antarctic Science **17** (04):533-540.
* Kremser, U., P. Klemm, and W.-D. Kötz. 2005. Estimating the risk of temporary acoustic threshold shift, caused by hydroacoustic devices, in whales in the Southern Ocean. Antarctic Science **17** (1):3-10.
* Lurton, X. and S. DeRuiter. 2011. Sound radiation of seafloor-mapping echosounders in the water column, in relation to the risks posed to marine mammals. International Hydrographic Review **November**:7-17.
* Lurton, X. 2016. Modelling of the sound field radiated by multibeam echosounders for acoustical impact assessment. Applied Acoustics **101**: 201-221.
* Southall 2007
* *Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing*, NMFS 2016

4. Update on Bearing Strait (US) navigation planning

The Seventeenth Coast Guard District (USA) concluded the Prot Access Route Study (PARS) of the Chuckchi Sea, Bering Strait and Bearing Sea and announces the availability of the report. The Coast Guard is also requesting comments on the preliminary findings contained in the report. Any comments received will be reviewed and considered as the Coast Guard deliberates advancing the recommendations from this study forward into a domestic (US) rulemaking or international agreement. Comments must be submitted to the online docket via [http://www.regulations.gov](http://www.regulations.gov/) before May 30, 2017. For further information, please contact David.M.Seris@uscg.mil or Kody.J.Stitlz@uscg.mil. [7](#_bookmark6) Please see Appendix B for supplemental information.

Reference Document:

* Preliminary Findings Port Access Route Study: In the Chukchi Sea, Bering Strait, and Bering Sea [Docket Number USCG-2014-0941 and USCG-2010-0833] Seventeen Coast Guard District (23 December, 2016)
1. *Membership*

The contact information presented is updated (see Appendix C). The Chair invites any updates be provided at the earliest convenience.

1. *2017-18 Action Plan Development*

The ARHC has expressed a desire for the OTWG to develop an action plan to help facilitate collaboration and communications. The Chair invites members to liaise and contribute to the development of a draft plan for 2017-2018 that could be presented for review at ARHC-7.

# Recommendations

Member States of the ARHC are invited to consider this report and offer direction and guidance to the Working Group.

# Actions Requested of ARHC intersessional:

The ARHC is invited to:

1. Note this report;

7 Federal Register/Vol. 82, No. 37/Monday, February 27, 2017

1. Offer guidance to the OTWG in its preparations for ARHC-7

Appendix A

# INTERNATIONAL CODE FOR SHIPS OPERATING IN POLAR WATERS (POLAR CODE)

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# CHAPTER 11 – VOYAGE PLANNING

# Goal

The goal of this chapter is to ensure that the Company, master and crew are provided with sufficient information to enable operations to be conducted with due consideration to safety of ship and persons on board and, as appropriate, environmental protection.

# Functional requirement

In order to achieve the goal set out in paragraph 11.1 above, the voyage plan shall take into account the potential hazards of the intended voyage.

# Requirements

In order to comply with the functional requirement of paragraph 11.2 above, the master shall consider a route through polar waters, taking into account the following:

* + 1. the procedures required by the PWOM;
		2. any limitations of the hydrographic information and aids to navigation available;
		3. current information on the extent and type of ice and icebergs in the vicinity of the intended route;
		4. statistical information on ice and temperatures from former years;
		5. places of refuge;
		6. current information and measures to be taken when marine mammals are encountered relating to known areas with densities of marine mammals, including seasonal migration areas;13
		7. current information on relevant ships' routing systems, speed recommendations and vessel traffic services relating to known areas with densities of marine mammals, including seasonal migration areas;14
		8. national and international designated protected areas along the route; and
		9. operation in areas remote from search and rescue (SAR) capabilities.15

Appendix B



Appendix C

Membership

As understood as of April 2017

|  |  |  |  |
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