INTERNATIONAL MARITIME ORGANIZATION

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ANY OTHER BUSINESS

Furthering international efforts to reduce the adverse impacts of underwater noise from commercial ships

Submitted by Canada and New Zealand

SUMMARY

Executive summary:	This document highlights international efforts to address adverse underwater noise and the need for international collaboration to proliferate innovation and knowledge of quiet ship design. The submitting delegations invite interested parties and experts to an international workshop on this topic.
Strategic direction, if applicable:	4
Output:	Not applicable
Action to be taken:	Paragraph 18
Related documents:	MEPC.1/Circ.833; MEPC 72/16/5 and MEPC 71/16/5

Introduction

1 Previously, the Committee considered documents MEPC 72/16/5 and MEPC 71/16/5, which sought to enhance the collective international understanding of underwater noise from shipping and the measures available to mitigate it. These documents built upon a foundation set by the previous work of the Committee and Member States.

Global nature of underwater noise

2 Anthropogenic underwater noise continues to garner attention in various international forums. Most recently, anthropogenic underwater noise was the subject of the 19th meeting of the United Nations Open-ended Informal Consultative Process (UN ICP) held in June 2018. Previous to this, the issue received attention through meetings under the Convention on Biological Diversity, which examined the impact of underwater noise on marine species, and the International Whaling Commission, which looked at the issue in relation to cetaceans. Impacts of underwater noise remains a point of focus amongst European Union (EU) Members

as they pursue action in accordance with the EU's 2008 Marine Strategic Framework Directive.[1] Some of this action, which includes monitoring programmes, has been coordinated through the OSPAR Convention[2] and the Baltic Marine Environment Protection Committee (HELCOM). Further, the Arctic Council has been considering the issue throughout 2018 in its Protection of the Marine Environment (PAME) working group, including the development of a state of knowledge review on underwater noise in the Arctic region.

3 The UN ICP meeting is the most recent dedicated global discussion on underwater noise. During this meeting, scientific evidence was presented on the adverse effects of underwater noise on various marine species, including whales, fish and invertebrates. With specific reference to impacts caused by international shipping, many international organizations, scientists, Member States and industry associations called on the international community to evaluate the impacts and identify ways to mitigate adverse effects, where possible, to this global threat to marine ecosystems.

4 The need for international collaboration is supported by the scientific evidence that continues to find adverse impacts on many different marine species and ecosystems from high levels of anthropogenic underwater noise. The Convention on Biological Diversity reports at least 55 marine species are known to be detrimentally affected by anthropogenic noise and a 2018 paper on the impact of ocean noise on fish and invertebrates identifies many more.[3]

5 Canada has submitted information document MEPC 73/INF.23 titled Scientific support for underwater noise effects on marine species and the importance of mitigation, highlighting the scientific evidence of shipping's contribution to the ocean soundscape and the impact of noise on marine species.

6 Higher levels of shipping activity have contributed to increased overall noise levels in the oceans since the 1960s.[4] During this time, the global fleet has also gradually grown in size[5] and recent data indicates the trend remains. According to the United Nations, in 2012 there were 84,709 merchant ships registered around the world. By 2017, this number increased 10% to reach 93,262. Similarly, the gross tonnage of the global merchant fleet over the same time period has grown from 1,034 million tonnes to 1,258 million tonnes – a 21% increase over five years.[6] Moreover, the gross tonnage of the global fleet will continue to increase into the foreseeable future, with a doubling of bulk carriers and containerships by 2030 under status quo conditions according to an analysis in *Global Marine Trends 2030*. Projecting into the future, the trend of a growing global fleet and the correlation between ocean noise and shipping activity suggests underwater noise will intensify unless global actions are taken to systematically address its root causes.

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1 The European Union's Marine Strategy Framework Directive (2008/56/EC) requires Members States to achieve or maintain 'good environmental status' in its coastal waters, which includes ensuring the "introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment".

2 The OSPAR Convention, formally the Convention for the Protection of the Marine Environment of the North-East Atlantic, frames cooperation in the North-East Atlantic amongst its 16 Contracting Parties so they may deliver on their collective commitments.

3 UNEP/CBD/SBSTTA/16/INF/12, *Scientific Synthesis on the Impacts of Underwater Noise on Marine and Coastal Biodiversity and Habitats*; and Weilgart, L.S., *The Impact of Ocean Noise Pollution on Fish and Invertebrates*, Available at: https://www.oceancare.org/wp-content/uploads/2017/10/OceanNoise_FishInvertebrates_May2018.pdf

4 Scripps Institution of Oceanography, *Ocean Noise Has Increased Considerably since 1960s, According to New Scripps Analysis (August 18, 2006)*, Available at: https://scripps.ucsd.edu/news/2594

5 Ibid.

6 United Nations Conference on Trade and Development, *Merchant fleet by flag of registration and by type of ship, annual, 1980-2018*, available at: http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx?ReportId=93

The wide potential for reducing underwater noise sources

7 In 2014, the International Maritime Organization (IMO) published the *Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life* (MEPC.1/Circ.833) (the *Guidelines*). IMO's guidance to address underwater noise recognized two opportunities for mitigating the adverse effects of underwater noise: routeing and operations, and ship design and maintenance. Routeing and operations offer important mitigation options that can provide an immediate acoustic benefit; however, ship design and maintenance provide the best long-term solutions.

8 A recent case study has demonstrated that reducing speeds can result in significant underwater noise reductions[7] and therefore could be an immediate option within specific areas, when safe and operationally feasible to implement. Computer modelling and assessments of risks, however, indicate that some routeing and operational measures may be ineffective or unsafe. In addition, viable mitigation measures are sometimes further restricted as a result of geography or due to the classes of ships that transit within a particular area. Nonetheless, there may be certain ports, coastal zones or areas in transoceanic crossing that route alteration and operational adjustments could be useful tools in mitigating adverse noise effects.[8] Quiet ship design and retrofits, however, present an opportunity to address the principle source of underwater noise on a more global scale.

9 There have been significant advances in quiet ship design, technologies and understanding since the adoption of the *Guidelines*. Important research on underwater noise and ship design has been conducted by the Achieve Quieter Oceans (AQUO) project as part of the European Union directive on the marine environment. Among other things, this multifaceted project produced a list of design and technology-based solutions that would likely reduce underwater noise for new and existing ships.[9] Additionally, Hemmera evaluated and compared different ship design features such as hull coatings, innovative propeller designs and alternative forms of propulsion.[10] A further example includes the collaborative case study between Maersk and Scripps Institute of Oceanography,[11] which tested a hypothesis that retrofits to new Neo-Panamax sized container ships for the purposes of fuel efficiency resulted in noise reductions. The study demonstrated that retrofitting these ships typically resulted in an eight decibel reduction in the 100 – 1000 Hertz frequency band, but it also indicated that fuel savings could be realized as well. In recognition of the various efforts on quiet ship design, five major classification societies belonging to the International Association of Classification Societies have developed notations specific to underwater noise.

10 The aforementioned retrofits and observations by Maersk are of particular significance. The study indicates that a reduction in underwater noise through ship design is coincident to improvement in fuel efficiency. Although more research is needed to understand and quantify the relationship, these potential dual benefits may prove to be a powerful

7 Vancouver Fraser Port Authority, ECHO Program, *Voluntary Vessel Slowdown Trial – Summary Findings*, June 2018, https://www.flipsnack.com/portvancouver/echo-haro-strait-slowdown-trial-summary/full-view.html

8 Halliday, W. D., Insley, S. J., Hilliard, R. C., de Jong, T., and Pine, M. K. (2017). *Potential impacts of shipping noise on marine mammals in the western Canadian Arctic.* Marine pollution bulletin, 123(1-2), 73-82.

9 *Achieve Quieter Oceans by Shipping Noise Footprint Reduction, Guidelines for Regulation on UW Noise from Commercial Shipping*, 2015.

10 Hemmera, *Vessel Quieting Design, Technology, and Maintenance Options for Potential Inclusion in EcoAction Program*, Enhancing Cetacean Habitat and Observation Program, 2016.

11 The joint-study was conducted by container shipping company Maersk and the Marine Physical Laboratory at the Scripps Institution of Oceanography. Further information can be found in document MEPC 72/16/5.

economic incentive for shipowners and operators who can reduce operating expenses with more quiet ship designs. In sum, these recent studies and events demonstrate that international progress is being made to address underwater noise and the collective international knowledge has demonstrably improved since 2014.

11 Despite this substantial international progress, especially as it relates to ship design, there are still unanswered questions and critical knowledge gaps. For example, it remains unclear as to the conditions or ship types that are likely to benefit most from specific quiet ship designs or technologies. It is also unknown if and how design features can be combined to compound benefits. Most of all, uncertainty persists as to the overall level of noise reduction that can be realistically implemented for commercial ships.

Areas of focus for quiet ship designs

12 The *Guidelines* rightly identify that the largest opportunities for reduction of underwater noise will be during the initial design of a ship. To this end, the *Guidelines* pinpoint several design areas that are likely to reduce a ship's underwater noise emission, such as:

.1 propellers designed and selected in order to reduce cavitation. This can be achieved through good design, such as optimizing propeller load, ensuring as uniform water flow as possible into propellers and careful selection of the propeller characteristics such as: diameter, blade number, pitch, skew and sections;

.2 ships with a controllable pitch propeller with variability on shaft speed to reduce operation at pitch settings too far away from the optimum design pitch for efficiency;

.3 hull forms with appendages designed such that the wake field is as homogeneous as possible;

.4 onboard machinery and equipment optimized based on its accessibility for regular maintenance and lubrication, as well as its susceptibility to remain in optimal operating conditions;

.5 advanced propulsions systems, such as diesel-electric with high-quality electric motors incorporated, instead of conventional less-efficient systems; and

.6 four-stroke engines (in lieu of two-stroke engines (when available)) mounted on flexible couplings and resilient mountings.

13 IMO's adoption of the *Guidelines* has been useful to identify ship designs, technologies and operations that are likely to reduce underwater ship noise. New additional evidence to support and expand upon them, however, has emerged while certain aspects of ship designs and related technologies are likely to have changed.

Ship design and technology workshop

14 To gather and share recent research conclusions and assess current and future quiet ship designs, Canada will be hosting an international workshop from 30 January to 1 February 2019 at IMO Headquarters. To ensure success, Member States are urged to make their respective national experts aware of this international workshop and to facilitate their participation. Representation from, inter alia, naval architects, marine engineers, ship operators, shipyards, national policy makers, industry associations, academics and non-governmental organizations will result in a breadth of expertise with diverse viewpoints and lead to a more complete and accurate assessment of the current state of, and opportunities for innovative designs and technology. Furthermore, the expertise of attendees should also span across ship-types (e.g. bulk, cargo, container, passenger and tugboats) and propulsion systems and elements (e.g. controllable pitch propeller, azimuth thruster and hybrid propulsion systems).

15 This forum will provide an opportunity for international collaboration and allow participants to share the newest research and technical solutions for more quiet ship design and retrofits. The specific objectives of the proposed workshop will include, but are not necessarily limited to:

.1 validating current technologies and identifying important gaps and challenges to further progress;

.2 assessing areas for innovation potential to determine where more focused research may be needed;

.3 understanding and quantifying whether improvements made to ship design for fuel efficiency overlap with improvements made to reduce noise; and

.4 documenting the conclusions of the workshop to guide future discussions on reducing underwater ship noise or as groundwork for a review of the existing *Guidelines*.

16 A symposium will be held in Canada in late 2018 as a precursor to the international workshop. Its purpose will be to gather technical information to create a draft working document that the international workshop can build upon.

17 IMO Member States, intergovernmental and non-governmental organizations interested in participating in the domestic workshop or supporting the international workshop are invited to contact Transport Canada's Mrs. Michelle Sanders (Michelle.Sanders@tc.gc.ca). Official invitations to participate in the international workshop will be delivered to the delegation of all IMO Member States, intergovernmental, and non-governmental organizations. Any questions or comments can be sent to Mrs. Michelle Sanders.

Action requested of the Committee

18 The Committee is invited to note the information in this document and take action as appropriate.