INTERNATIONAL MARITIME ORGANIZATION

E

MARINE ENVIRONMENT PROTECTION COMMITTEE
76th session
Agenda item 12

MEPC 76/INF.39
7 April 2021
ENGLISH ONLY
Pre-session public release: ☒

WORK PROGRAMME OF THE COMMITTEE AND SUBSIDIARY BODIES

Results of the Joint Monitoring Programme of Ambient Noise in the North Sea (JOMOPANS)

Submitted by the Netherlands

SUMMARY

Executive summary:	This document summarizes the results of the Joint Monitoring Programme of Ambient Noise in the North Sea (JOMOPANS). JOMOPANS develops a framework for a fully operational joint monitoring programme for ambient noise in the North Sea and produces maps of depth-averaged sound pressure levels for the North Sea
Strategic direction, if applicable:	1, 2, 3, 4 and 6
Output:	Not applicable
Action to be taken:	Paragraph 10
Related documents:	MEPC.1/Circ.833; MEPC 71/16/5; MEPC 72/16/5; MEPC 73/18/4, MEPC 73/INF.23; MEPC 74/17/2, MEPC 74/INF.28, MEPC 74/INF.36; MEPC 75/14 and MEPC 75/14/2

Introduction

1 In 2014, MEPC approved the *Guidelines for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life* (MEPC.1/Circ.833) (2014 Guidelines). The 2014 Guidelines recognize two opportunities for mitigating the adverse effects of underwater noise: routeing and operations, and ship design and maintenance. In 2019, Australia, Canada and the United States proposed a new output on the agenda of MEPC to review the 2014 Guidelines and identify next steps. In document MEPC 75/14/2, the Netherlands among others commented favourably on the request of the co-sponsors of document MEPC 75/14.

2 In the European Marine Strategy Framework Directive (MSFD) (European Commission, 2008), underwater noise was for the first time recognized as a pollutant and subsequent action had to be taken by Member States of the European Union.

3 As a result, the seven countries along the North Sea are working together in a Joint Monitoring Programme to Monitor Underwater Noise in the North Sea (JOMOPANS). JOMOPANS started in January 2018. This document provides a summary of the key findings of the programme. A summary of the results can be found in the annex.

Joint Monitoring Programme of Ambient Noise in the North Sea (JOMOPANS)

4 JOMOPANS is a cooperation between 11 organizations from seven countries working together to deliver an innovative combination of modelling and high-quality measurements at sea for an operational joint monitoring programme for ambient noise in the North Sea.

5 The use of consistent measurement standards and interpretation tools identifies, for the first time, where noise may adversely affect the North Sea.

6 The data on ambient underwater noise in the North Sea contributed to the production of several soundscape maps over 2019. Soundscape maps were calculated for each month in 2019 and for all relevant frequencies.

Key findings of JOMOPANS

7 A constant high increase (up to 20 dB) of the sound levels in the southern part of the North Sea and along certain shipping routes was found. The sound levels of shipping, especially in the southern part of the North Sea, can be as high as 120 dB, where the 125 Hz band level of the natural sound by wind is fairly constant over the North Sea at around 90 dB.

8 A lower increase of continuous noise was found in the central regions of the North Sea, like the Dogger Bank.

9 If the commercial shipping sector continues to grow in the coming years, there is a strong likelihood that the underwater noise levels in the North Sea will continue to grow if left unrestricted.

Action requested of the Committee

10 The Committee is invited to note the information provided in this document, and take it into account when considering the proposal in document MEPC 75/14 for a new output.

***

ANNEX

JOINT MONITORING PROGRAMME OF AMBIENT NOISE NORTH SEA (JOMOPANS)

Summary Jomopans results

By programme coordinator: Niels Kinneging, Rijkswaterstaat
Date: 30 March 2021

Partners: Rijkswaterstaat (NL), Federal Maritime and Hydrographic Agency (DE), TNO, Netherlands Organisation for applied Scientific Research (NL), Swedish Defence Research Agency (SE), Marine Scotland Science (UK), Institute of Marine Research (NO), Norwegian Defence Research Establishment (NO), National Physical Laboratory (UK), Royal Belgian Institute of Natural Sciences (BE), Aarhus University (DK), Centre for Environment, Fisheries and Aquaculture Science (UK).

Contact: niels.kinneging@rws.nl
More information: https://northsearegion.eu/jomopans/

Introduction

Sound is omnipresent in the underwater environment and can be produced by natural (waves, weather, animals) and man-made (shipping, wind farms, oil and gas activities) sources. For marine animals, such as whales, fish and even invertebrates, the auditory senses are very important. Underwater visibility is usually very low in both the North Sea and elsewhere. Animals use sound to navigate, find food, communicate with potential partners and as a warning against various threats. Man-made noise can disturb one or more of these conditions essential to animal survival. Sound is therefore directly relevant for marine life, yet the integrated impact of sound on marine life is largely unknown. In the European Marine Strategy Framework Directive, MSFD (European Commission, 2008), underwater noise was for the first time recognised as a pollutant and subsequent action had to be taken by member states of the European Union. Moreover, underwater sound carries over large distances and is typically a transnational phenomenon. Therefore monitoring of underwater sound should be implemented as a joint effort of all countries bordering a sea region. For the North Sea 11 institutes have formed the Jomopans consortium to set up the monitoring framework. As a result, the seven countries along the North Sea are working together in a joint monitoring programme to monitor underwater noise in the North Sea (Jomopans). Jomopans started in January 2018.

Joint Monitoring Programme of Ambient Noise North (Jomopans)

Jomopans develops a framework for a fully operational joint monitoring programme for ambient noise in the North Sea. The project implements the monitoring strategy outlined by the the European Union (Dekeling et al., 2013), The aim of this programme is to gather information for marine policy in relation to continuous underwater noise in the North Sea. In Jomopans, monthly maps of depth-averaged sound pressure levels for the North Sea were produced. These maps will enable policy makers to identify, for the first time, where noise may adversely affect the North Sea ecosystem. Jomopans uses high quality measurements taken at a few

locations in the North Sea (see figure 1), and numerical modelling to provide a full North Sea overview.

Figure 1: Map of the North Sea with the measurement locations for the Jomopans project, as well as the logos of the participating institutes.

The project has produced a large number of maps. These maps offer valuable information on the amount of continuous noise, as well as the spatial and temporal variations. This information can be used to design and evaluate mitigation measures, like quiet ship technology. Within the Jomopans project detailed AIS data and dynamic oceanographic conditions, like wind speed, were used. Also more static oceanographic parameters, bathymetry and bottom composition, were used and obtained from the EMODNET data portals. Soundscape maps were calculated for each month in 2019 and for all relevant frequencies.

Results

In this paper we present the 125 Hz band soundscape maps averaged over whole 2019. The 125 Hz 1/3-octave band is the major frequency band for shipping noise. Figure 2 shows the median sound pressure level for the natural sound by wind. And figure 3 shows the median sound pressure level for shipping on the same scale.

The 125 Hz band level of the natural sound by wind is fairly constant over the North Sea at around 90 dB*. The sound levels of shipping are usually much higher, especially in the southern part of the North Sea. They can be as high as 120 dB.

* Please note that a sound level in water (in dB) may not be compared to sound levels in air, because the dB scales differ.

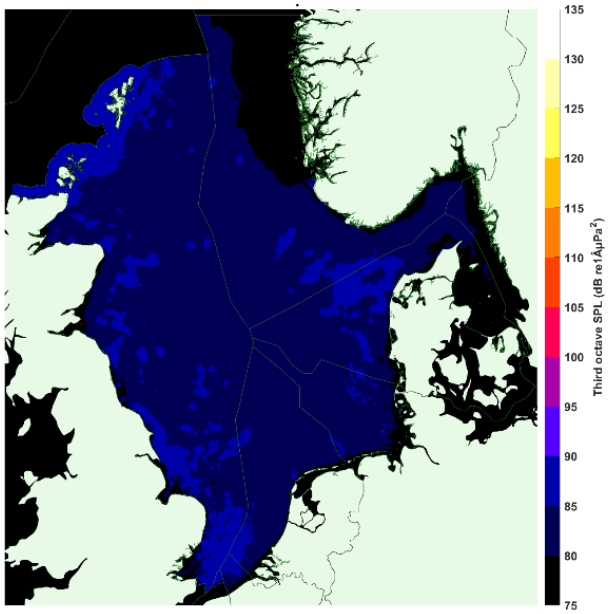

Figure 2: Median Background Sound Level 125 Hz band (wind)

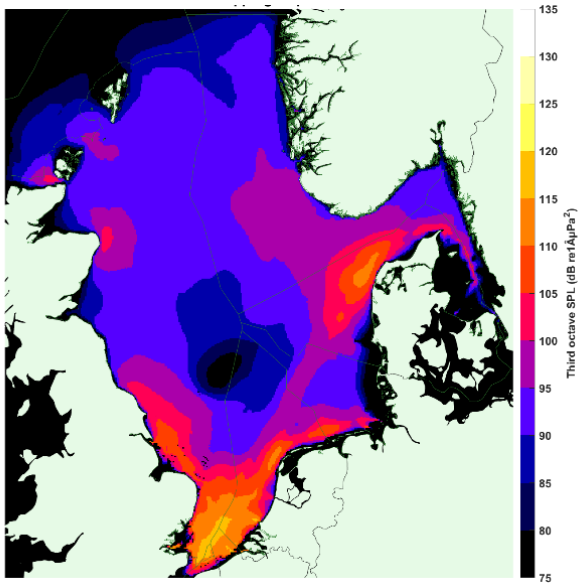

Figure 3: Median Sound Pressure Level by shipping, 125 Hz band.

The continuous noise will be assessed based on the Excess Level, which is the difference between the total sound pressure and the natural sound pressure. Excess Level is a quantity related to the reduction of communication range of marine species, called masking. Masking means that an animal faces increased difficulties in detecting and decoding other sounds (from conspecifics, prey, predators etc.) and ultimately means that the listener fails to react to a signal it would otherwise have reacted to. For other effects on marine life, like hearing damage, other metrics can be used, but for the North Sea masking is the major effect we consider. In figure 4 the Excess Level is displayed.

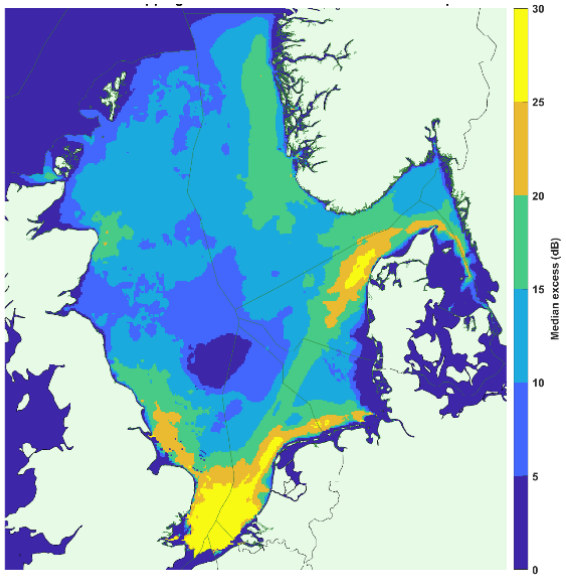

Figure 4: Median Excess Level, 125 Hz band.

Underwater noise can vary considerably in time and space. The maps presented above display the spatial variation of the median soundscape. Hence the variations in time are lost in these figures. A dominance map aims to make the variations in time more visible. Dominance is the percentage of time that the Excess Level is higher than a certain cutoff level. In figure 5 the dominance is shown for a cutoff level of 20 dB, which means that the noise level exceeds the natural sound level by 20 dB.

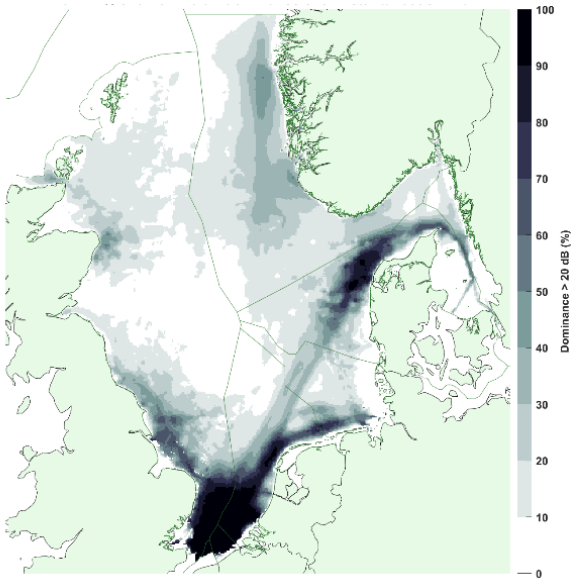

Figure 5: Dominance maps for a cutoff level of 20 dB of the Excess Level.

Conclusions

In this paper we presented the quantitative soundscape maps for the North Sea. These maps show a constant high increase (up to 20 dB) of the sound levels in the southern part of the North Sea and along certain shipping routes. The increase in continuous sound is lower in the central regions of the North Sea, like the Dogger Bank. If the commercial shipping sector continues to grow in the coming years, there is a strong likelihood that the underwater noise levels in the North Sea will continue to grow if left unrestricted. Further refinements of the method are needed to include all sources of continuous noise and to improve the model for

natural sound. Also the quality of the AIS data needs to be reviewed carefully. This monitoring strategy can act as a template for other sea regions, like the Atlantic Seas and the Arctic Seas.

References

Duarte, C.M., Chapuis, L., Collin, S.P., Costa, D.P., Devassy, R.P., Eguiluz, V.M., Erbe, C., Gordon, T.A.C., Halpern, B.S., Harding, H.R., Havlik, M.N., Meekan, M., Merchant, N.D., Miksis-Olds, J.L., Parsons, M., Predragovic, M., Radford, A.N., Radford, C.A., Simpson, S.D., Slabbekoorn, H., Staaterman, E., Van Opzeeland, I.C., Winderen, J., Zhang, X., Juanes, F., 2021, *The soundscape of the Anthropocene ocean, Science **371**, 583 (2021)*

Dekeling, R.P.A., Tasker, M.L., Van der Graaf, A.J., Ainslie, M.A, Andersson, M.H., André, M., Borsani, J.F., Brensing, K., Castellote, M., Cronin, D., Dalen, J., Folegot, T., Leaper, R., Pajala, J., Redman, P., Robinson, S.P., Sigray, P., Sutton, G., Thomsen, F., Werner, S., Wittekind, D., Young, J.V., 2013, *MSFD Monitoring Guidance Underwater Noise Part I Executive Summary*, JRC Scientific and Policy Report EUR 26555 EN, Publications Office of the European Union, Luxembourg

IMO, 2014, *IMO Guidelines for reducing underwater noise from shipping*, MEPC.1-Circ 883 Noise Guidelines April 2014

Nikolopoulos, A., Sigray, P., Andersson, M., Carlström, J., Lalander, E., 2016, *BIAS Implementation Plan – Monitoring and assessment guidance for continuous low frequency sound in the Baltic Sea*, BIAS report

European Union (EU), 2008. *Directive 2008/56/EC of the European Parliament and of the Council of 17 June 2008 Establishing a Framework for Community Action in the Field of Marine Environmental Policy (Marine Strategy Framework Directive)*, Official Journal of the European Union 25.6.2008.

Chou, E., Southall, B.L., Robards, M. and Rosenbaum, H.C., 2021, *International policy, recommendations, actions and mitigation efforts of anthropogenic underwater noise*, Ocean and Coastal Management, 202 (2021)

Van Oostveen, M., Barbé, D., Kwakkel, J., 2020, *Proposal assessment framework, OSPAR candidate indicator ambient underwater sound*, Royal Haskoning DHV, BH2849WATRP2011251151, https://puc.overheid.nl/doc/PUC_625270_31