Development of the ICES Continuous Underwater Noise reporting format and database

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Introduction

Underwater noise is an anthropogenic pressure that can have a negative effect on the organisms that are exposed to it[1], and it is recognised as a pressure on the marine environment by the EU Marine Strategy Directive (MSFD). Underwater noise can be of impulsive or continuous nature. The latter, also referred to as ambient underwater noise, is a low frequency noise that occurs over an extended period of time, as opposed to being associated to a particular event.

Ambient underwater noise has been monitored in the North Atlantic as part of time limited projects such as the Baltic Sea Information on the Acoustic Soundscape (BIAS)[2] and the Joint Monitoring Programme for Ambient Noise North Sea (JOMOPANS)[3]. As part of the BIAS project, a Soundscape tool for the Baltic Sea was delivered. The Soundscape tool was used in the Helsinki Commission (HELCOM) Second Holistic Assessment of the Ecosystem Health of the Baltic Sea (HOLAS II). In 2019, the HELCOM expert group on underwater noise (EN-Noise) proposed to establish a continuous noise database, and transfer the hosting of the Soundscape tool to an international data platform. After a tender specification was published, the International Council for Exploration of the Sea (ICES)[4] was selected as the preferred contractor. The database has the purpose of hosting continuous underwater noise monitoring data collected by HELCOM countries. These data are to be used in the upcoming HOLAS III assessment.

Reporting format and data submission

The HELCOM countries (bordering the Baltic Sea) collect continuous or duty cycled sound recordings from stationary monitoring stations, which is referred to as raw data. Prior to submission to ICES, data are processed and reported in mean sound pressure levels (dB re. 1 uPa) at regular intervals and in regularly spaced 1/3-octave bands. The data are organised around deployments, and countries are to report data on how the deployment was made along the mean sound pressure levels. The ICES Continuous Underwater Noise format[5] is based on the data structures used by BIAS and JOMOPANS, and it was developed by the ICES Data Centre in cooperation with EN-Noise. Data are submitted to the Continuous Underwater Noise database through the website[6] (figure 1) in HDF5 files, which are organised in three groups: a) File Information, b) Metadata, c) Data. Each of these groups consists of

[1] https://ec.europa.eu/environment/marine/pdf/MSFD_reportTSG_Noise.pdf

[2] https://biasproject.wordpress.com/

[3] https://northsearegion.eu/jomopans/

[4] https://ices.dk/Pages/default.aspx

[5] https://ices.dk/data/Documents/ContinuousNoise/ICES-Continuous-Underwater-Noise-format.zip

[6] https://underwaternoise.ices.dk/continuous

several datasets. During submission, data undergo quality checks aimed at controlling for file integrity, format compliance and quality control. The Continuous Underwater Noise database was opened for testing in March 2020, and it is planned to open for HELCOM submissions as soon as the community finish the tests.

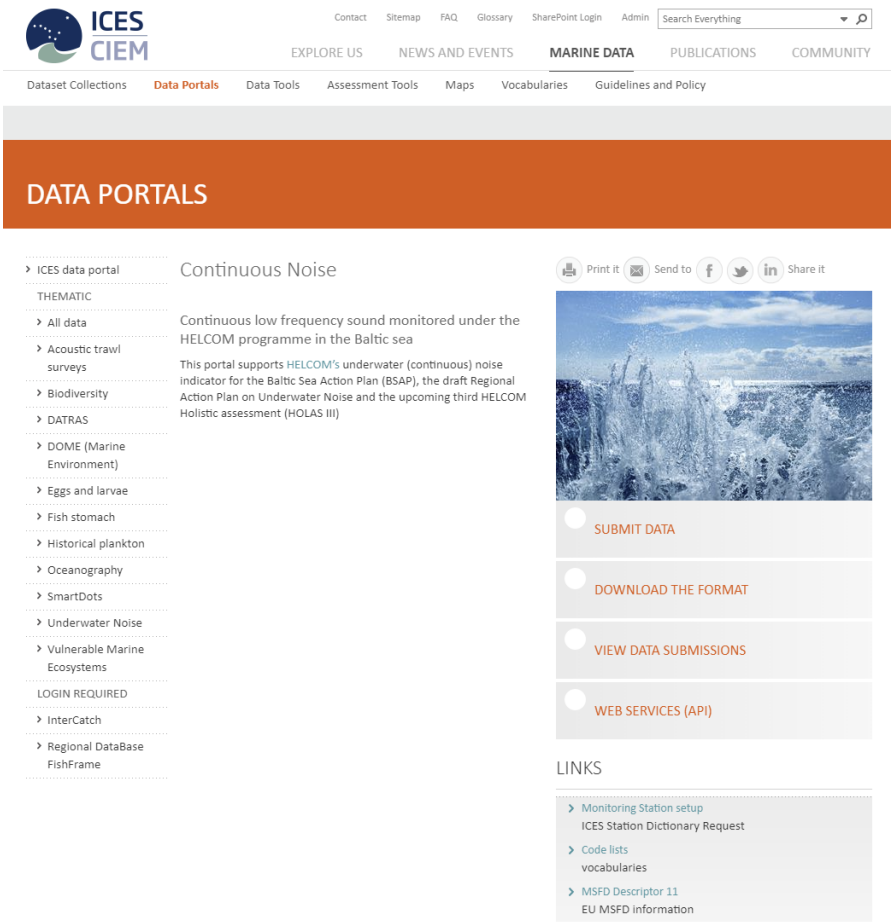

Figure 1: Continuous underwater noise website

The database consists of two components: an SQL server database, and data files. Currently, the files are kept outside of the database and this segregation is in place due to the size and non-flat nature of the HDF5 files. To submit files up to 2 GB, the data can be uploaded to ICES using an upload form. To submit files larger than 2 GB, the user has to provide a link to submit the file to the database.

Data extraction and visualisation

Users will be able to download data from the database. The data will be delivered in HDF5 format and the user will able to filter data based on a time period, an area and range of channels. If the period of time covers more than one deployment, the user will receive as many files as deployments. If the period of that covers only part of a deployment, the user will receive a file that has been trimmed to include only the data corresponding to the requested time period. Users will be able to download data under the conditions detailed in the ICES data policy[7] as soon as the database is populated. After the database is populated, maps of summary data per station will be produced as a visualization tool for the data hosted by ICES.

[7] http://ices.dk/marine-data/Documents/ICES-Data-policy.pdf