



Document title	HELCOM database on continuous underwater noise hosted at ICES
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Background

During the EN-Noise meeting in May 2019, HELCOM discussed the possibility of ICES to host a database on continuous underwater noise. Details can be consulted in the HELCOM document with code 4-1. Later in 2019, ICES and HELCOM signed a contract for ICES to host this database. The continuous noise database is now operational and ready for the first data submissions, and it was presented at the EN-Noise meeting on March 27th 2020 ([document 2-2](#) and [Presentation 1](#)).

This document contains the document prepared by ICES as submitted to PRESSURE 12-2020 on the HELCOM Continuous Underwater Noise database hosted at ICES.

Action requested

The Meeting is invited to take note of the information.

HELCOM database on continuous underwater noise hosted at ICES

1. Introduction

Continuous underwater noise, also referred to as ambient underwater noise, has been monitored in the Baltic Sea and in the North Atlantic as part of time limited projects such as BIAS¹ and JOMOPANS². In the Baltic Sea, the BIAS project delivered a Soundscape tool, which has been used by HELCOM in the HOLAS II assessment. Through the Baltic Sea Action Plan, and HELCOM's efforts to support its contracting parties in establishing thresholds for Good Environmental Status (GES) under the EU Marine Strategy Directive (MSFD), as well as the next holistic assessment (HOLAS III), underwater noise is recognized as a pressure on the marine environment. The HELCOM expert network 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, ICES was selected as the preferred contractor.

A contract was signed between HELCOM and ICES in 2019, for ICES to develop and host an ambient underwater noise data portal. EN NOISE, in consultation with the HELCOM Secretariat oversees the implementation of this contract.

2. Technical description

The HELCOM countries 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. Further details on mean sound pressure level data can be consulted in the EN-NOISE 2019 document with code 4-1. The continuous noise data are to be submitted to ICES in HDF5 format, as per the agreement between HELCOM and ICES.

During the database development, an outline of the data structure was sent to ICES by the BIAS contact person. The ICES data centre, along with the experts from the BIAS and JOMOPANS projects developed the ICES Continuous Underwater Noise format based on the data structures used by BIAS and JOMOPANS. The agreed format was sent to the community before being finalised.

2.1. Format of the input data

The data are organised around deployments, and countries are to report data on how the deployment was made, along the mean sound pressure levels. To guarantee future understanding of the data, information on the reporting institute is to be reported as well. The **reporting format**³ thus structures the data in three groups:

- the file information group, where information about the institute, the data file, and the period and location of data collection are reported;
- the metadata group, where information about the deployment is reported;
- the data group, where mean sound pressure levels are reported.

The quality of the data reported is the full responsibility of the submitters, as per the agreement between ICES and HELCOM. Additionally, ICES guarantees the integrity of the data submitted by: a) limiting the input data in certain fields through the use of controlled vocabularies⁴, and b) performing quality checks prior to submission to the database. A list of the vocabularies used can be found in the reporting format.

Due to the non-flat nature of HDF5 files, the Continuous Underwater Noise format raised some challenges in the design of the quality checks. The quality checks on the file information and metadata groups will be

¹ <https://biasproject.wordpress.com/>

² <https://northsearegion.eu/jomopans/>

³ <http://ices.dk/marine-data/Documents/ContinuousNoise/ICES-Continuous-Underwater-Noise-format.zip>

⁴ <https://vocab.ices.dk/>

performed by the DATa Screening Utility tool (DATSU), and these consist of control of data against the vocabularies and data type, as well as potential custom made quality checks to be agreed between the ICES data centre and the community. The quality checks on the data group will be done during the upload, using C#. These consist of controlling the data collection date range against the dates reported in the file information group, as well as controlling the total number of measurements against the value reported in the metadata group. Additionally, no empty values will be accepted in the data group. The choice to use DATSU was made due to its easiness of use for data officers, who might not always have the programming skills needed to write custom checks in C#. Unfortunately, DATSU cannot be used for quality checking of the data group, as the number of datasets within will vary between submissions, due to the number of channels used to collect the reported data.

2.2. Database structure

The database consists of two components: an SQL server database, and a filesystem database. The SQL server database is used to store the File Information and Metadata groups, as well as a link to the file location. This segregation is in place due to the size and non-flat nature of the HDF5 files, which can be up to 5 GB large, with thousands of records.

2.3. Extracting data from the database

Users will be able to download data from the database. The data will be delivered in HDF5 format and the user will be able to filter data based on a time period. 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 in which the Data group has been trimmed to include only the data corresponding to the requested time period.

2.4. Soundscape tool

In addition to monitoring data, HELCOM requested the production maps of modelled sound in the entire HELCOM area. The production of these maps requires expertise that ICES does not have, and thus a third party will be required to produce these maps. ICES is, however, to host the soundscape tool.

3. Website and submission facilities

Continuous underwater noise data can be submitted and downloaded through the website⁵. The continuous noise landing page has links to the format download, a list of all data submissions, to the web services, and to the data submission facilities (Figure 1).

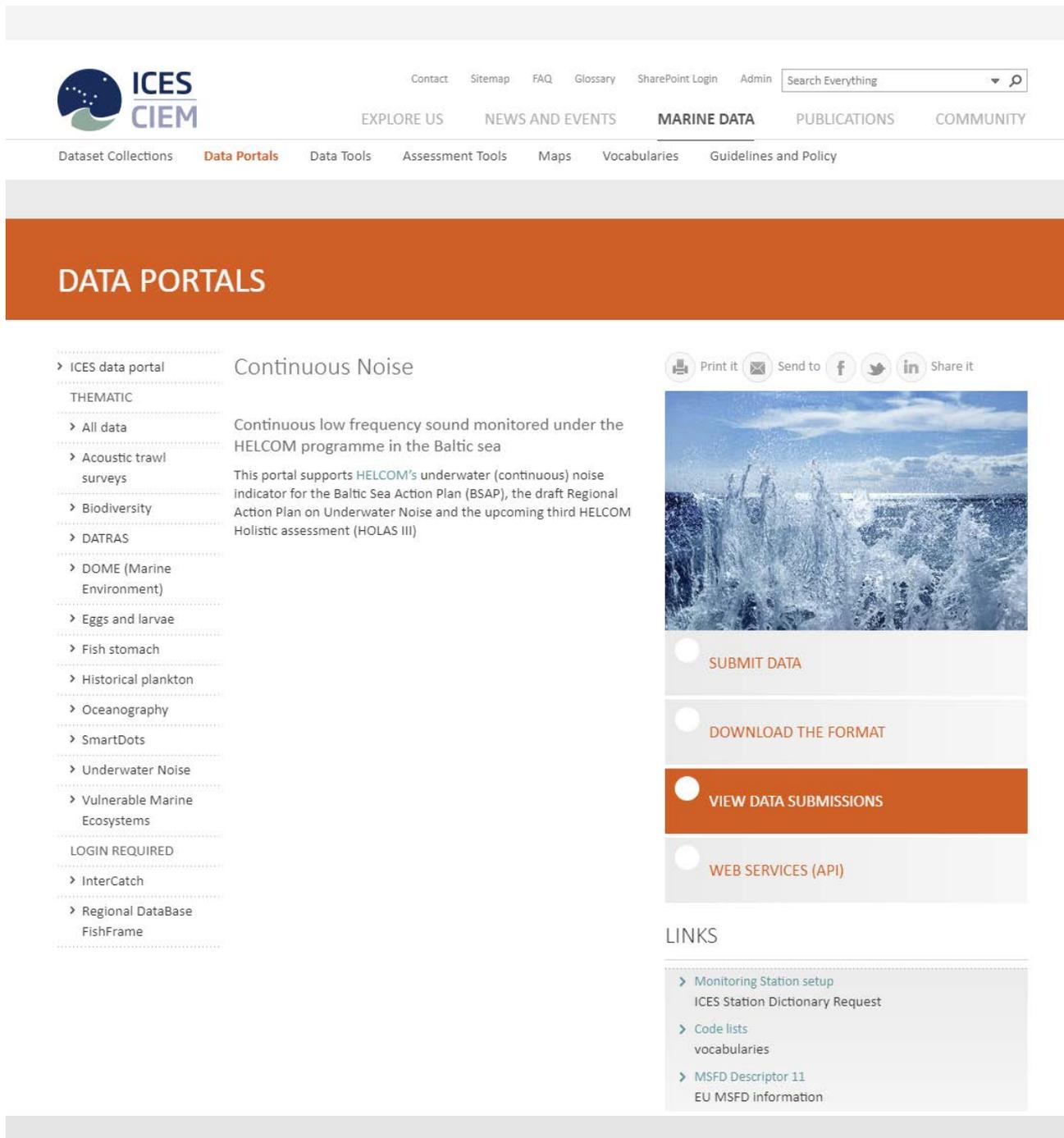


Figure 1. Continuous noise landing page.

⁵ <https://underwaternoise.ices.dk/continuous>

To submit data, the user will be required to login prior to data submission. Upon logging in, the user can choose to upload a file for quality screening, view their data submissions, or view their file uploads (Figure 2).

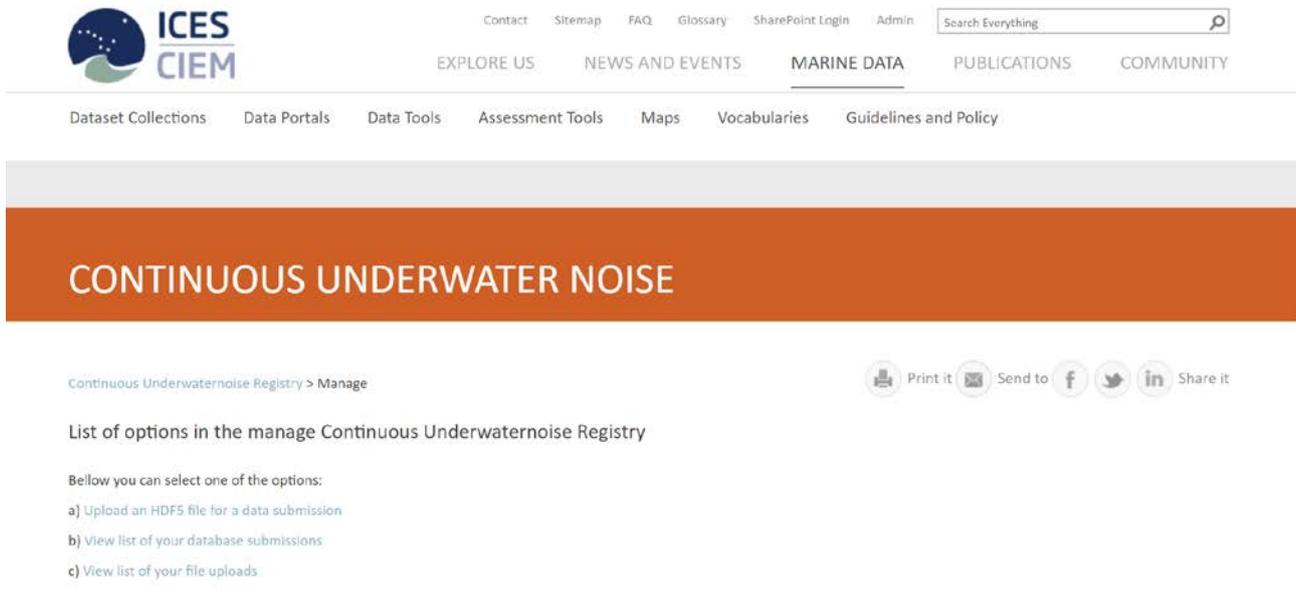


Figure 2. Data submission menu, after login.

Upon screening a file, the user will be able to view detailed information on the quality checking of their data (Figures 3). The user will also receive an email with information on whether or not their data are compliant with the format.



CONTINUOUS UNDERWATER NOISE

Continuous Underwaternoise Registry > Manage > File upload details

Print it
 Send to

 Share it

Results from the ICES Data Screening Utility program for the following data:

Country	DE
Dataset	Continuous underwater noise
File Name	730BIAS_Station031_Apr2014-Sep2014.h5.csv
Email	xxxx@ices.dk
Monitoring Year	2020
Screening Date	25/03/2020 15:14:00

List information, errors and warnings during the screening process:

Record Line	Type	Reported Errors	Reported Errors	Error Fields
2	error	Field value is invalid (Rel) - prevents entry to database	SM2M	HydrophoneType
2	error	Field value is invalid (Rel) - prevents entry to database	WILDLIFE	RecorderType
2	error	Field value is invalid (Rel) - prevents entry to database	Project	MeasurementPurpose
2	error	Field value is invalid (Rel) - prevents entry to database	Autonomous	MeasurementSetup
2	error	Field width exceeded expected maximum	Mooring with floating buoy	RigDesign
2	error	Field value is invalid (Rel) - prevents entry to database	Mooring with floating buoy	RigDesign
2	error	Field width exceeded expected maximum	188909	MeasurementTotalNo
2	error	Field value is invalid (Rel) - prevents entry to database	dB re 1 Pa	MeasurementUnit
2	error	Field value is invalid (Rel) - prevents entry to database	Closed pressure chamber/pistonphone (250 Hz)	CalibrationProcedure

You can check the continuous underwater noise format [here](#)

Figure 3. Screening report of a file that cannot be submitted to the database.

The user can consult all their uploads under the upload option in the main menu. In case data are compliant with the format, the user will have the option to submit these data to the database (Figure 4), and their submission can be consulted under the data submission option in the main menu.



CONTINUOUS UNDERWATER NOISE

[Continuous Underwaternoise Registry](#) > [Manage](#) > [File upload details](#)

Print it
 Send to

 Share it

Results from the ICES Data Screening Utility program for the following data:

Country	DE
Dataset	Continuous underwater noise
File Name	928UTF8 in Comment.h5.csv
Email	xxxx@ices.dk
Monitoring Year	2020
Screening Date	25/03/2020 15:15:00

File had no errors. You can choose to upload the file to the database!

[Import the data to ICES](#)

You can check the continuous underwater noise format [here](#)

Figure 4. Screening report of a file that is ready be submitted to the database.

3.1. Data upload tutorial

To facilitate the initial submissions to the database, the ICES data centre gave a tutorial on how to screen and upload data to the database, and on how to use the ICES Station Dictionary⁶. This tutorial took place during the EN-Noise meeting on March 27th 2020.

⁶ <https://vocab.ices.dk/request/help/StationUserGuide.pdf>