

Continuous Underwater Noise Reporting Format

ICES - Science for Sustainable Seas

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1. Introduction

An agreement was made between HELCOM and ICES for the latter to host ambient underwater noise data. The continuous underwater noise submission format has been agreed by the ICES Data Centre, JOMOPANS and EN-NOISE.

2. Reporting format

The Continuous Underwater Noise format has to be submitted to ICES in HDF5 file format, and consists of three groups, each containing several datasets. A description of each group can be found in the subsections below. In the tables below, the “Field” column defines the datasets in each group, the “Status” column describes whether the dataset is mandatory, conditionally mandatory, or optional, the “Data type” column defines the data format in each dataset, the “Field definition” column describes the dataset, and the “Reference” column links to the controlled vocabulary for the corresponding dataset, when existent. A dataset is considered to be conditionally mandatory when a specified value is present in a related dataset.

2.1. File information group

Field	Status	Data type	Field definition	Reference
Email	Mandatory	String(50)	Creator of the HDF5 file/ who holds responsibility for data QA and creation of the submitted hdf5 file.	
CreationDate	Mandatory	DateTime(21)	Date of file creation. UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss] . Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z	https://en.wikipedia.org/wiki/ISO_8601
StartDate	Mandatory	DateTime(21)	Measurement collection start date. UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z	https://en.wikipedia.org/wiki/ISO_8601
EndDate	Mandatory	DateTime(21)	Measurement collection end date. UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z	https://en.wikipedia.org/wiki/ISO_8601
Institution	Mandatory	String(6)	Institution which acquired the data.	https://vocab.ices.dk/?ref=1398
Contact	Mandatory	String(255)	Contact of all future external queries/who submits/holds responsibility for submission	
CountryCode	Mandatory	String(4)		https://vocab.ices.dk/?ref=337
StationCode	Mandatory	String(10)	The station code and its associated coordinates can be found in the ICES station dictionary	https://vocab.ices.dk/?ref=1399

2.2. Metadata group

Field	Status	Data type	Field description	Reference
HydrophoneType	Mandatory	String(255)	This field describes the manufacturer and the used hydrophone type/model e.g. 'Brüell&Kjaer 8106'. This field needs to be an array if there are multiple channels (one per channel).	https://vocab.ices.dk/?ref=1584
HydrophoneSerialNumber	Mandatory	String(50)	e.g. "SN#1234". This field needs to be an array if there are multiple channels (one per channel).	
RecorderType	Mandatory	String(50)	Recorder/data logger type e.g. "Soundtrap"	https://vocab.ices.dk/?ref=1585
RecorderSerialNumber	Conditional Mandatory	String(50)	Recorder serial number e.g. "SN#2345"	
MeasurementHeight	Mandatory	Float	Height above the seafloor, in meters	
MeasurementPurpose	Mandatory	String(10)	Description of why the continuous underwater noise measurements reported were monitored	https://vocab.ices.dk/?ref=1586
MeasurementSetup	Mandatory	String(10)	Description of deployment. Mandatory in case the purpose is "HELCOM monitoring"	https://vocab.ices.dk/?ref=1587
RigDesign	Conditional Mandatory	String(10)	Description of deployment construction. Mandatory in case the purpose is "HELCOM monitoring"	https://vocab.ices.dk/?ref=1588
FrequencyCount	Mandatory	Integer	Number of frequency bands	
FrequencyIndex	Mandatory	Float	Third octave band nominal center frequencies. This field is an array of frequencies, with as many columns as the number of frequency bands reported under FrequencyCount.	
FrequencyUnit	Mandatory	String(10)		https://vocab.ices.dk/?ref=1592
ChannelCount	Mandatory	Integer	Number of channels used	
MeasurementTotalNo	Mandatory	Integer	Number of measurements	
MeasurementUnit	Mandatory	String(10)	Unit in which the values are in e.g. dB re 1µPa	https://vocab.ices.dk/?ref=1589
AveragingTime	Mandatory	Integer	Averaging time in seconds	
ProcessingAlgorithm	Optional	String(225)	Algorithm used to process the data e.g. computation method for third octave band (fft, filter bank ...)-analysis	https://vocab.ices.dk/?ref=1590
DataUUID	Mandatory	String(255)	Unique identification number, linking the data submission to the corresponding raw data. It should be used for resubmissions of the same data; matlab function available: uuid = char(java.util.UUID.randomUUID);	
DatasetVersion	Mandatory	String(255)	Indicates version of the submitted dataset. It should be changed upon resubmission	
CalibrationProcedure	Conditional Mandatory	String(255)	Method used to check the measuring chain. e.g. point calibration with pistonphone, functionality test with microphone and loudspeaker (frequency dependent), or other method used to check the measuring chain. e.g. point calibration with pistonphone, functionality test with microphone and loudspeaker (frequency dependent), or other. Mandatory in case the purpose is "HELCOM monitoring"	https://vocab.ices.dk/?ref=1591
CalibrationDateTime	Conditional Mandatory	DateTime(21)	Date of when the system was last calibrated. Mandatory in case "CalibrationProcedure" is specified UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z	https://en.wikipedia.org/wiki/ISO_8601
Comments	Optional	String(255)		

2.3. Data group

Field	Status	Data type	Field definition	Reference
DateTime	Mandatory	DateTime(21)	UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z	https://en.wikipedia.org/wiki/ISO_8601
LeqMeasurementsOfChannel1	Mandatory	Float	Equivalent continuous sound pressure level measurements over time for all covered frequency bands. One frequency per column. In case there are multiple channels, there should be an array of values for each channel. If there are 3 channels, there would be three arrays called LeqOfChannel1, LeqOfChannel2, LeqOfChannel3. In case of channel failure, please report NAN values.	
LeqMeasurementsOfChannel...				
LeqMeasurementsOfChannelN				

3. Calculating the measurement values

To learn about how to calculate the values reported in the “LeqMeasurementsOfChannel1”, “LeqMeasurementsOfChannel...” and “LeqMeasurementsOfChannelN” datasets in the “Data” group, please refer to the table and figures below.

Quantity	Unit	Reference value
Sound pressure level (SPL)	dB	$p_0^2=1\mu\text{Pa}^2$
(mean-square sound pressure level)		$p_0=1\mu\text{Pa}$
NOTES:		
based on ISO 18405, entry 3.2.1.1		
Mean-square sound pressure	Pa ²	Integral over a specified time interval (from $t=t_1$ to $t=t_2$) of squared sound pressure, divided by the duration of the time interval, for a specified frequency range
		NOTES:
		Source: ISO 18405, entry 3.1.3.1
		Note that the time interval must be specified.

$$L_{p,rms} = 10 \log_{10} \left[\frac{\overline{p^2}}{p_0^2} \right] \text{ dB} = 20 \log_{10} \left[\frac{p_{rms}}{p_0} \right]$$

$$\overline{p^2} = \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} p(t)^2 dt$$

4. Change log

Date	Change	Prepared by
3 March 2020	Initial version created	Joana Ribeiro, ICES
18 March 2020	Field "Comment" in Metadata record updated to "Comments"	Joana Ribeiro, ICES
05 September 2022	- Change [MeasurementSetup] to Mandatory from ConditionalMandatory - Change [RecorderSerialNumber] to ConditionalMandatory from Mandatory	Neil Holdsworth, ICES

