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Makara Data Submission Guide

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Makara Data Submission Guide

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General Information

This guide provides data contributors with instructions, field definitions, and examples for how to enter acoustic data and metadata into the template tables and submit them for archiving in the Northeast Fisheries Science Center's (NEFSC) Makara Database. Data that are archived in Makara may also be displayed on the Passive Acoustic Cetacean Map (PACM), with permission from the data owner(s).

1 Document History and Revisions

Version	Date	Author	Description
1.0	May 1, 2025	Julianne Wilder	Document Created
1.1	June 10, 2025	Jeffrey Walker	Updated “Data Table Template Instructions” to clarify that filenames and folder structure must match “templates” sub-directory.
1.2	August 26, 2025	Jeffrey Walker	Renamed the **organization_code** to **deployment_organization_code** in the analyses and detections tables to clarify that this field refers to the organization that owns the deployment. Also added **analysis_organization_code** to the detections table. Both tables now include both the **deployment_organization_code** (organization that the deployment and recording(s) belong to), and **analysis_organization_code** (organization that the analysis belongs to). Added **track_uri** to tracks table for linking tracks to external files in cloud storage (useful for linking track metadata to high resolution data not stored in makara) Fixed minor typos
1.3	October 7, 2025	Jeffrey Walker	Clarified that deployments, recordings, analyses and detections are the primary data tables, but not always required for each submission Added **Sensor Datasets** and **Sensor Values** templates Added **deployment_realtime** and **deployment_url** fields Updated **JSON** guidelines and examples Set default value for **recording_n_channels** to 1 Fixed **analysis_processing_types** to have values of POST_PROCESSEDandREAL_TIME(underscores instead of dashes) Clarified descriptions of **analysis_release_data** and **analysis_release_pacm**

2 Contact Information for the Makara Database Support Team

If you have questions or issues regarding your data submission, please contact nmfs.nec.pam-data@noaa.gov.

3 Tips and Recommendations

- Timezones/Timestamps: All timestamps that are entered into the data submission templates should include the timezone (even if they are in UTC; e.g., 2023-10-12T18:09:05+0000). The NEFSC generally recommends that all recordings are made in UTC. Other timezones are okay, so long as the timezone information is included within the timestamp (e.g., 2023-10-12T18:09:05+0500 to indicate that the audio was recorded in Eastern Standard Time).
- Scenarios and Examples: It is highly recommended that data contributors look through our Scenarios section and the 'examples' template folder in the downloadable zipped folder on the Passive Acoustic Reporting System Templates webpage prior to entering their data into the data submission templates. There may be an example that is similar to their situation.

4 Data Table Template Instructions

To submit data and metadata to the Makara database, the information must be organized into template tables. The data template tables and example tables are provided in a downloadable zipped folder on the Passive Acoustic Reporting System Templates webpage, and are described in more detail below. Some of the tables are required, but do not necessarily need to be submitted at the same time. Other tables are optional, but it is highly recommended that the data contributor fills out any tables that are applicable to their deployment(s). Within each table, there are required and optional (but recommended if applicable) fields. The required tables/fields are the bare minimum of what metadata should be submitted.

Within the template zipped folder is a sub-directory named "templates/". This subdirectory contains empty CSV files that can be used as starting templates for filling out each table. Each data submission should contain one or more of these CSV files with data rows properly entered based on the formats described below. The names of each CSV file as well as the folder structure must match what is in the templates folder. Data cannot be submitted as an Excel Workbook (*.xlsx file).

5 Primary Data Tables

The following tables are the primary tables for any data submission. Together, these four tables represent the core data stored in Makara. However, they are not strictly required for every submission. For example, a submission could contain only deployments but no recordings, analyses or detections, which could be added in a later submission. For each table, the data only needs to be submitted once unless updates or corrections are needed. In those cases, a revised table may be submitted so long as there are no changes in the primary codes identifying each row (e.g., deployment_code, recording_code, etc.).

Data Table	Definition	When to Submit
Deployments	The use of a platform (e.g., bottom-mounted mooring, buoy, glider, towed array) to record audio over a period of time	After a deployment has ended (the start date/time of a deployment is a required field, so a partial table could be submitted once a recorder is in the water, but would need to be updated after retrieval)
Recordings	Single or multichannel recordings that were made over the course of one or more deployments	After a deployment has ended
Analyses	The metadata needed to understand the detection results (i.e., the parameters of the analysis protocol)	After the data have been analyzed (if applicable, at the same time as the Detections table)

Detections	A time-binned or event-based identification of a sound source (e.g., dolphin, Atlantic cod, humpback whale, rain, vessel) produced from a passive acoustic detector or manual analysis that is used to determine presence of the sound source	After a recording has been analyzed (if applicable)

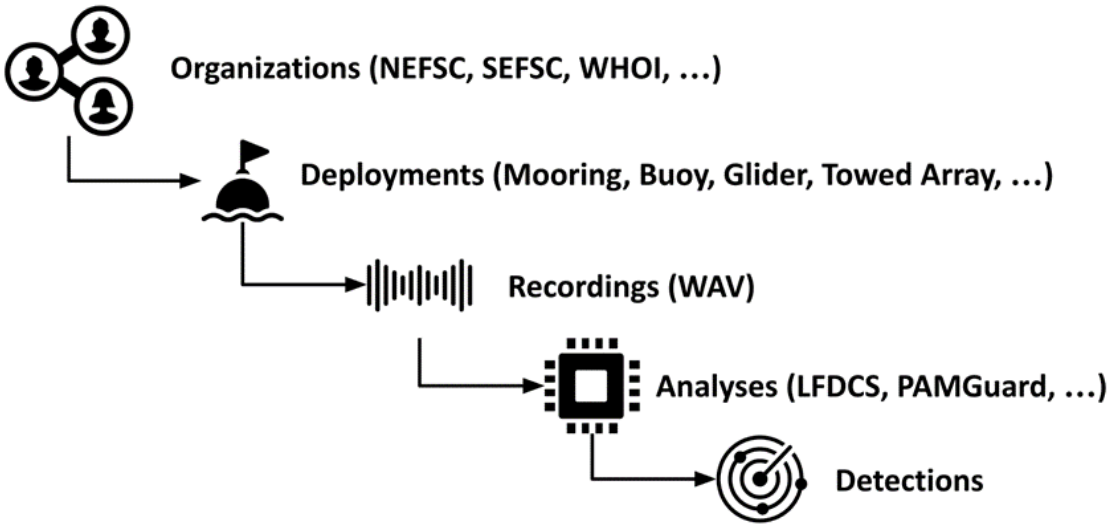

Figure 5.1: Diagram showing how the primary tables are related. Each organization owns one or more deployments, for which there can be one or more recordings. The recordings are then analyzed, generating detections.

6 Optional Data Tables

The following tables are optional for any data submission as long as the desired categories already exist in the database. For each table, the data needs to be submitted only once. For example, if a device has already been submitted with a deployment, and then referenced by a deployment that is submitted later, then the Device table including that device does not need to be included in the second submission as it will already exist in Makara.

Data Table	Definition	If/When to Submit
Devices	A specific piece of equipment used as part of a deployment (e.g., platforms, hydrophones, recorders, sensors, acoustic releases, gliders, arrays)	If there are new devices that are not already in Makara
Projects	A group of deployments	If multiple deployments are submitted that the data contributor would like to have grouped together, or if new deployments are submitted that should be grouped with deployments that are already in Makara. If a project was already created with previously submitted deployment(s) and there are new deployments to be added to that project, then another Project table does not need to be submitted.

Sites	The fixed location(s) where recordings were made over the course of one or more deployments, or general region for mobile deployments	If there are new deployment sites that are not already in Makara
Recording Intervals	The range of time and/or frequencies with compromised or invalid audio (this table is not for tracking duty cycled data)	If a deployment has periods of compromised data (duty cycling is accounted for in the Recordings table, not the Recording Intervals table)
Sensor Datasets	Metadata about the collection of sensor readings (e.g., temperatures)	If sensor data (e.g., temperatures) were collected on the deployment
Sensor Values	The timestamped sensor readings belonging to a Sensor Dataset	If sensor data (e.g., temperatures) were collected on the deployment
Tracks	Metadata about the collection of track data (e.g., position, speed, and other variables) associated with a mobile platform	If a mobile deployment is submitted
Track Positions	The instantaneous timestamped location, speed, etc. along the track of a mobile platform	If a mobile deployment is submitted

7 Reference Tables Maintained by NEFSC

NEFSC maintains the reference tables that are listed below. An updated copy of each table can be accessed by downloading the Excel document on the Passive Acoustic Reporting System Templates webpage. **If a data contributor is submitting data, but does not see the correct or applicable category that they need in one of these tables, they can contact the Makara Database Support Team to request that the category be added.** For example, if the submission includes detection data from an acoustic detector that does not already exist on the Detectors table in Makara, then the data contributor can contact the support team and have the new detector added to the reference table.

Reference Table	Definition
Analysis Granularity Types	The granularity of an analysis (e.g., time-binned intervals, call-by-call events, encounter events)
Analysis Processing Types	The processing method of an analysis (e.g., real-time, post-processed)
Analysis Quality Types	The analysis quality indicating the level of detection validation (e.g., full, partially, or not validated)
Behaviors	The behavior associated with a detection event (e.g., foraging, socializing)
Call Types	The unique call/click types associated with one or more sound sources/species (e.g., sperm whale clicks, North Atlantic right whale upcalls)
Call Type / Sound Sources	A list of call type codes and sound source codes indicating which call types can be used for which sound sources. This table can be used to find the call types available for a given species by filtering for that species sound_source_code.

Demographics	The demographics associated with a detection event (e.g., adult male, female or juvenile)
Detection Quality Types	The quality of detection type indicating whether it was validated or not (e.g., unverified, valid)
Detection Result Types	The detection result types based on the analysis methods (e.g., detected, possibly detected, not detected)
Detectors	The acoustic detector software programs used to process raw acoustic data (e.g., LFDCS, PAMGuard's whistle and moan detector)
Device Types	The general types of devices used as part of a deployment (e.g., platforms, hydrophones, recorders, sensors, acoustic releases, gliders, arrays)
Localization Methods	The methods used to localize the position of individual sound sources (e.g., DMON real-time tracking, time difference of arrival)
Localization Depth Methods	The methods used to localize the depth of individual sound sources (e.g., 3D Simplex, automatic direct reflected time difference of arrival)
Organizations	Any organizations that are registered in Makara (e.g., NEFSC, Woods Hole Oceanographic Institution, Cornell University)
Platform Types	The types of platforms upon which the hydrophones are mounted (e.g., gliders, moorings)
Recording Quality Types	The recording quality types indicate whether a recording is good, compromised, unusable, etc.
Sensor Variables	The variables that are measured by a sensor (e.g., temperature)

Sound Sources	Specific biological, anthropogenic, environmental, or unknown sound sources (e.g., North Atlantic right whale, recreational vessel, rain)

8 Data Type Formatting Instructions

Some fields on the data table templates require specific formatting when entering values.

Data Type	Required Formatting	Examples
Boolean	TRUE or FALSE	TRUE
Code	Uppercase letters, numbers, underscores (_), and dashes (-) only (no spaces, lowercase letters, or other symbols)	“NEFSC_MA-RI_-202202_COX01”, “SOUNDTRAP-53423”
Code List	Comma-separated list of Codes within a single string	“SOUNDTRAP-53423,VEMCO-9867,FPOD-12355”
Date	Date as “YYYY-MM-DD”	“2025-03-26”
Float	Decimal number	72.56281
Integer	Integer number	1
JSON	Valid JavaScript Object Notation (JSON) for storing structured data objects and arrays (see JSON Instructions)	{ “KEY”: “VALUE”, “KEY”: [1, 2, 3, ...], ... }
Text	Text string (no character limit)	“Recorder lost at sea”

Timestamp	Date and time in one of the following ISO-8601 formats (seconds and milliseconds are optional), must include timezone suffix (use 'Z' for UTC): "YYYY-MM-DDTHH:MMZ" "YYYY-MM-DDTHH:MM:SS±HH" "YYYY-MM-DDTHH:MM:SS±HHMM" "YYYY-MM-DDTHH:MM:SS.SSS±HHMM"	"2025-03-26T15:34Z" "2025-03-26T15:34:27+04" "2025-03-26T15:34:27-0500" "2025-03-26T15:34:27.921-0500"
Timezone	Timezone as UTC offset in one of the following formats: "UTC" "UTC±H" "UTC±HH" "UTC±HHMM"	 "UTC" "UTC+4" "UTC+04" "UTC-0500"
URI	Valid Uniform Resource Indicator (URI) address for files in cloud storage. Must start with the protocol (e.g., "gs://" for Google Cloud buckets), followed by the bucket name, and then path to the file within the bucket.	"gs://nefsc-1/bottom_-mounted/NEFSC_-GOM/NEFSC_GOM_-200410/NEFSC_-GOM_200410_-PU05"
URL	Valid Uniform Resource Locator (URL) address for web page	"https://dcs.whoi.edu/gom2412/gom24we14.shtml"

8.0.1 JavaScript Object Notation (JSON) Instructions

JSON (JavaScript Object Notation) is a lightweight data interchange format that is easy for humans to read and write and for machines to parse and generate. In Makara, several fields are designated as JSON type to store structured data that doesn't fit well into standard columns. For example, information about device calibration, channel maps, and detector settings can all be stored as JSON for loading directly into other software.

8.0.2 When to Use JSON Fields

The JSON fields are primarily intended to be used in the following situations:

- To store structured data that benefits from consistent data structures (e.g., calibration tables)
- When you need the data to be directly queryable within the database
- When the data can be read or processed directly by other software applications

JSON is particularly valuable for device specifications, channel mappings, calibration data, and complex configuration settings. However, if your additional information is primarily free-text notes or simple comments that don't require structured querying or programmatic access, NEFSC recommends using the standard comments field available in each table instead. The comments fields are simpler to fill out, don't require special formatting, and are better suited for human-readable annotations that don't need computational processing.

8.0.3 What is JSON?

JSON consists of two primary structures:

- **Objects**: Collections of key-value pairs enclosed in curly braces { }. Each key must be a string in double quotes, followed by a colon :, and then a value. Example: { "DETECTOR_THRESHOLD": 0.75 }
- **Arrays**: Ordered lists of values enclosed in square brackets [ ]. Example: [0.5, 0.75, 0.9]

Values in JSON can be:

- **Strings**: Text in double quotes "example"
- **Numbers**: Integers or decimals without quotes 42 or 3.14
- **Booleans**: true or false (lowercase, without quotes)
- **null**: Represented as null (without quotes)

There are no specific formats required for dates and timestamps. However, NEFSC recommends using the same formats listed in the Data Type Formatting Instructions table based on the ISO8601 standard (e.g., { "date": "2025-03-20", "datetime": "2025-03-26T15:34:27Z" }).

8.0.4 Example JSON Structures

Simple object for the sensitivity of a recorder:

```
{ "SENSITIVITY": -1.8 }
```

Nested object for the high and low gain sensitivities of a recorder:

```
{ "GAIN": { "HIGH": 177.4, "LOW": 189.9 } }
```

Object with nested array for the sensitivity calibration of a hydrophone:

{ “SENSITIVITIES”: [-170.1, -169.8, -170.2], “CALIBRATION_DATE”: “2023-05-15”}

Complex nested structure containing a calibration frequency table represented as an array of objects where each object within the array is a row in the table:

{

“FREQ_TABLE”: [

{ “FREQ_HZ”: 1, “GAIN_DB”: 10.6 },

{ “FREQ_HZ”: 2, “GAIN_DB”: 20.3 },

{ “FREQ_HZ”: 5, “GAIN_DB”: 35.8 },

{ “FREQ_HZ”: 10, “GAIN_DB”: 47.9 },

etc...

]

}

8.0.5 Recommended Guidelines

NEFSC recommends adhering to the following guidelines when creating JSON data for submission to Makara. Please note these are only guidelines, not requirements. The only requirement for these fields is that the data is in valid JSON format.

- Each entry in a JSON field should be an object at the top level, not an array or individual value so that all values have a key specifying what they are (e.g., use "{"SENSITIVITIES": [-170.1, -169.8, -170.2] }" instead of just the array of values "[-170.1, -169.8, -170.2]"
- Always use uppercase letters for object keys to avoid changes in case across rows (e.g., { "HIGH": 177.4 } and { "high": 177.4 } are not compatible)
- Do not wrap numeric values in double quotes, leave them as numbers (e.g., { "HIGH": 177.4 } instead of { "HIGH": "177.4" })

8.0.6 Tips for Working with JSON in Spreadsheets

- Create your JSON in a text editor or JSON validator first to ensure proper formatting
- For complex JSON structures, consider using a JSON validation tool (like jsonlint.com) before pasting into your spreadsheet
- Keep JSON structures as simple as possible while still capturing the necessary data

8.0.7 Consistency is Critical

It is the responsibility of the data contributor to adhere to consistent structures (aka schema) within the JSON field of each table. This is critical for ensuring data integrity and usability, and so JSON data can be readily combined across multiple rows in a given table. While NEFSC provides some example formats for each JSON field in this guide, each data contributor can develop their own JSON schema that aligns with their software and workflow.

9 Data Table Field Definitions

The following tables contain definitions for each field or column in the data table templates contained in the zipped folder. Each of the following field definitions tables in this document has a number of columns which are defined below in the Column Header Key section, including columns for specifying which fields are required, the type of data that should be entered (e.g., text, integer, URL), and which reference tables to refer to when filling out that field.

9.0.1 Column Header Key

- **Field:** The name of the field
- **Definition:** The definition of the field with examples of formatting and what to include
- **Required:** Indicates whether the field is required (i.e., 'Always') or conditional (e.g., "If recording_device_lost=FALSE, then this field is always required"). Some fields are required if the data are also being submitted to the National Centers for Environmental Information (NCEI). If those fields are not already required for submitting data to the Makara database, then there will be a note in the Required column saying "Required for NCEI".
- **Default:** Indicates whether the field has a default value if no other value or text is entered
- **Data Type:** The data type accepted by that field (see Data Type Formatting Instructions)
- **Reference Table:** The reference table that contains the category options for each field. Some reference tables are labeled with "(see Excel)", indicating that they are global reference tables available in the "Makara - Reference Tables" Excel document* in the zipped folder. If a reference table is listed here but not found with the rest of the reference tables, it is likely a reference table that is maintained internally by NEFSC and the categories can be searched for directly in Makara.
- **Constraint:** Any constraints on the contents of that field

9 Data Table Field Definitions

**Note: An updated copy of each reference table can be accessed by downloading the Excel document on the Passive Acoustic Reporting System Templates webpage. If a data contributor is submitting data, but does not see the correct or applicable category that they need in one of these tables, they can contact the Makara Database Support Team to request that the category be added.*

10 Deployments Table Field Definitions

Filename: deployments.csv

Below are the field definitions for the Deployments table, which is a primary table.

11 Recordings Table Field Definitions

Filename: recordings.csv

Below are the field definitions for the Recordings table, which is a primary table.

12 Analyses Table Field Definitions

Filename: analyses.csv

Below are the field definitions for the Analyses table, which is a primary table.

13 Detections Table Field Definitions

Filename: detections.csv

Below are the field definitions for the Detections table, which is a primary table.

Field	Definition	Required	Default	Data Type	Reference Table	Constraint
deployment_organization_code	Code of the organization that the deployment belongs to. Examples: “NEFSC”, “WHOI”	Always		Code	Organizations (see Excel)	
deployment_code	Unique code for the deployment that the analysis belongs to. Examples: “WHOI_GOM_202310_WE03”, “WHOI_MA-RI_202210_WE16”, “NEFSC_MA-RI_202110_NS01”, “NEFSC_MA-RI_202202_COX02”	Always		Code	Deployments	

analysis_organization_code	Code of the organization that conducted and owns the analysis. Examples: “NEFSC”, “WHOI”	Always	Code: Organizations (see Excel)
analysis_code	Code of the analysis that the detection belongs to. Examples: “RIWH_ANALYSIS”, “BEAKED_ANALYSIS”	Always	Code: Analyses
detection_start_datetime	Start date and time for the time period for the detection event or time bin depending on analysis granularity Example: “2025-03-26T15:34:27-0500”	Always	Timestamp
detection_end_datetime	End date and time for the time period for the detection event or time bin depending on analysis granularity. If detection is for a single point in time, the start and end datetimes can be the same. Examples: “2025-03-26T15:34:27-0500”, “2025-03-26T15:34:30-0500”	Always	Timestamp
detection_effort_secs	The amount of time (in seconds) the effort occurred in. This would translate to encounter or event duration for encounter/event level data. If the entire period was analyzed, enter total duration between the detection start and end datetimes. Example: If the first 5 minutes of every hourly analysis bin was analyzed, this number would be “300”. If the full hour of every hourly analysis bin was analyzed, this number would be “3600”.	Always	Float

detection_sound_source_code	The species or detected sound the detection period relates to Examples: “HUWH”, “STDO”, “RV-L”, “RAIN”	Always	Code	Sound Sources (see Excel)
detection_call_type_code	The call/click type used for presence determination for the detection period Examples: “RIWH_UPCALL”, “HUWH_SONG”, “OD_WHIS_HF”	Always	Code	Call Types (see Excel)
detection_behavior_code	Behavior associated with detected event Examples: “CONTACT”, “FORAGING”, “MOM_CALF”, “MATING”		Code	Behaviors (see Excel)
detection_demographic_code	The demographic determined of the sound source for the detection period Examples: “ADULT_FEMALE_OR_JUV”, “MID-SIZED_INDIVIDUAL”, “MIXED_GROUP”		Code	Demographics (see Excel)
detection_n_validated	Number of actual detections that have been validated to be correct in the detection time period Examples: “3”, “258”		Integer	
detection_n_total	Total number of detections for the sound source within the detection time period (can include true and false detections) Examples: “15”, “179”		Integer	

detection_result_code	Detection result indicating if the species was detected or not Examples: “DETECTED”, “POSSIBLY_DETECTED”, “NOT_DETECTED”	Always	Code: Detection Result Types (see Excel)
detection_event_type	Type of detection event (if available) Example: PAMGuard’s eventType field		Text
detection_event_id	ID of the detection event (if available) Example: PAMGuard’s event ID		Text
detection_latitude	Latitude of the platform location at time of detection (or start of encounter) in decimal degrees (DD.DDDD), only applicable to mobile platforms (e.g., gliders, buoys) Example: “41.141289”		Float
detection_longitude	Longitude of the platform location at time of detection (or start of encounter) in decimal degrees (DD.DDDD), only applicable to mobile platforms (e.g., gliders, buoys). Negative for locations west of the central meridian. Example: “-71.102908”		Float

detection_received_level_db	Received level of the detection in dB. For single call detections, a singular value should be placed here. For encounters or time binned data, an average or median received level should be placed here. Further details such as the exact unit (e.g. dB RMS, or dB pp), and whether a median or average received level was used should be placed in the analysis_json or analysis_comments fields of the parent analysis. For encounters/time binned data, each signal's received level can be placed in the detection_json field. Example: "15"	Float
detection_quality_code	Quality type of the detection if it was validated or not. This field may be left blank if the analysis_quality_code is "UNKNOWN" for the parent analysis, otherwise it is recommended to fill it out. Examples: "INVALID", "UNVERIFIED", "VALID", "PARTIALLY_VALID"	Code: Detection Quality Types (see Excel)
detection_n_animals	Estimated number of animals thought to be in the detection Example: "25"	Integer
detection_n_animals_min	Minimum number of animals thought to be in the detection Example: "1"	Integer

detection_n_animals_max	Maximum number of animals thought to be in the detection Example: “3”		Integer
detection_json	Additional structured data about the detection		JSON
detection_comments	Comments about the detection		Text
localization_method_code	Method used to localize the position of the animal(s) Examples: “3D_SIMPLEX”, “DMON_REAL-TIME”, “SHIP-POSITION”	Required if submitting localization data	Code: Localization Methods (see Excel)
localization_latitude	Estimated localized latitude of the animal in decimal degrees (DD.DDDDDD) Example: “41.141289”		Float

localization_latitude_min	Minimum localized latitude accounting for localization uncertainty in decimal degrees (DD.DDDDDD) Example: “40.724307”	Float
localization_latitude_max	Maximum localized latitude accounting for localization uncertainty in decimal degrees (DD.DDDDDD) Example: “41.141289”	Float
localization_longitude	Estimates localized longitude of the animal in decimal degrees (DD.DDDDDD), negative for locations west of the central meridian Example: “-71.102908”	Float
localization_longitude_min	Minimum localized longitude accounting for localization uncertainty in decimal degrees (DD.DDDDDD), negative for locations west of the central meridian Example: “-70.016567”	Float
localization_longitude_max	Maximum localized longitude accounting for localization uncertainty in decimal degrees (DD.DDDDDD), negative for locations west of the central meridian Example: “-71.102908”	Float

localization_distance_m	Estimated range of detection (in meters) from the recording platform Examples: “3”, “60.5”	Float
localization_distance_m_min	Minimum range of detection (in meters) from the recording platform Example: “0”	Float
localization_distance_m_max	Maximum range of detection (in meters) from the recording platform Example: “8047”	Float
localization_bearing	For beamforming, the estimated bearing angle of the localization cone (0-360 degrees). Specify if bearing is measured relative to true north, magnetic north, or device orientation, and compass rose convention (clockwise, counter-clockwise) in analysis_json or analysis_comments. Examples: “170”, “170.5”	Float
localization_bearing_min	For beamforming, the start bearing angle of the localization cone (0-360 degrees) Examples: “167”, “167.5”	Float

localization_beam_forming_bearing_max	For beamforming, the end bearing angle of the localization cone (0-360 degrees) Example: “175”, “175.34”	Float
localization_depth_method_code	Method used to estimate depth of the animal(s) Examples: “3D_TDOA”, “MANUAL_DRTD”, “WHALEDO”	Code: Localization Depth Methods (see Excel)
localization_depth_n_signals	Number of signals used to derive the depth Examples: “7”, “218”	Integer
localization_depth_m	Estimated depth of animal (in meters) Examples: “5”, “28.6”	Float
localization_depth_m_min	Minimum depth of animal (in meters) Example: “1.5”	Float

localization_depth_m_max	Maximum depth of animal (in meters) Example: “893”	Float
localization_json	Additional structured data about localization in JSON format	JSON
localization_comments	Comments about the localization	Text

14 Devices Table Field Definitions

Filename: devices.csv

Below are the field definitions for the Devices table, which is an optional table. It is only required if one or more new devices need to be added to Makara.

15 Projects Table Field Definitions

Filename: projects.csv

Below are the field definitions for the Projects table, which is an optional table. It is only required if multiple deployments are submitted that the data contributor would like to have grouped together, or if new deployments are submitted that should be grouped with deployments that are already in Makara.

16 Sites Table Field Definitions

Filename: sites.csv

Below are the field definitions for the Sites table, which is an optional table. It is only required if one or more new deployment sites need to be added to Makara.

17 Recording Intervals Table Field Definitions

Filename: recording_intervals.csv

Below are the field definitions for the Recording Intervals table, which is an optional table. It is only required if one or more recordings have periods of compromised data (duty cycling is accounted for in the Recordings table, not the Recording Intervals table). For an example of a recording_intervals table that is filled out, see Example #1. **UPDATE LINK**

18 Tracks Table Field Definitions

Filename: tracks.csv

Below are the field definitions for the Tracks table, which is an optional table. It is only required if one or more mobile deployments are being submitted to Makara.

19 Track Positions Table Field Definitions

Filename: track_positions.csv

Below are the field definitions for the Track Positions table, which is an optional table. It is only required if one or more mobile deployments are being submitted to Makara.

20 Sensor Dataset Field Definitions

Filename: sensor_datasets.csv

Below are the field definitions for the Sensor Datasets table, which is an optional table. It is only needed when submitting sensor data such as temperatures for a deployment. Note that a separate dataset must be created for each variable.

21 Sensor Values Table Field Definitions

Filename: sensor_values.csv

Below are the field definitions for the Sensor Values table, which is an optional table. It is only required if one or more mobile deployments are being submitted to Makara.

22 Frequently Asked Questions

22.0.1 Where can I find the submission templates to enter my data/metadata?

The data template tables and example tables are provided in a downloadable zipped folder on the Passive Acoustic Reporting System Templates webpage.

22.0.2 What happens if I find a mistake in my metadata after I have submitted my templates? For example, you submit your recordings data in local time but realize later you need to change it to UTC.

Not to worry! You have two options: 1) you can resubmit a whole table (or tables) with the corrected data, or 2) you can go to Makara directly and correct a field or fields. For example, if you change the site_code in the Sites table, all of the deployments that reference that site_code will automatically be updated to the new site_code.

23 Example Scenarios

The following scenarios describe potential situations that may arise when submitting data and metadata to Makara. Each scenario is associated with a set of example templates provided in the zipped folder that provide a mockup of what that scenario might look like. Within the template zipped folder is a sub-directory named "examples/". This sub-directory contains four example folders containing CSV files that are filled out according to each scenario.

23.0.1 Example #1: Single moorings with multiple same recorder types but different settings

23.0.1.1 Location of example templates within zipped folder: examples/EXAMPLE_1_Moorings_Same_Recorder_Type

This example shows two single, bottom-mounted moorings, each equipped with two SoundTraps, a temperature sensor, and a Vemco receiver. The NS01 mooring was deployed near Nantucket Shoals off the coast of Massachusetts and Rhode Island from October 2021 to February 2022. It had one SoundTrap600 (ST600 STD) and one high-frequency SoundTrap600 (ST600 HF) to record harbor porpoises. Both devices recorded over the whole deployment, but the ST600 HF was duty-cycled, recording for 5 minutes at the beginning of each hour with a sampling rate of 384 kHz. The ST600 STD recorded continuously with a lower sampling rate of 64 kHz. This example also shows what it looks like when there are compromised data in one of the recordings (e.g., a data gap in the recording from the ST600 HF), which can be viewed on the recording_intervals table. Daily presence of North Atlantic right whales was analyzed for 6 days from the ST600 STD recording, and hourly presence of harbor porpoises was analyzed for 6 days from the ST600 HF recording.

The COX01 mooring was deployed near Cox Ledge off the coast of Massachusetts and Rhode Island from November 2021 to February 2022. It had two ST600 HF hydrophones that recorded continuously with a sampling rate of 384 kHz, but one is only on and recording for the first half of the deployment (2021-11-03 to 2022-01-01) and the other is recording for the second half of the deployment (2022-01-01 to 2022-02-24; see the

recordings table). Daily presence of North Atlantic right whales and hourly presence of harbor porpoises were analyzed for 6 days from each of the COX01 recordings. Note: More analyses were performed over the whole deployment, but for this example we only showed 6 days worth of analysis.

23.0.2 Example #2: Single moorings with multiple different recorder types

23.0.2.1 Location of example templates within zipped folder: examples/EXAMPLE_2_Moorings_Different_Recorder_Types

This example shows a single, bottom-mounted mooring that was deployed in the offshore Gulf of Maine along the northern edge of Georges Bank from July to December 2022. The mooring was equipped with two hydrophones (one SoundTrap600 with a sampling rate of 64 kHz and one FPOD with a sampling rate of 1,000 kHz to record harbor porpoise), a temperature sensor, and a Vemco receiver. Both devices recorded continuously over the whole deployment, but the FPOD recordings were automatically deleted once they were processed in real-time by a click detector onboard the platform (so only detection data were collected from the FPOD, no audio data). Daily presence of blue whales were analyzed for 6 days from the ST600 STD recording, and hourly presence of harbor porpoises were determined automatically from the detection data for 6 days from the FPOD data. Note: More analyses were performed over the whole deployment, but for this example we only showed 6 days worth of analysis.

23.0.3 Example #3: Towed array deployments across multiple cruise legs

23.0.3.1 Location of example templates within zipped folder: examples/EXAMPLE_3_Towed_Array

This example shows recordings from five towed array deployments across different legs of a research cruise that surveyed offshore of the northeast U.S. in June-August 2016. The towed array setup consisted of two separate oil-filled arrays (an inline and an endline array), each containing multiple hydrophones and one containing a depth sensor. There were different types of hydrophones (e.g., APC, Reson, HTI), all of which recorded continuously whenever the array was deployed. Some had a sampling rate of 192 kHz while others had a sampling rate of 500 kHz to record Kogia clicks.

All of the 192 kHz recordings were post-processed and analyzed for the clicks of various beaked whale species including Blainville's, goose-beaked, Gervais', unidentified True's/Gervais', Sowerby's, True's, and unidentified Mesoplodon. Three of the

500 kHz recordings from deployments NEFSC_HB1603_DEP1, DEP3, and DEP4 were post-processed and analyzed for unidentified pygmy/dwarf sperm whales. The 192 kHz recording from deployment NEFSC_HB1603_DEP3 was also analyzed in real-time onboard the ship for presence of Blainville's beaked whales, bottlenose dolphins, unidentified common dolphins, goose-beaked beaked whales, Gervais' beaked whales, unidentified Risso's/bottlenose dolphins, unidentified True's/Gervais', unidentified pilot whales, pantropical spotted dolphins, Sowerby's beaked whales, sperm whales, striped dolphins, True's beaked whales, and unidentified dolphins.

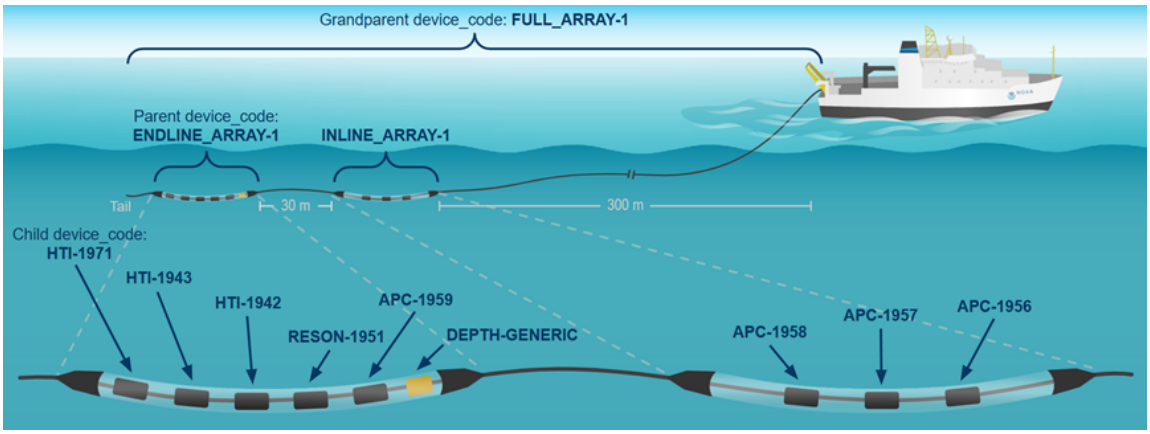

Figure 23.1: Diagram of a towed array of hydrophones being towed from the back of a research vessel. The labeled, nested devices correspond to the devices listed in the Example 3 templates.

23.0.4 Example #4: Glider deployment

23.0.4.1 Location of example templates within zipped folder: examples/EXAMPLE_4_Gliders

This example shows an autonomous Slocum glider that was deployed near Cox Ledge off the coast of Massachusetts and Rhode Island from October 2022 to December 2023. The glider was equipped with a second generation Digital Acoustic Monitoring instrument (DMON2) and a Vemco receiver. The DMON2 was recording continuously throughout the deployment with a sampling rate of 2 kHz. Subsampled periods of simplified spectrograms (without the acoustic recordings) were transmitted to shore via satellite every 2 hours, and then analyzed for presence of sei, fin, humpback, and North Atlantic right whales in near-real time . The full audio recordings were collected when the glider and hard drive were retrieved.