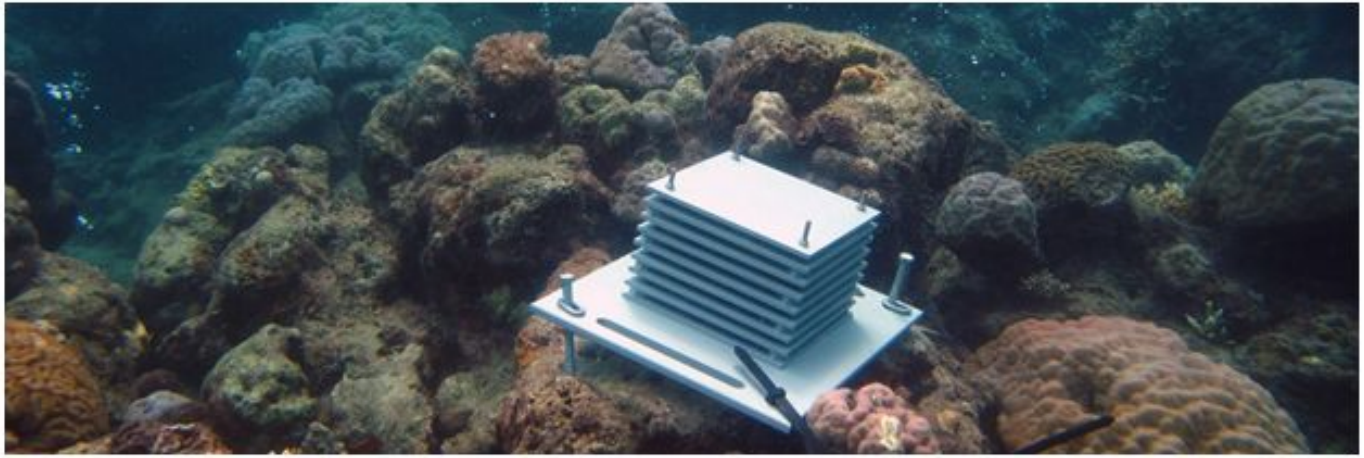


MBON
Marine Biodiversity Observation Network

How to manage your ARMS-MBON data and metadata

Katrina Exter (VLIZ)
Aug. 2022

Scope of this guide

In this guide we explain

- How to start managing your ARMS-MBON metadata and data when you begin in the project
- How to continue managing your ARMS-MBON (meta)data in PlutoF after each sampling event
- What happens after you have shipped your samples
- The importance of using the correct identifiers for your observatory, units, events, material samples and images

Contact for help

Network coordinator : Matthias Obst, University Gothenburg, matthias.obst@marine.gu.se
Data management : Katrina Exter, VLIZ, katrina.exter@vliz.be
Sequencing/ENA submission: Christina Pavloudi, cpavloud@hcmr.gr

Documentation

https://github.com/arms-mbon/Documentation: for the Handbook, SOPs, the Access and Benefit Sharing guide, and the Data Management Plan
https://github.com/arms-mbon/Templates: various spreadsheet templates for you to use when submitting images, manual observations, and when setting your IDs in PlutoF

Websites

ASSEMBLE Plus: http://arms-mbon.org/ = https://www.assembleplus.eu/research/ARMS-MBON
ARMS-MBON github: https://github.com/arms-mbon and https://data.arms-mbon.org
Overview googlesheet:
https://docs.google.com/spreadsheets/d/1j3yuY5lmoPMo91w6e3kkJ6pmp1X6FVGUtLealuKJ3wE/

Starting in the ARMS-MBON project

Step 1a: registration via the ARMS website

If not already done so, you need to register to join ARMS

1. Fill in the registration form on the ARMS website
    a. ARMS webpage: http://www.assembleplus.eu/research/ARMS-MBON
    b. ARMS registration form: https://registration.vliz.be/ARMS-registration-form

What information do you need to provide when you register?

You are requested to choose a descriptive name and a shorter ID for your **Observatory**. For the ID, use

- **one word**
- **no spaces, hyphens, etc**

The Observatory ID is fixed for all time.

The Observatory identifies a region in which you will place your ARMS unit(s). Most partners chose to use only one Observatory, but if you are using regions that are widely dispersed or in very different environments, it is helpful to define more than one Observatory.

You are also requested to chose the IDs for your **ARMS units** (noting that more can be added later). Each ID must be unique among all partners (once combined with the Observatory name) and permanent (i.e. once set, do not change). The ID should be

- **one word**
- **without spaces, hyphens, etc**

Note that the ARMS unit ID is not actually fixed to the physical unit itself, rather to the location in which it is placed. If you place a new unit in the same location as a previous one, it keeps that place's ID. If you place a unit in a new location, you need to define a new ID

Starting in the ARMS-MBON project

Step 1b: register with PlutoF

Once you are accepted in ARMS MBON, you need to register with PlutoF

- Register with PlutoF on https://plutof.ut.ee/#/register
- Once registered, contact Matthias Obst to be added to the ARMS-MBON space (https://plutof.ut.ee/#/study/view/81139)

PlutoF is the data-management platform used by ARMS-MBON. You will describe your Observatory and ARMS units there, and after each ARMS unit retrieval, you will upload your metadata and data files (images and manual observations) there. ASVs and species information are also managed there by the ARMS-MBON management team.

The sampling teams (i.e. you) are expected to keep their PlutoF account up-to-date and to conform to the metadata requirements as outlined in the Handbook

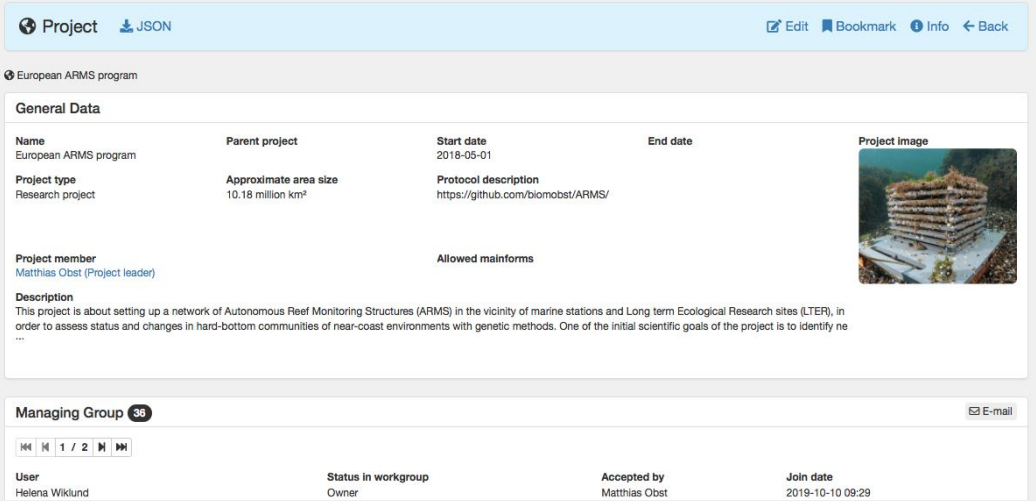
Working in PlutoF

Step 2: The ARMS-MBON project home page

Once you have a PlutoF account and access to the ARMS-MBON project, you need to define your Observatory(ies) and ARMS unit(s)

1. Log on to https://plutof.ut.ee/#/study/view/81139

The “European ARMS program” general information is at the top of the home page of the ARMS-MBON project

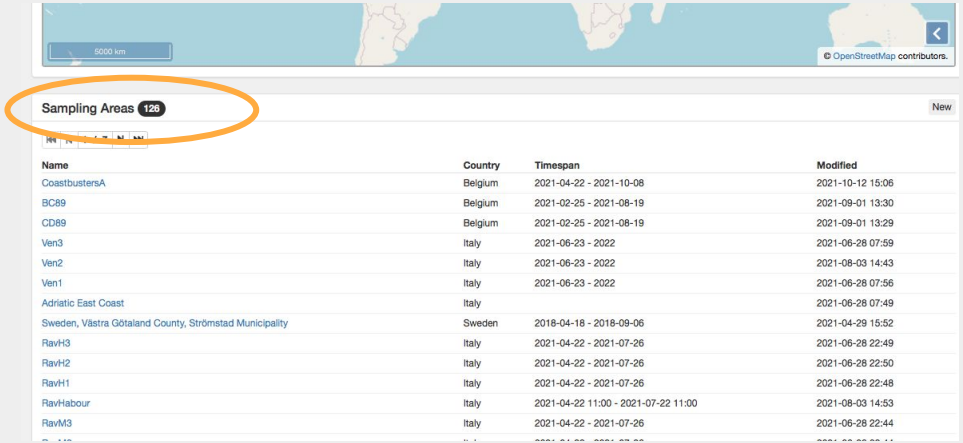


Working in PlutoF

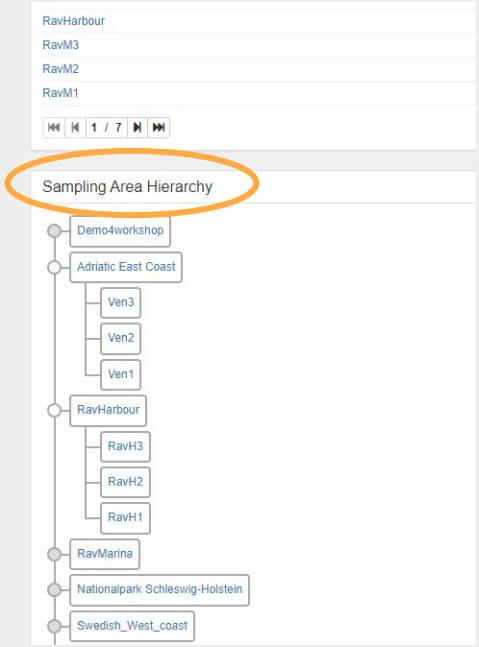
Step 2: The ARMS-MBON project home page

Look to see if your Observatory is present. Below the *General Data* is a map, and below the map, are two listings of *Sampling Areas*. In PlutoF, both Observatories *and* ARMS units are called “sampling areas”.

- The first list mixes the Observatories and units
- The second list is hierarchical, showing the Observatories and, upon a click on the circle, its ARMS units



Name	Country	Timespan	Modified
CoastbustersA	Belgium	2021-04-22 - 2021-10-08	2021-10-12 15:06
BC89	Belgium	2021-02-25 - 2021-08-19	2021-09-01 13:30
CD89	Belgium	2021-02-25 - 2021-08-19	2021-09-01 13:29
Ven3	Italy	2021-06-23 - 2022	2021-06-28 07:59
Ven2	Italy	2021-06-23 - 2022	2021-08-03 14:43
Ven1	Italy	2021-06-23 - 2022	2021-06-28 07:56
Adriatic East Coast	Italy		2021-06-28 07:49
Sweden, Västra Götaland County, Strömstad Municipality	Sweden	2018-04-18 - 2018-09-06	2021-04-29 15:52
RavH3	Italy	2021-04-22 - 2021-07-26	2021-06-28 22:49
RavH2	Italy	2021-04-22 - 2021-07-26	2021-06-28 22:50
RavH1	Italy	2021-04-22 - 2021-07-26	2021-06-28 22:48
RavHabour	Italy	2021-04-22 11:00 - 2021-07-22 11:00	2021-08-03 14:53
RavM3	Italy	2021-04-22 - 2021-07-26	2021-06-28 22:44



Working in PlutoF
Step 3: Defining your Observatory

If your Observatory and/or your ARMS units are not present, you need to add them

Adding a new Observatory

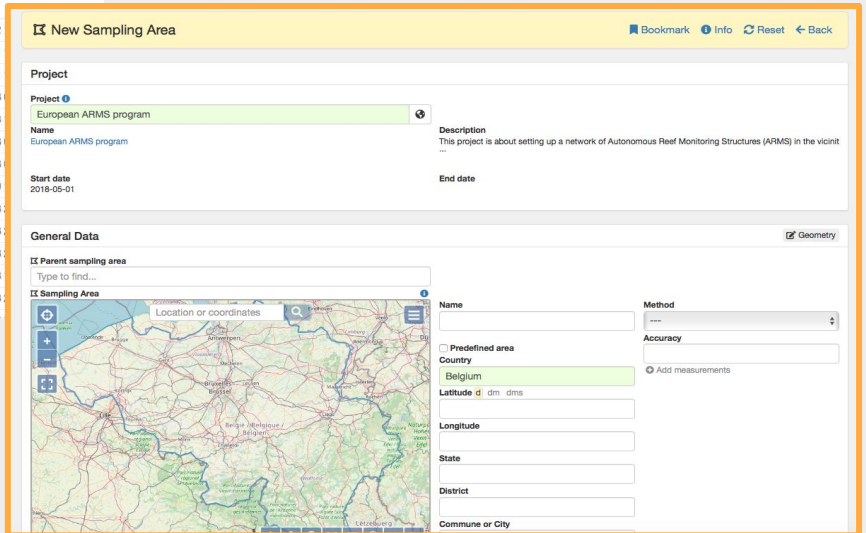
1. Create a new Sampling Area by clicking “new” above the *Sampling Areas* list

Sampling Areas 126

New

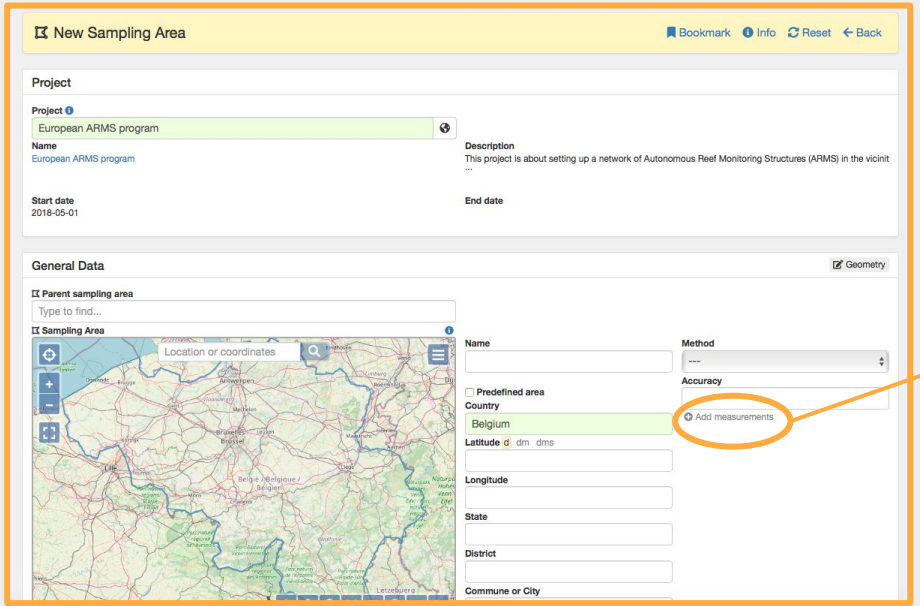
1 / 7

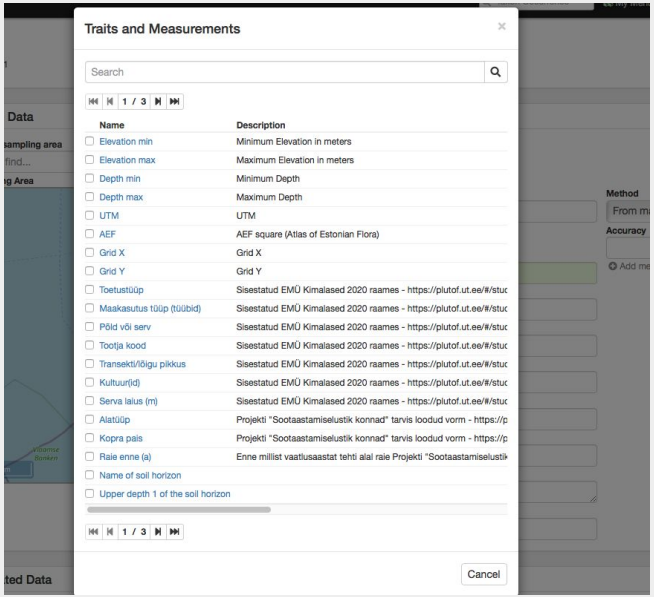
Name	Country	Timespan	Modified
CoastbustersA	Belgium	2021-04-22 - 2021-10-08	2021-10-12
BC89	Belgium	2021-02-25 - 2021-08-19	2021-09-01
CD89	Belgium	2021-02-25 - 2021-08-19	2021-09-01
Ven3	Italy	2021-06-23 - 2022	2021-06-28
Ven2	Italy	2021-06-23 - 2022	2021-08-03
Ven1	Italy	2021-06-23 - 2022	2021-06-28
Adriatic East Coast	Italy		2021-06-28
Sweden, Västra Götaland County, Strömstad Municipality	Sweden	2018-04-18 - 2018-09-06	2021-04-29
RavH3	Italy	2021-04-22 - 2021-07-26	2021-06-28
RavH2	Italy	2021-04-22 - 2021-07-26	2021-06-28
RavH1	Italy	2021-04-22 - 2021-07-26	2021-06-28
RavHabour	Italy	2021-04-22 11:00 - 2021-07-22 11:00	2021-08-03
RavM3	Italy	2021-04-22 - 2021-07-26	2021-06-28



Working in PlutoF
Step 3: Defining your Observatory

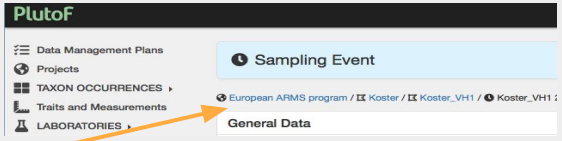
2. Fill in the following fields in the *General Data* section to define your Observatory:
   a. Name = Observatory ID as selected by you when you registered
   b. Country
   c. Latitude and Longitude (either search and click on the map, or type them in)
3. (Ignore the field *Parent sampling area* because the Observatory is already the top-most sampling area level)
4. Click to “Add measurement”, select “Depth max”, enter your value (this can be changed later)
5. Click “Save” at the bottom of the page





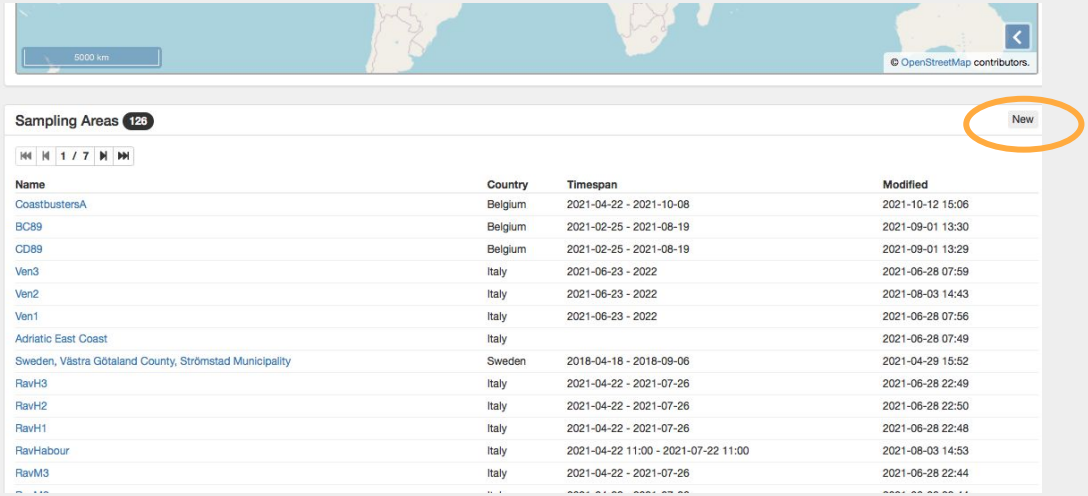
Working in PlutoF

Step 4: Defining your ARMS units



Add your ARMS units also as new *Sampling Areas*

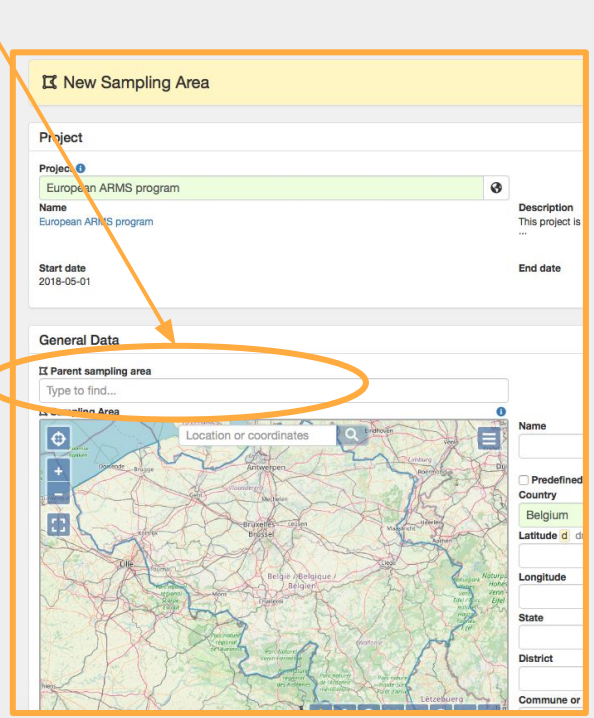
1. Go back to the ARMS programme front page
   a. Go go https://plutof.ut.ee/#/study/view/81139
   b. Or if you are already in PlutoF, click “European ARMS program” at the top of the page
2. Go to the *Sampling Areas* again, to again create a new sampling area by clicking “new”



Working in PlutoF

Step 4: Defining your ARMS units

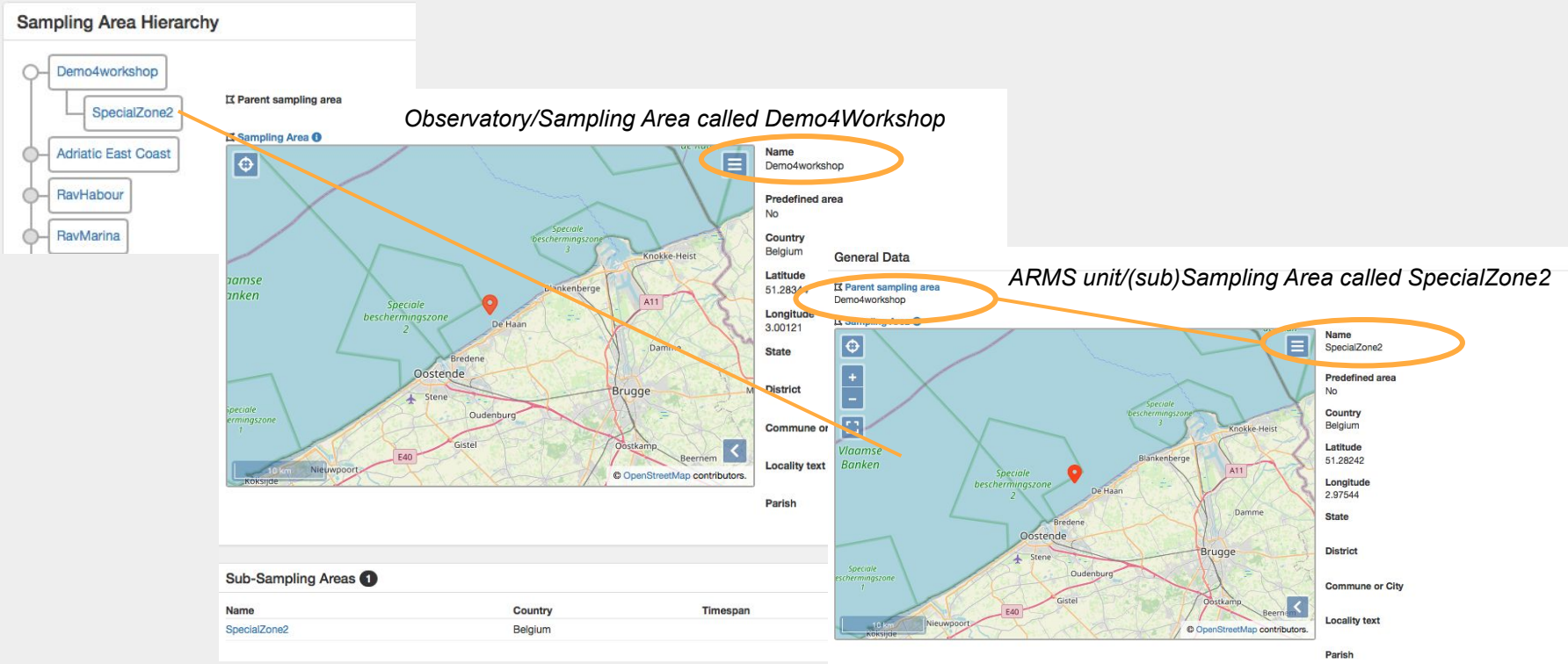
3. In the *General Data section*, this time do go to the “Parent sampling area”
   a. Enter the name of your Observatory that the ARMS unit will be located in (i.e. the name entered when you created the Observatory *Sampling Area*)
4. Enter next the following information for your ARMS unit
   a. Name = ARMS ID as selected by you when you registered
   b. Country
   c. Latitude, Longitude (to a precision of 5 significant digits)
   d. Click to add the “measurements” for
      i. Depth min
      ii. Depth max
5. Click to “Save” at the bottom of the page



Working in PlutoF

Step 5: Check your results

Go back to the home page and check to see your new *Sampling Areas* (as demonstrated below).

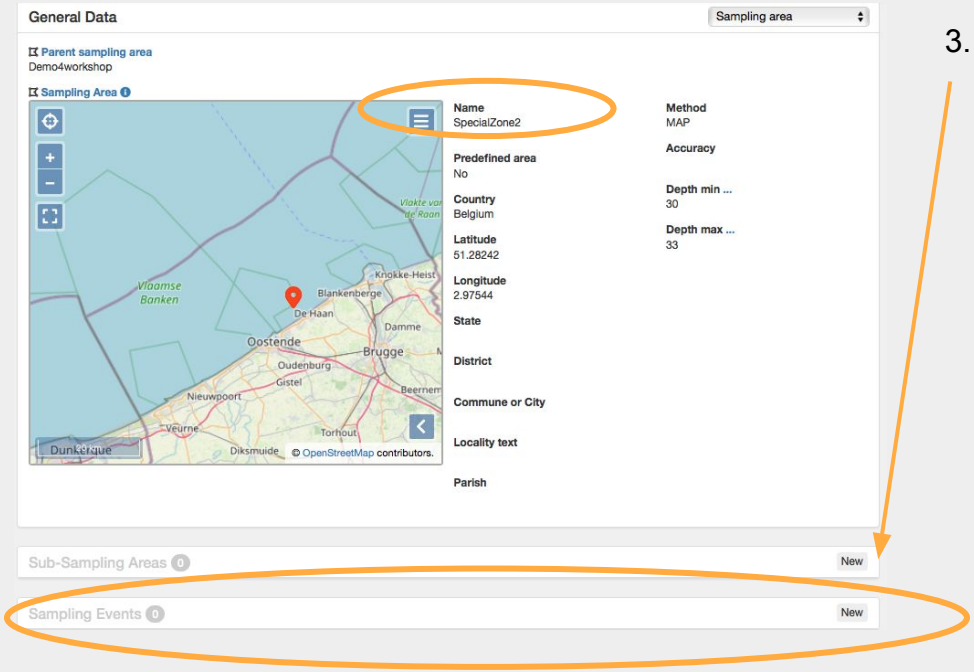


Working in PlutoF

Step 6: Adding a new sampling event

Once you have deployed your ARMS unit(s) in your Observatory, you can start the new *Sampling Event(s)* in PlutoF.
For each ARMS unit you have deployed

1. Go to its *Sampling Area* (see previous slides)
2. Near the bottom of the sampling area page is a section called *Sampling Events* (this will have no entries at first)



3. Click “New” to create a new sampling event

Working in PlutoF

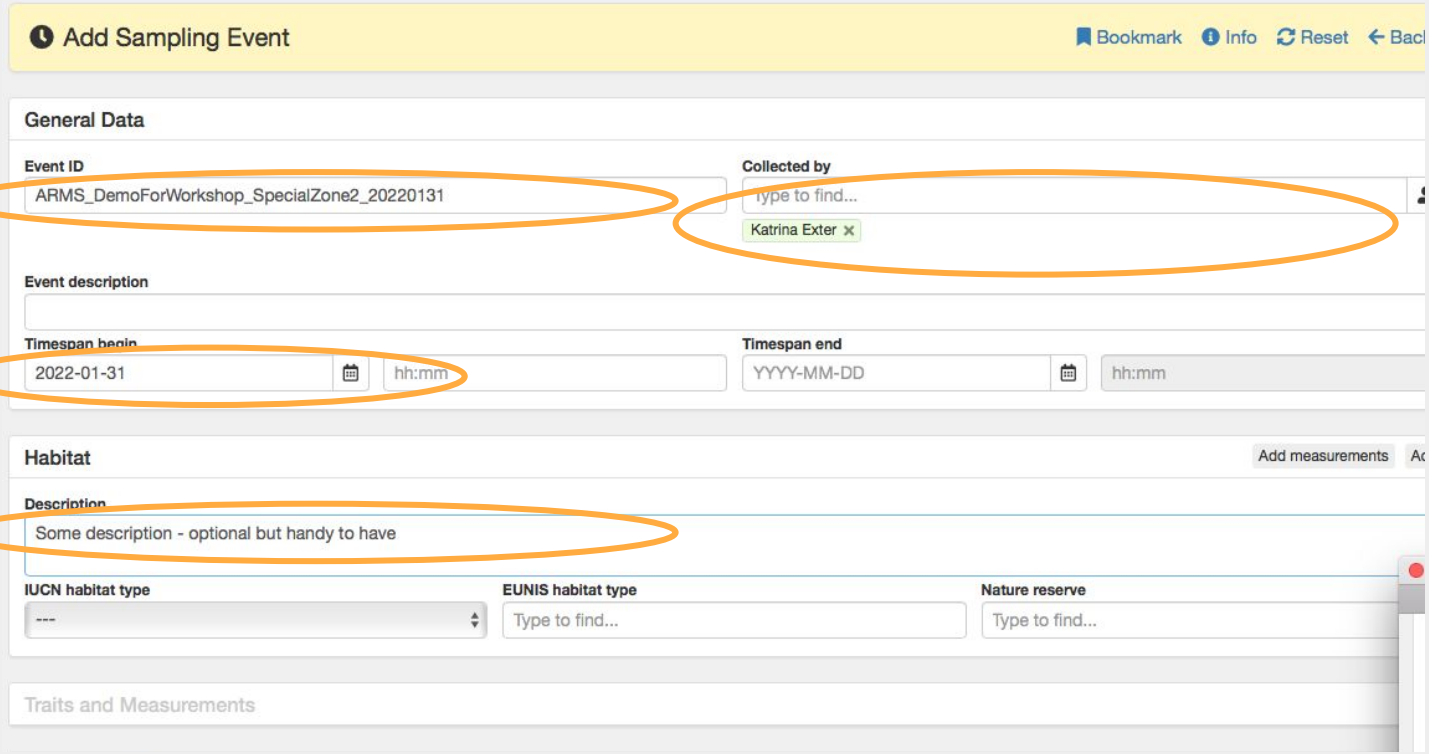
Step 6: Adding a new sampling event

Fill in the following information in the *General Data* section

4. Event ID:
    a. Please use the Event ID as defined in the ARMS Handbook
        i. ARMS_[observatoryID]_[ARMSID]_[date in]_[date out] (dates being YYYYMMDD) e.g. ARMS_Demo4Workshop_SpecialZone2_20220131_20220331
        ii. See https://docs.google.com/spreadsheets/d/1j3yuY5lmoPMo91w6e3kkJ6pmp1X6FVGUtLealuKJ3wE/edit#gid=855411053 column “EventID” for examples of eventIDs
    b. *It is clear that right now you only know the “date in”; the “date out” part you can add once you have collected your unit*
5. You can leave Event Description blank or write a short description
6. Fill in the “Timespan begin”; and after retrieval you will fill in “Timespan end”. It is sufficient to only add the date, not also the time
7. Fill in “Collected by” with your name (the person mentioned here must already exist in the PlutoF system, so you will need to add others if you want to mention them here)
8. A “Habitat” description is a nice-to-have
9. Click “save” at the bottom of the page

Working in PlutoF

Step 6: Adding a new sampling event



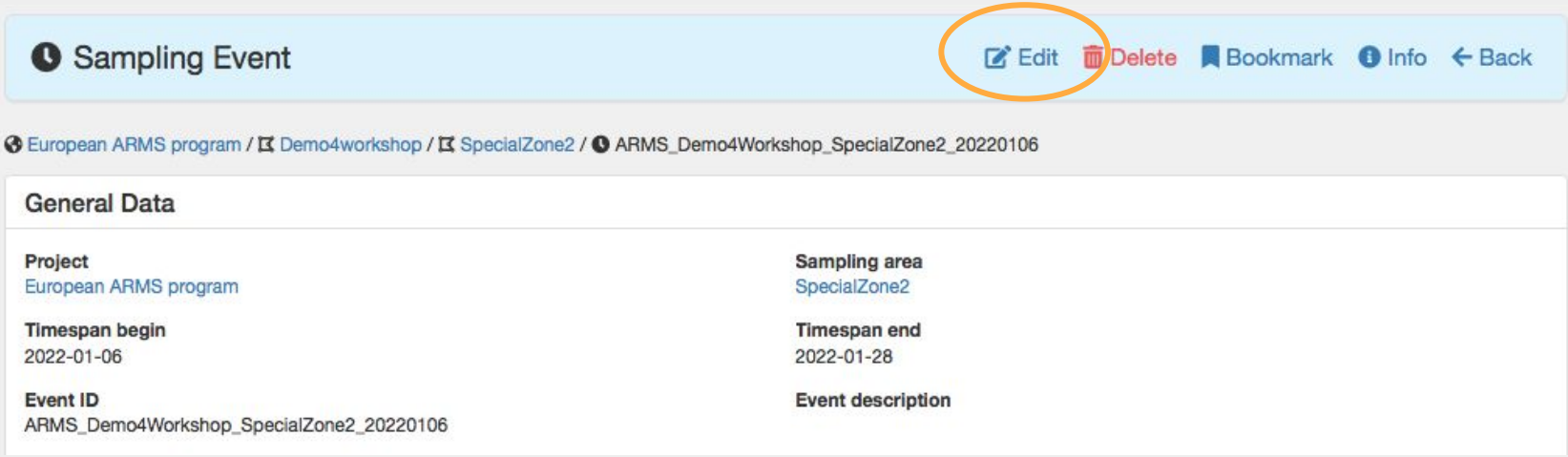
Working in PlutoF

Step 7: Updating a sampling event

Once you have retrieved your ARMS unit, and processed and shipped the material samples to HCMR, you should update your entry in PlutoF
This is done by editing your previously-created *Sampling Event.* Go to the event and “Edit” the page

Information to add

- Retrieval date in the “Timespan end” field
- Add retrieval date (YYYYMMDD) on to the end of the “Event ID“ field
- Add any useful comments in the “Event Description” field



Working in PlutoF

Step 8: Adding your ARMS images

The photographs you take of your ARMS units before you process them (see the Handbook for instructions) must be uploaded to PlutoF. Ideally you do this as soon as possible.
A description of those images must also be uploaded to PlutoF

Images are added to a *Sampling Event*

1. In the sampling event page, click to Edit
2. At the bottom, you can upload images as *Associated Data*
3. To upload an image, click the Upload button and a file-selection box will pop up
4. Once uploaded, set the *licence* (CC BY) and the *creator* of the file (you)

Image metadata

You need to provide a certain amount of information about each image you upload. Unfortunately there are not enough fields in PlutoF to hold this information, so there are instead one of two ways you can do this

1. Putting this in each image filename
2. Putting these in a description spreadsheet

These options are explained on the next slide.

Without these metadata, it is impossible for us to organise the 1000s of images that are taken over all partners and years of the ARMS-MBON project.

Working in PlutoF

Step 8: Adding your ARMS images

Option 1: Using the image filenames to provide the metadata

You can name all your images following a standard identifier if you like. This identifier consists of the eventID followed by some keywords. For example

- ARMS_Demo4Workshop_SpecialZone2_20220131_20220331_IMG_5B_2 -> this is an image of plate 5, bottom, and this is the second image of plate 5B
- ARMS_Demo4Workshop_SpecialZone2_20220131_20220331_Field_4 -> this is the 4th image taken in the field (e.g. of a trophy specimen, of something that was not attached to a plate but came up with the unit in the water)

Option 2: Using a spreadsheet to provide the metadata

A template spreadsheet which you can fill in to provide the metadata for each image can be found on the ARMS-MBON github (Templates) site. In this spreadsheet you will enter

- EventID (ARMS_Demo4Workshop_SpecialZone2_20220131_20220331)
- The ARMS plate number that image is of (1-9, counting from the baseplate upwards)
- Whether it is the top of bottom of the plate (T/B)
- The image filename as uploaded to PlutoF
- For images that are not of ARMS plates, instead you will write “field” plus an extra (optional) description

The image description spreadsheet should be uploaded together with the images, in the same manner. It should be called something like “ImageDescription” and can be saved as CSV or excel format. If you add more images to the same event, please append the descriptions to the file and re-upload it with the same name.

Working in PlutoF

Step 8: Adding your ARMS images

Edit Sampling Event

Bookmark

General Data

Event ID

ARMS_DemoForWorkshop_SpecialZone2_20220131_20220331

Collected by

Type to find...

Katrina Exter ×

Event description

Timespan begin

Timespan end

...

...

Traits and Measurements

Associated Data

Files 0

Uploaded file

Type to find...

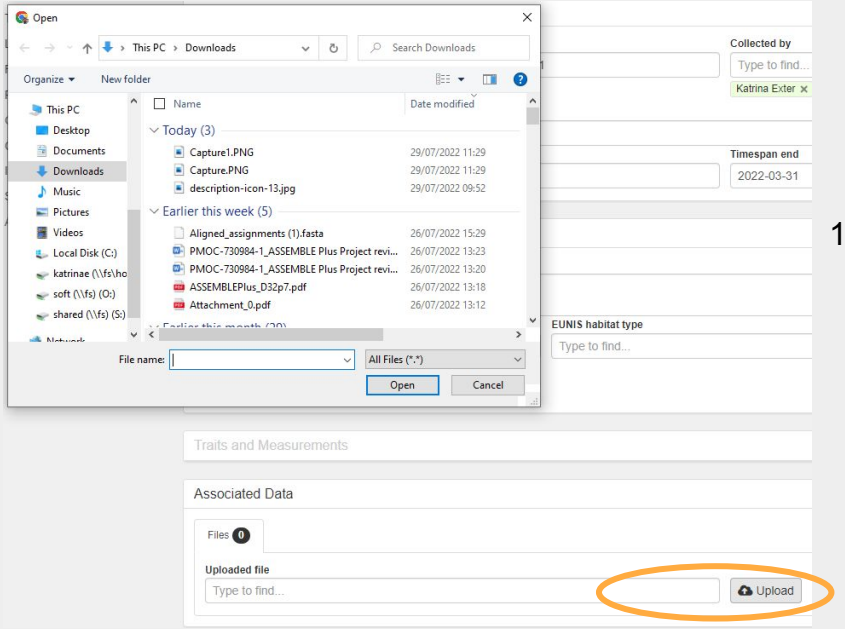
Upload

✔ Save

✖ Cancel

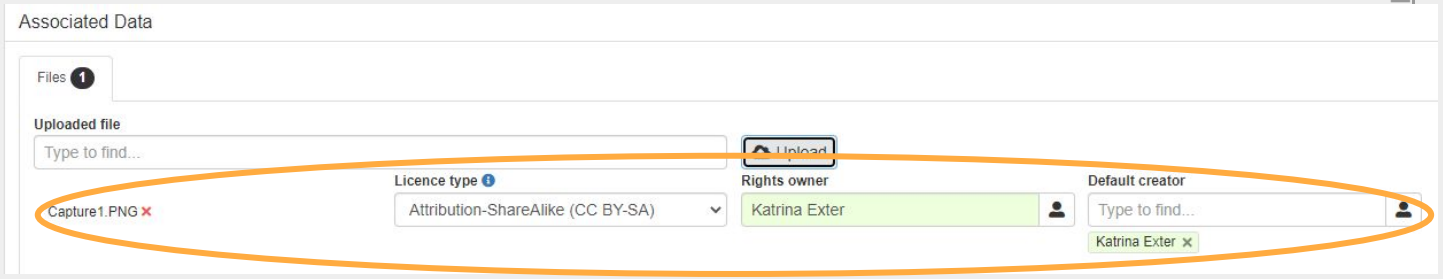
Working in PlutoF

Step 8: Adding your ARMS images



1

2



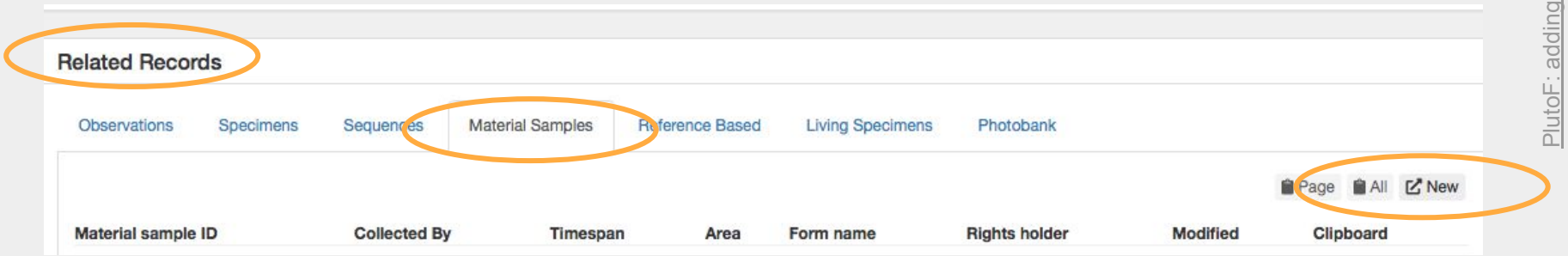
Working in PlutoF

Step 9: Creating Material Sample pages

The second action upon having retrieved ARMS unit(s), and processed and shipped your samples, is to create *Material Samples* for your unit(s). In most cases, you will have collected and shipped three samples for each ARMS unit: two motile fractions and one sessile fraction. The material sample pages in PlutoF are simply to record the fact that you have shipped these samples.

This is done by editing the relevant *Sampling Event.*

1. Go to the event page, and at the bottom are the tabulated *Related Records*.
2. Click on the *Material Samples* tab, and then click *New*



Working in PlutoF

Step 9: Creating Material Sample pages

In this *Material Sample* form, the General data and Event information are already added, as these were taken from the Event page you were on when you clicked to add a New Material Sample.

Please fill in the following fields in the page

Form

- Water (there is no form yet for ARMS units)

Material Samples

In the boxes, type or select

- Material sample ID: is the eventID with _MF500, MF100, SF40 appended (or another combination of “motile fraction”/”sessile fraction” + “filter size in microns”, if such were made)
- Type: water
- Size: the filter size in microns (e.g. “500”)
- Description “motile” or “sessile” (or another description if your sample is not one of these two)
- Click “Save” (note: there is a “save and add new” and “save and link to event”, but at the time of writing these both opened a completely new page in which the event information was not provided)
- Add the next material sample in the same way.

Working in PlutoF

Step 9: Creating Material Sample pages

New Material Sample

Form

(•) Water ( ) Soil ( ) Plant-associated ( ) Host-associated ( ) Built Environment ( )

Name
Material sample: water

Rights holder
PlutoF Platform

Material Samples 1

#	Material sample ID	Subcode	Type	Size	Description
1	ARMS_DemoForWorkshop		Water	500	Motile

Location in collection	pH	Temperature(°C)	Salinity(mS/m)	Potassium(mg/kg)	Calcium(mg/kg)	Mg(mg/k

Organic carbon(g/kg)	Organic matter(g/kg)	Total nitrogen(g/kg)	Dissolved carbon dioxide(µmol/l)	Chloride(mg/l)	Ammonium(µmol/l)

Save | Cancel | Save and add new | Save and copy | Save and link to area | Save and link to event

Working in PlutoF

Step 10: Manual Observations

If you made any observations of species yourself, from the field, from ARMS units, from photos of ARMS units, etc, then you can record them in a ManualObservations spreadsheet, the template for which is provided on the ARMS-MBON GitHub site (Templates folder)
Please follow that template CSV file, and then upload your file to PlutoF with a name something like:
"ManualObservations_[eventID]".

This should be uploaded to an event page, as you did for your photos.

I**t is important to be clear what your observations are of**.
→ If they are of ARMS plates, then this can be combined with/used in the image analysis of those ARMS images
→ If they are of species that are processed into your sessile and motile fractions, then this can be combined/compared with species identifications from the DNA.
In order to avoid double counting species, and in order to be able to use these manual observations not just as the information themselves, but also to help refine the image and omics analysis results, we need this information.
Otherwise, we have no idea what the relationship of your manual observations is to the physical samples you ship to HCMR.

What happens next?

Every few months, all the information in PlutoF are downloaded to the ARMS-MBON github site.

There they are managed by VLIZ: the IDs are corrected, all terms are semantically annotated (linked to vocabularies), images are organised according to their IDs (taken from your image description file).
The metadata are open access immediately: the images, however, are under embargo following the agreed period of time. Once they are open access, they can be downloaded via the github site, as well as via PlutoF.
It is from github that the data will be formatted to be published in IMIS, GBif, EurOBIS, etc, probably once a year for the entire data collection and as-required on GBif and/or EurOBIS..

Once the samples are received, they are processed and sequenced by HCMR (for ARMS-MBON) or EMBRC (for those partners who are also part of EMO BON). It can take several months (up to half a year) before these data to be archived in ENA.

Accession numbers of the sequences are then made available. They will be included in the overview spreadsheets provided on the ARMS-MBON github site. They can also (first) be found on the ARMS-MBON overview google spreadsheet.