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DATA COLLECTION AND MANAGEMENT TOOLS TO SUPPORT THE REGIONAL OBSERVER SCHEME PILOT PROJECT

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EXECUTIVE SUMMARY

The ROS tools are a set of data models, software components and interactive applications developed by the IOTC Secretariat (with funds from NOAA and WWF) as part of the Regional Observer Scheme (ROS) pilot project, in accordance with IOTC Resolution 16/04.

The purpose of this project is to create a set of tools to support the collection and management of scientific information as recorded by on-board observers, and enable automated data exchange with national institutions and eventually the IOTC Secretariat, to build the so-called Regional Observer Database.

The ROS tools do currently include:

- The e-Reporting interface (targeting scientific observers)
- The National Database interface (deployed at national institutions at country level)
- The Regional Database interface (hosted by the IOTC Secretariat)

All these components are designed to exchange data through the same *Observer Data Model* defined in accordance with the gear-specific set of requirements for both data collection *and* reporting that is part of the *ROS Observer Manual*[3] specifications (Version 1.2, October 2015).

OVERALL PICTURE

The envisaged data collection workflow originates from registered IOTC observers deployed on board of vessels fishing within the Indian Ocean.

Observers are provided with an installation package for the e-Reporting interface, which is a multi-platform software that can be installed on the most common operating systems (Windows, Mac OSX and Linux) and has a very minimal memory and hardware foot-print.

The e-Reporting interface is an *offline* tool, and as such it does not require users to be under network coverage to function properly. It provides a user-friendly graphical interface – running in a common browser window – to support observers in recording the various gear-dependent data fields (mandatory and recommended) as specified by the ROS Observer Manual, on a trip by trip basis.

Once finalized, scientific data collected for a trip or a set of trips can be exported and shared with the identified national focal point for the vessel flag country.

As part of the suite of ROS tools, the IOTC Secretariat has also designed a specific application - meant to be deployed locally, once for each participating CPC - with the purpose of ingesting all

[3] http://iotc.org/sites/default/files/documents/science/IOTC-2015-ROS_11_04_Observer_Manual_v1.2.pdf

scientific data collected by observers for a specific flag country and provide CPC with the skeleton of a National Observer Database where all information that is currently marked as "mandatory for collection" is stored.

The National Observer Database can be exported as a standalone Microsoft Access database for national focal point to analyze its content and extend its basic data extraction capabilities.

The interface designed for the management of the National Observer Database is capable of synchronizing its content with the centralized (hosted by the IOTC secretariat) Regional Observer Database, that will accommodate and collate only the set of information marked as "mandatory for reporting" within the ROS Observer Manual.

The goal of these ROS tools is manifold, as these tools and their interconnecting workflow are currently capable of supporting:

1. The formal definition of a scientific observer data model (based on the ROS Observer Manual) that is independent from the data exchange format;
2. A more effective scientific observer data *collection* process (including the mandatory fields for data *reporting* to the IOTC Secretariat);
3. The creation of a number of National Observer Databases, whose content can be used to generate country-specific statistics and reports;
4. The collation of all mandatory data *reporting* information from National Observer databases into a single, centralized Regional Observer Database.

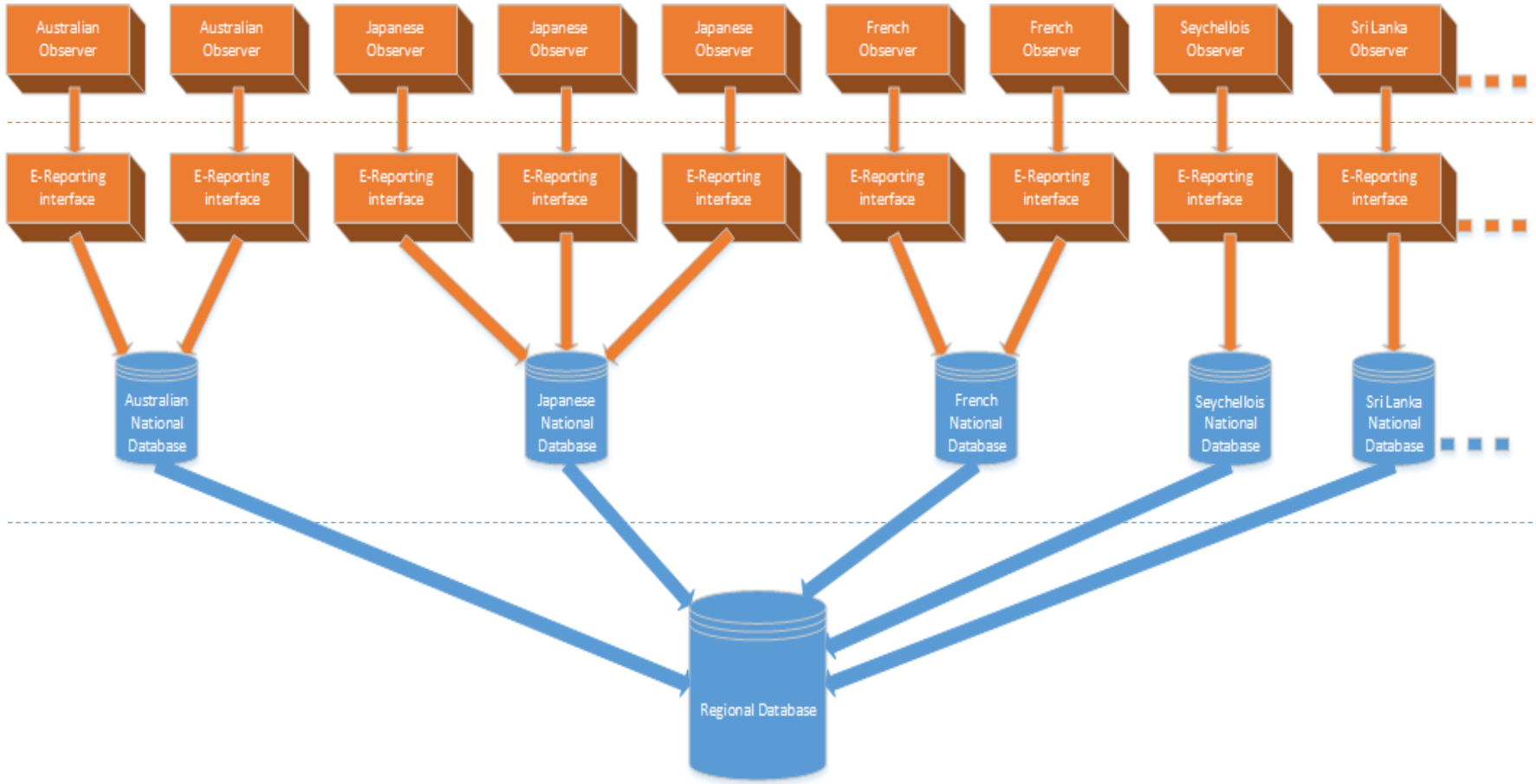
Once the Regional Observer Database will regularly be receiving data from the National Databases, its content could be used to cross-reference and complement the mandatory statistical information received by the IOTC Secretariat and stored within its main database.

While it is unpractical for the IOTC Secretariat to provide customized versions of the National Observer Database for all participating CPCs (so as to account for the different needs that can emerge at country level) it can undoubtedly provide support through capacity building missions and dedicated training to enable national focal point extend and leverage the National Observer Databases according to their own requirements. For this to be effective, though, a dedicated activity – with specific funding sources and priorities – should be added to the WPDCS Program Of Work (2018-2022).

A visual explanation of the envisaged data flow is as follows:

All fields mandatory for data collection

All fields mandatory for data reporting



COMPONENTS

THE ROS MODEL

The ROS model represents the logical structure of the gear-specific scientific observer *data structure* and acts as the conceptual interface interconnecting the various components of the workflow.

It has been designed by applying O-O modeling techniques to the business specifications, and implemented using Java EE technologies that facilitate its persistence (JPA) and serialization as a structured document (JAXB).

Beside simplifying all interactions between the system components, this structured and comprehensive data model (formally defined by its XSD schema) can also easily be extended and modified when required.

All the collected data for one or more trips will fill the ROS model that can be serialized to the XML format which, with ad-hoc XSL can be converted to many other formats such as HTML pages, PDFs and many more.

DATA CONVERSION FILTERS

A number of different *formats* for the collection and exchange of scientific observer data do already exist, and these most often materialize as a set of XLS documents and templates.

The *structured* nature of the scientific observer data does not match well with the *flat* nature of these spreadsheet-based formats, and therefore the adopted XLS documents need to use specific trip and set identifiers to connect all the bits-and-pieces of the overall information, resulting in an increased difficulty in filling all the required details as well as in unnecessary redundancy.

The IOTC Secretariat has been historically receiving observer information provided through flat file templates (either through the IOTC data reporting forms or via other similar formats such as the ICCAT ST09 or a Japanese-specific format that is comparable to the IOTC one).

For this reason, and in order to incorporate as much historical information as possible within the Regional Observer Database, the IOTC Secretariat has also developed a set of data conversion filters that allow seamlessly import of data provided through these formats.

Potentially, a similar data conversion filter capable of ingesting data currently stored within the ObServe2[4] database could be designed to ensure that all the historical data collected by France, Spain and Seychelles within the Indian Ocean could be successfully imported within the Regional Observer Database.

[4] Copyright info and references for ObServe2 – to be added

Also, observer data collected as part of the SWIOFP[5] Observer Program could be a good candidate for incorporation within the historical baseline of the Regional Observer Database (assuming that a proper conversion filter could be created).

Another reason to implement specific data conversion filters (in particular the ICCAT ST09 and the ObServe2 one, with the latter yet to be implemented) is also to ensure that countries already collecting and reporting scientific observer data through such means could continue doing so in the future, without forcing CPCs to mandatorily adopt the e-Reporting and National Observer Database tools.

Conversely, CPCs that do not collect and report observer data yet, could see their capacity effectively increasing by the adoption of the IOTC ROS tools.

[5] Copyright info and references for SWIOFP Observer Program – to be added

E-REPORTING INTERFACE

The e-Reporting interface is an offline tool to let observers collect scientific data during a fishing trip on the vessel they're deployed to.

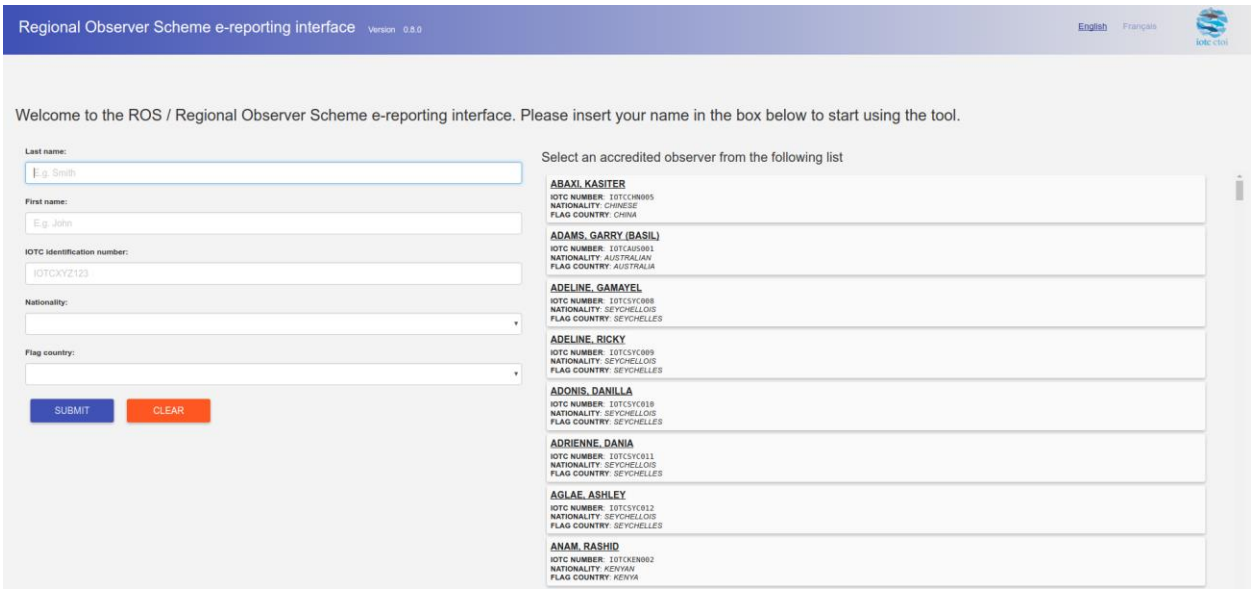
The interface is designed to facilitate data input by applying several techniques to minimize errors and data inconsistency, implementing several layers of data validation during the process.

The e-Reporting interface will be provided to end-users with a basic setup program that will take care of installing all the required components.

The setup file will be available for Windows, Mac OSX and Linux platforms and as its only dependency it will require Java 8 (either as JDK or JRE) to be installed on the target machine.

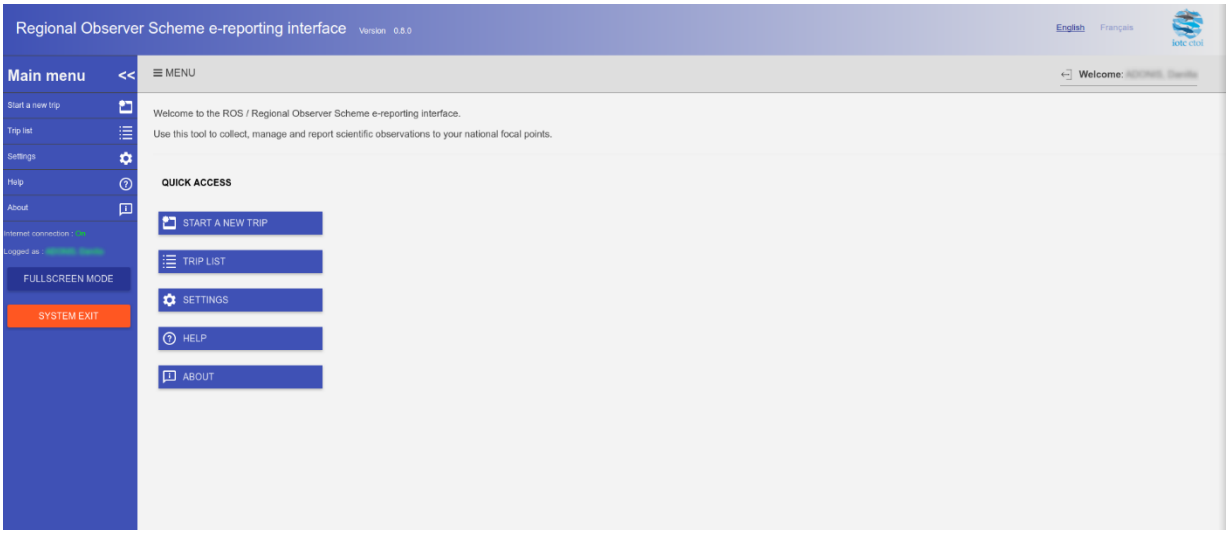
As soon as the installation is complete, a new icon will appear on the user desktop: when the user runs the e-Reporting interface for the first time (by clicking on the *launch* icon) he / she will be asked to provide information to let the application recognize the user as a specific, authorized observer in the list of accredited ones (as this is available to the IOTC Secretariat).

The user can either fill the left form or choose his name from the list on the right-hand side:



THE MAIN MENU

Once the user is identified, he will be redirected to the main menu page:



The main menu is always available on the left hand side of the screen: it is collapsed by default, and can be expanded by clicking the "MENU" label or on the arrows icon on its left.

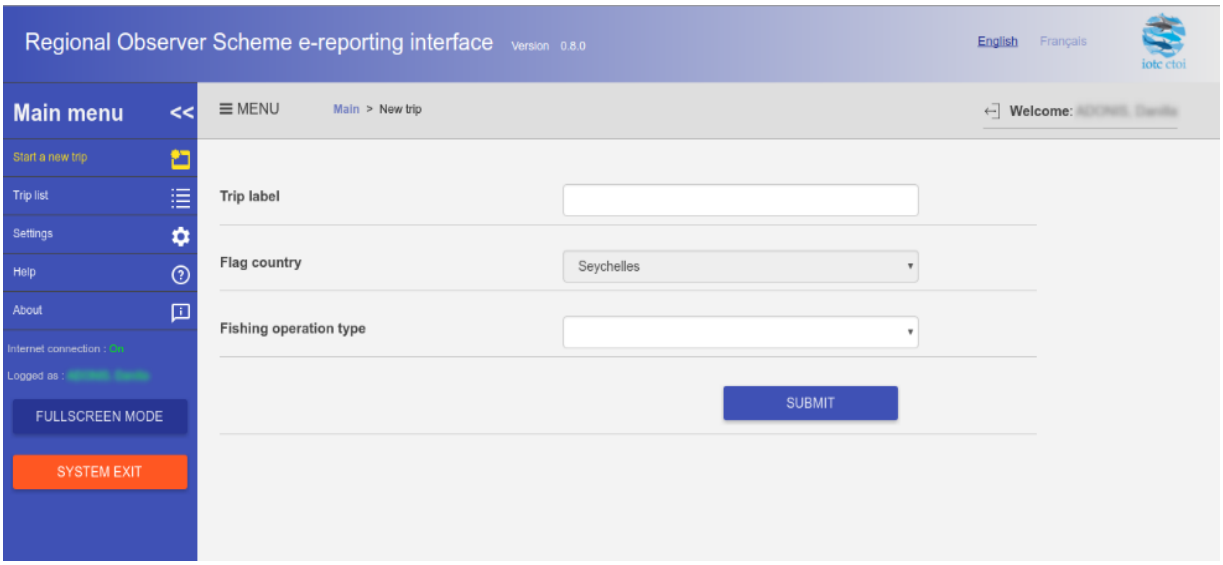
The entries on the menu are:

- **Start a new trip** lets observers can start a new observation.
- **Trip list** shows the list of recorded observations.
- **Help** lets observers read relevant manuals.
- **About** shows information about the software producers.
- **Internet connection** shows wether internet connectivity is currently available or not.
- **Logged as** shows the name of the observer.
- **Fullscreen Mode** switches the screen to fullscreen.
- **System Exit** exits the program

STARTING A NEW TRIP

Starting a new trip will present a page where observers can input basic information about the trip:

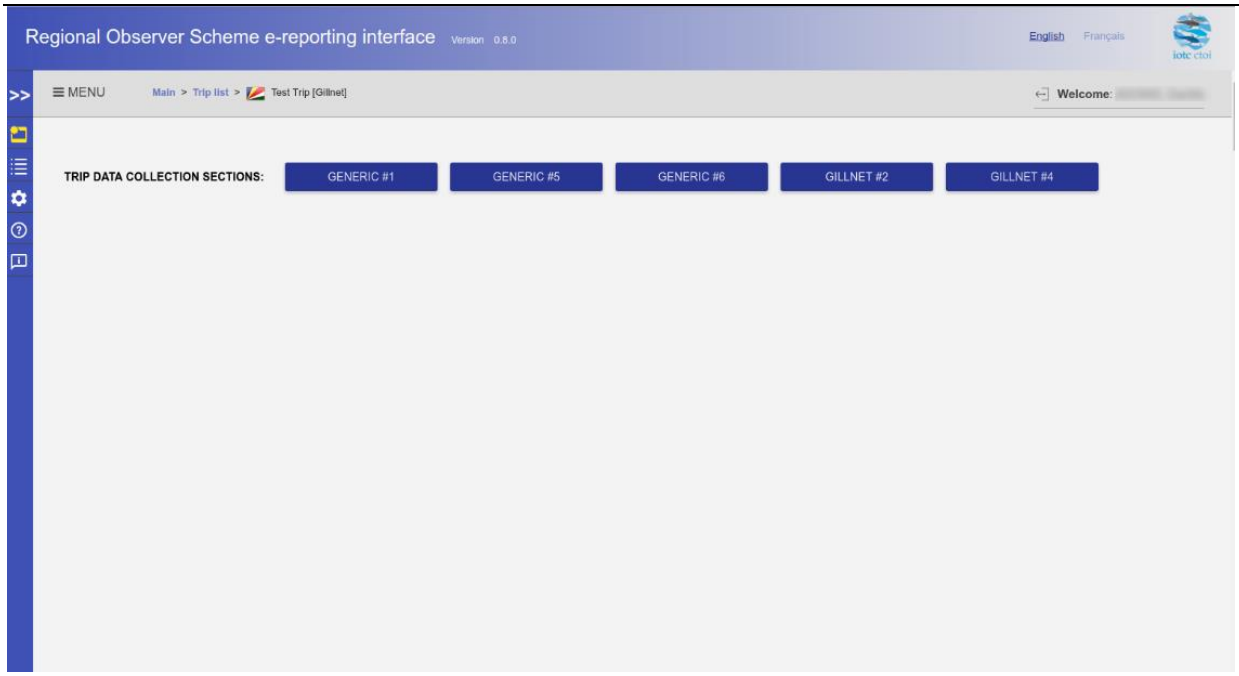
- **Trip Label** alphanumeric identifier for the trip
- **Flag Country** automatically selected by the system based on the Observer's flag country. Note that EU observers can choose any EU country.
- **Fishing operation type** can be either Gillnet, Longline, Pole and Line and Purse Seine



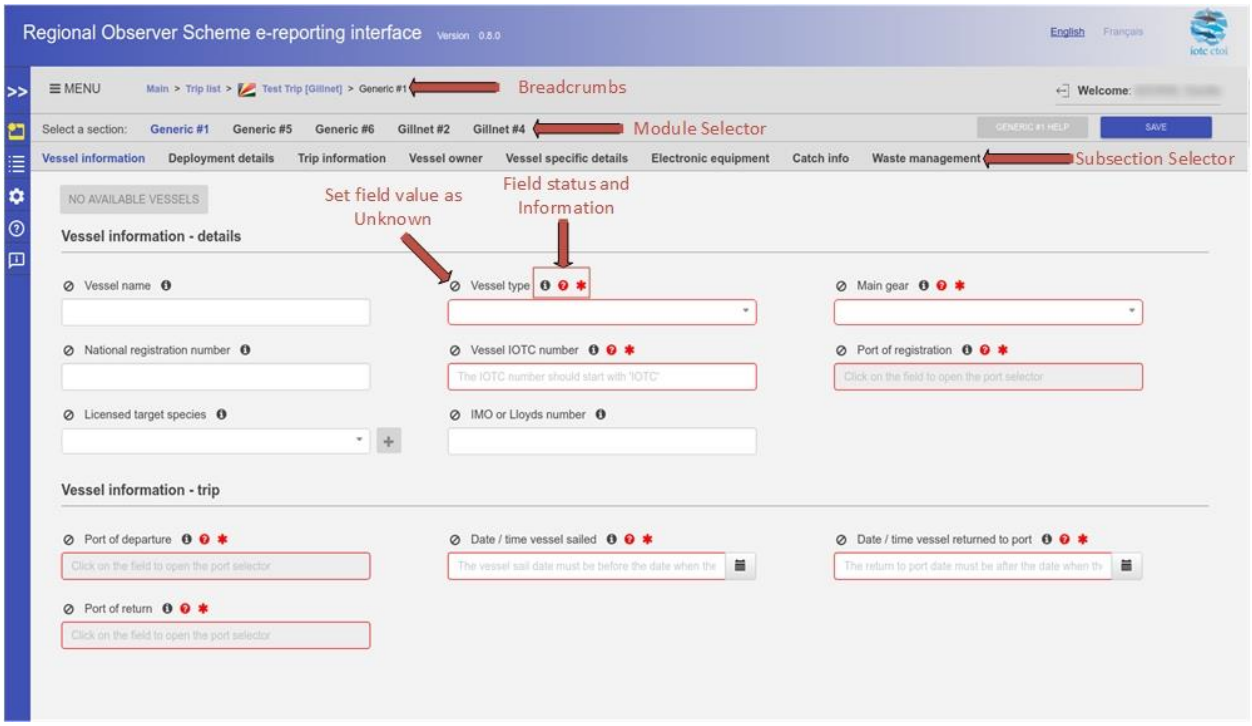
Allowed Fishing Operation Types are: Gillnet, Longline, Pole and Line, Purse Seine.

Once the trip is created observers can start filling all the required modules, all the different Fishing Types have different modules to be filled[6]. The following screenshots will show examples for a Gillnet observation. Annex 1A explains in details all the modules for all the Fishing Types.

[6] See part C section II of the ROS observer manual



The screenshot above shows the module selector page. All fishing types have five modules to be completed; two generic modules and three per per gear specific modules. Generic modules are always present for any gear type observation.



The above screen shows Generic #1 module / Vessel Information section. It highlights the main parts of how the forms are implemented.

FORM FIELD ICONS

The following list explains the icons for each field

- Set the field value to "Unknown".
- Clicking this icon a pop up will appear showing information about the field.
- Clicking this icon a pop up will appear showing the validation rules applied to the field.
- This icon warns about mandatory field. Mandatory fields are such when they are either mandatory for collection or for reporting[7]

FORM IMPLEMENTATION AND DATA VALIDATION

All the forms for each section and subsection ~~follow the same pattern for their layout~~ have common styles and rules. The input fields can be of different types, depending on the nature of the information that needs to be collected. Annex 1B expains all the field types in details.

In the list of possible input field types we currently have:

- Simple text box
- Text Area
- Numeric values (either integers or floats)
- Date and Time
- Position (for latitude longitude)
- Multiselection
- Port selectors

Each field belongs to a group of *questions* (for example ***Vessel Information – Details***) and group of questions can be *multiple*.

This means that observers can add multiple multiple answers for the same groups. As an example, the ***Generic #1 / Catch Info / Catch Transhipped Summary*** group can be added multiple times, depending on the number of transhipments that have been recorded at the time of observation.

Single fields or subgroup of fields inside groups can also be multiple: e.g. multiple ***Generic #1 / Trip Information / Dates Searching Or Active Fishing*** can be added as many times as needed.

DATA VALIDATION

For any field of the e-Reporting interfaces strict validation rules are applied in real time. This validation mechanisms have been developed to lower the risk of inconsistency of data that can happen when a human inputs data in a system.

[7] See Part C section II of the ROS observer manual

The data validation is divided in two types:

- **Per-field validation:** Applied to the single field (e.g. a measure that can't exceed a certain value);
- **Cross-check validation:** Applied to a field when it has to be validated against the current value of another field (e.g. the end date of a trip can not be set to a date / time preceeding the start date of the same trip);
- **Mandatory fields:** Applied when a field is explicitly marked as *mandatory*.

These validation techniques can either be applied once or mixed together. An example of mixed validation rule can be as follows: *value for field X must be less than 100 but greater than the value assigned to field Y*.

The amount of validation rules that can be mixed together is not limited, thus allowing the data collection forms to implement robust and complex validation routines in real time.

Validation rules are customizable allowing the interface to be easely exapanded or modified with no needs of writing code to support it.

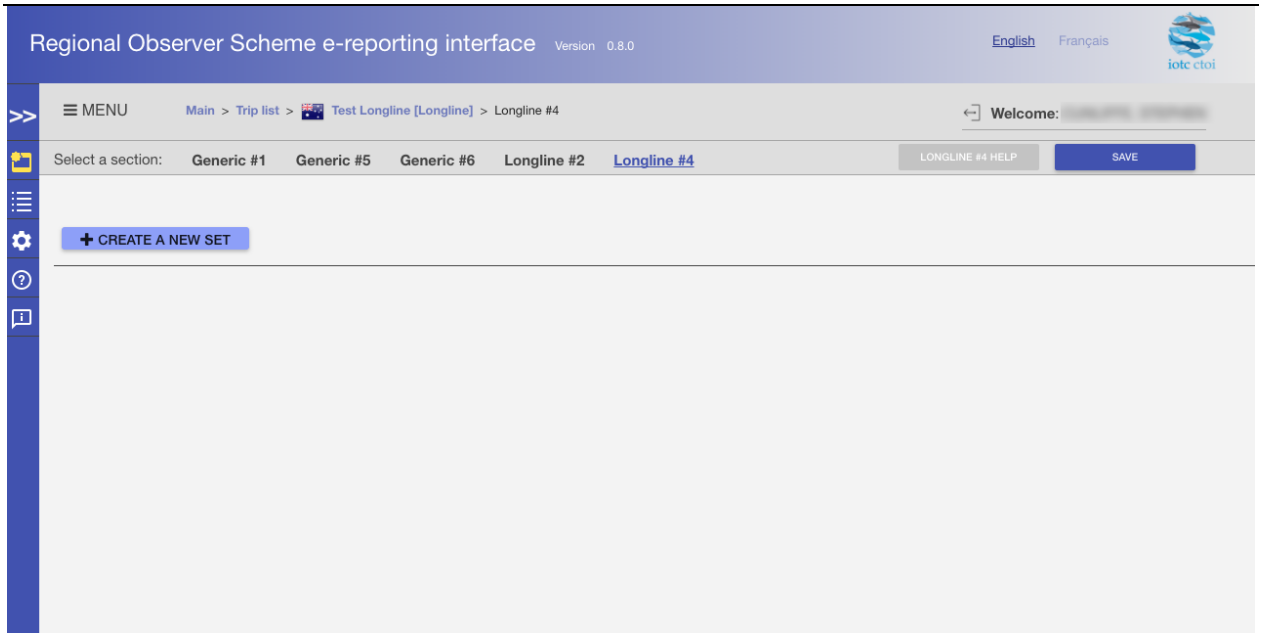
FISHING SETS

Modules Gillenet #4, Longline #4, Pole and Line #4 and Purse Seine #4 are divided in sets.

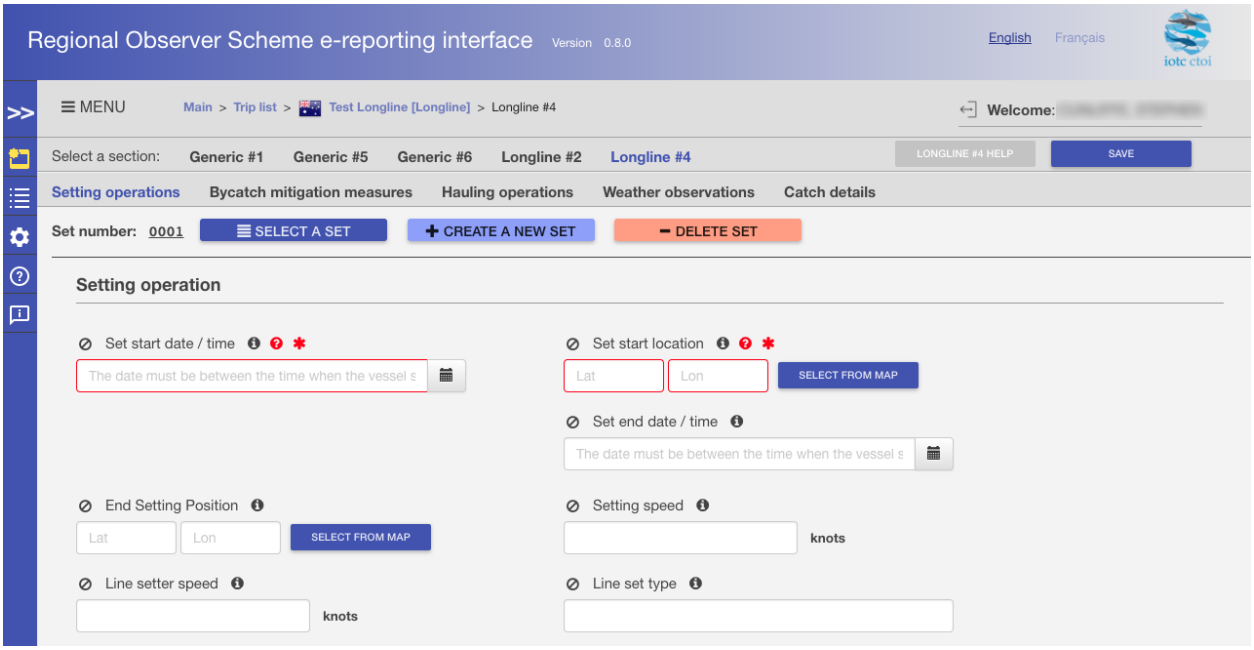
A set can be added by the observer as needed and there is no limit on the amount of sets that can be added to an observation.

Each specific fishery type set has different information to be collected, and in the examples below we will focus on the Longline #4 module. Details about the specific requirements in terms of data to be collected for each set for the other gear types can be found in the ROS manual.

The first time an observer enters specific fisheries' set module a page like the next one will be shown.



By clicking on the "Create a new set" button, a new occurrence of a set will be created and assigned a number based on an auto-incrementing counter that starts from **#0001**



The new set will have the following buttons:

- **Select a set** shows a pull down with all the available sets created by the observer.
- **Create a new set** creates a new set adding 1 to the set counter (if the last created set is #0004 the next one will be #0005).

- **Delete set** deletes the current set.

All sets are divided in subsections, depending on the currently selected fishing type for the trip.

All fishery types have one common section, that is the Catch Details one, where all the observed specimens can be recorded.

CATCH DETAILS

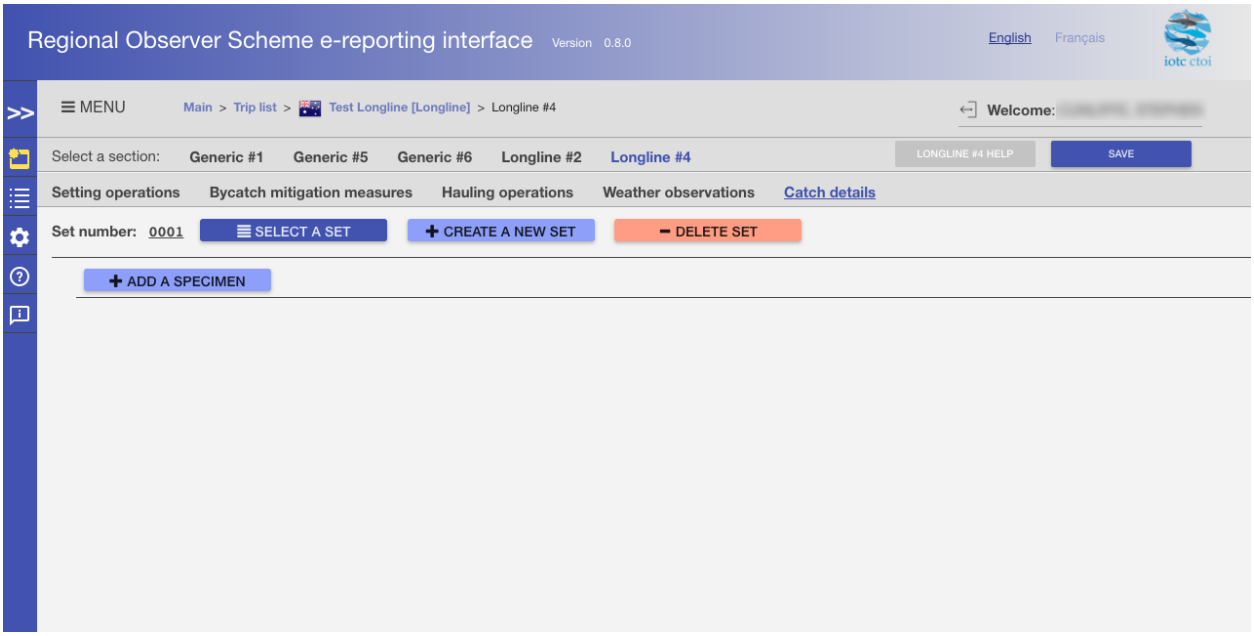
Very much like the Fishing sets the catch details will record sets of specimen observed.

Observers can create sets of specimen observed within each single fishing set: the system will assign an incremental value to each single specimen belonging to a fishing set, starting from #0001.

All the created IDs, either for specimen and sets, are unique for the trip and automatically generated by the system. The E-reporting interface does not require observers to record/create sets/specimen IDs.

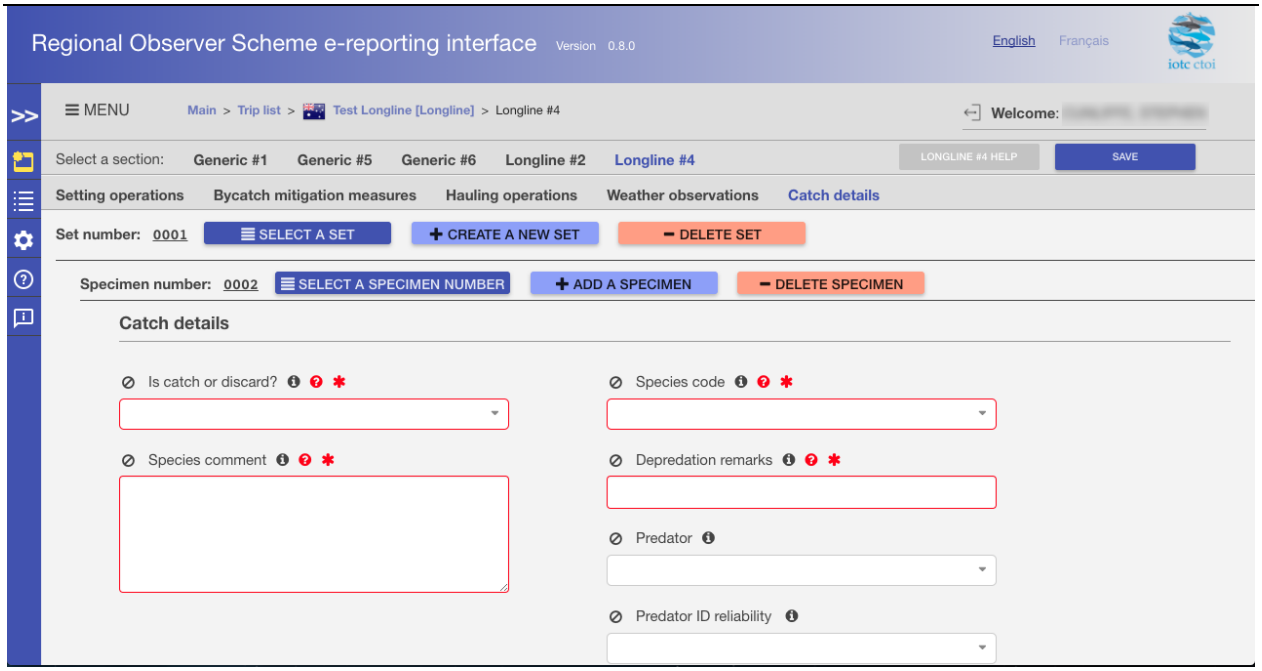
There is no limit on the amount of specimen an observer can record.

An empty Catch Details section will look like as the following screen:



By clicking the "Add Specimen" button, a new occurrence of a specimen will be created.

The layout used to display the set number will clearly inform the observer that the specific specimen will be added to a particular set (in this case #0001).



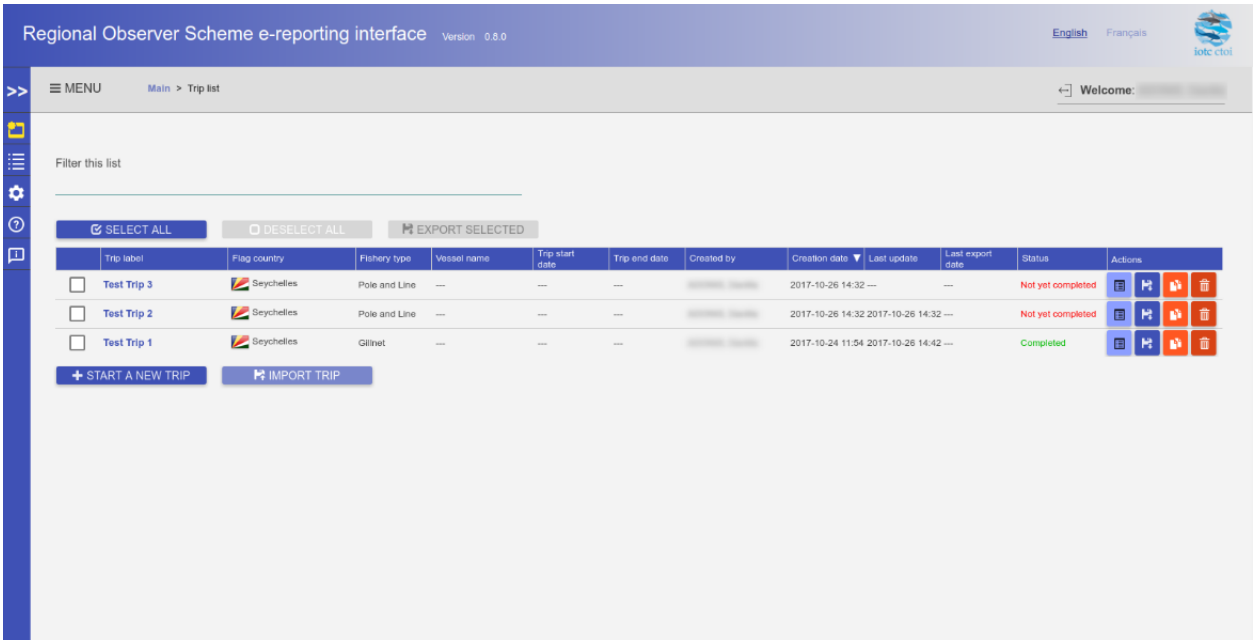
The above screen shows the information for a specimen that has just been recorded.

Three buttons will appear alongside the new specimen header:

- **Select a specimen number** where a dropdown will appear letting the observer select a specimen within the current Fishing set.
- **Add a specimen** adds a new specimen with incremental number added by one.
- **Delete specimen** deletes the current specimen.

TRIP LIST

The trip list page provides summary information for all the trips currently recorded by the system and visible to the logged user, while at the same time enabling a number of potential actions to be performed on the single trips within the list.



The entire e-Reporting interface is multi-user by nature and multiple observers can use the same instance.

The trip list will show all trips belonging to the country of nationality for the currently logged observer, but just the owner of the trip data can edit and export the trip.

Clicking on the trip label observers can open and edit the trip data: if the selected trip does not belong to the logged observer, then its forms will be opened in read-only mode.

Trips have also a status that can be either "Completed" or "Not yet completed"

A trip has status Completed when all the required data has been provide and no inconsistencies were found. Status "Not yet completed" is given when there is missing, required data and/or some data is inconsistent (for example if a set date is beyond the trip's start-end dates).

Four distinct actions can be performed for each trip in the list:

- **Trip Status Report** performs a check on the data inserted by the observer and shows a report of all the fields missing or with wrong values.
- **Export Trip** exports the trip in ROS format, ready to be sent to the National Focal Point (option available just if the trip belongs to the logged observer).

- **Clone Trip** clones the trip with all its data to a new one.
- **Delete Trip** deletes the trip from the system (option available just if the trip belongs to the logged observer).
- **Trip Activity Details on Map** shows all the recorded activities of the trip on a map

EXPORT TRIP DATA

Observed trips can be exported from the list page. The export converts one or more trip data to the ROS logical model and wrap it in a file that can be used for backups and data exchange.

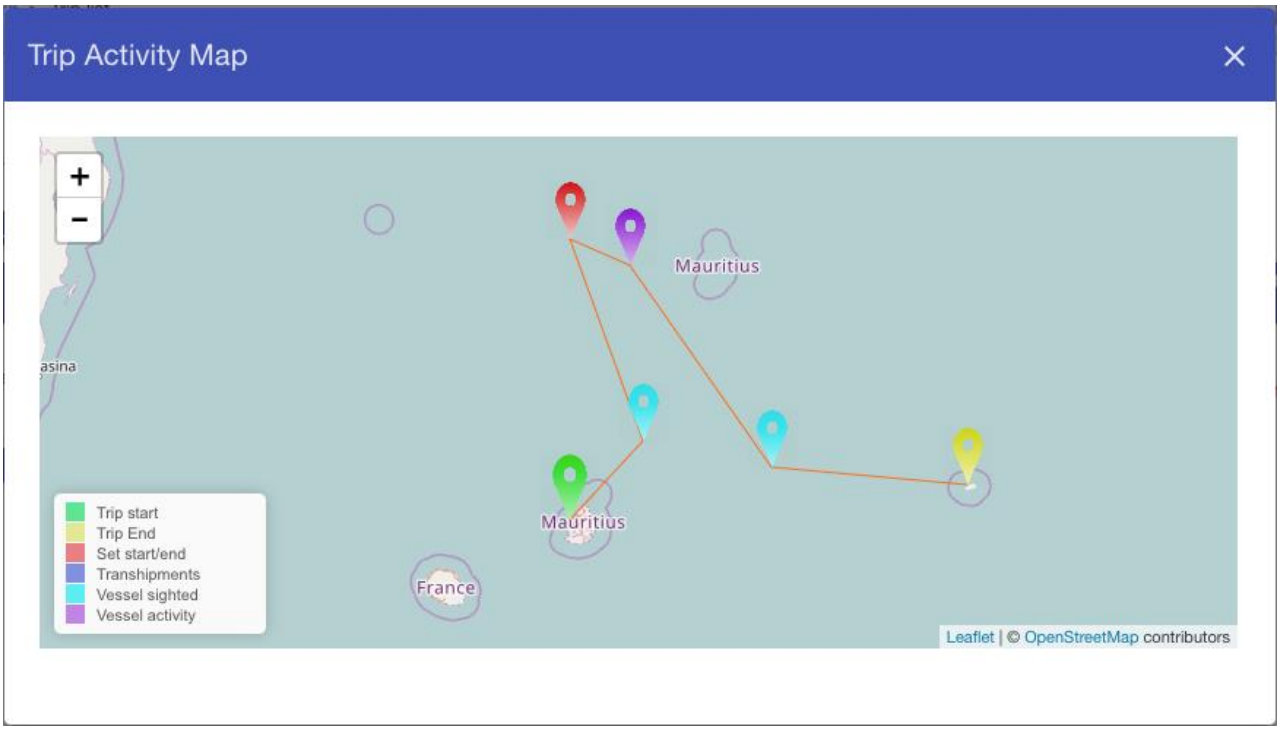
Trips can be exported in any status (Completed or Not yet completed). Observers have to be aware anyway that exporting and sending incomplete trips can cause inconsistencies in the data analysis in both the National Database and the Regional Database.

IMPORT TRIP DATA

Exported trip data can be re-imported in the e-Reporting interface from the list page. This option is particularly useful to restore backed-up observations.

TRIP ACTIVITY DETAILS ON MAP

With this function observers can see all the recorded details of the trip on a map.



NATIONAL OBSERVER DATABASE

The National Observer Database aims at providing National Focal Points with a centralized repository where all information recorded by observers authorized by the flag country can be collected, managed and analyzed.

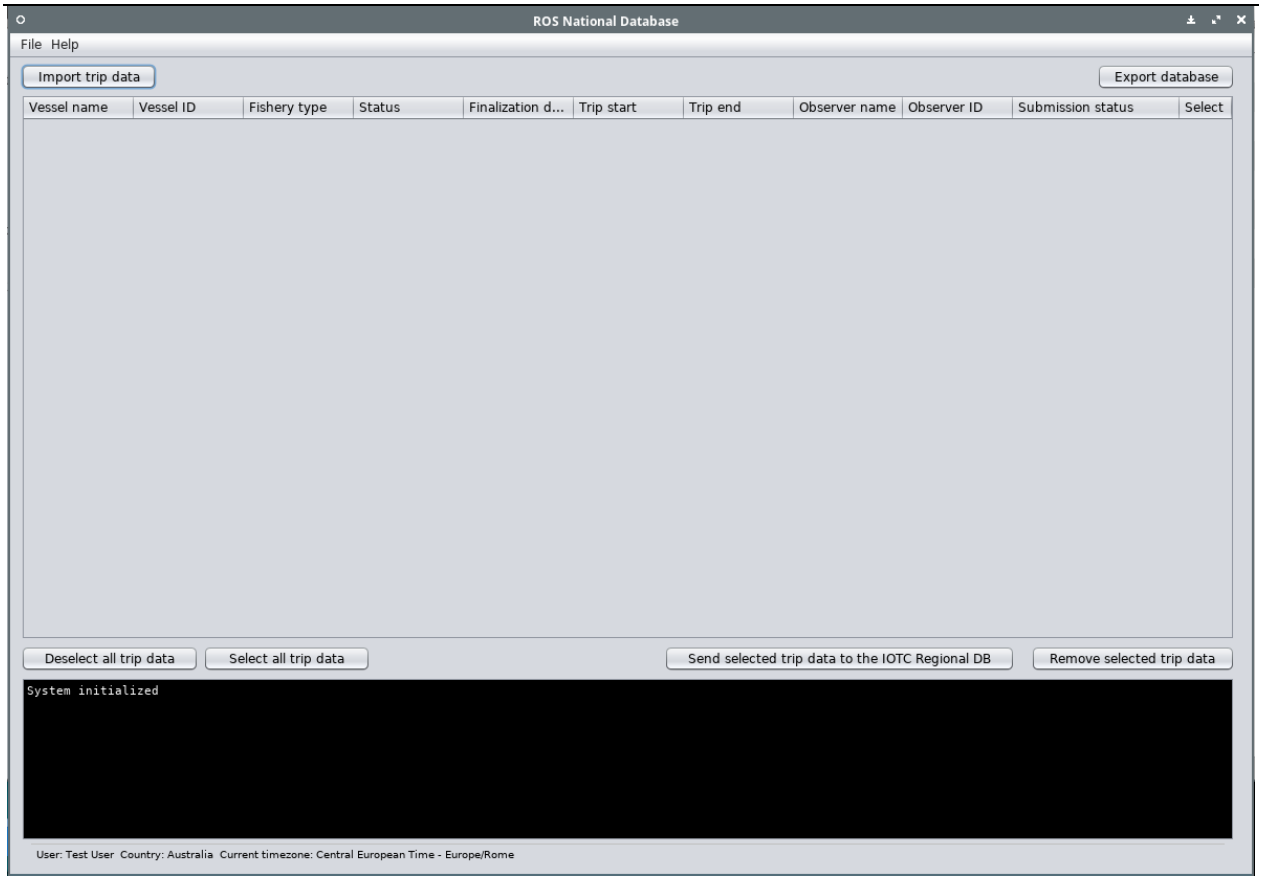
The National Observer Database is multi-platform by design (having been built in Java, it can seamlessly work on Windows, Mac and Linux desktop computers) and can export all the recorded information as a Microsoft Access database.

The National Observer Database presents a simple user interface that allows users to upload and manage trip observations received by national observers and eventually submit all the information marked as "mandatory for reporting" to the IOTC Regional Observer Database.

USAGE

On first run users are asked to identify themselves by a login page. Credentials must be requested to the IOTC Secretariat by e-mail before starting using the National Database.

Once logged in, the main workspace appears and users can start managing the observations received

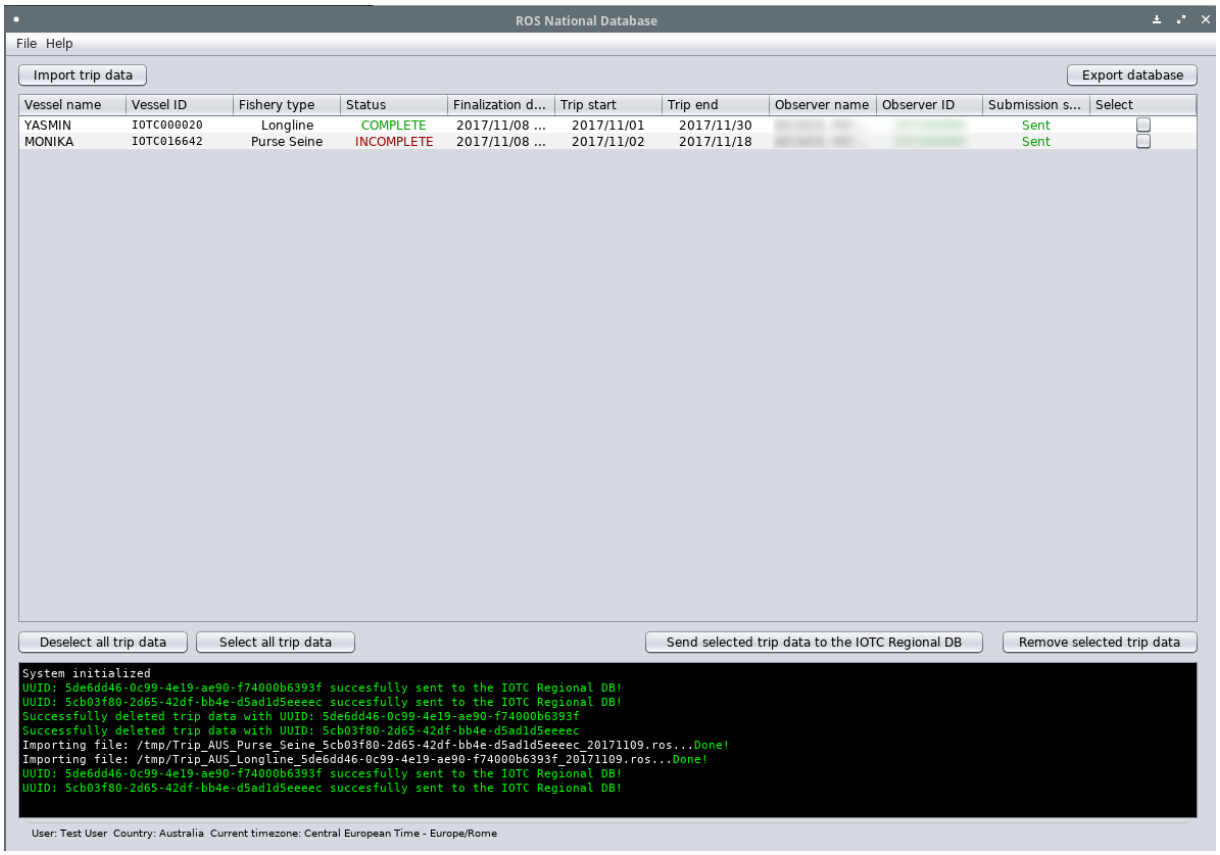


Here all the possible actions that can be performed:

- **Import trip data** to import data received as .ros files from a national observer; Users can import one or multiple at the same time.
- **Export Database** to produce a copy of the Microsoft Access database with all the currently recorded data.
- **Deselect all trip data** to de-select all trip data from the list;
- **Select all trip data** to select all trip data from the list;
- **Send selected trip data to the IOTC Regional DB** to send all selected trip data to the Regional Observer Database (requires Internet connectivity). Not all the data is sent to the Regional Database but just the data needed for regional data analysis based on the ROS Manual[8].
- **Remove selected trip data** to delete all selected trip data from the local database and from the remote Regional Observer Database in case these were already sent to the Regional Observer Database in the past.

[8] The ROS observer manual can be downloaded from http://details.iotc.org/sites/default/files/documents/science/IOTC-2015-ROS_11_04_Observer_Manual_v1.2.pdf

- Here below a screen that show the National Database with some inserted observations



- The list of inserted information is composed by different information and us sortable by clicking on any of the column headers.

- **EXPORTING THE DATABASE**
- When users click on the "Export database" button the system will opens the database directly in a Microsoft Access instance if Microsoft Access is available in the user's machine; otherwise it just asks to save the file in the preferred location of the user's machine.
- The Microsoft Access database will have all the forms available to let users easily querying all the data stored.

ACKNOWLEDGEMENTS

The ROS tools have been developed with funding from NOAA, through a collaborative effort between the IOTC Secretariat and WWF.

The e-Reporting interface is meant to be installed on observers' PCs and accessed as a standalone application: for beta-testing purposes, a temporary online version of the interface is available at: http://ros-reporting.iotc.org

ANNEX 1A: E-REPORTING INTERFACE - MODULES FOR FISHING TYPE

This section provides additional details for all the data collection modules, including the generic and the fishery-dependent ones. For further information about the data needed to be collected please refer to the ROS Observer Manual[9].

GENERIC MODULES

Generic modules are common to all fishing types.

GENERIC #1

- **Vessel Information** records information about the vessel; name and type, gears and registration number, sailed date and location, return date and location.
- **Deployment Details** records information about the observer and the observation.
- **Trip Information** records details about the trip. When the vessel has searched and fished, sampling strategies and records the time lost.
- **Vessel Owner** records information about the vessel owner and the crew.
- **Vessel Specific Details** records information about the equipment used to store fish and about vessels length and materials.
- **Electronic Equipment** records information about all the electronic equipment available on the vessel.
- **Catch Info** records information about the amount of catches and transshipments made during the observation.
- **Waste Management**

GENERIC #5

Records information on vessels that have been sighted by the observer during the trip.

GENERIC #6

Records capture information on all transshipments that took place during the trip.

GILLNET MODULES

Gillnet type vessels have two specific modules to be filled.

GILLNET #2

Records information about the nets (types and amounts) used by the vessel.

[9] The ROS observer manual can be downloaded from http://details.iotc.org/sites/default/files/documents/science/IOTC-2015-ROS_11_04_Observer_Manual_v1.2.pdf

GILLNET #4
Module used to record fishing sets for Gillnet type vessels.

- **Setting Operations** records all the information about the set; date and location, nets used, speeds, etc.
- **Hauling Operations** records information about hauls. Where, when and how it occurred.
- **Weather Observations** records information about weather changes over the period of the set.
- **Catch Details** records all the information about the specimen analyzed by the observer.

LONGLINE MODULES

Longline type vessels have two specific modules to be filled.

LONGLINE #2
Records information about the gears used by the Longliner vessel.

- **Longline gears**
- **Bait castings**
- **Line Setters**
- **Line Haulers**
- **Shark Lines**
- **Branchline Details**
- **Tori Line Details**

LONGLINE #4
Module used to record fishing sets for Longline type vessels.

- **Setting Operations** records all the information about the set. Date and location, speeds; floats, shark lines, hooks used. etc.
- **Bycatch Mitigation Measures** records all the mitigation measures used for bycatch. Hooks and branch-line used. Bait details, etc.
- **Hauling Operations** records information about hauls. Where, when and how it occurred.
- **Weather Observations** records information about weather changes over the period of the set.
- **Catch Details** records all the information about the specimen analyzed by the observer.

POLE AND LINE MODULES

Pole and Line type vessels have two specific modules to be filled.

POLE AND LINE #2
Records information about the gears used by the vessel.

POLE AND LINE #4
Module used to record fishing sets for Pole and Line type vessels.

- **Activity and School** records the activity (date and position) and the school used for the activity.
- **Baits** records information about the baits used during the set.
- **Fishing Events** records information about fishing activities made during the set. Date and position, hooks used, schools adopted, baits used, etc.
- **Weather Observations** records information about weather changes over the period of the set.
- **Catch Details** records all the information about the specimen analyzed by the observer.

PURSE SEINE MODULES

Purse seine type vessels have two specific modules to be filled.

PURSE SEINE #2
Records information about the gears used by the purse seiner vessel.

PURSE SEINE #4
Module used to record fishing sets for Purse Seine type vessels.

- **Activity and School** records the activity (date and position) and the school used for the activity.
- **Purse Seine setting Information** records fishing activities made during the set. Date and position, schools used, brailing information, etc.
- **Weather Observations** records information about weather changes over the period of the set.
- **Catch Details** records all the information about the specimen analyzed by the observer.

ANNEX 1B: E-REPORTING INTERFACE – FIELD TYPES

SIMPLE TEXT BOX

Used to input short text

TEXT AREA

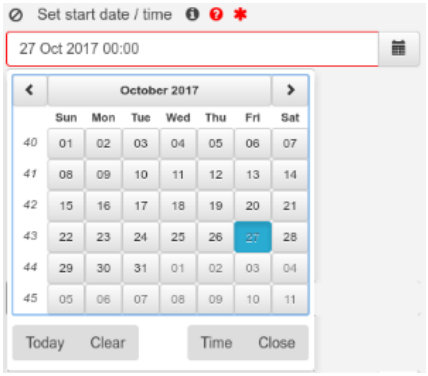
Used to input long text; usually used to record observer comments.

NUMERIC VALUES

Used to input numbers, the field can be configured to record either integers (natural numbers) or floats (real numbers).

DATE AND TIME

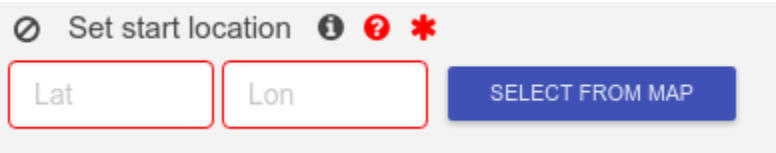
Used to input dates and times. They have an interface to standardize the inputs by the observer. By clicking on the field or on the icon on the right hand side of the field a pop-up will appear letting the observer choose the date and time needed.



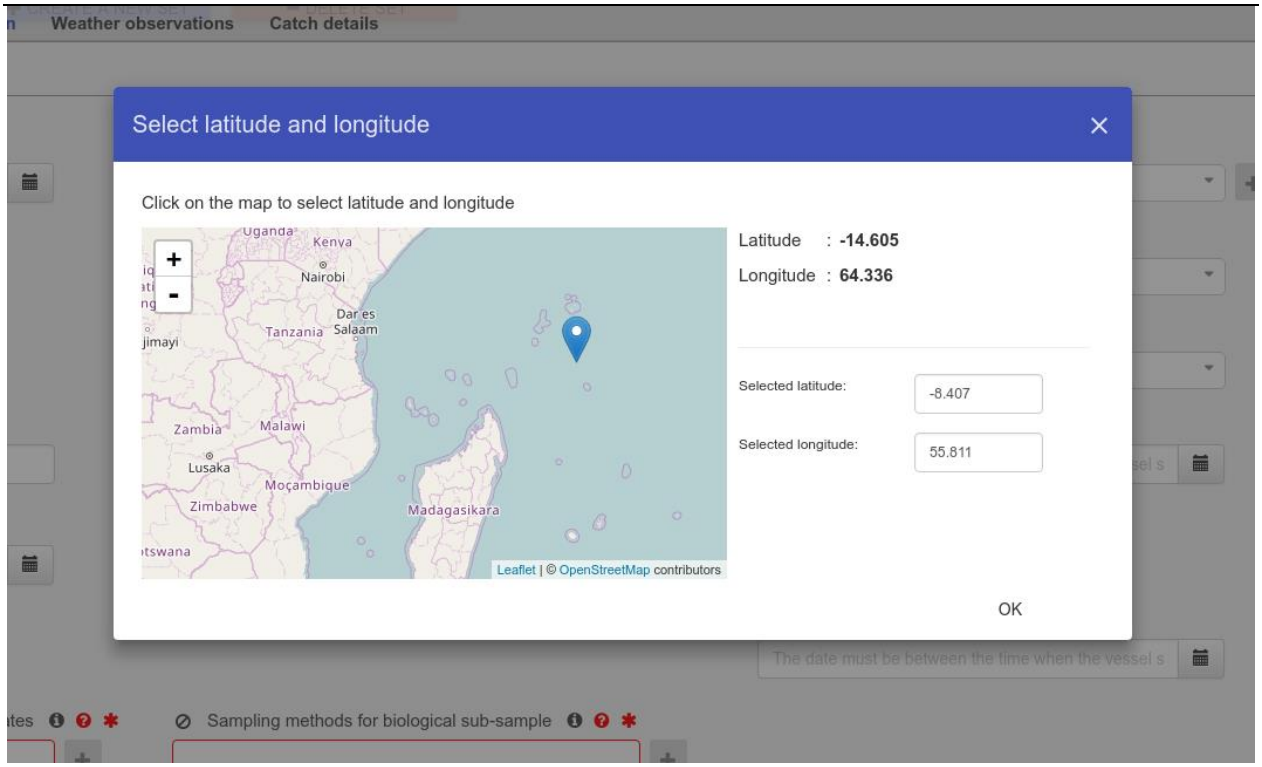
POSITION

Used to input positions in latitude/longitude. Observers can either input the position manually or use a graphical interface where they can pick the location by moving a cursor over a map.

A position field looks like this:



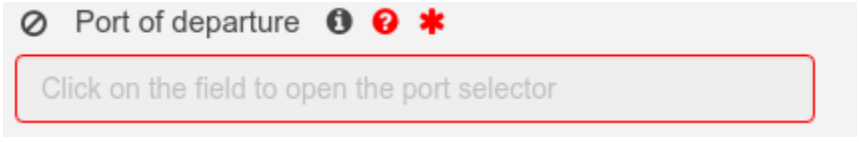
Observers can input their needed position manually or by clicking on the "SELECT FROM MAP" button a modal window will appear very much like the next screen:

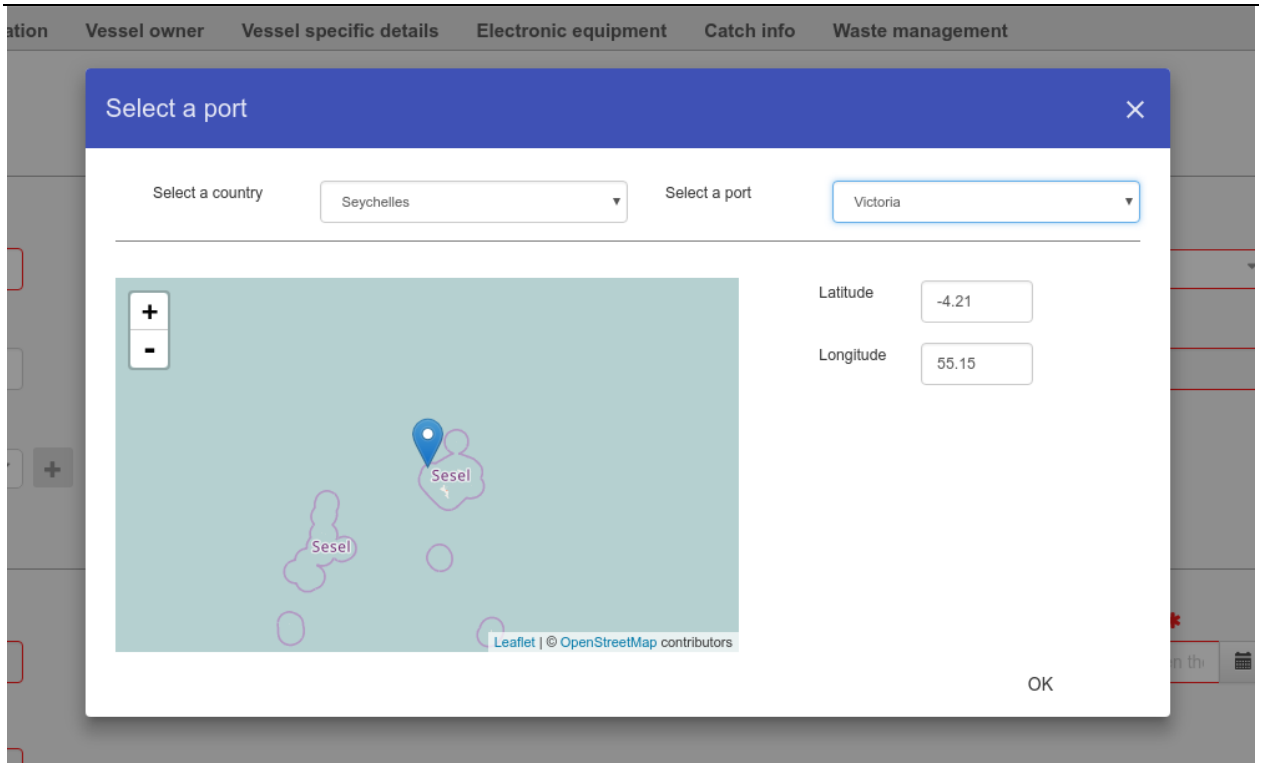


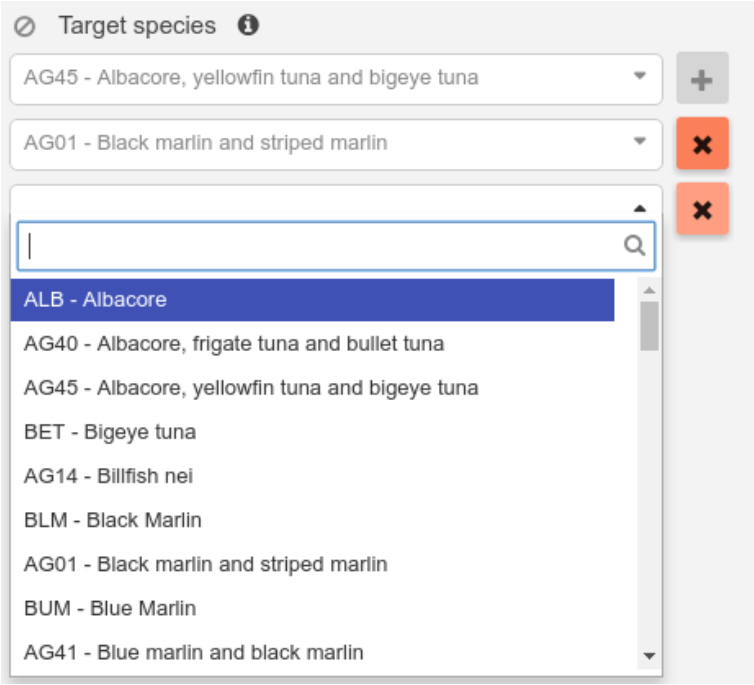
The map can be zoomed in until a good detail of the area needed.

PORT SELECTORS

Port selectors are used to input name and position of a port. It is composed by an interface where observers can pick a port from a comprehensive list divided by country. Most of the ports have already a position (latitude, longitude) attached. In the case there is no position attached to the selected port observers can choose a position from a visual map.





MULTISELECTOR

Multiple choices selectors are used to provide multiple input values from a specific reference list. Observers can select as many entries as they want.