

FORCOAST



Earth Observation Services For Wild Fisheries, Oystergrounds
Restoration And Bivalve Mariculture Along European Coasts

PLATFORM USER MANUAL

June 2022
Deltares



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1. General navigation

1.1. Introduction to FORCOAST web-platform

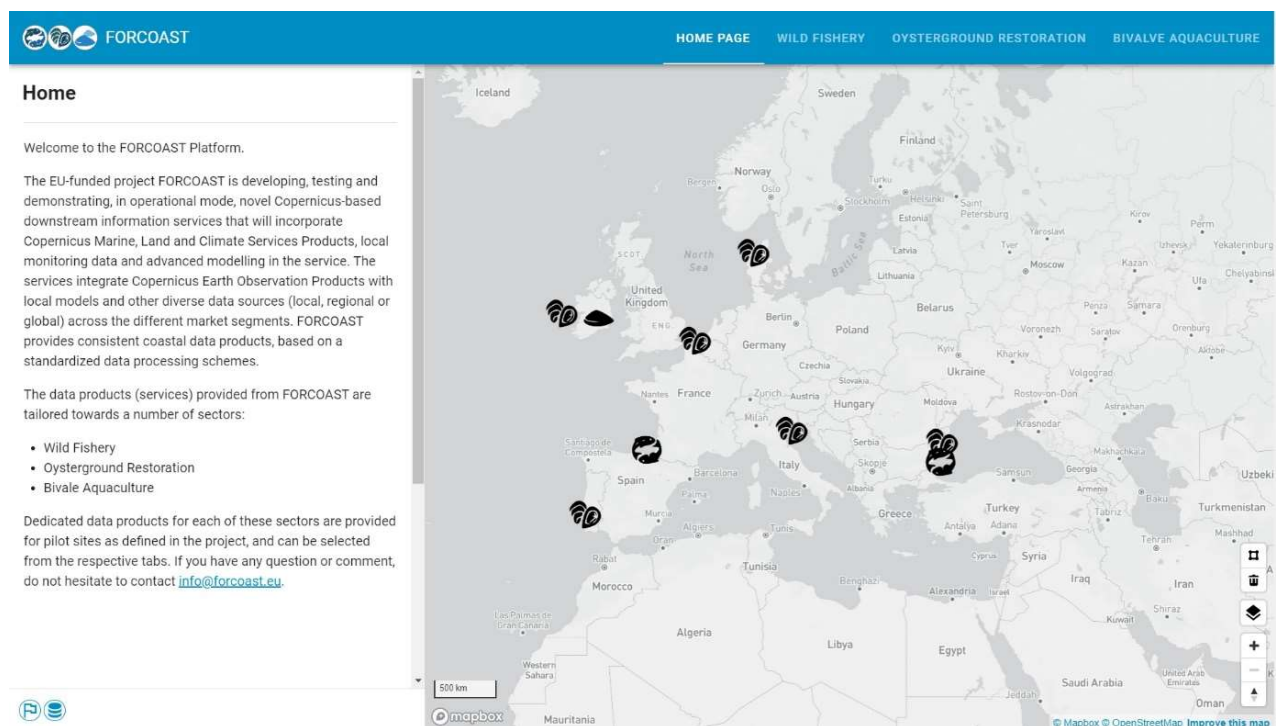


Figure 1 : Homepage

Once the user enters the platform the homepage is displayed. On the left of the screen there is a short introduction to the project and the three main sectors, namely Wild Fishery, Oystergrounds Restoration and Bivalve Aquaculture. On the top of the screen the user can navigate to the homepage of the project for more information and the different sectors and services by clicking on the selected drop-down tab. Clicking on a sector will pop up the areas of interest and the available services for each pilot area as shown in Figure 2.

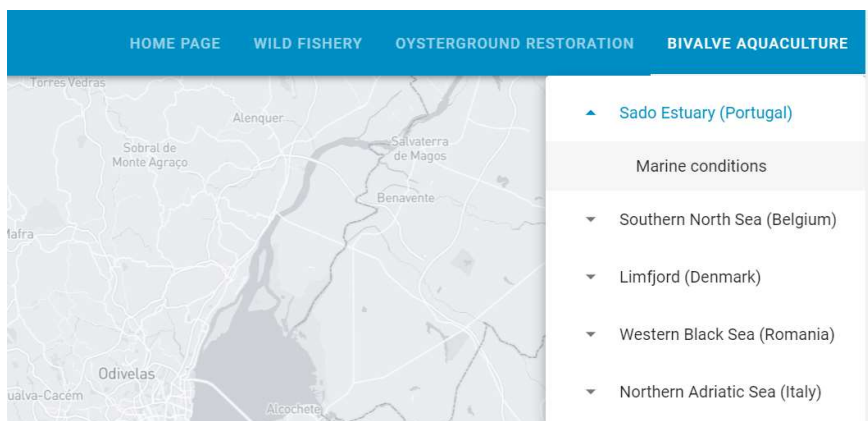


Figure 2: Sector bar and pilot areas

The interactive map display shows the different pilot areas and the provided services. The user can move, zoom in and out, alter the map's background and generate polygons over areas of choice using the bar on the right lower corner as shown in Figure 3.



Figure 3: Map bar

1.2 Exploring the data viewer

By selecting a sector and a pilot area from the top bar of the screen, the user will directly navigate to the selected area. Figure 4 shows an example case for using the data viewer.

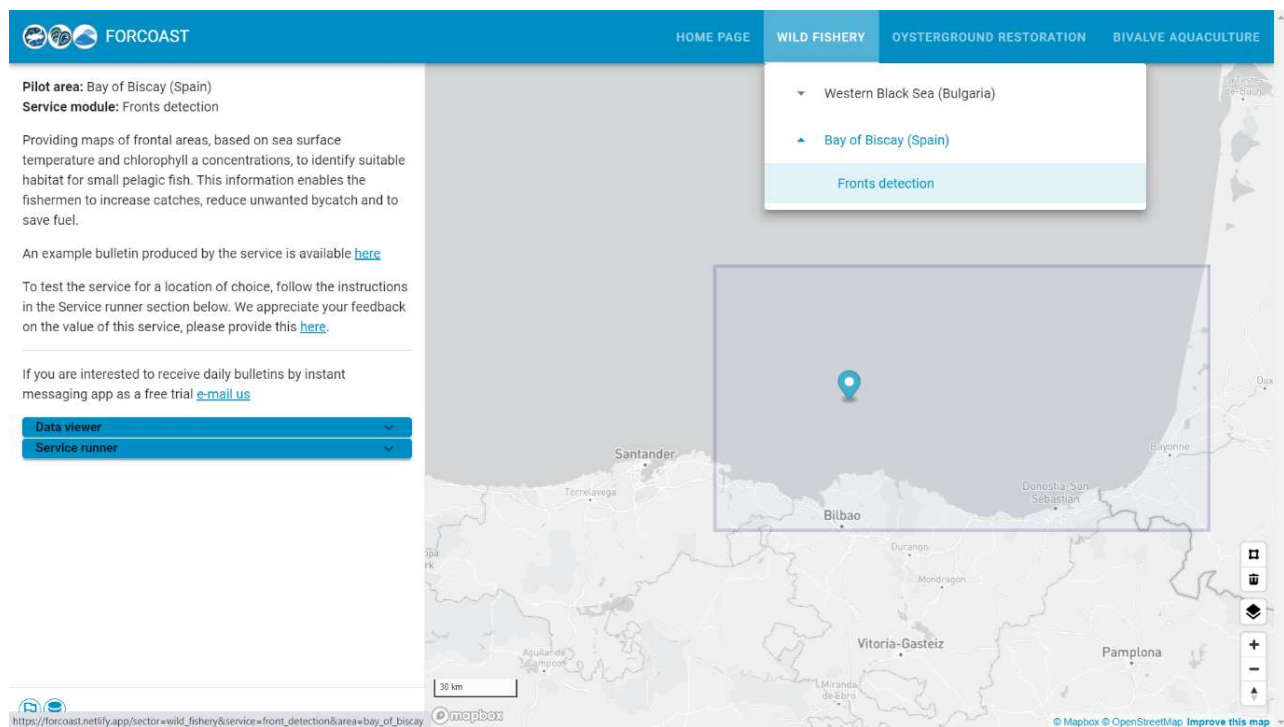


Figure 4: Example display of a pilot area and service selection

On the left of the screen, a short description is provided for the selected service, together with a service output example. From here, the user can open an example bulletin as created by this service, can access a feedback form through which feedback on FORCOAST platform can be provided (Figure 5), and can get in touch by e-mail (Figure 6).

FORCOAST - Service Feedback

Your feedback after using the FORCOAST Services is of great value since it helps us to improve the service, offering you a better product in return. Please consider answering the questions below:

daniel.twigt@gmail.com [Switch account](#)

* Required

Email *

Your email

Which Service would you like to evaluate? *

☐ Fronts Detection
☐ Suitable Fishing Areas
☐ Contaminants Source Retrieval
☐ Marine Conditions
☐ Land Pollution
☐ Site Prospection
☐ Spat Capture Assistance

What is your impression of the use service via the platform of the following aspects from 10 (highest) to 1 (lowest)? *

10 9 8 7 6 5 4 3 2

Figure 5: Digital feedback form which can be accessed from the User Interface

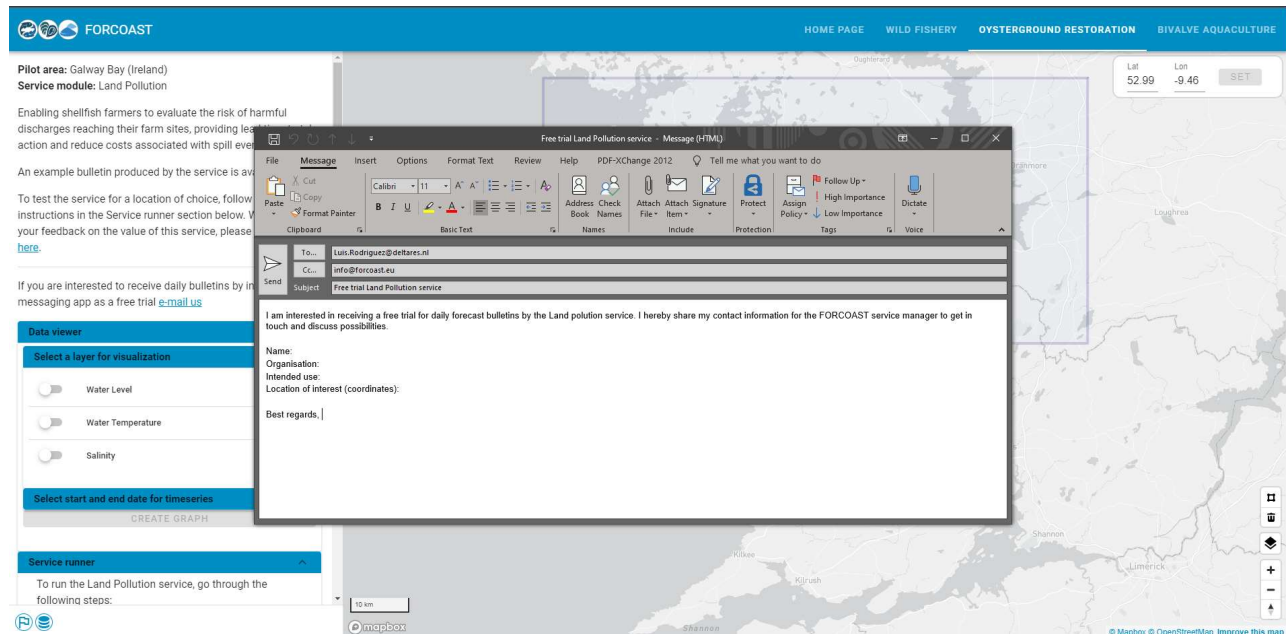


Figure 6: E-mail template to register for automated service

Bellow the description, the Data viewer and “Service Runner” drop-down bars are displayed (Figure 7).



Figure 7: Data-viewer and service runner drop-down bars

The data viewer has the same functionality for all pilot areas and service modules, namely it allows users to visualize data, directly on the web-map viewer. Figure 8 provides an example of the togglable units included in the Data viewer

for the above example. Each layer displays the latest data available. An example of a visualized layer can be seen in Figure 9.

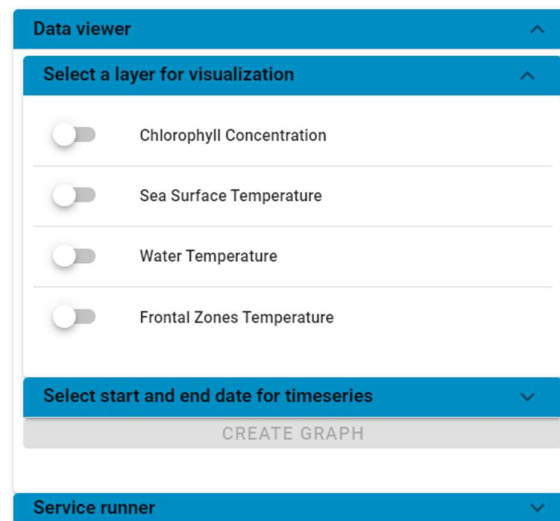


Figure 8: Data viewer toggable units and timeline selection

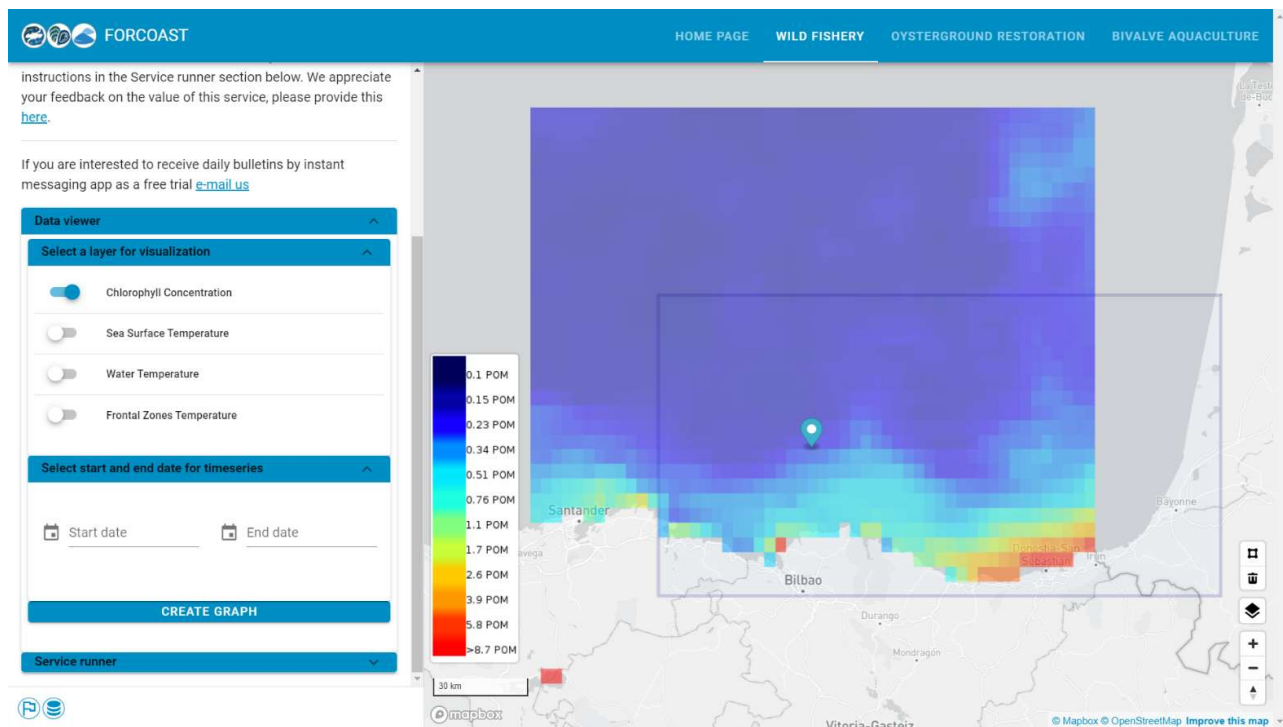


Figure 9: Data-viewer, Visualizing a layer without a timestamp.

Some data can be viewed on a specific date and time as shown in Figure 10. The user can use the top-left panel on the web-map display to select a certain date or (in some cases) a specific time of the day for the layer to be visualized.

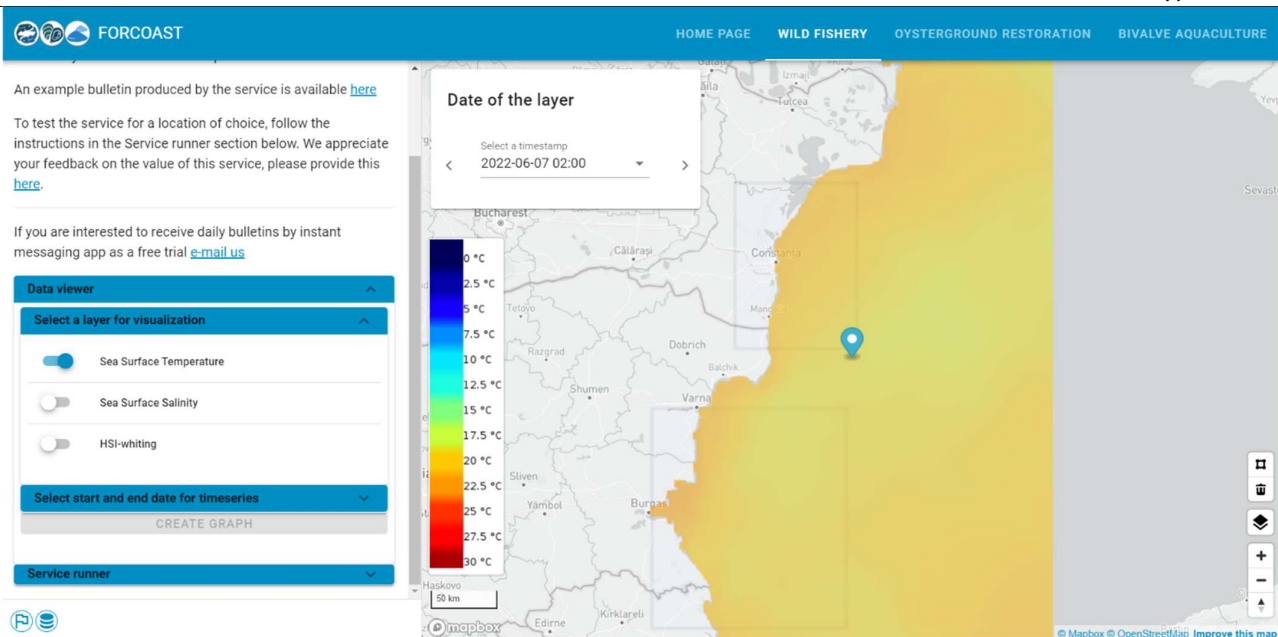


Figure 10: Data-viewer, Visualizing a layer with a selected timestamp

2. Service specific manual

In this section, the user can find information on how to use the different services provided in the platform for each pilot area. Before diving further into details, a general notice is that some of the services require some input or certain actions from the user, such as declaring a threshold value or other information required. On the other hand, there are certain services, which run as scheduled tasks and the user is only asked to indicate a time range and certain location. The following chapters will explain how to utilize each service using the FORCOAST platform. Some services may apply to multiple pilot areas and thus this manual will provide one example for each individual service.

2.1. Service module: F1 - Suitable Fishing Areas

The presence of areas with high concentrations of fish resources in Bulgarian and Romanian coastal waters (Pilot where the SM has been initially developed) is highly influenced by seasonal variations. In addition, spatial distribution of zones with high fish resources could represent an issue – large distances between fishing areas and collecting centers. The aim of the Fishing Suitability Index developed within this service module is to address these specific stakeholder needs by offering information regarding the localization of optimal conditions for fishing activities in the area of interest. The index has values ranging from 0.1 (less suitable) and 1.0 (best condition)

As shown in Figure 11, this service runs as a scheduled task. To make use of the service, there are two options. First, the user can simply visualize the HSI-layer by toggling the layer on. Selecting different timestamps from the time panel on the top-left of the web-map display allows the user to historically explore the data and have a visual inspection.

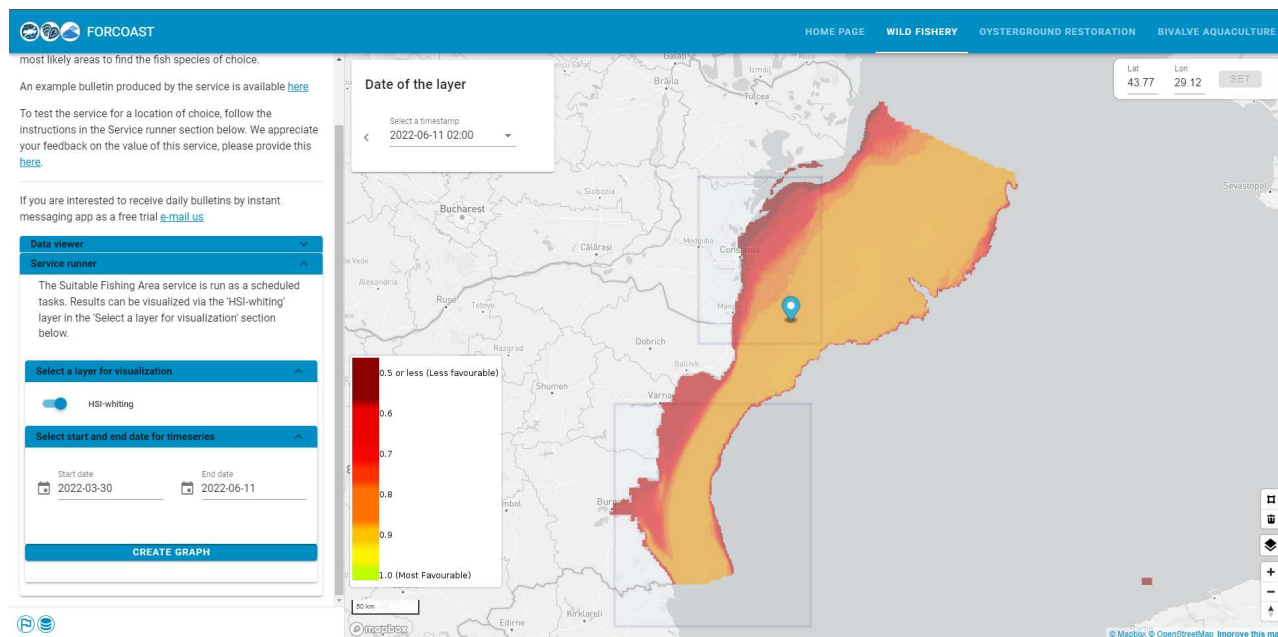


Figure 11: F1-Suitable Fishing Areas, visualizing the HSI-whiting layer and generating a graphical representation of a selected time range.

In addition, the user can select a time range from the panel on the left of the screen below the layers for visualization. After defining a time range, the user can specify the selected area of interest by placing the blue marker on top of it, inside the indicated purple box or by specifying the selected coordinates manually from the top-right panel on the web map-display. Finally, the user needs to lock the coordinates given, by clicking on the “SET” tab. Once these two steps are fulfilled, the user can click on the “Create Graph” tab on the left side of the screen to run the service and produce a graphical representation of the HSI-layer over a selected time range. An example of the final output can be viewed in Figure 12. Once the graph is generated, a pop-up window appears on the screen displaying the data

graphically. This window provides the user with certain options, such as zooming in, viewing the data series, changing the graph to bar or line chart and downloading the file into a local directory in a .PNG format. This process can be executed for all the layers included in this pilot area.



Figure 12: Example output graph for the HSI-whiting at defined time range on a specified location.

2.2. Service Module: F2 - Front detection

Frontal areas are those where there is a sharp gradient in certain properties of seawater, such as temperature or chlorophyll-a concentration. These areas are characterized by a higher-than-normal biological activity, and therefore can be used as an indicator of the presence of certain commercial fish species, helping the user identify potential fishing grounds.

Sea fronts can be identified using both remote sensing imagery (real-time) and model data (forecast of fronts' positions and intensities). The fishing sector needs easy to understand and highly processed data to make fast decisions on where to go for optimizing routes, in combination with the user knowledge and experience. This service module has been designed with both qualities in mind, which allows identifying the areas of interest immediately, with the subsequent reduction in the time spent at sea and fueling usage.

The F2-Front detection service runs as a scheduled task. Figure 13 shows a visual output of the "Frontal Zones Temperature" layer for a specified date and time. The user is required to toggle the switch under "Service runner", "Select a layer for visualization" to activate the layer and then select from the top-left panel of the web-map display, the selected timestamp.

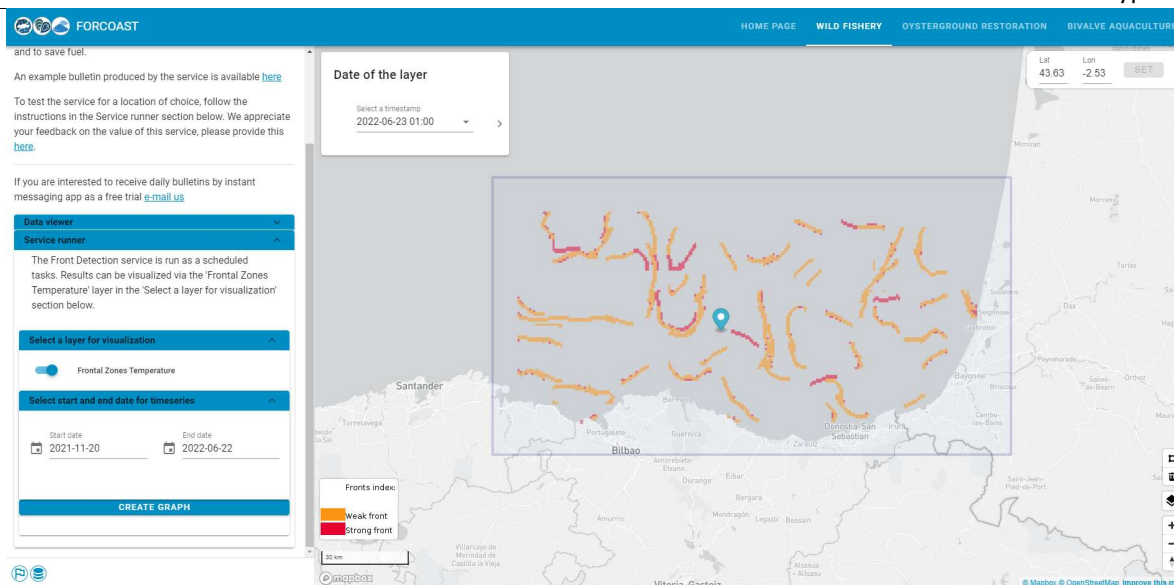


Figure 13: Example of the Front detection service module

This way, the user can see the areas where there are weak or strong fronts (orange and red, respectively) and assess their permanence at a glance.

In addition, the user can select a time range from the panel on the left of the screen below the layers for visualization, under “Select start and end date for timeseries”. After defining a time range (Start and End date), the user is required to indicate a selected area of interest by placing the blue marker on top of it, inside the indicated purple bounding box or by specifying the selected coordinates manually from the top-right panel on the web map-display. Finally, the user needs to lock the coordinates given, by clicking the “SET” tab (Figure 14). Once these two steps are fulfilled, the user can click on the “Create Graph” tab on the left side of the screen to run the service and produce a graphical representation of the Front Zones Temperature layer over a selected time range. Once the graph is generated, a pop-up window appears on the screen displaying the data graphically. This window provides the user with certain options, such as zooming in, viewing the data series, changing the graph to bar or line chart and downloading the file into a local directory in a .PNG format (Figure 15). This process can be executed for all the layers included in this pilot area. This is another way to assess the permanence or appearance of the fronts in the desired area.

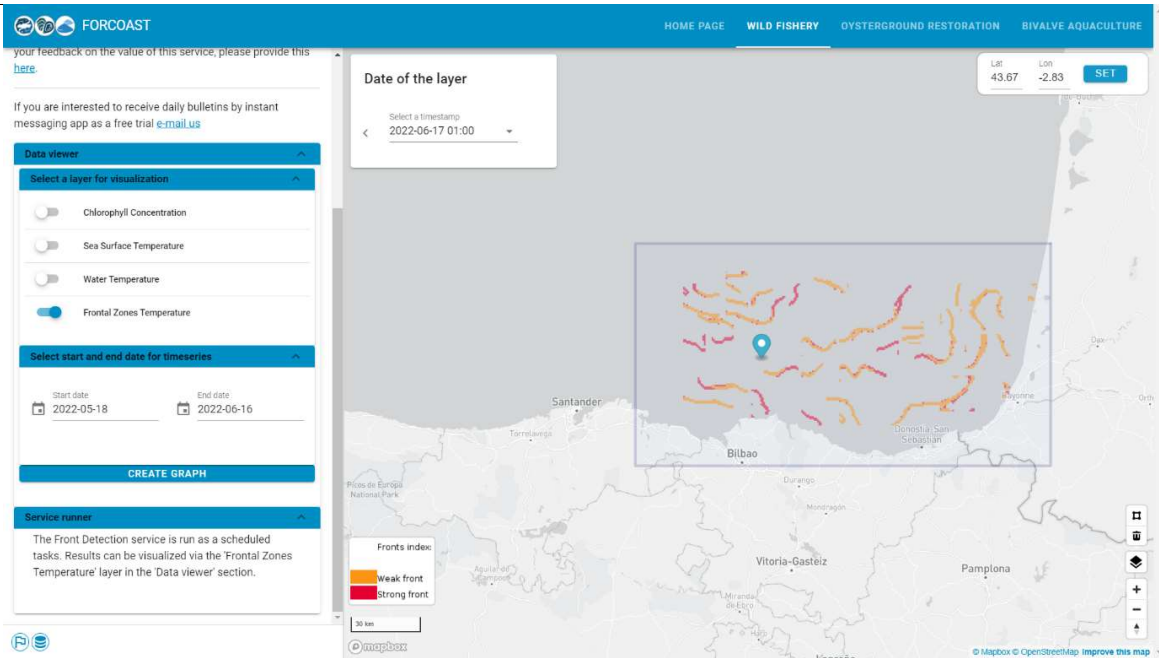


Figure 14: Front detection service - setting up the graphical representation

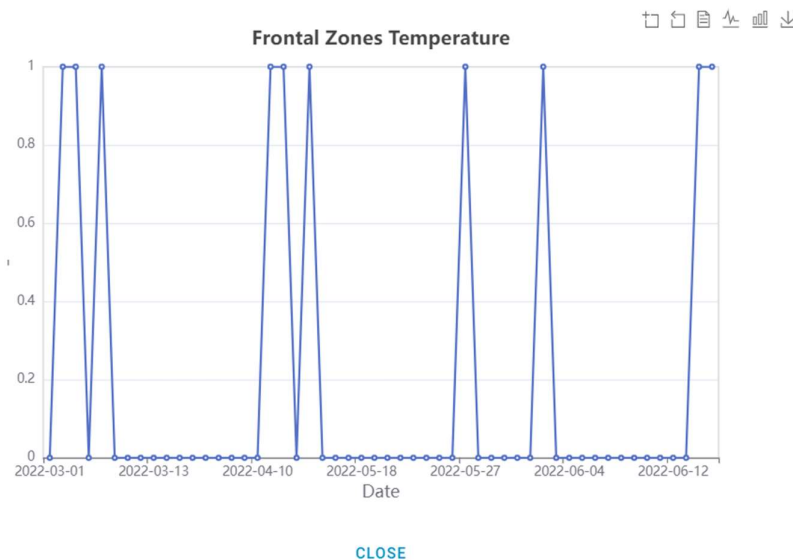


Figure 15: Example output graph for the Front Zones Temperature at defined time range on a specified location

2.3. Service Module: A1 - Marine conditions at farming site/alarm system and scheduler

To run the Service runner in the Marine Conditions service the user must follow certain steps, which are also displayed on the left of the screen (Figure 16).

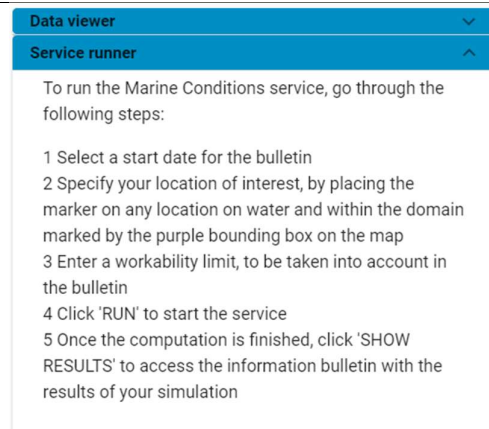


Figure 16: Service runner description for the A-Marine Conditions and scheduler

The first step is to indicate a specific day for the service to start the simulation. To select a starting date for the service run, click on corresponding tab and select an appropriate day for running the service, click “OK”. Once this step is fulfilled, the user must specify the location. There are two ways to do this: one is to place the marker on the web-map display on the location of interest, and the other is to directly type latitude and longitude of the service location in the upright location bar, as shown in Figure 17, and lock the selected coordinates by clicking on the “SET” tab on the top right of the web-map display. The next step asks the user to enter a workability limit for the selected variables. Currently only water level is implemented, and the workability limit of water level must be in range of 0-2 meters.

Notice: The marker, must be placed inside the purple bounding box on top of water locations only

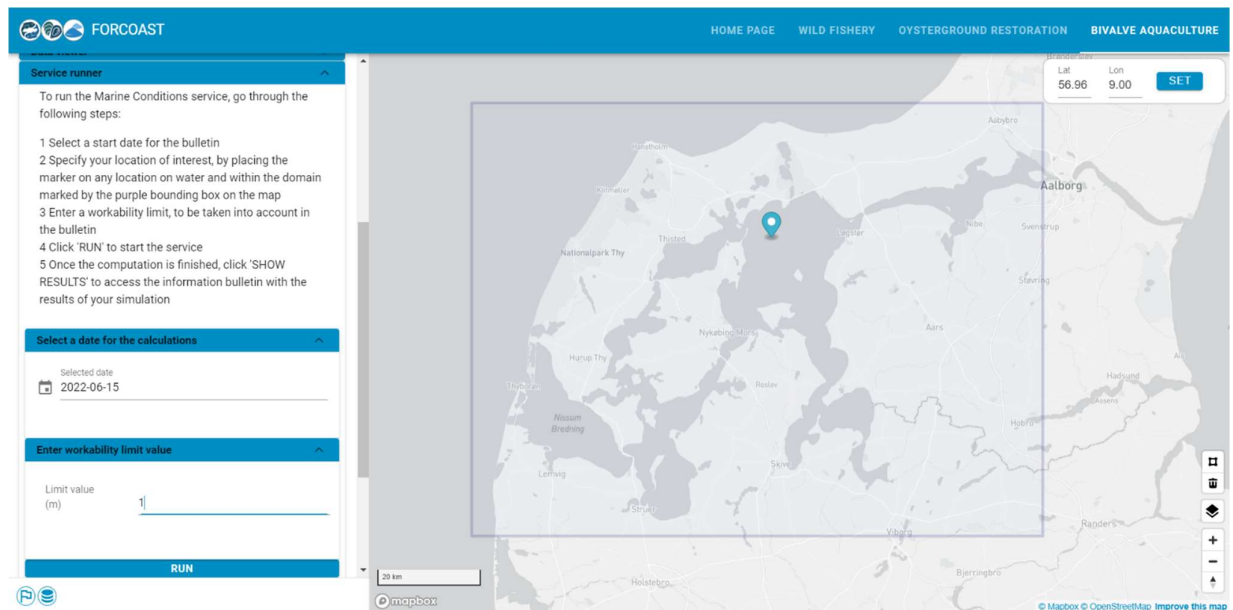


Figure 17: Setting up the date and the location of interest for the service by using the marker

Completing the beforementioned steps will allow the user to run the service clicking on the “RUN” tab. Figure 18 shows an example run of this service module.

Select a date for the calculations

Selected date

2022-06-15

Enter workability limit value

Limit value (m)

1

RUN

Process status: accepted

Figure 18: Running the A1-Marine Conditions and Scheduler service

Once the run process is completed successfully a new tab will appear below the “RUN” tab called “GET RESULTS” (Figure 19). The user must click on this tab to display the bulletin result of the service.

RUN

Process status: successful

GET RESULTS

Figure 19: Get results tab

Finally, the bulletin results are displayed on the screen (Figure 20). The bulletin can be downloaded by right-clicking on the screen and saving the image locally. Since this bulletin focuses on water level related working environment, the results show 48-hour forecasts of the weather (winds and precipitation) and water level, together with high tide and low tide information. It should be noted that currently wind speed has a unit of km/h: 1 m/s = 3.6 km/h.

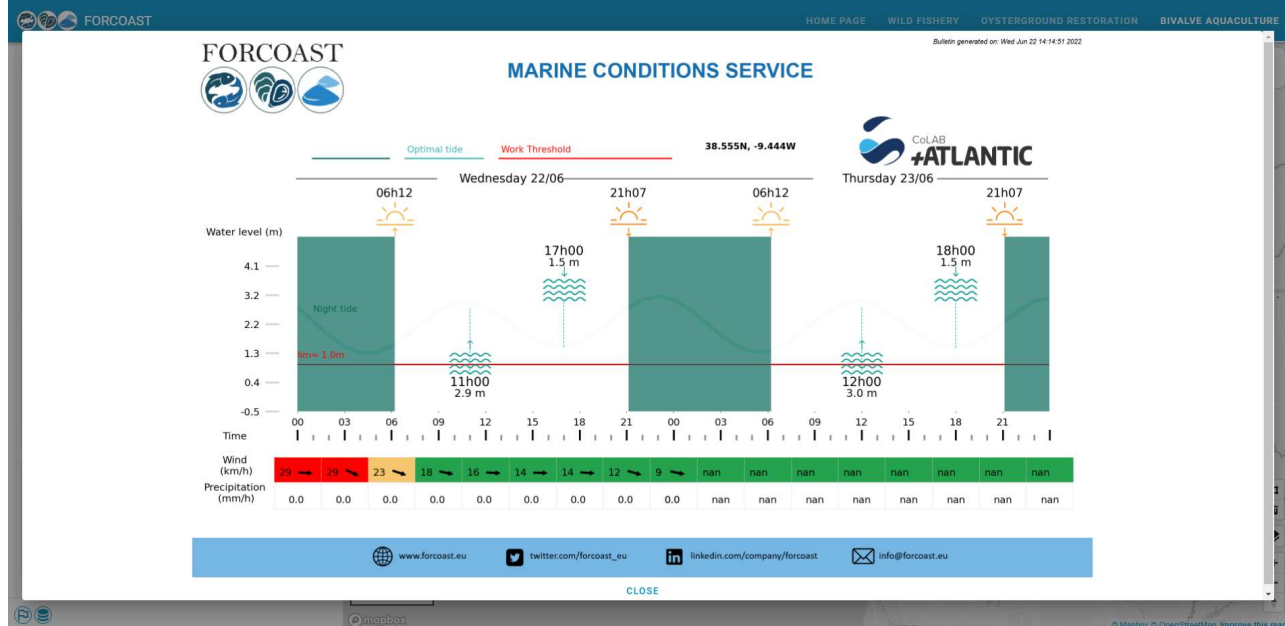


Figure 20: Bulletin result example for A1-Marine conditions and scheduler service module.

2.4. Service Module: A2 - Land Pollution

Nearshore farming infrastructures are exposed to land discharges, which in some cases carry harmful substances (e.g. E. coli, pollutants). High-resolution circulation forecasts can be used to assess the likelihood of a farm being affected by material released from potentially harmful sources. This service aims to support quality control, by providing a measure of the probability for farming sites to be affected by harmful land discharge.

To run the Land Pollution service the user must follow certain steps, which are also displayed on the left of the screen to guide the users (Figure 21).

Data viewer

Service runner

To run the Land Pollution service, go through the following steps:

- 1 Select a start date for the simulation
- 2 Specify the pollution discharge location, by placing the marker on any location on water and within the domain marked purple on the map
- 3 Draw a rectangle in the map where the area you want to evaluate is (e.g. farm location) by using the drawing tool in the top left part of the map. This should be done on water and within the domain marked by the purple bounding box on the map
- 4 Click 'RUN' to start the service
- 5 Once the computation is finished, click 'SHOW RESULTS' to access the information bulletin with the results of your simulation

Select a date for the calculations

Specify bounding box for target location

RUN

Overview of jobs

Figure 21: Service runner description for the A2-Land Pollution service module

The first step is to indicate a specific day for the service to start the simulation. To select a starting date for the service run, click on corresponding tab and select an appropriate day for running the service. Once this step is fulfilled, the user must place the marker on the web-map display on the potential discharge location as shown in Figure 22 and lock the selected coordinates by clicking on the “SET” tab on the top right of the web-map display. The next step asks from the user to use the polygon tool from the bar on the right-bottom side of the web-map display and draw a polygon around the location of interest (e.g. fish farm) as shown in Figure 16. To draw a polygon, the user must select the polygon tool, then click once on the selected location and move the cursor to generate the polygon around the specified area. In case the user needs to find another location or change the given one, it is first required to select the delete tool from the web-map display bar on the right, delete the former generated polygon and by following the above steps create a new one.

Notice: Both the marker and the polygon, must be placed inside the purple bounding box on top of water locations only.

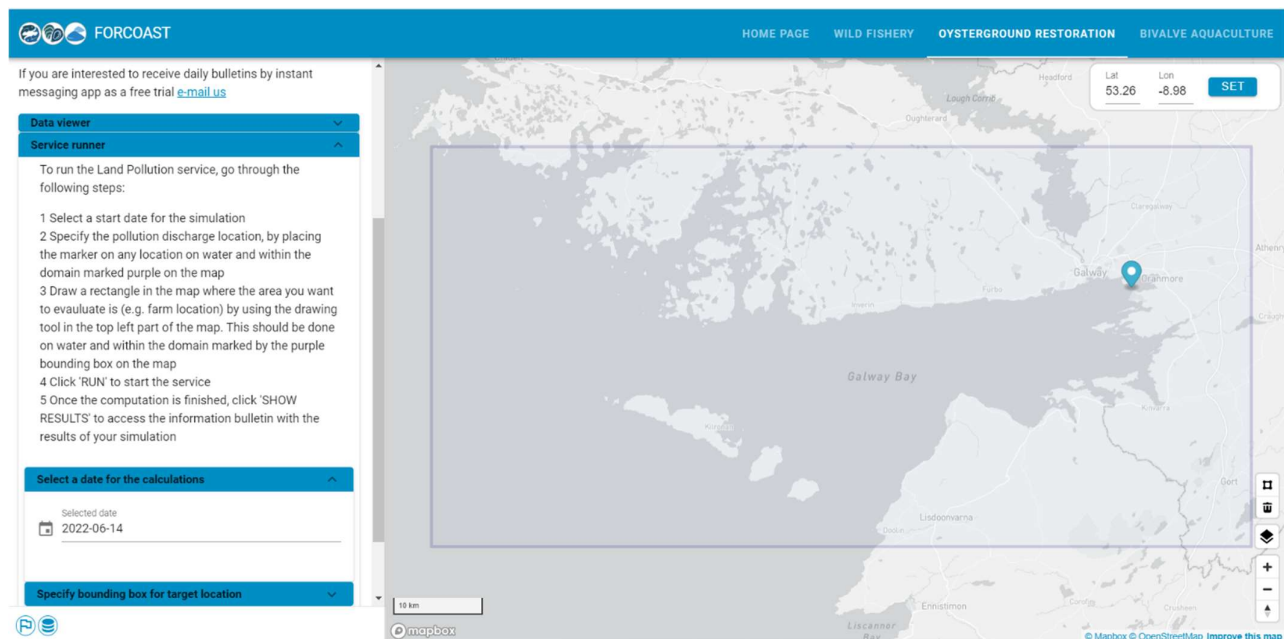


Figure 22: Setting up the date and the specified pollution discharge location by using the marker

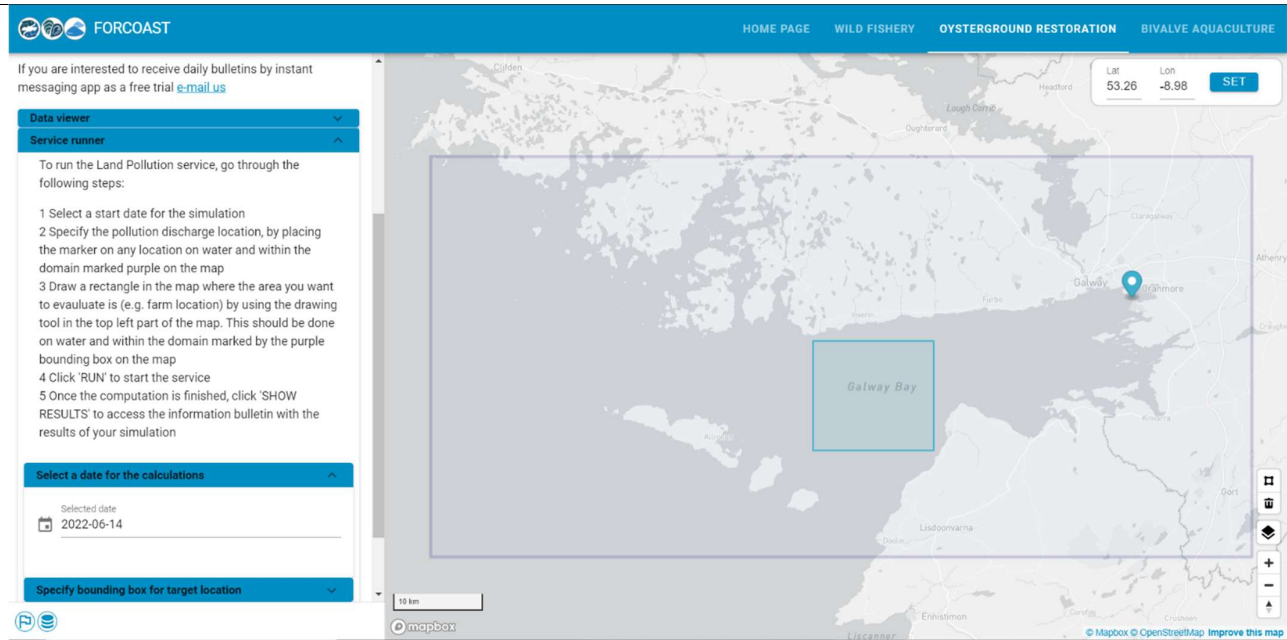


Figure 23: Generation of polygon around the area of interest

Completing the beforementioned steps will allow the user to select the “RUN” tab to start running the service. Figure 24 shows an example run of this service module.

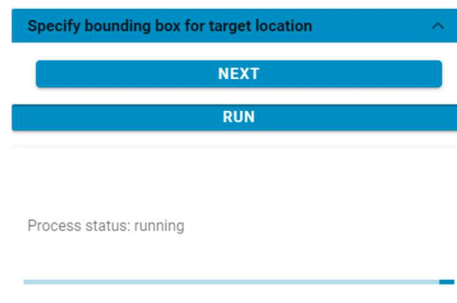


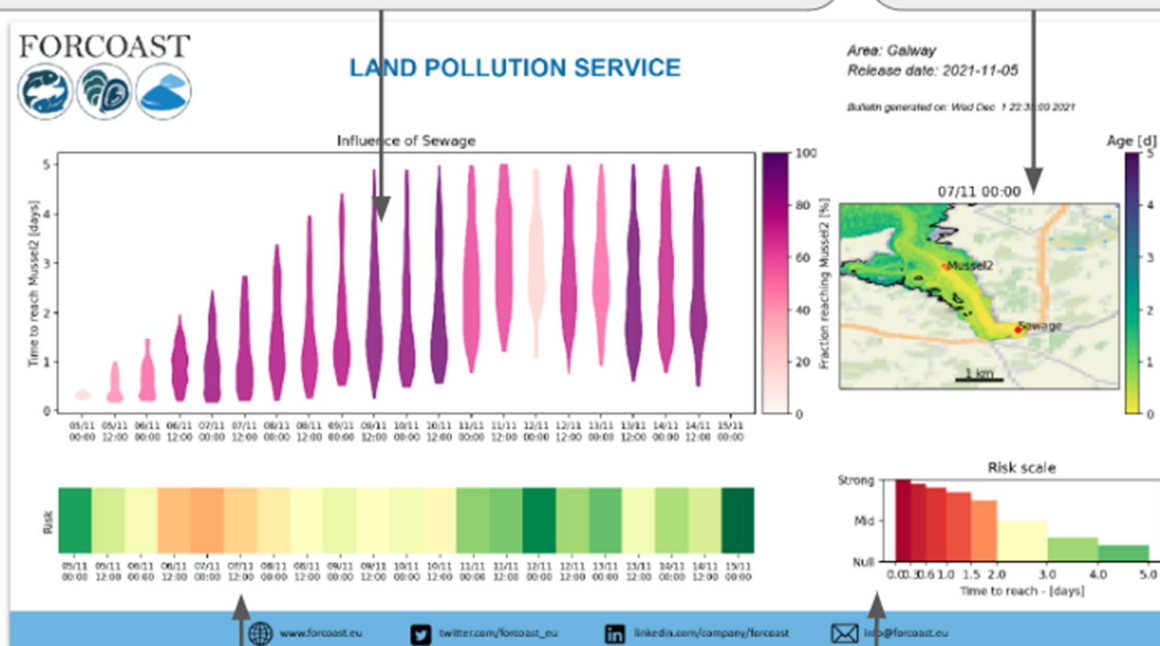
Figure 24: Running the A2-Land Pollution service

Note: due to the significant runtimes of this Service Module, this is preferably run as a scheduled, automated task, in which case the user will receive results when available, rather than needing to wait for this after dispatching a manual run.

3. Detailed figure, provides an exhaustive view on the fraction of release entering the farming site, and time taken to get there.

- *Deep purple*: most of the release reaches the farm.
- *Light purple*: only a small fraction reaches the farm.
- *Lower Bulk* : Pollutants reaching the farm have been released recently.
- *Upper bulk* : Pollutants reaching the farm have been released long ago.

1. Map, including source and farm area. It shows the pollutants track and the time since release ("Age" in colors).



4. The risk timeline, is computed according to fraction of release reaching the site and the time taken to get there. This constitutes the principle information provided to users .

2. The risk scale, is settled upon subscription. It used to compute the "risk" factor, which merges the fraction of pollutants reaching the farm, and the time taken to get there since release. Generally, the faster pollutants reach the farm, the more dangerous they are.

Figure 25: Results of the A2-Land Pollution service

A completed execution of A2, be it triggered manually on the platform or automatically in the case of scheduled executions, ends with the compilation of a synthetic bulletin reporting the results (Fig. 25). Note that an animated version of the bulletin is also provided. The bulletin contains all the elements intervening in the service's computation :

1. The **map** highlights the pollution source and target farming site defined by the user. In addition, it displays a selected snapshot of the simulation with tracks of the advected particles (i.e., the pollution tracer) and their age (i.e., time elapsed since release). The date of the selected snapshot is that of the 'worst' situation for that run.
2. The **risk scale** is a user-defined relative risk metric, scaling the dangerousness of the pollution for different values of age. For instance, a substance may carry a strong risk if it reaches the farm in less than 6 hours, but only a moderate risk if it has circulated more than two days before reaching the farm.
3. The **detailed figure** provides additional information for the insightful user. In particular, it indicates for each time step (typically, from 5 days before to five days after present-time) what is the fraction of release that reaches the farm (purple color bar), and what is the age distribution for those particles reaching the farm. It may help to decide whether a high-risk index results from a lot of particles reaching the farm, or because of a small amount reaching the farm very quickly.

4. The **risk timeline** is the principal component of the bulletin. It provides a time series of the risk-index, computed based on the user-defined risk scale and the result of the simulated circulation.

It should be stressed that in its present form, the service does not consider real-time discharge data for the pollutant source, nor does it resolve the dynamics of the pollutant itself (I.e., decay of the pollutants, bacterial growth). Those are pieces of information that are difficult to gather automatically. Also, our sole risk assessment is based on 'time since release' which is the best information that can be derived without requesting user knowledge of the pollution's exact nature and discharge rate.

2.5. Service Module: A3 – Site Prospection

The purpose of the service module is to identify areas with highest growth potential and lowest mortality for flat oysters, *Ostrea edulis*, and thereby increase harvest and restoration potential. The oyster farmers tend to face challenges with high spat mortality and variable growth depending on environmental conditions. The service module can also be applied to other species, i.e., blue mussels, if the user has knowledge of the species' characteristics.

To run the A3-Site Prospection service the user must follow certain steps, which are also displayed on the left of the screen (Figure 26). In the data viewer, the user can see the background data for a selected period and extract time-series from a chosen location.

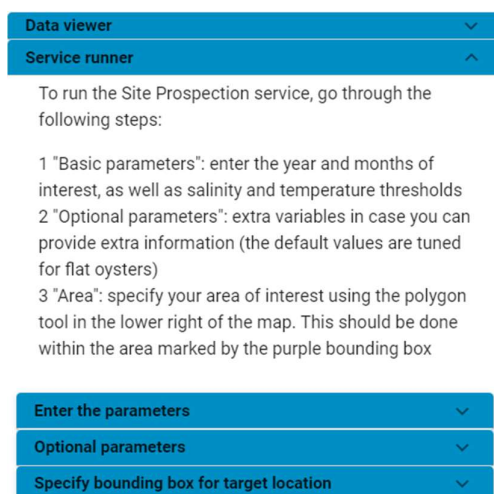


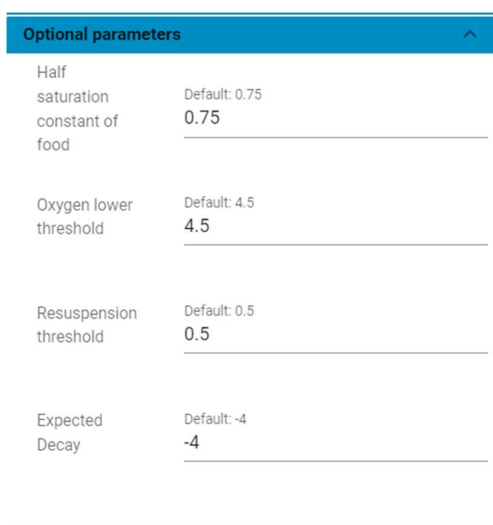
Figure 26: Service runner description for the A3-Site Prospection service

In the service runner, there are two parameter settings tabs. The first one is required to be filled as it refers to the basic input parameters for the service to run (Figure 27). The basic input is the considered months for culturing that can be calculated for different years. Further, the user can define the lower and upper thresholds for salinity and temperature dependencies of the species based on local knowledge or literature data. The second one (Figure 28) refers to optional or advanced parameters in case the user wants to provide more information in relation to the food response, sensitivity to low oxygen levels and the resuspension of sediment that increase the risk for burial.



Enter the parameters		
Enter a start date	February	2010
Enter an end date	March	2012
Salinity thresholds	Lower: 8	Upper: 15
Temperature thresholds	Lower: 8	Upper: 12

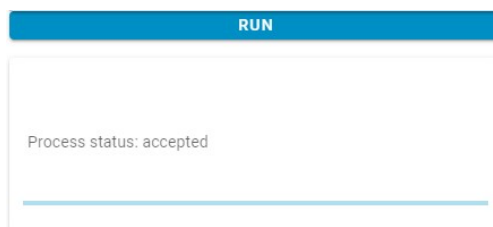
Figure 27: Basic parameters settings tab



Optional parameters	
Half saturation constant of food	Default: 0.75 0.75
Oxygen lower threshold	Default: 4.5 4.5
Resuspension threshold	Default: 0.5 0.5
Expected Decay	Default: -4 -4

Figure 28: Optional/Advanced parameter settings tab

After providing the relevant input, the user can press “RUN” tab to dispatch the job to the FORCOAST back-end.



RUN

Process status: accepted

Figure 29: Running the A3-Land Pollution service

The bulletins created show the spatial habitat suitability index (HSI) of flat oysters (or other considered species), indicating the most optimal locations for bottom aquaculture and restoration. The HSI is informed by user-specific provided knowledge of the considered species (e.g. salinity tolerance), DEB modeling, and the literature. The obtained HSI is based on the integration of the scoring indices (0 to 1) for each environmental variable for the chosen period by the user. A value of 1 is the best suitable location and value of 0 means not suited

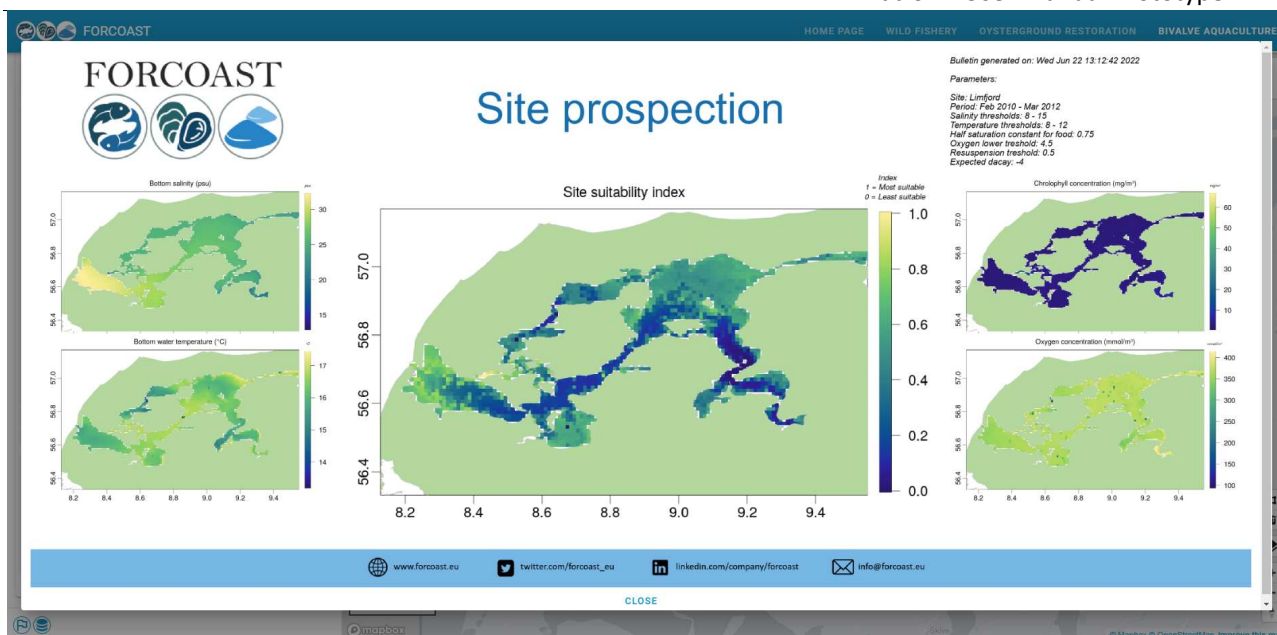


Figure 30: Results of the R1-Contaminant Source Retrieval service

2.6. Service Module: A4 – Spat Capture Assistance

To run the Spat Capture Assistance service the user must follow certain steps, which are also displayed on the left of the screen (Figure 31)

Data viewer

Service runner

To run the Assistance for Spat Capture service module go through the following steps:

- 1 Select a method to be used: 'Temperature threshold' or 'Cumulative temperature'
- 2 The temperature threshold method requires a temperature threshold for spat spawning
- 3 The cumulative temperature method requires to give a threshold for gonade development and a threshold of cumulative temperature. The cumulative temperature value is the sum of water temperatures since the beginning of the year.
- 4 Select the pelagic larval duration. This is time it will take for the spats to drift to the farming location
- 5 Select the duration of the spawning period of the spats

Enter the parameters

Figure 31: Service runner description for the A4-Spat Capture Assistance service module

Note: selection of area or coordinates is not required

The first step is to choose the parameters asked, which includes the method to use for the spawning/release triggering (either based on a temperature threshold or on a cumulative temperature threshold), the temperature threshold or the gonad development threshold and the cumulative temperature threshold of releasing, and finally the pelagic larval duration. Those parameters will automatically be filled, when the user selects either Oysters or Mussels, but can also be modified manually from the user (Figure 30). When the parameters are filled successfully, the user must click on the “RUN” tab to run the service.

Enter the parameters

Select a preset

Mussels

Method

☐ Temperature threshold
☒ Cumulative temperature

Threshold of temperature for gonade development

degrees celcius

7

Threshold of cumulative temperature

degrees celcius

576

Pelagic larval duration

Minimal

25

Maximal

45

Duration of spawning period

days

30

Specify bounding box for target location

RUN

Figure 32: A4-Spat Capture Assistance parameter settings & Run

After “RUN” is pressed. The process status will turn to “accepted” once the back-end accepted the job request. Subsequently, the status will change to “running” one the job is running in the back-end. If the job is unsuccessful, the status will be set to “failed”. Upon successful completion, the job status will be set to “successful” (See Figure 33 for example). Note that it might take a couple of minutes for a run to complete.

Once the service run is completed successfully, the “GET RESULTS” tab will appear, which allows users to display the bulletin result on their screen (Figure 33, Figure 34).

RUN

Process status: successful

GET RESULTS

Figure 33: Get results tab after successful run



The mention “No spawning event” means that spawning event had not started yet in the considered spawning ground with the selected parameterization.

2.7. Service Module: R1 - Contaminants Source Retrieval

To run the Contaminants Source Retrieval service the user must follow certain steps, which are also displayed on the left of the screen (Figure 35).

Figure 35: Service runner description for the R1 - Contaminants Source Retrieval

The first step is to indicate a specific day for the service to start the simulation. To select a starting date for the service run, click on corresponding tab and select an appropriate day for running the service. Once this step is fulfilled, the user must place the marker on the web-map display on the potential location, where contaminants are present, as shown in Figure 36 and lock the selected coordinates by clicking on the “SET” tab on the top right of the web-map display. The next step asks from the user to enter a time period for the simulation (1-48 hours).

Notice: The marker, must be placed inside the purple bounding box on top of water locations only.

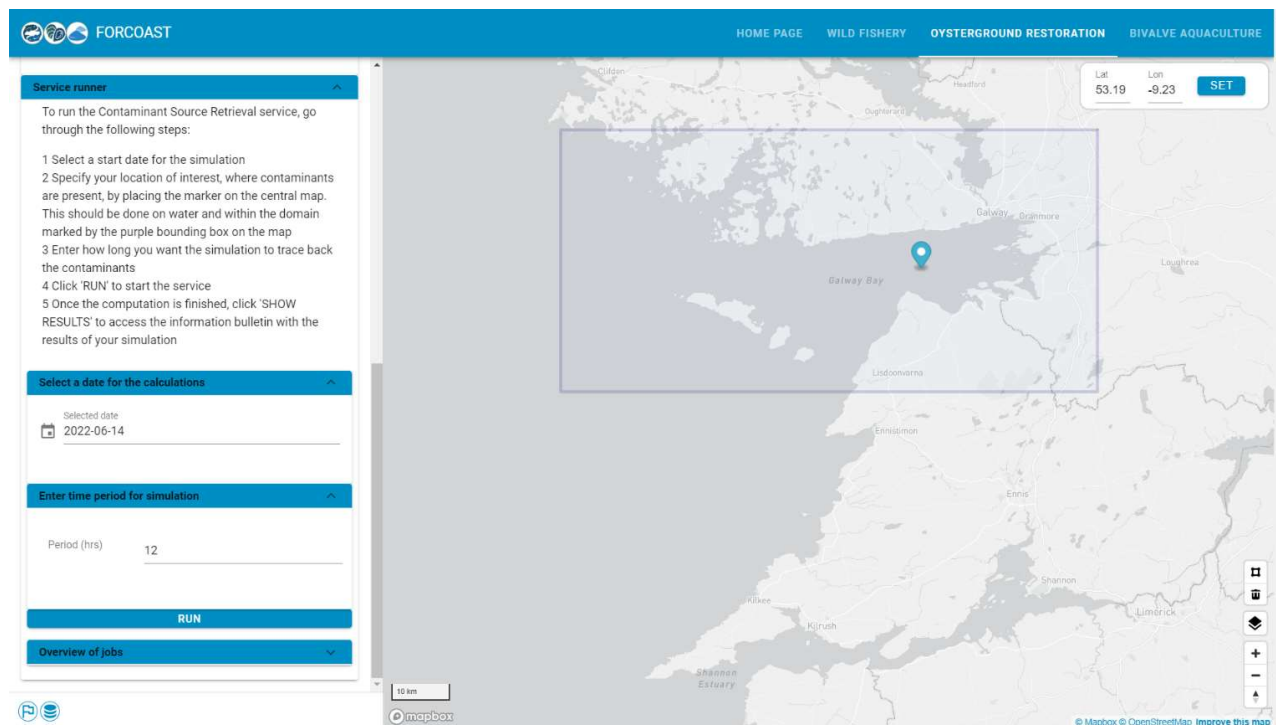


Figure 36: Setting up the date and potential contaminant location by using the marker.

Completing the aforementioned steps will allow the user to run the service clicking on the “RUN” tab. Figure 37 shows an example run of this service module. During the service run, the user can have an overview of the tasks executed in the back end bellow the tab “Overview of jobs”.

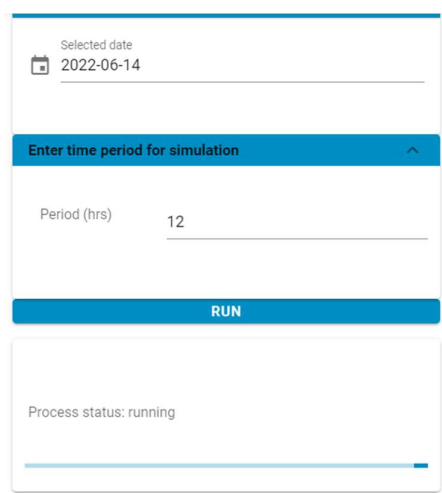


Figure 37: Running the R1-Contaminants Source Retrieval service

The bulletin generated provides the user with maps showing:

1. The location of the contamination plume (shown as red bubbles) at the time indicated at the top of the map.
2. At each site, and at the time indicated at the top of the map, the probability that contaminants can be found at that site. The probability is shown as a color scale, with light yellow colors indicating a lower probability, while dark red colors showing a higher probability. Where no color is shown (i.e., the background map can be seen), it means that the model has determined that that area would not be impacted by the contamination at the indicated time.
3. A map highlighting the areas where the contaminants would stay for longer periods of time. These regions would typically be semi-enclosed, near-coastal areas with stagnant waters. However, quite often such regions cannot be identified, and thus the corresponding map will not display any meaningful information. This map has the label "Areas where Local Exposure Time longer than [...]". The Local Exposure Time is the time that, on average, the contaminants spend at each site. The overall maximum Local Exposure Time is then determined across the whole region, and the map in the bulletin will highlight only those areas where the Local Exposure Time is 75% above that maximum.

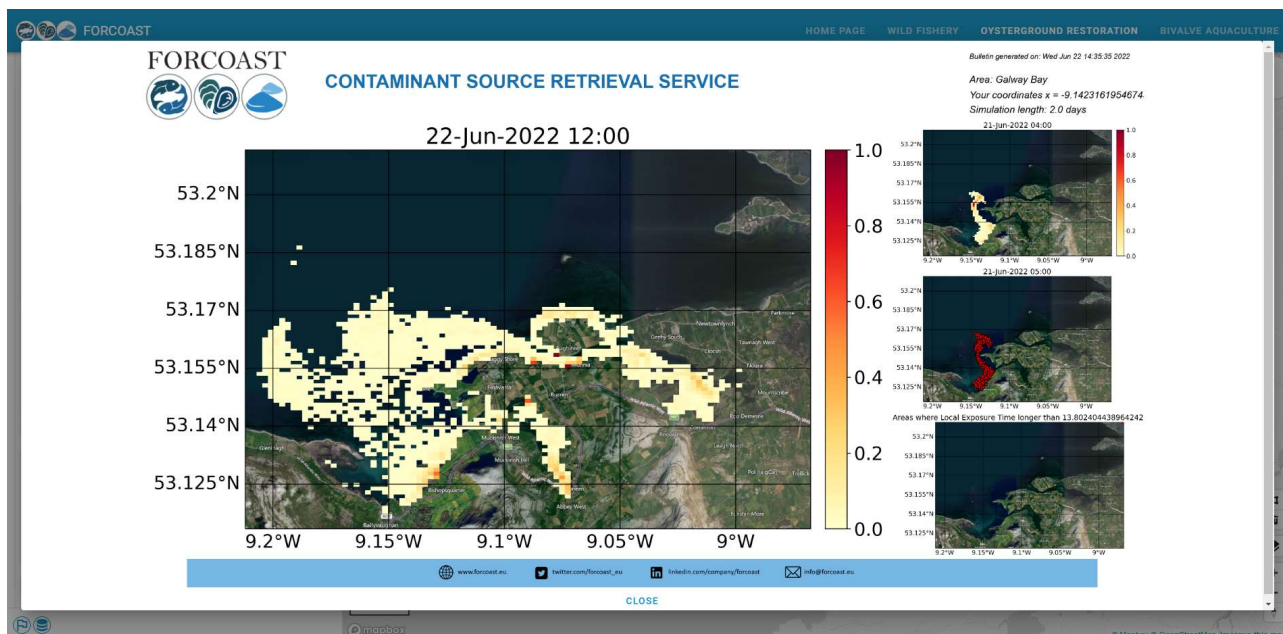


Figure 38: Results of the R1-Contaminants Source Retrieval service

3 Data availability

The FORCOAST service modules are dependent in input data generated by the FORCOAST pilots and provided from CMEMS. To check whether relevant data sources are up-to-date, data monitoring bulletins are created. These can be accessed from the database icon in the lower left (Figure 39).



Figure 39: access data monitoring bulletin

The bulletin accessed this way is presently updated every 12 hours and shows whether the data sources listed are up-to-date or delayed (Figure 40).

Pilot	Source	Layers	TinyURL	Response code	Last available date	Date status	Status
1. Sado Estuary	MARETEC THREDDS	(YYYYmmd)00_Surface.nc:ssh	tinyurl.com/2t8t8eje	Success (200)	22-06-21:02:00:00	Up-to-date < 96h	✓
1. Sado Estuary	MARETEC THREDDS	(YYYYmmd)00.nc:wind_speed	tinyurl.com/29pvpb5x	Success (200)	22-06-21:02:00:00	Up-to-date < 96h	✓
2. Bay of Biscay	EuskOOS THREDDS	(YYYYmmd) fronts_exp.nc:sst	tinyurl.com/5enq2szh	Success (200)	22-06-23:02:00:00	Up-to-date < 96h	✓
2. Bay of Biscay	Geoserver	forcoast:biscay_sst	tinyurl.com/FORCOAST	Success (200)	22-06-21:23:00:00	Up-to-date < 96h	✓
2. Bay of Biscay	Geoserver	forcoast:biscay_fronts_sst	tinyurl.com/FORCOAST	Success (200)	22-06-21:23:00:00	Up-to-date < 96h	✓
3. Black Sea BG	Geoserver	forcoast:pilot_3_CMEMS_sst	tinyurl.com/FORCOAST	Success (200)	22-06-30:00:00:00	Up-to-date < 96h	✓
3. Black Sea BG	Geoserver	forcoast:HSL_whiting	tinyurl.com/FORCOAST	Success (200)	22-06-11:00:00:00	Outdated > 96h	⊘
4. North Sea	RBINS ERDDAP	NOS_HydroState_V1.nc:sst	tinyurl.com/3hfeuj2n	Success (200)	22-06-24:02:00:00	Up-to-date < 96h	✓
5. Galway Bay	Marine Institute THREDDS	galway_bay_(YYYYmmd)HH_AN.nc:?	tinyurl.com/22e8936j	Success (200)	22-06-13:02:00:00	Outdated > 96h	⊘
5. Galway Bay	Marine Institute THREDDS	IMI_ROMS_HYDRO_GALWAY_BAY_NATIVE_70M_BL_1H_forecast	null	Success (200)	22-06-22:02:00:00	Up-to-date < 96h	✓
6. Limfjord	DMI FTP via Geoserver	forcoast-dk_elev	tinyurl.com/FORCOAST	Success (200)	22-06-26:00:00:00	Up-to-date < 24h	✓
6. Limfjord	DMI FTP via Geoserver	forcoast-dk_salt	tinyurl.com/FORCOAST	Success (200)	22-06-26:00:00:00	Up-to-date < 24h	✓
6. Limfjord	DMI FTP via Geoserver	forcoast-dk_temp	tinyurl.com/FORCOAST	Success (200)	22-06-26:00:00:00	Up-to-date < 24h	✓
6. Limfjord	DMI FTP via Geoserver	forcoast-dk_currentspeed	tinyurl.com/FORCOAST	Success (200)	22-06-26:00:00:00	Up-to-date < 24h	✓
6. Limfjord	DMI FTP via Geoserver	forcoast-dk_windspeed	tinyurl.com/FORCOAST	Success (200)	22-06-26:00:00:00	Up-to-date < 24h	✓
7. Black Sea RO	SEAMOD THREDDS	2_EFORIE_grid_T	null	Success (200)	22-06-24:02:00:00	Up-to-date < 96h	✓
7. Black Sea RO	SEAMOD THREDDS	1_NWS_grid_T	null	Success (200)	22-06-24:02:00:00	Up-to-date < 96h	✓
7. Black Sea RO	SEAMOD THREDDS	BS_1h_grid_T	null	Success (200)	22-06-24:02:00:00	Up-to-date < 96h	✓
8. Northern Adriatic	Geoserver via OGS	forcoast:northernadriatic_thetao	tinyurl.com/FORCOAST	Success (200)	13-01-01:00:00:00	Up-to-date < 96h	✓
8. Northern Adriatic	Geoserver	forcoast:northernadriatic_fronts_sst	tinyurl.com/FORCOAST	Success (200)	22-06-21:23:00:00	Up-to-date < 96h	✓
8. Northern Adriatic	OGS THREDDS	chl	null	Success (200)	22-06-23:23:00:00	Up-to-date < 96h	✓
8. Northern Adriatic	OGS THREDDS	o2	null	Success (200)	22-06-23:23:00:00	Up-to-date < 96h	✓
Multiple pilots	CMEMS THREDDS	CHL	null	Success (200)	22-06-20:00:00:00	Up-to-date < 96h	✓
Multiple pilots	CMEMS THREDDS	analysed_sst	null	Success (200)	22-01-01:00:00:00	Outdated > 96h	⊘

Figure 40: data monitoring bulletin, showing whether relevant input datasets are up to date