Fish-X

D5.3 Live Use Cases – WP5

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Abstract	This document describes and analyzes the data collected by the tested digital solutions in all three use cases (Ireland, Croatia, Portugal) namely NEMO (Vessel Monitoring system for SSF), FISHWeb (digital platform to visualize VMS trajectories), NAOS (electronic gear marking) with graphs and maps that cover the period July 2023-September 2024. Several datasets are captured such as NEMO installation progress, battery charge level, fishing trips and tracks, NAOS beacons activation and tracks and FISHWeb accounts activation. This deliverable paves the way for D5.4 which will go into the details of the use of digital technologies by fishers and the qualitative interpretation of the data retrieved from all tested digital tools.

Document history

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Version	Issue Date	Stage	Description	Contributors (Name/affiliation)
1.0	21/11/2024	Final first Draft		Hrvoje Čeprnja (WWF Adria) Florence Bouillé Chada (CLS) Jean-Pierre Cauzac (CLS) Joana Oliveira (ANP|WWF Portugal) Laure Guillevic (WWF EU) Raquel Pereira (Sciaena) Sylvie Giraud (CLS) Seamus Bonner (IIMRO) Théo Saccareau (CLS)
2.0	26/11/2024	Draft Review		Ankith Kumar (TMT) Andrew Thorsen (TMT) Jana Stünkel (TMT) Seamus Bonner (IIMRO)
3.0	28/11/2024	Final version		Laure Guillevic (WWF EU)

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Acronyms and abbreviations

Abbreviation	Meaning
AI	Artificial Intelligence
AIS	Automatic Identification System
EEZ	Exclusive Economic Zone
FISHWeb	CLS Web-platform for the management of VMS and ERS data
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
MCS	Monitoring, Control, and Surveillance
MPA	Marine Protected Areas
NAOS	CLS satellite tracking buoy for fishing gears
NEMO	CLS VMS for SSF
SSF	Small-Scale Fisheries
VMS	Vessel Monitoring System

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Executive Summary

This section describes and analyses the data collected by the tested digital solutions in all three use cases (Ireland, Croatia, Portugal) namely NEMO (Vessel Monitoring system for small-scale fisheries), FISHWeb (digital platform to visualise VMS trajectories), NAOS (electronic gear marking) with graphs and maps that cover the period July 2023 to September 2024. This deliverable will pave the way for D5.4 which will go into the details of the use of digital technologies by fishers and the interpretation of the data retrieved from all tested digital tools.

For NEMO, it encompasses the recharging of the battery when necessary and the use of the safety button. For FISHWeb platform, it relates to the access to the web service from a smartphone and/or PC and the display of their data. For NAOS, it includes the monitoring of the fishing gears and for the ERS application, the registrations of catch data on a smartphone application.

The objective of D5.3 is to collect and analyse a range of data retrieved from the completion of the three use cases. It is closely linked with D5.4 which will use the data provided by D5.3 to explain some behaviors of fishers and to enable comparisons between use cases. D5.3 is a key piece of WP5 to provide results of the progress of the use cases. This deliverable will also be useful for WP2 (events, white paper 3), WP4 (development of Insight Platform), WP6 (development of Traceability platform) and for WP7 (policy recommendations, roadmap).

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1. Shipboard devices and visualization web-platform descriptions

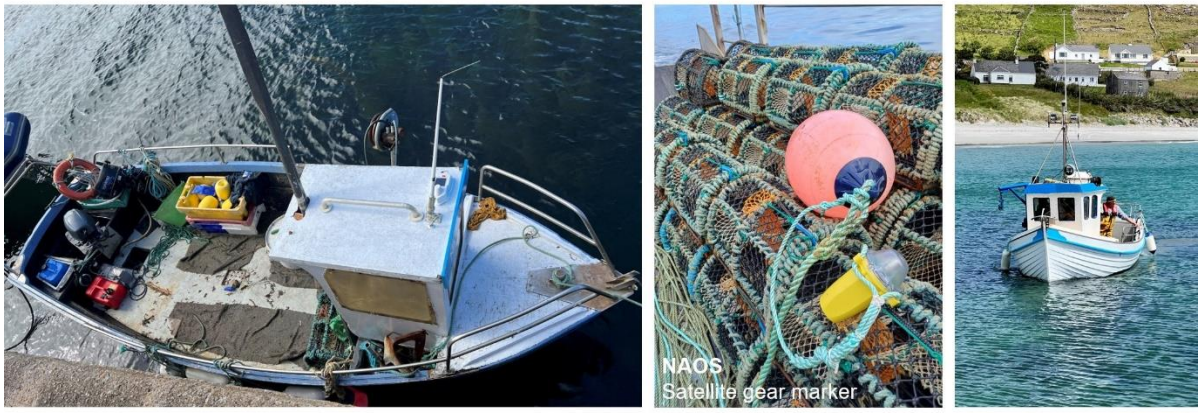
1.1 NEMO and NAOS beacons

The two devices tested for the use cases in Croatia, Portugal and Ireland are a Vessel Monitoring System (VMS) beacon called NEMO and a connected fishing gear marking buoy, called NAOS, provided by CLS.

The NEMO device is a solar powered shipboard VMS transmitter specifically designed for the small-scale fleet segment. The NEMO has a hybrid connectivity using mobile network in coastal areas and switch to satellite when the vessel is out of terrestrial networks. The NAOS device is a satellite buoy designed for passive and drifting fishing gear monitoring (i.e. lines, pots and traps, nets, anchored and drifting Fish Aggregating Devices etc.) with flexible reporting rates up to 96 positions a day.

NEMO and NAOS devices were shipped by CLS to the WP5 partners (WWF Adria, Sciaena and IIMRO) in charge of their deployment in their respective countries along with technical information sheets and a user manual including installation instructions (see Annexes 1 and 2). A simplified, pictogram-based, NEMO user manual bespoke for fishers (available in Portuguese and English languages) was given.

Raquel Pereira and Nicolas Blanc (Sciaena) installing a NEMO device on a vessel in Algarve, Portugal. ©Camila Prisco Paraiso



NEMO and NAOS installations in Ireland, ©Seamus Bonner, IIMRO

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1.2 FISHWeb platform

FISHWeb is a user-friendly web portal for fleet managers that provides secure access to fishing fleet data generated by the installed devices. Much more than a simple VMS visualisation tool, FISHWeb helps fishers and shipowners to optimise their business.

TRACK	- Display vessel info in one click (location, speed, ETA, terminal ID, MMSI, etc.) - Search for vessel positions equipped with NEMO beacons and NAOS positions - Export data in multiple formats - Configure VMS status alerts
SECURE	- Data is encrypted and sent via VMS - Guaranteed data security: ISO 27001 - Operations center 24/7/365
MANAGE	Create your own zones (entry/exit, speed) Alerts for device events Configure automatic alerts Choose alert recipient Simplified ocean data (temperature, wind/waves, wave height)

Figure 1: FISHWeb characteristics and functions

The FISHWeb platform can be used with Internet browser (PC, iOS/Android devices).

FISHWeb is operated by CLS and all data collected during the use cases are managed in the CLS datacenter. An informed consent form detailing how fishers' personal data are managed by CLS (in full compliance with EU 2016/679 GDPR regulation[1]) was signed by participating fishers.
Some illustrations of FISHWeb applications are shown below with practical cases in Croatia, Portugal and Ireland. Secure access to FISHWeb was granted to fishers to visualise their individual tracks, and to the WP5 partners (WWF Adria, Sciaena and IIMRO) to visualise the data from the whole fleet to

[1] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance)

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support the monitoring of their respective deployments. No other recipient from the Fish-X consortium had a FISHWeb account.

2. Analysis of digital solutions per use case

2.1 Deployment of NEMO beacons

The first installations of NEMO beacon were completed in Croatia in July 2023 and in August 2023 in Portugal. After having been tested at the office of WWF Adria in Zagreb (first installation and fully charging the battery), the NEMO beacon was installed aboard the first fishing vessel. Then, installations of NEMO beacons were performed progressively in Croatia and Portugal thanks to WWF Adria and Sciaena and ANP|WWF Portugal partners. In 2024, NEMO beacons started to be deployed in Ireland by IIMRO, the Irish use case partner.

During the first weeks, NEMO beacons were set to collect positions at a frequency of 10 minutes and to transmit a message every 30 minutes (one message with 3 GNSS positions sent every half-hour). In September 2023, the whole network of active NEMO beacons was updated to collect positions at a frequency of 3 minutes (one message with 10 GNSS positions sent every half-hour). NEMO beacons are set to prioritise the cellular network (GPRS) for data transmission. NEMO beacons can also transmit using the ARGOS satellite communication system, at a 1-hour frequency.

When approaching a port or if the vessel is reducing its velocity until being considered as stationary, the reporting of a NEMO beacon enters a "stationary mode" and starts emitting at a lower, power-saving emission frequency (one position every 240 minutes – 4 hours).

The graph below shows the total number of NEMO beacons installed in Croatia, Portugal and Ireland over the period July 2023-September 2024.

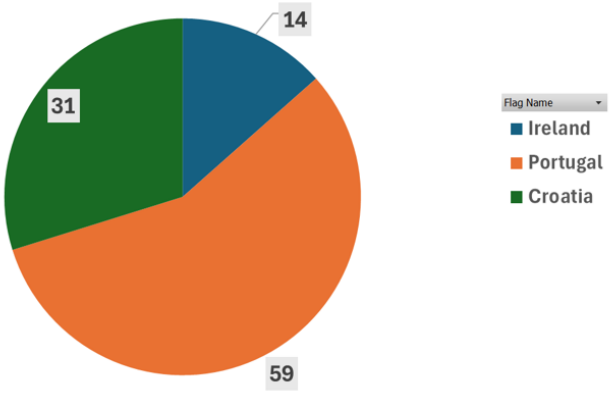

Figure 2: Number of NEMO beacons installed in Croatia, Portugal, and Ireland

The histograms below show the temporal activation progress of NEMO beacons by country since August 2023.

Before being installed aboard the vessel, the NEMO beacon must first be activated in a dedicated platform at CLS that processes all VMS positions (the Fish-X partner must send an email to CLS support

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team to activate the beacon). After being activated for the first time using a magnet, the NEMO beacon can start emitting positions at the set intervals.

For this reason, there can be an interval of days between activation of NEMO beacon in CLS platform and first beacon positions received in FISHWeb.

2.1.1 Installation progress in Croatia

The First installation of a NEMO beacon was completed in Croatia in June 2023. After having been tested at the office of WWF Adria in Zagreb (first installation and fully charging the battery), the NEMO beacon was finally installed on board the first fishing vessel in July 2023.

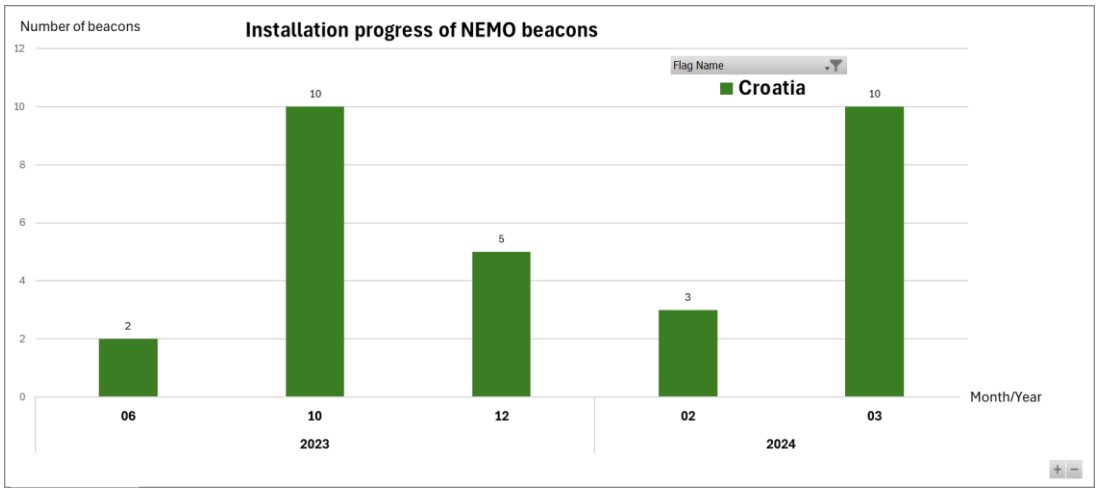

Figure 3: Installation progress of NEMO beacons in Croatia

2.1.2 Installation progress in Portugal

On August 2nd, 2023, a meeting was held between Sciaena, ANP|WWF Portugal and CLS to explain all steps of the process to be followed for installation and activation of NEMO beacons aboard a vessel.

Then, 4 NEMO beacons were installed aboard vessels on August 18th, 2023, and activated on August 31st, 2023, some days before the fishing vessels left to sea.

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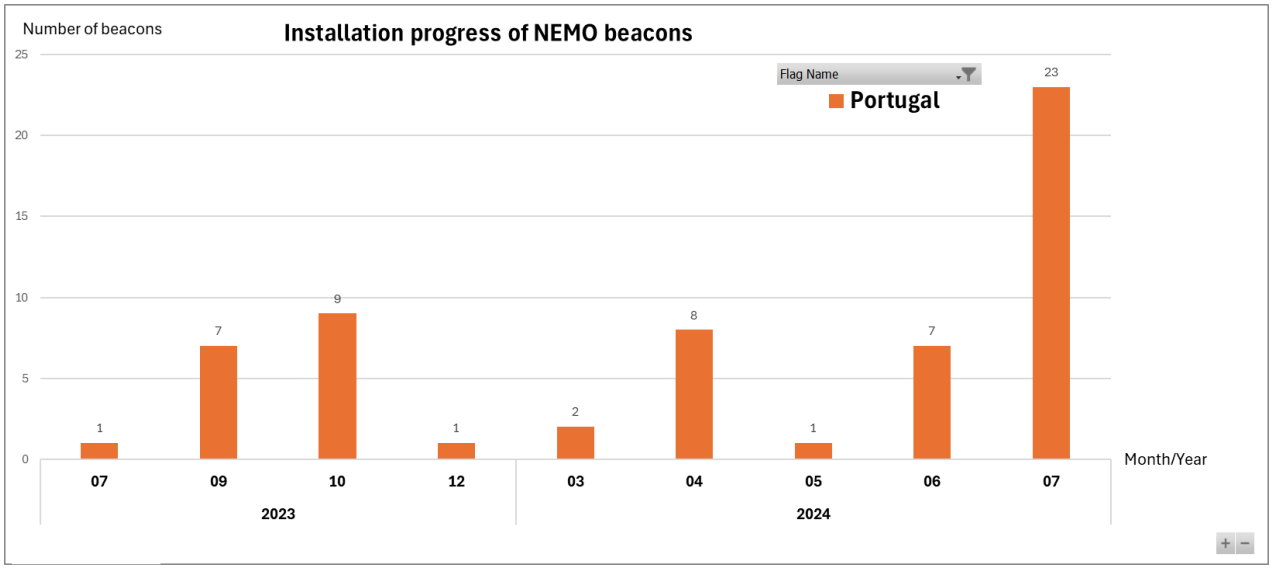

Figure 4: Installation progress of NEMO beacons in Portugal

2.1.3 Installation progress in Ireland

IIMRO became a partner in the Fish-X project in June 2024. Nevertheless, a partnership had already begun between CLS and IIMRO in 2022 to technically test some units in real world conditions after a request by IIMRO. Some NEMO beacons were installed aboard vessels in Ireland with lower frequency of emission (emission every 10 or 15 minutes).

The graph below also includes numbers of NEMO beacons that were initially deployed in 2022.

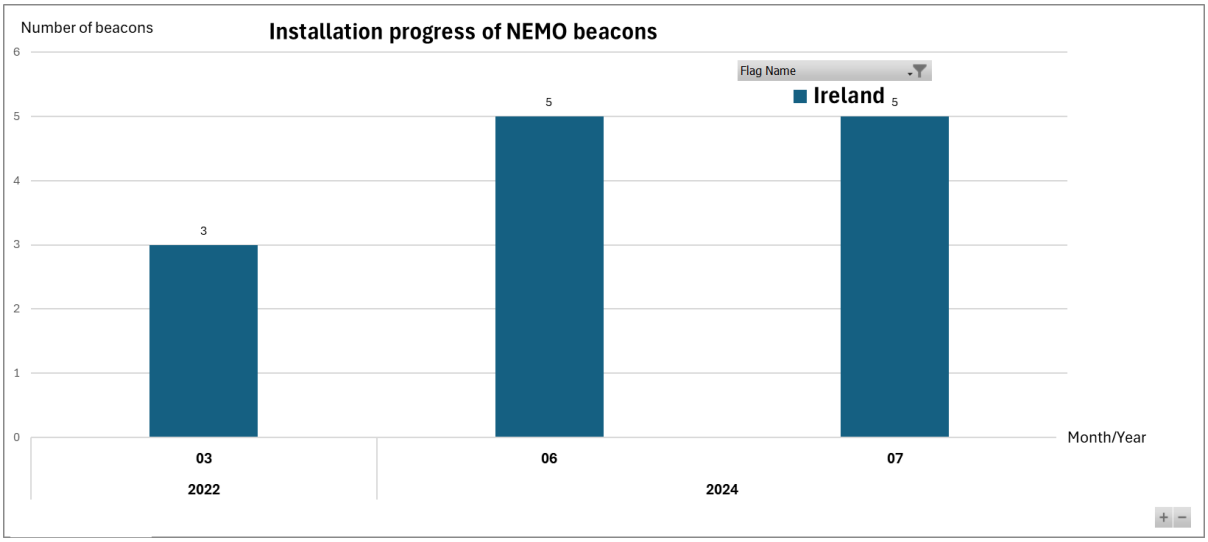

Figure 5: Installation progress of NEMO beacons in Ireland

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2.2. NEMO battery settings

NEMO is a robust, solar-powered VMS transmitter, simple and reliable even in cases of bad weather conditions at sea. Before installation on board the vessel, the internal battery of the NEMO beacon must be fully charged by connection to engine power or at the office. Thanks to its built-in solar panel, the NEMO's battery will be fully autonomous because it will keep recharging using sunlight. The NEMO beacon can also be charged by an external power source if needed.

At port, and in case the NEMO's solar panel is not perfectly exposed to sun or in shaded areas, the battery charge level can decrease. For this reason, when anchored at sea at or port for long time, the frequency of emission will be lower as NEMO beacons are set to emit every 4 hours instead of every half-hour (including positions every 3 or 10 minutes).

The graphs below show the evolution of battery charge level over the 2024 period across the three use cases.

2.2.1 Battery charge level monitoring over the 2024 period

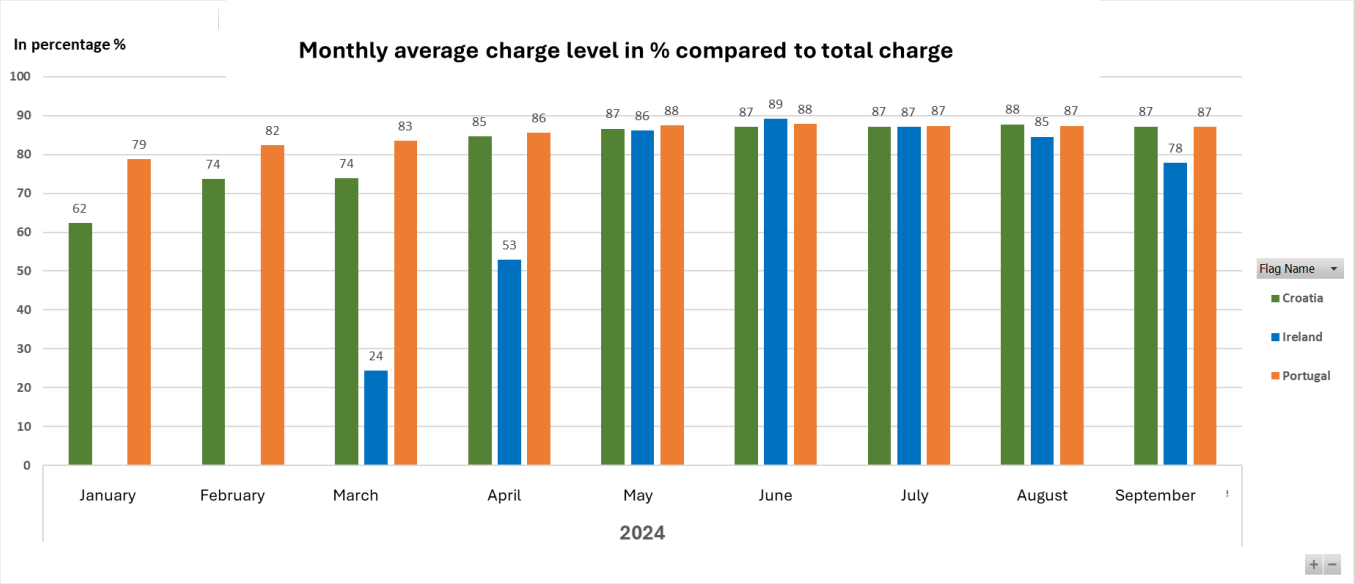

Figure 6: Temporal Evolution of charge level over 2024 period

Even if NEMO beacons are deployed in three different areas where climate conditions are very different, we can note that since May 2024, the monthly average charge level is nearly similar in Croatia, Portugal, and Ireland.

The monthly average was calculated considering all active NEMO beacons, including NEMO at port which can imply lower battery charge level during NEMO stays at port.

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Monthly average in March and April 2024 in Ireland correspond to the period when first NEMO beacons were installed, sometimes after first total load. If the NEMO beacon stays at port in a shaded area for a long time, the battery level may decrease. However, once NEMOs are at sea, the battery starts loading normally, given sufficient sun exposure.

2.2.2 Battery charge level monitoring by season

The graphs below show the distribution of battery charge levels inside the network of NEMO beacons during April 2024 and September 2024, by country.

Each message transmitted by NEMO beacon has information corresponding to the current charge level of the NEMO beacon.

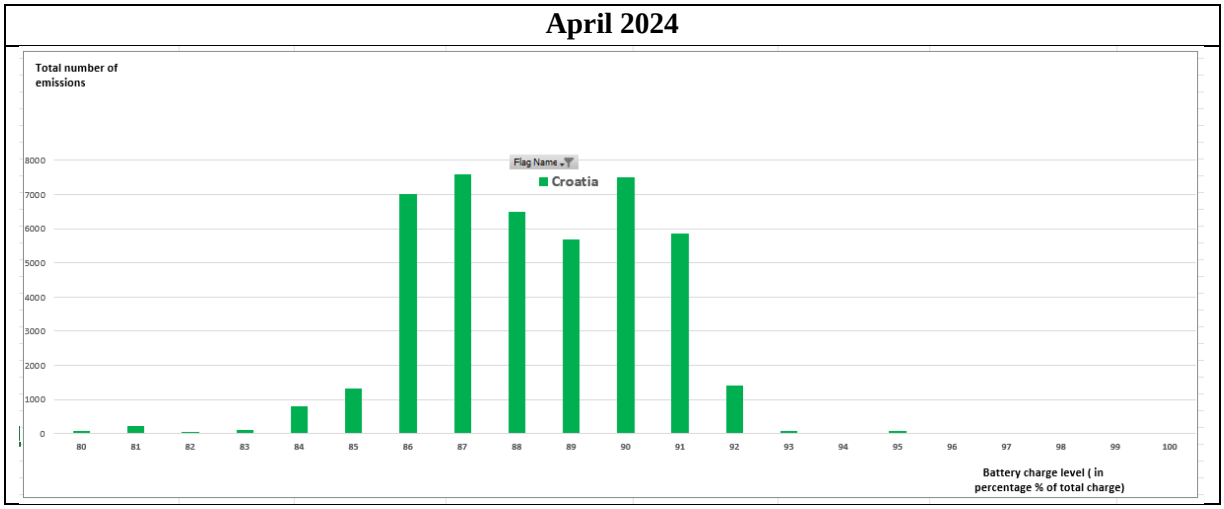
In graphs below, the X axis corresponds to the distribution of battery charge level (in %) and Y axis gives the total number of received messages including the information of "charge level".

The comparison of histograms show that the battery charge level remains high within the network of NEMO beacons (in Croatia, Portugal, and Ireland), mainly between 80% and 90%, in April and September 2024. A more spread-out distribution of battery charge levels in Ireland is noted for the month of September. This may be due to poorer sunlight conditions at sea, but also when vessels stay at port during "wintertime" from September due to deteriorating weather conditions and seasonal demand.

- **In Croatia:**

During April and September 2024, messages sent by NEMO beacons reveal that the battery charge level varies between 82% and 92%, within the NEMO network. Some messages sent lower battery levels, but it usually corresponds to isolated cases of beacons at port.

This proves that the battery charge level remains high even if the rate of beacon emission is high with emissions every 30 minutes (position every 3 minutes).



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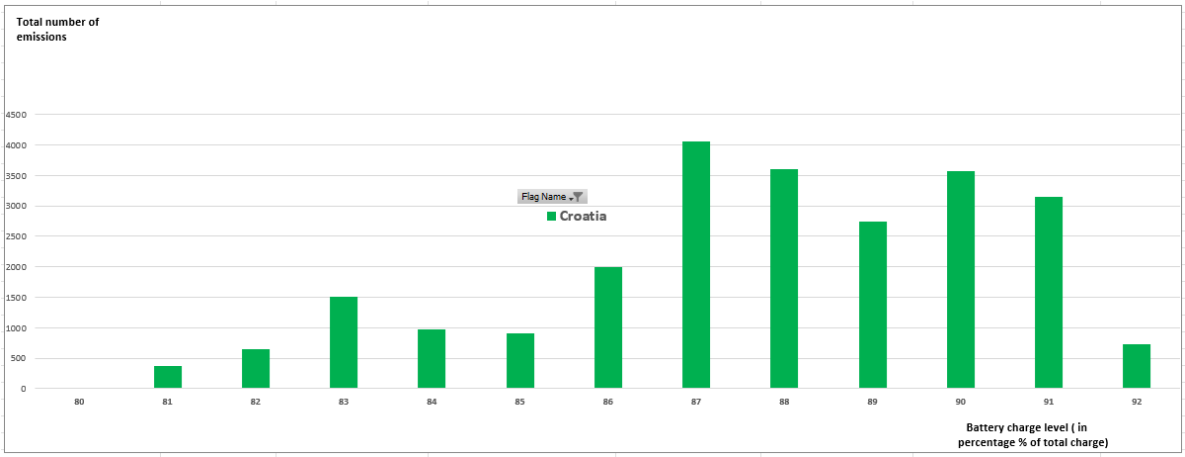
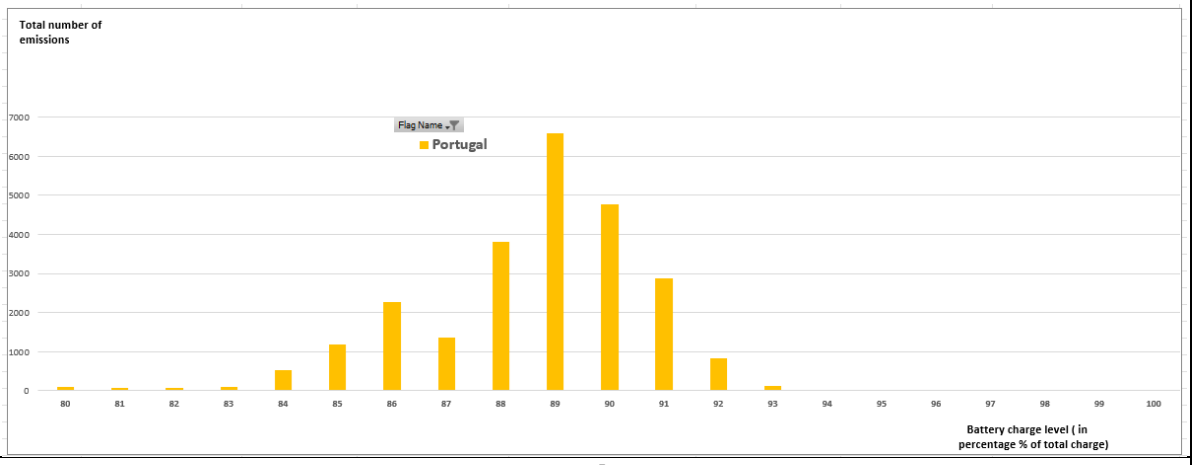
In September 2024
 *Figure 7: Distribution of battery charge level in April and September 2024 - NEMO network of Croatia*

- **In Portugal:**

During April and September 2024, messages sent by NEMO beacons reveal that the battery charge level varies between 80% and 93%, within the NEMO network. Some messages sent lower battery value levels, but it usually corresponds to isolated cases of beacons at port.

This proves that the battery charge level remains high even if the rate of beacon emissions is high with emissions every 30 minutes (position every 3 minutes).

April 2024

In September 2024

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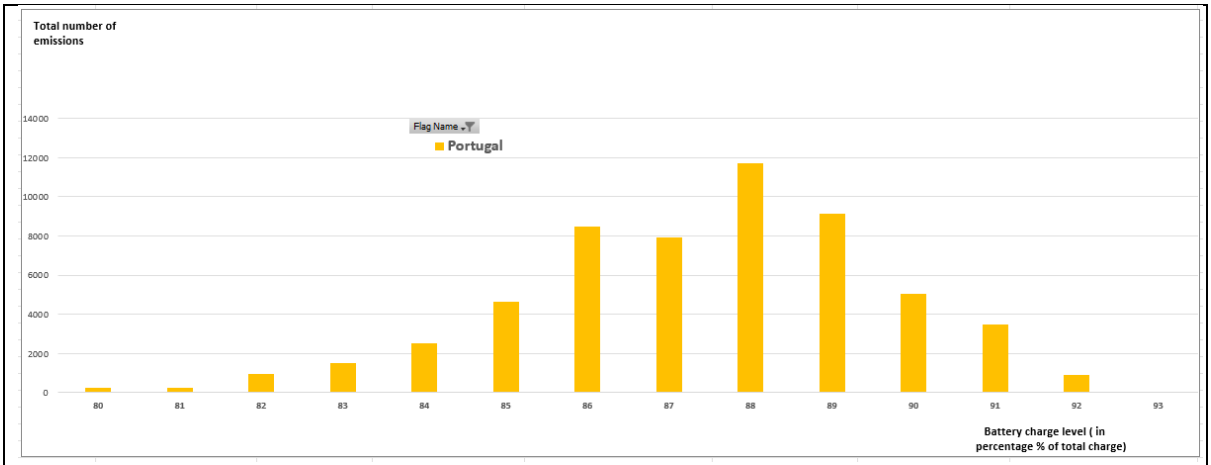


Figure 8: : Distribution of battery charge level in April and September 2024 - NEMO network of Portugal

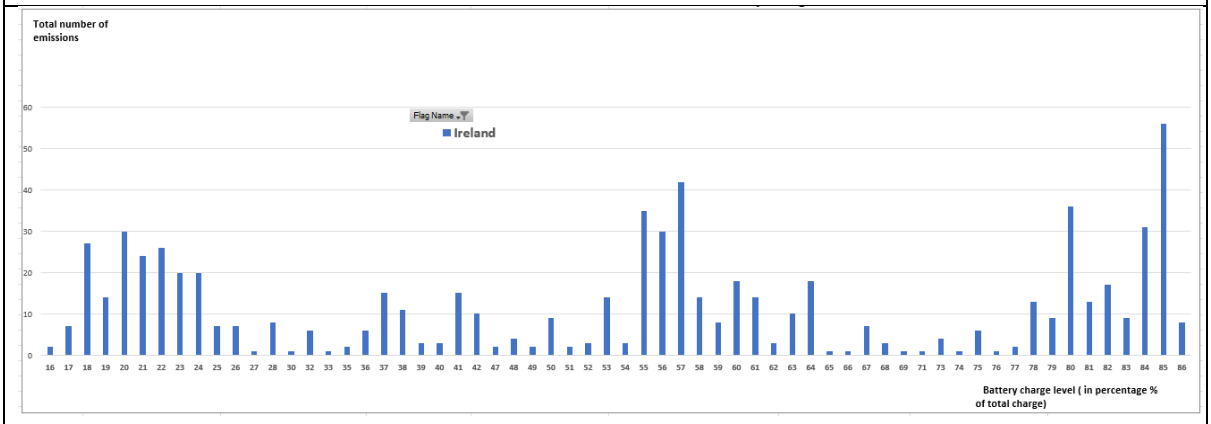
- **In Ireland:**

Messages sent by NEMO beacons deployed in Ireland reveal that the battery charge level varies between 20% and 86% in April 2024 and between 47% and 91% in September 2024.

These graphs show that because of sunlight exposure, the NEMO battery charge level can decrease, and charge more slowly probably because of sunlight exposure conditions at this period.

However, there were no cases of battery that fully drained because of heavy cloud cover.

In April 2024



In September 2024

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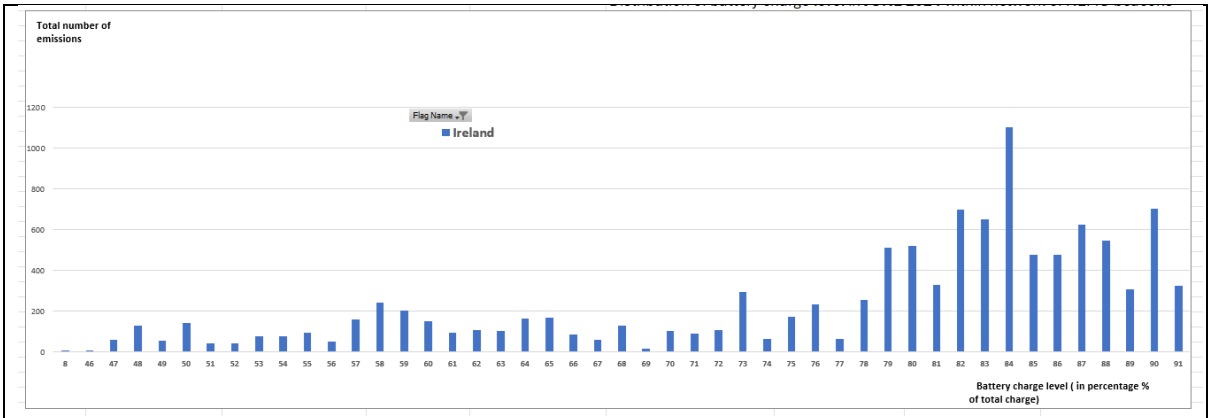

Figure 9: Distribution of battery charge level in April and September 2024 - NEMO network of Ireland

2.3. Analysis of fishing trips using NEMO tracks

In the following paragraphs, the analysis is dedicated to the characteristics of fishing trips over the 2023-2024 period.

One of the machine learning algorithms designed by CLS is designed to detect when vessels are in port, or probably sailing to specific locations for fishing activities. This relatively simple machine learning model uses the following input data: distance from the shore, changes in instantaneous speed (provided by the VMS beacon) and changes in average speed.

A vessel is considered 'active' if it leaves port at least once during the defined period (day, month, or year). Thus, CLS has developed a binary supervised classification algorithm with two categories: PORT and OCEAN. Positions classified as 'PORT' are excluded from the calculation of statistical graphs.

This analysis was realised using VMS positions of NEMO beacons collected during the project in Croatia, Portugal, and Ireland. It can provide us with more information about the duration of trips made by small-scale fisheries, by seasons and by area.

This objective of the study was not to compare the efficiency of installation of NEMO beacons by area but to highlight that using NEMO, fishers and the fishing community can learn more about fishing trends in European waters.

2.3.1 Average monthly number of hours spent by day at sea

The graph below shows the evolution of fishing trip duration per day and per month during the year. The daily duration is calculated by dividing the total hours spent at sea by the number of days the vessel was actively at sea.

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As an example, in July 2024, “fishing trips” lasted ~5.5 hours per day in Croatia, ~6 hours per day in Ireland and ~4 hours per day in Portugal.

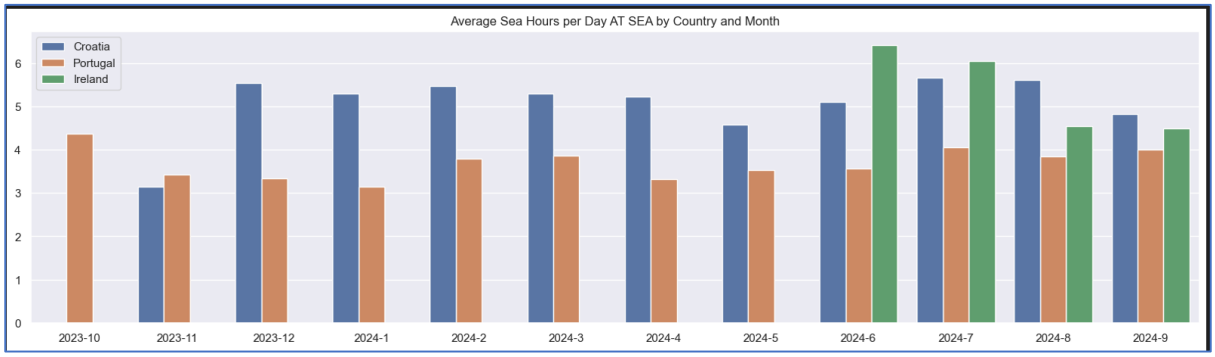

Figure 10: Average monthly number of hours spent by day at sea by country

2.3.2 Average monthly travelled distance per day by country

The figure 11 below shows the monthly average distance travelled by day. This graph must be related to the previous graph as the travelled distance was realised during the corresponding duration.

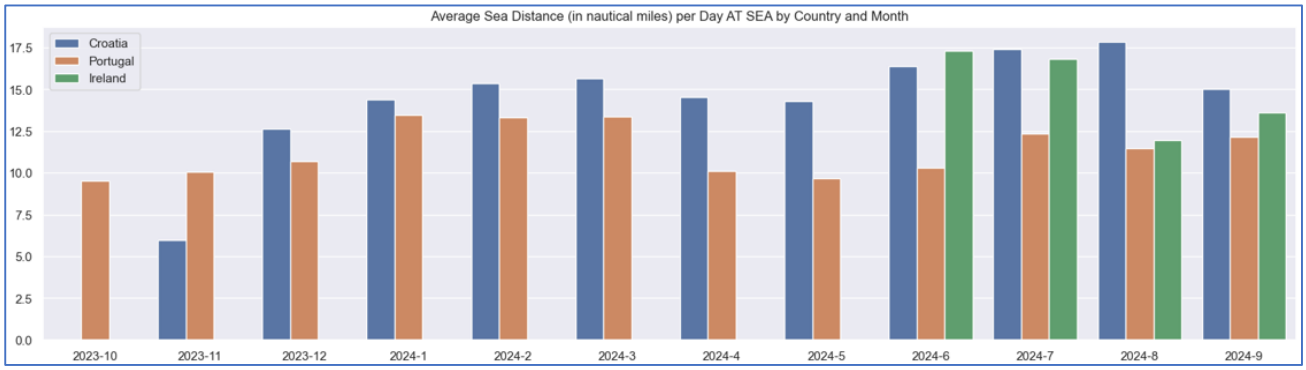

Figure 11: Average monthly distance travelled per day at sea by country

2.3.3 Proportion of days spent at sea by month

The graph below shows the proportion of days spent at sea by month. The graph indicates the seasonal variations across use cases showing proportionally less days at sea during wintertime than in summertime.

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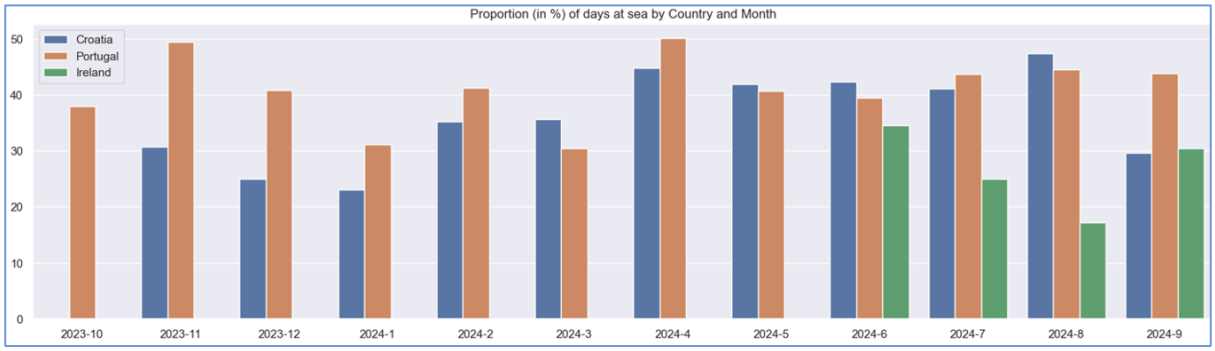


Figure 12: Proportion of days spent at sea by month

2.3.4 Duration of fishing trips per country

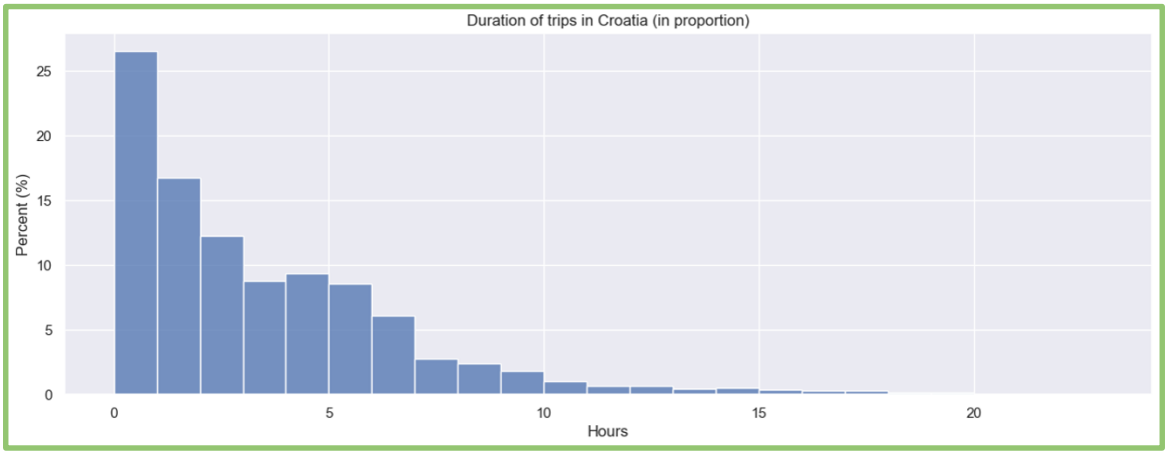
By leveraging the Machine Learning algorithm, the model segmented the trajectory into trips by detecting port positions, enabling the computation of trip durations over the study period (2023–2024, depending on when the NEMO beacons were deployed).

Each histogram below illustrates the distribution of fishing trip durations (in hours) as a percentage, calculated using all NEMO beacons deployed at sea during the study period, categorised by country.

Results are expressed in percentage (%).

For instance, comparison and better understanding of graphs:

- In Croatia, ~12% of vessels (Y axis) realised fishing trips with duration between 2 and 3 hours (X axis).
- In Portugal, ~12,5% of vessels (Y axis) realised fishing trips with duration between 2 and 3 hours (X axis).
- In Ireland, ~10% of vessels realised (Y axis) fishing trips with duration between 2 and 3 hours (X axis).



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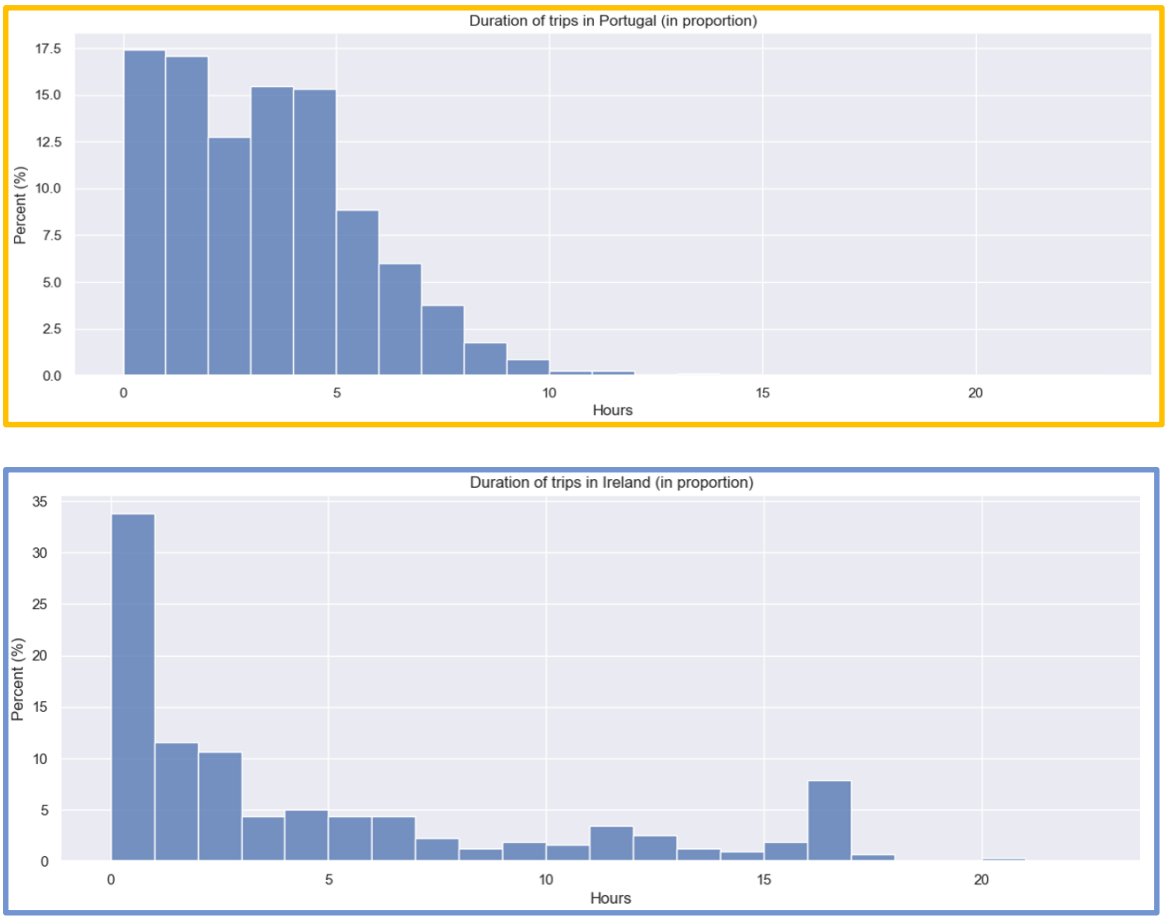

Figure 13: Proportion of fishing trip duration within NEMO network by area

2.3.5 Duration and travelled distance ranges

The graphs below inform about the average speed range of vessels during fishing trips at sea.

Each graph gives the distribution of average speed for each NEMO network (Portugal, Croatia, and Ireland), and corresponding distance travelled and duration.

For instance, comparison and better understanding of graphs:

- In Croatia, over 2023-2024 period, there were 17500 nautical miles travelled during 2500 hours with speed of 6-8 knots,
- In Portugal, over 2023-2024 period, there were 10000 nautical miles travelled during 1800 hours with speed of 4-6 knots,
- In Ireland, since June 2024, there were 3900 nautical miles travelled during 580 hours with speed of 6-8 knots.

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Figure 14: Average monthly duration and distance travelled by day at sea by country

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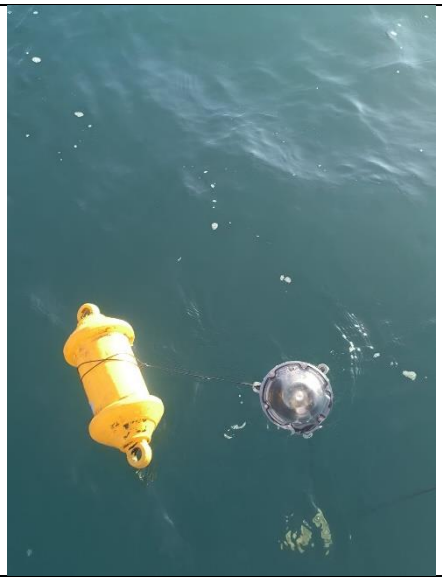
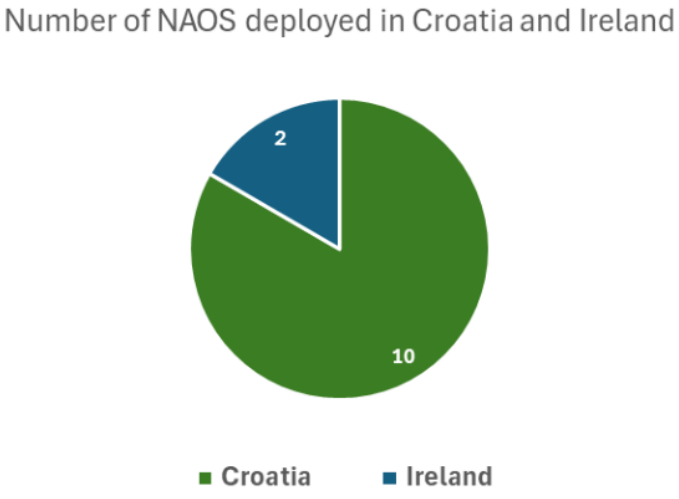
2.4. Deployment of NAOS beacons

Installations of NAOS beacons were performed in Croatia and Ireland thanks to WWF Adria and IIMRO partners.

The first installations of NAOS beacons were completed in Croatia in December 2023. In June 2024, two NAOS beacons were deployed in Ireland on pots from two vessels by IIMRO. NAOS beacons are set to use ARGOS satellite communication system transmitting one position every hour.

NAOS attached to a buoy	NAOS deployed at sea in Croatia
	

The graph below shows the total number of NAOS beacons deployed in Croatia and Ireland over the period December 2023 - November 2024.



This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

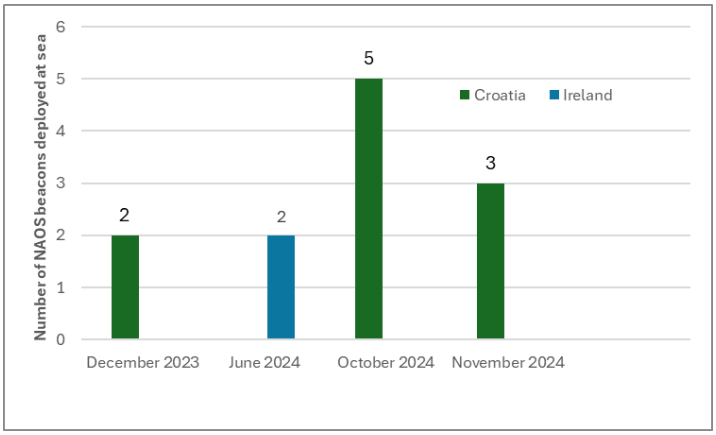


Figure 15: Total number of NAOS beacons deployed in Croatia and Ireland

2.5. NAOS tracks displayed in FISHWeb

NAOS beacon tracks can be monitored in real-time using FISHWeb by the fisher who deployed them.

In Croatia, a NAOS beacon was attached to a buoy and launched at sea on December 28th, 2023 (Picture 1). One week later, the NAOS beacon broke free but was still emitting positions on Argos mode enabling to locate the device on the FISHWeb platform. With the monitoring of the NAOS positions and of its trajectory at sea, it was deduced that the NAOS was taken by a ferry that connects to the island of Cres (Picture 2). This leads to the conclusion that the NAOS is a device that can significantly contribute to the monitoring of the positions of fishing gear that can be dislocated due to numerous reasons, which, in the end, gives safety to the fisher and also to the managing authority to make more precise decisions based on this data.

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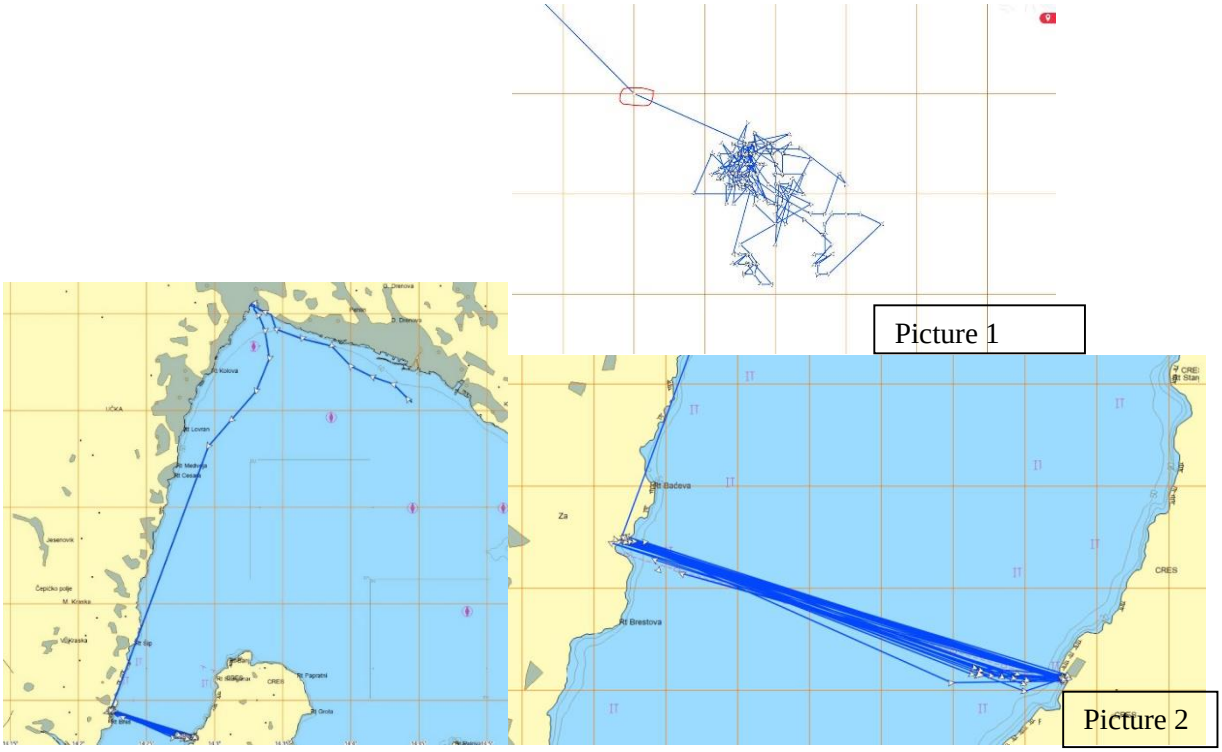

Figure 16: : Study case in Croatia: trajectory of NAOS beacon and sea surface currents displayed in FISHWeb

The utility of the NAOS devices was demonstrated in October 2024 when a device deployed by an IIMRO member off the Donegal coast in Ireland broke loose after an interaction with a passing vessel. The device along with two marker buoys and a length of rope then drifted in the North Atlantic for 31 days over a distance of 877 nautical miles (1,624 km) and ended up on the West coast of the Shetland Islands in Scotland. As the device continued to transmit its position every hour by satellite the vessel owners were able to monitor its position for the duration of its journey and arrange for its recovery through a contact after it made landfall. The device is currently making its way back to the fisher and will be redeployed after checks. The device, which was tracked via FISHWeb, followed closely the modelled sea surface ocean currents (from Copernicus Marine Services) displayed in the FISHWeb platform. Additional functionality such as geofencing is another capability which can alert fishers if the device moves unexpectedly allowing them to recover lost gear or buoys. The NAOS devices are extremely robust having been deployed in very challenging and sometimes stormy weather and sea conditions off the West coast of Ireland since Summer 2024.

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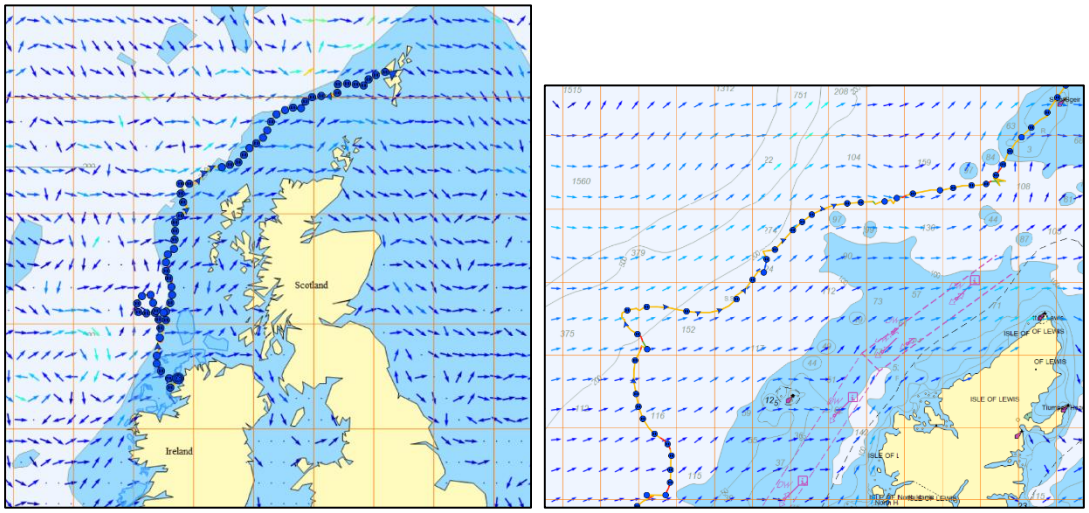

Figure 17: Study case in Ireland: trajectory of NAOS beacon and sea surface currents displayed in FISHWeb

3. Tracking vessels' movement using the FISHWeb platform

3.1 User account for fishers

Once a NEMO or NAOS beacon is activated, a dedicated account is manually created for each fisher in the FISHWeb platform so the fisher can visualise real-time and past positions of their own vessel.

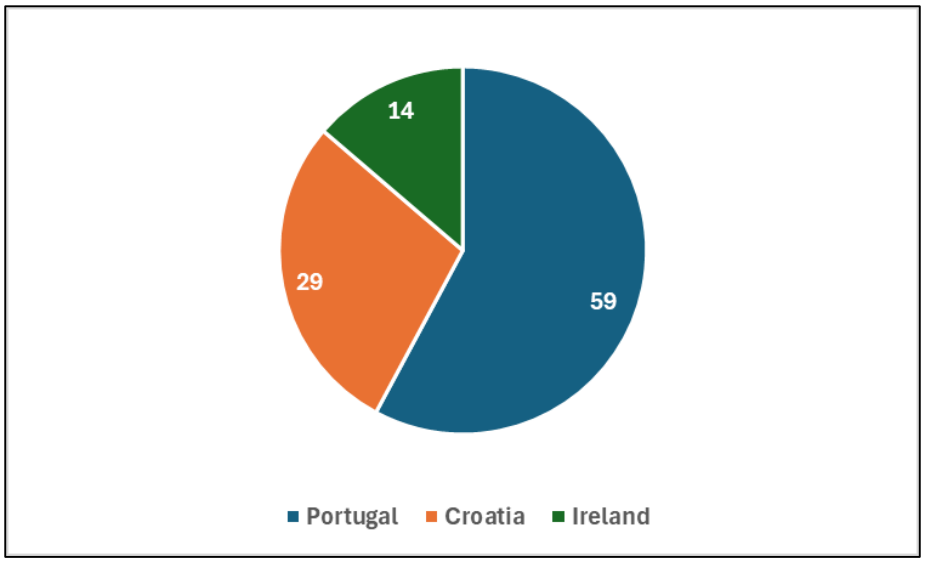

Figure 18: Number of FISHWeb user accounts per use case/country

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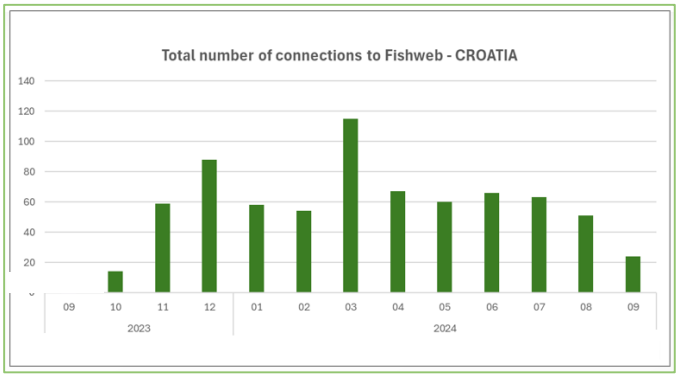
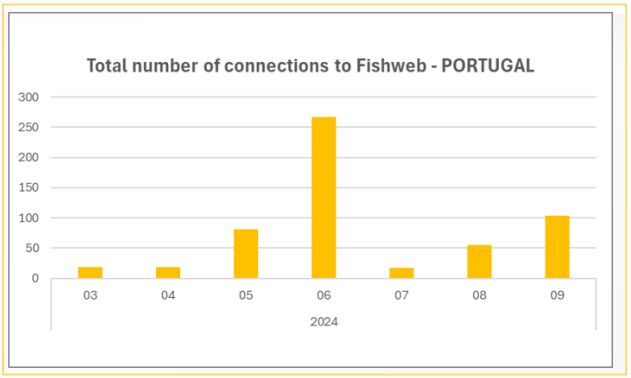
3.2 Number of connections to FISHWeb platform

The graphs below show the total number of connections realised by fishers since 2023.

Answers to the questionnaire made by partners in Portugal, Croatia and Ireland may explain the evolution and quantity of connections over time.





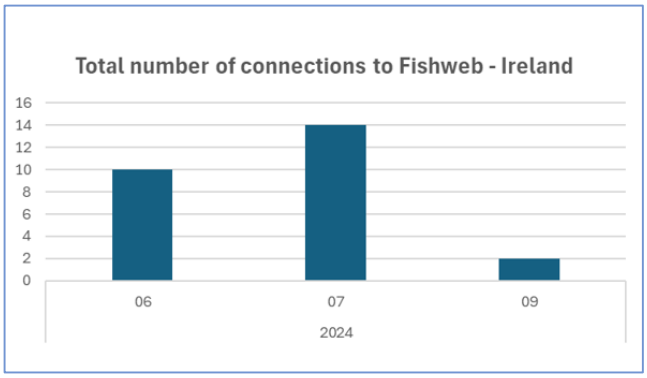


Figure 19: Temporal evolution of the number of connections to FISHWeb platform per use case/country

3.3 Display of vessel trajectories in FISHWeb

For each area, the graphs below show vessel trajectories at various spatial scales.

The first map represents at large scale, many trajectories of vessel equipped with NEMO beacon over a defined period. The second map represents the same trajectories centred on an area. Then, the third map represents the trajectory of one vessel over a longer period.

Heat maps represent the “presence of vessels in an area” on a grid whose resolution is chosen by the user. In each case, heat maps highlight where vessels were most present during the last 30 days at 1 km resolution.

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After searching the positions corresponding to a specific period (30 days in this case), FISHWeb displays a “heat map”. The red colour corresponds to a “warmer” area where more vessels crossed the area. The following types of maps are exclusively available to the fisher for his own vessel.

To note that the Fish-X project does not communicate individual information (e.g. positions of one particular vessel) to any other parties, and only the fisher owning the FISHWeb account is able to see his own track. The tracks in the above figure have been edited to remove too precise information such as the port area.

- **In Croatia:**

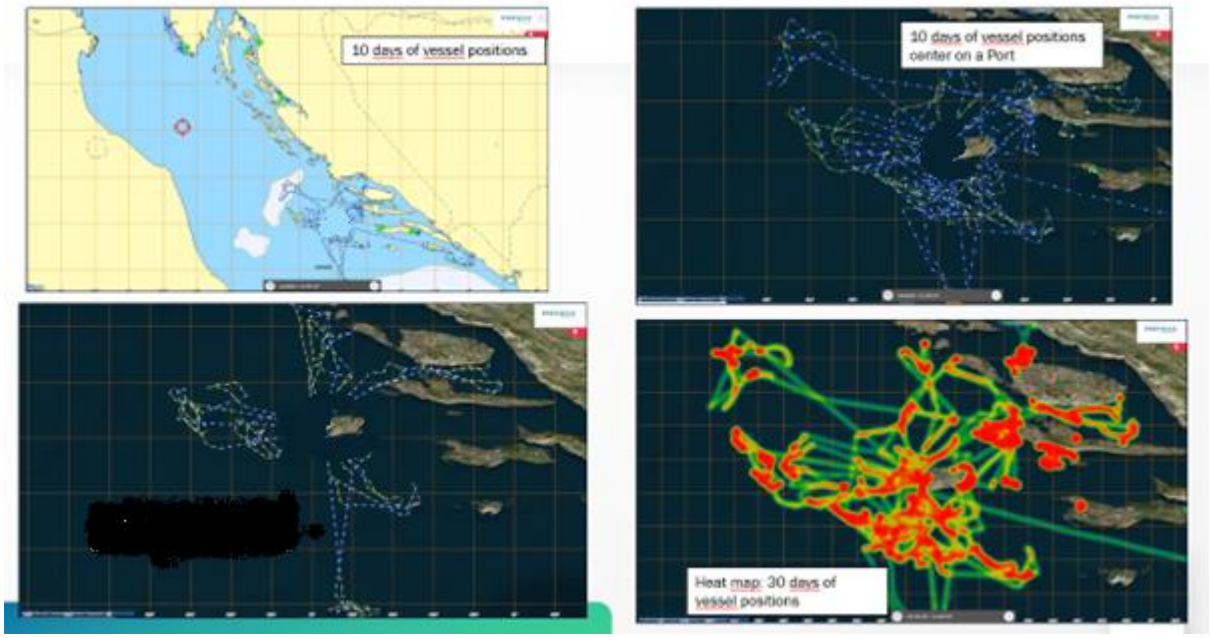

Figure 20: Trajectories of vessels (NEMO) and Heat map in Croatia

- ***In Portugal:***

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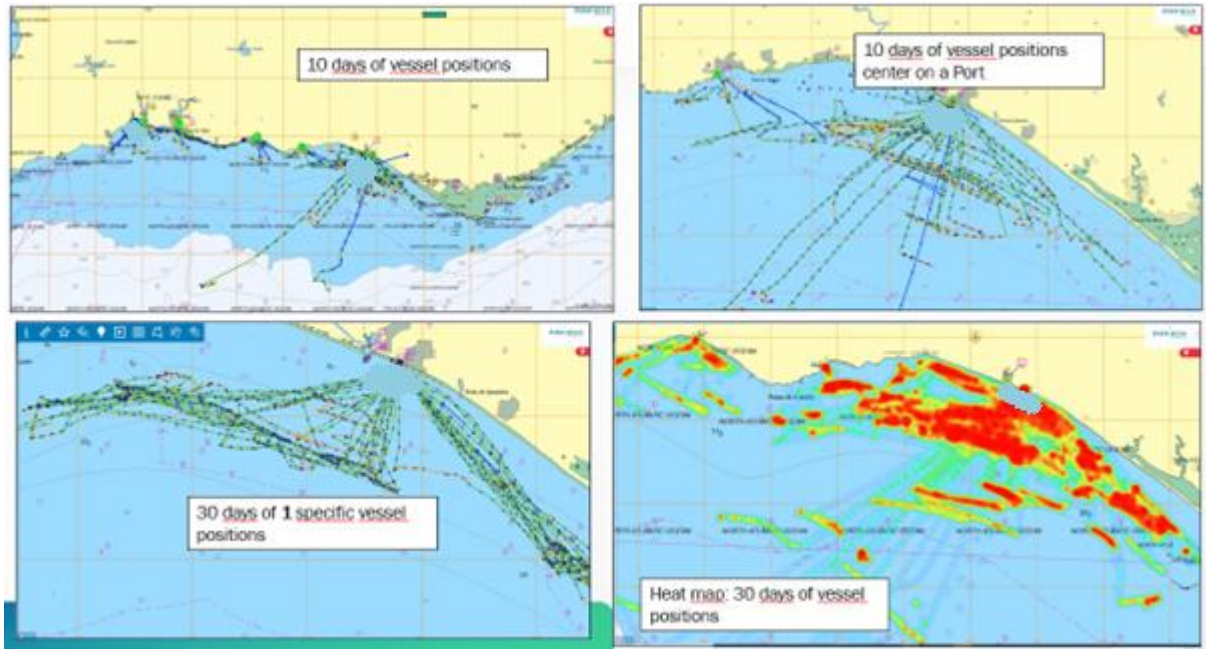

Figure 21: Trajectories of vessels (NEMO) and Heat map in Portugal

- **In Ireland**

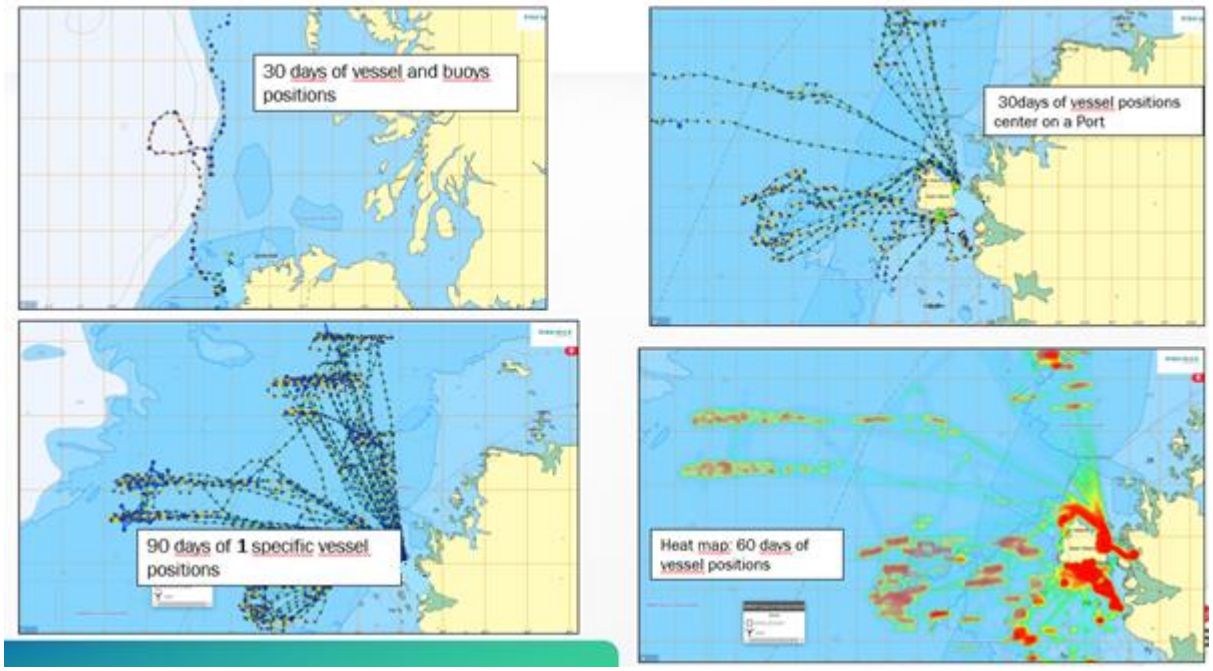

Figure 22: Trajectories of vessels (NEMO) and Heat map in Ireland

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3.4 Alerts in FISHWeb

The FISHWeb platform also enables the display of alerts associated with events of NEMO beacons or corresponding to situations that need to be supervised by the fisher or some organisations of producers (OP), fish owners or fishing authorities.

3.4.1 User-specified alerts in FISHWeb

The following alerts can be defined in FISHWeb to detect:

- Vessel Rendezvous: The Vessel RDV is an alert triggered if two vessels at sea remain close for a significant period of time. Three tabs to complete in the information panel to specify the desired parameters.
- Port Entry/Exit: Geolocation alert to know when a vessel enters and/or leaves a port (zone defined as = port in FISHWeb). Three tabs to complete in the information panel to specify the desired parameters.
- Duration in port: Alert that is triggered according to an X number of hours in port for a defined list of vessels and/or fleet. Three tabs to complete in the information panel to specify the desired parameters.
- Anchored ship: A ship located at sea is immobile (slight movement between several successive positions). The immobility threshold is to be defined in nautical miles between two positions.
- Zone Entry/Exit: Geolocation alert to know when a vessel enters and/or leaves a selected zone.

3.4.2 User-specified alerts in FISHWeb

Other alerts are available in FISHWeb and correspond to “Beacon events (exceptions)”.

These alerts do not need to be defined by the User in FISHWeb, they will be automatically raised in case the corresponding situation is detected by the NEMO device.

When a beacon emits an exception message, an alert is raised, and a red icon appears on the map.

Main “Beacon alerts” are:

- Loss of main power supply,
- Return of main power supply,
- Low battery,
- Request for assistance / End of assistance (when NEMO’s assistance button is pressed onboard the vessel),
- Loss of GPS signal / Return of GPS signal,

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- Beacon opening (intrusion = open) / Beacon closing (intrusion = close)

3.5 Display of alerts on beacon events in FISHWeb

3.5.1 Alert due to request for assistance

This alert is triggered by the fisher when he pushes the “red button” on the NEMO device. The alert message is transmitted using the GPRS communication system and the ARGOS satellite system and imported into FishWeb.

Portuguese fishers showed interest in activating the “request for assistance” to increase their safety options, however the fact that the message of the request was sent by email and not through phone was a negative point and almost all of them end up not requesting the activation of that option.

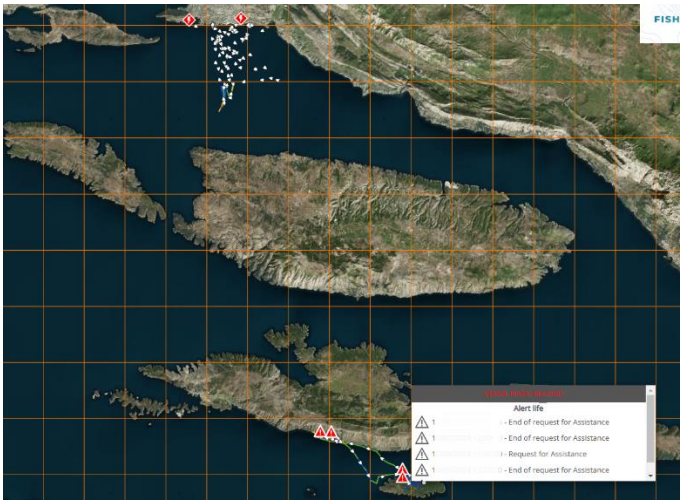

Figure 23: Display of a “request for assistance” alert raised onboard the vessel

3.5.2 Alert due to low battery

This alert is automatically sent by the firmware of the NEMO device when the battery level is below 10%. The alert message is transmitted using the GPRS communication system and the ARGOS satellite system at the same reporting rate than the one used for positional reporting.

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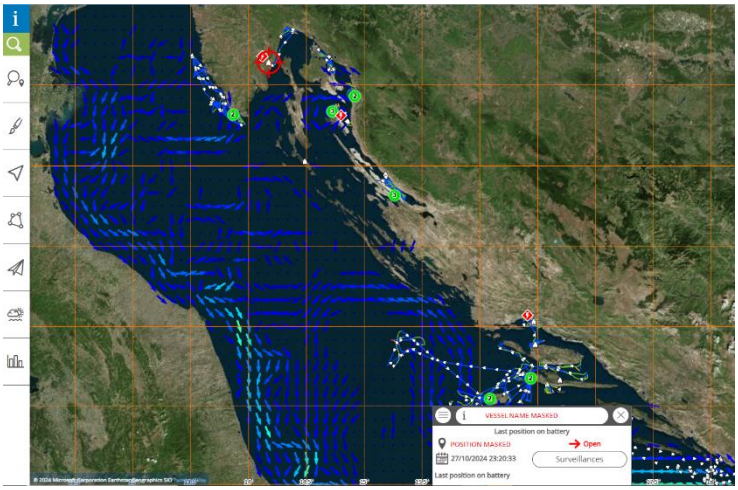

Figure 24: Alert raised because of low battery

3.5.3 Alert due to zone entry/exit

In the example below, each time the vessel enters or exists a specific area (specified in FISHWeb), an alert is raised in the system and an icon appears in FISHWeb (red circle). The fisher can receive an email each time an alert is raised. This type of alert can be, for example, interesting to monitor vessels approaching a Marine Protected Area (MPA) or not authorised to enter an area. The FISHWeb platform can be configured to generate alerts when the vessel enters or leaves a defined area. In the above figure, each crossing of the Marine Protected Area triggers an alert and is represented by a red circle.

In Portugal, the implementation of a new marine protected area at the same time of the implementation of the use case contributed for the interest utility for the fishers of the “entry/exit” alert, with almost all the fishers showing interest in activating that alert. They get the alert through the FISHWeb platform and at the same time, NEMO emits sounds to warning them that they are entering the protected zone.

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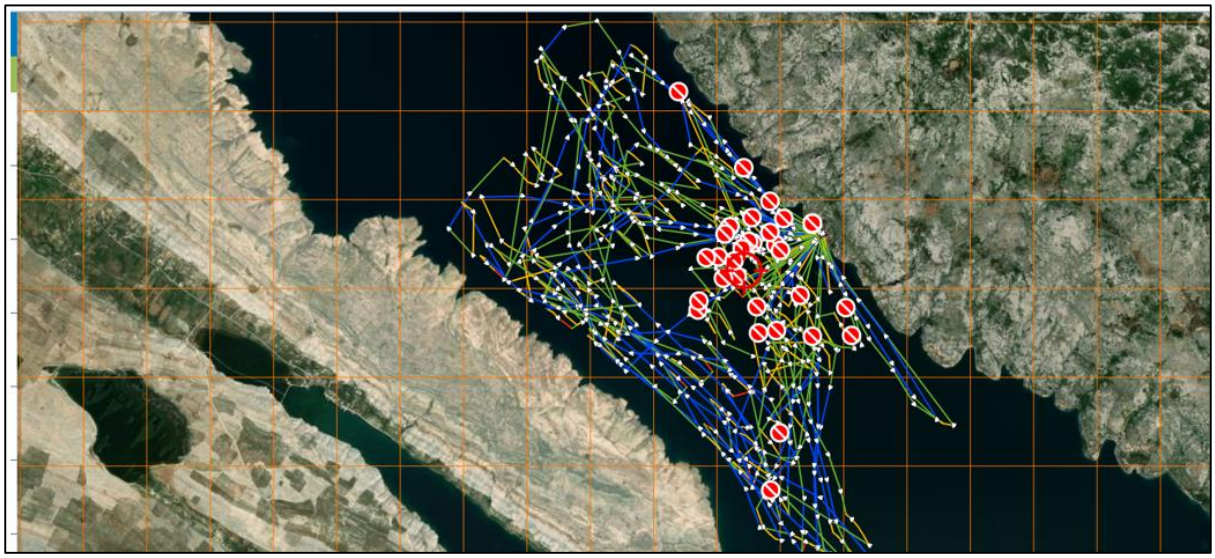

Figure 25: Alert because of entry/exit of vessel in an area

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Annex 1: NEMO factsheet

NEMO

Connected. Protected. Empowered.

SIMPLE, RELIABLE, AFFORDABLE, SOLAR POWERED VMS FOR SSF

NEMO is the solar-powered transmitter from the first all-in-one system specifically designed by CLS for monitoring and protecting small-scale fisheries. NEMO offers global hybrid connectivity, using mobile/IoT networks in coastal areas and automatically switching to satellite communication when the vessel moves outside the range of terrestrial networks. Services range from basic delivery of data collected and processed in CLS' data center to data integration with client's fisheries monitoring centre and access to CLS' web platform for data visualization, alert management and customized analytics.

BENEFITS

- CE certified
- Solar panel
- Rugged, waterproof design
- (IP67)
- Fitted with a HMI
- Anti spoofing capabilities
- Easy to use: Plug-and-Fish
- Tamper-proof
- Smart reporting
- Unique identifier

FEATURES & FUNCTIONALITIES

Tracking your fishing trip

- Global coverage
- Automatic data collection of vessel movements
- Continuous on-board storage for data integrity
- Store and forward reporting
- Adjustable settings (GNSS updates, reporting frequency)
- Geofencing with different
- reporting strategy per zone

Connecting with your people

- Multi-operator GSM & cellular IoT network for high frequency reporting near the shore
- Satellite communication for service continuity and global coverage
- Cost-effective sea-to-shore reporting strategy
- Secure encrypted messages
- Bluetooth connection with smart devices
- Wired connection using mini-USB port

Protecting your fishing communities

- Assistance button
- Buzzer for zone boundaries crossing
- Alerts on events
- Sealing system and intrusion sensor

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Physical and environmental characteristics*

PHYSICAL	
Dimensions (L x l x H)	222 mm x 127 mm x 105 mm
Weight	0,873 kg
Mounting	Base attached with five screws of 5 mm Optional: base / transceiver seal Fixed or detachable
POWER	
Battery	3.7 V, 5.2 Ah - Lithium Ion
Battery operating time	Minimum 2 weeks. Maximum few months (mainly depending on climate conditions and configurations)
Charging time	Less than 12 hours with mini USB cable
Charging	Solar panel or mini USB (800 mA)
ENVIRONMENTAL	
Operating temperature	-20 to +50°C
Storage temperature	-25 to +70°C
Charging temperature	+0 to +45°C
Waterproof	IP67
Compliance	EN 60945/RED (mechanical, environmental and EMC/Radio) CE
OPERATIONALS	
Operating modes	Nominal, low battery, power save, assistance, geofencing and stationary
LEDs	Power supply, failure display, assistance
Audible alarm/buzzer	95 dB at 10 cm
Button	Request for assistance button
Programming/settings	Via Bluetooth, mini USB port and over-the-air (cellular)
Reporting interval	Configurable from 5 minutes to 24 hours
Internal memory	32-Mbit Flash Memory (i.e. 6 months of data with an acquisition frequency of 5 min)
Speed accuracy	0.1 knot
Positioning accuracy	10 m at 95%
Geofencing	100 zones with 100 points each
COMMUNICATION	
Cellular	2G, 4G LTEM, 4G NB-IoT
Satellite	ARGOS 2, KINEIS
Bluetooth	Bluetooth Low Energy
USB	Mini USB
POSITIONING SYSTEM	
GNSS	GPS, Galileo, GLONASS, BeiDou, QZSS

**All characteristics are subject to change without prior notice.*

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Annex 2: NAOS factsheet

NAOS
Connected Fishing Gears

An affordable, low-power satellite buoy for fishing gears monitoring.

Marking and re-locating fishing gears (lines, nets, pots and traps, anchored and drifting FADs, etc.) as well as monitoring their movements is an easy job with NAOS, the Argos-GNSS satellite buoy. NAOS integrates a GNSS data logger in a handy and compact design. NAOS brings global connectivity with flexible reporting rates of up to 96 accurate positions a day using the Argos/Kinéis satellite constellations.

Services range from basic delivery of data collected and processed in CLS' data center to data integration with client's fisheries monitoring centre and access to CLS' web platform for data visualization, alert management and customized analytics.

BENEFITS

- Easy to use and self-contained
- Floatable
- Global coverage
- Rugged, waterproof design (IP68)
- CE certified
- Fitted with a HMI
- Automatic data collection
- Smart reporting
- Unique identifier
- Provided with a web mapping interface

FEATURES

- Built-in GNSS receiver for accurate positioning
- Adjustable GNSS acquisitions & transmission rates
- Geofencing with different reporting strategy per zone
- Cost-effective sea-to-shore reporting strategy
- Secure encrypted messages
- Anti spoofing capabilities
- Bluetooth connection with smart devices

This project has received funding from the European Union's Horizon Europe programme under grant agreement No 101060879.

Physical and environmental characteristics*

PHYSICAL	
Dimensions	240 mm x 160 mm
Weight	1230 g
Mounting	Easy to deploy It floats on its own and turns on by removing the magnet Universal hooks thanks to its 3 fixing rings
POWER	
Battery	3.6V/26Ah Lithium - Primary lithium-thionyl chloride
Battery operating time	3 months to 2 years depending on the configuration
ENVIRONMENTAL	
Operating temperature	-20 to +55°C
Storage temperature	-25 to +70°C
Waterproof	IP68
Mechanical resistance	Up to 30m shockproof on water
Compliance	EN 60945/RED (mechanical, environmental and EMC/Radio) CE
OPERATIONALS	
Buoyancy	Vertical
LEDs	Indicate Bluetooth status, position acquisition & transmission & beacon activation
Programming/settings	Via Bluetooth
Reporting interval	Configurable from 15 minutes to 24 hours
Internal memory	32-Mbit Flash Memory
Speed accuracy	0.1 knot
Positioning accuracy	10 m at 95%
Geofencing	100 zones with 100 points each
COMMUNICATION	
Satellite	ARGOS 2, KINEIS
Bluetooth	Bluetooth Low Energy
POSITIONING SYSTEM	
GNSS	GPS, Galileo, GLONASS, BeiDou, QZSS

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