Fin Whale Project Report 2023

Results of the study of the fin whale on its route around the Iberian Peninsula

EDMAKTUB Association

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Contents

EDMAKTUB Association

The EDMAKTUB Association, for the Study and Dissemination of the Aquatic Environment, especially cetaceans, is a non-profit organisation based in Barcelona. Founded in the year 2000 by Dr. Eduard Degollada.

EDMAKTUB develops its activities on the basis of different research projects, either through its own initiatives or in collaboration with other institutions. The interest is always to deepen the knowledge of the sea and marine fauna in a global way, in order to preserve its richness and biodiversity.

The EDMAKTUB association has a complete research platform, the backbone of which is a catamaran equipped with reflex cameras, drone, hydrophone, echo sounder, thermal camera, biological sample collection equipment and other instruments for collecting images, sounds and records of sightings and maritime traffic.

The association's team is made up of a group of scientists and specialists in different fields: biology, veterinary science, environmental science, audiovisual techniques, etc. Volunteers and university students are a crucial part of the team, allowing the research projects to move forward with effort and hours of dedication.

Since 2013, the association has focused its activity on the Fin Whale Project, which has been authorised by the Directorate General for the Sustainability of the Coast and the Sea of the Ministry of Agriculture, Food and the Environment for the approach of cetaceans for scientific purposes along the Catalan coast and the Balearic Sea (rf116/3662).

www.edmaktub.org

Presentation of the Fin Whale Project

During the months of February to June, an extraordinary phenomenon occurs on the Catalan coast which, although it has been reported for decades by fishermen in the area, was little known in the field of research: it is the presence of fin whales.

With the scientific name of *Balaenoptera physalus*, the fin whale is a whale that can reach up to 24 metres in length and is the only whale that regularly inhabits the Mediterranean. The fin whale is a filter-feeding animal that feeds on fish and plankton, especially krill, which it gobbles up in large quantities.

It is also a protected species and in a vulnerable conservation status (according to the IUCN).

Fin whale photographed by the research drone as it came to the surface to breathe off the coast of Garraf.

With the dual aim of increasing knowledge about the presence of this whale on our coasts and promoting its preservation, the Rorqual Project, an initiative of the EDMAKTUB association, has been underway since 2013. The Rorqual Project is a project that from the outset was conceived as a long-term project, as many seasons are required to understand the presence of fin whales on our coasts and the variables that affect their distribution.

The Fin Whale Project is a pioneering research project because it is the first to study whales off the Catalan coast, and also because it uses new technologies such as drones to capture images and their subsequent analysis and development of new sampling techniques.

This project also includes the study of the biodiversity of the Catalan coast, including the 8 species of cetaceans, seabirds, sea turtles, fish and hydrozoans, among others.

The project has the collaboration of the Club Nàutic de Vilanova, Ports de la Generalitat, the Directorate General of Fisheries of the Generalitat de Catalunya, the Institut de Ciències del Mar (ICM-CSIC), the City Council of Vilanova i la Geltrú, and the Catalan fishing and nautical sectors. Recently, two new collaborations have been made; with the company TimeZero, a nautical software company, and FLIR, a thermal camera company.

Main goals of the Fin Whale Project

The Fin Whale Project has three main objectives:

1. **To improve knowledge of the fin whale** and the oceanographic conditions that favour its seasonal presence on the Catalan coast. Specifically, the project proposes:

    a. To draw up maps of the **presence and distribution** of fin whales along the Catalan coasts, analysing the number of individuals, their behavioural patterns and possible migratory routes.
    b. **Photo-identify the animals observed,** expanding the catalogue of fin whales sighted in the area. This catalogue will later be compared with catalogues of other Mediterranean and Atlantic associations in order to establish the possible migratory routes of fin whales in the Mediterranean.
    c. Determine the **oceanographic characteristics** of the area; chlorophyll and nutrients, temperature, salinity, and altimetry of the sea and their relationship not only with the presence of fin whales, but also with the great biodiversity of the Catalan coast.
    d. Collect **acoustic records** of whale vocalisation during their stay in the area.
    e. Determine the most abundant **plankton** species in the area and their relationship with oceanographic conditions and the presence of fin whales.
    f. Determine the conditions of **microplastics** in the area and how it may affect whales in the study area.
    g. **Assess the risk of collision** between whales and merchant vessels, identify areas of special risk and identify new techniques and regulations for the protection of fin whales to minimise risk.
    h. Implementation of a new **drone survey technique for the identification of cetaceans** and the development of an artificial intelligence algorithm to automate this recognition.
    i. Use of **stable isotopes** for diet and migratory route determination.
    j. **Genetic analysis** to determine the sex, the population of fin whales inhabiting our coast and the possible parentage between them.
    k. **Hormone analysis** to determine stress level, reproductive status, among others.
    l. **Satellite tags** to determine the movements of fin whales in the Mediterranean and the possible migratory routes they follow.
    m. To draw up maps of the presence and distribution of biodiversity in the area of the Garraf coast and the relationship of these with the

presence of fin whales and the oceanographic conditions of the area.

2. **To raise public awareness and promote the conservation of the marine environment.** The knowledge acquired about the species and its habitat allows us to determine the critical parameters for its conservation and to make recommendations. Through information, we contribute to making people, both at an individual and collective level, more willing to participate in environmental conservation. In the field of awareness and preservation, these are the objectives of the project:

    a. To demonstrate the special **ecological importance of the Catalan coast**, not only for the presence of whales but also for its remarkable richness in other marine species.
    b. Maintain a **network of contacts with fishermen and sailors** in the area and get information about their sightings.
    c. **Marine stewardship:** to involve the different entities and people who make use of the area, making them protagonists of the conservation tasks (not only fishermen and sailors, but also institutions and citizens of nearby towns). All of them are an essential part of establishing a network of marine stewardship of the Garraf coasts, with the common objective of conserving the area and its rich biodiversity.
    d. **Promote the designation of the Marine Mammal Protected Area (MPA)** for the Garraf Marine Area and other areas with a special presence of fin whales along the Catalan coast.

3. **Improve ethical standards in cetacean field research**.

    a. Develop **new research protocols**, defining new techniques and methodologies that are more effective and, at the same time, less invasive and less disturbing for the animals.
    b. To contribute in this way to **raising awareness among researchers** of the importance of wildlife welfare.

In order to achieve the objectives described above, three areas of action are carried out: research, education and dissemination.

Highlights of the Fin Whale Project 2023

2023 has been the ninth season of the Fin Whale Project, a season in which for the first time it has been possible to follow the migration of fin whales from the Catalan coasts, where they feed in spring, to the Galician coasts, which seems to be another feeding area for fin whales in summer. The highlights of the season are as follows:

- The year 2023 has been a year in which the weather has once again played a leading role. The **drought** suffered during the winter and spring months has meant a **low presence of fin whales** on the Catalan coast. The season started at the end of March and ended at the beginning of May.
- This year the season has been extended in the coasts of Denia from the end of June to the beginning of July, where several fin whales have been sighted migrating southwards. **Following**, for the first time, **the migration of the fin whale through the Strait of Gibraltar to Galician waters**. That is why this year the fieldwork has been extended until the beginning of October.
- The fin whales sighted throughout 2023 have shown travel behaviour in the nearshore areas, feeding behaviour has been observed, but more offshore, when going deeper into the submarine canyons.
- This season has also been notable for the **presence of calves**: after 5 years without sighting any calf, this year we have been able to **see a total of 5**! Two of them in the coasts of Garraf, two more in Denia and another one in the coasts of Galicia.
- The use of the **echo sounder**, the **TimeZero** software has been further refined to be able to assess the potential presence of food in the different areas and, in this way, to facilitate the task of searching for fin whales but also to help in the analysis of the results and the observed behaviour.
- It has been possible to continue with the study of the **thermal camera**, being able to film the fin whales in different situations and thus increase the database to be able to train the pattern recognition model and implement it to reduce the risk of collision.
- The **professional fishermen** of the Catalan coast, especially the trawlers, have once again been great collaborators of the project, reporting sightings, fishing and oceanographic conditions along the Catalan coast. This season, the **collaboration with 8 fishermen's guilds** has been maintained, extending the collaboration with some more fishermen from some of the guilds.
- A total of **33 biopsies** have been taken, which will be used to carry out **genetic, hormonal and stable isotope studies**. In this way we will be able to determine basic aspects such as sex, kinship, the moment of the reproductive cycle in which they are found and the level of stress, as well as their feeding areas and the type of feeding.

- Unfortunately, it has been another season with high maritime traffic. On several occasions we have been able to observe animals resting or feeding very close to merchant ships, which move through the area at an average speed of 12 knots, and can exceed 20 knots in some cases. We would like to point out once again **the inconvenience caused by the pursuit of recreational vessels, which are irresponsible, insensitive and unaware of the law that protects cetaceans and prohibits their approach** (Royal Decree 1727/2007, of 21 December, which establishes measures for the protection of cetaceans).
- On the coast of **Denia** we have been able to **identify 30 individuals**, of which two of them had already been sighted in Denia in 2022, one of them in 2023 was with a calf.
- Few sightings were made in the **Strait of Gibraltar** due to the harsh weather, but we still managed to identify **10 individuals**.
- The season ended in the waters off **Galicia**, where **128 individuals were identified**. We were able to confirm that the Galician coasts are a feeding ground for fin whales in summer. In the area at the end of the shelf, mainly between 100 and 300 metres, we found a high concentration of fin whales, but also of other species such as blue whales, humpback whales and minke whales that were cruising the area.
- Cataloguing the different individuals, **recaptures have so far been found between the different study areas**. This fact shows that at least part of the population that feeds on the Catalan coast in spring moves towards Atlantic waters at the beginning of summer.

Methodology

For the development of the marine campaigns of the Fin Whale Project, **random transects** are carried out on board the Maktub, the research vessel of the EDMAKTUB association. It is a Catana 47 sailing catamaran, 14.15 metres long, equipped with all the necessary equipment to carry out the research.

The marine campaigns are carried out **daily from the beginning of March to the beginning of June**, weather permitting. During the trips, random transects and a sighting effort are carried out in which four researchers cover 360 degrees of the vessel and all the biodiversity, meteorology, oceanographic conditions, and merchant vessels observed along the transect are recorded.

Image of research team in sighting effort.

When sighting cetaceans, the sighting effort is stopped and the environmental conditions, time, GPS data, distance and angle to the vessel, species, number of animals, interaction with the vessel, behaviour and whether photographs and photo-identification have been carried out are recorded. In the case of fin whale sightings, a detailed record of the behaviour of the animal(s) is carried out, **using the drone to obtain a complete record of the behaviour and number of animals**, also using as a **tool for photo-identification** of individuals through the pigmentation marks of the zenith zone, the chevron and the blazer. We are also working on the development of the technique for the collection of biological samples.

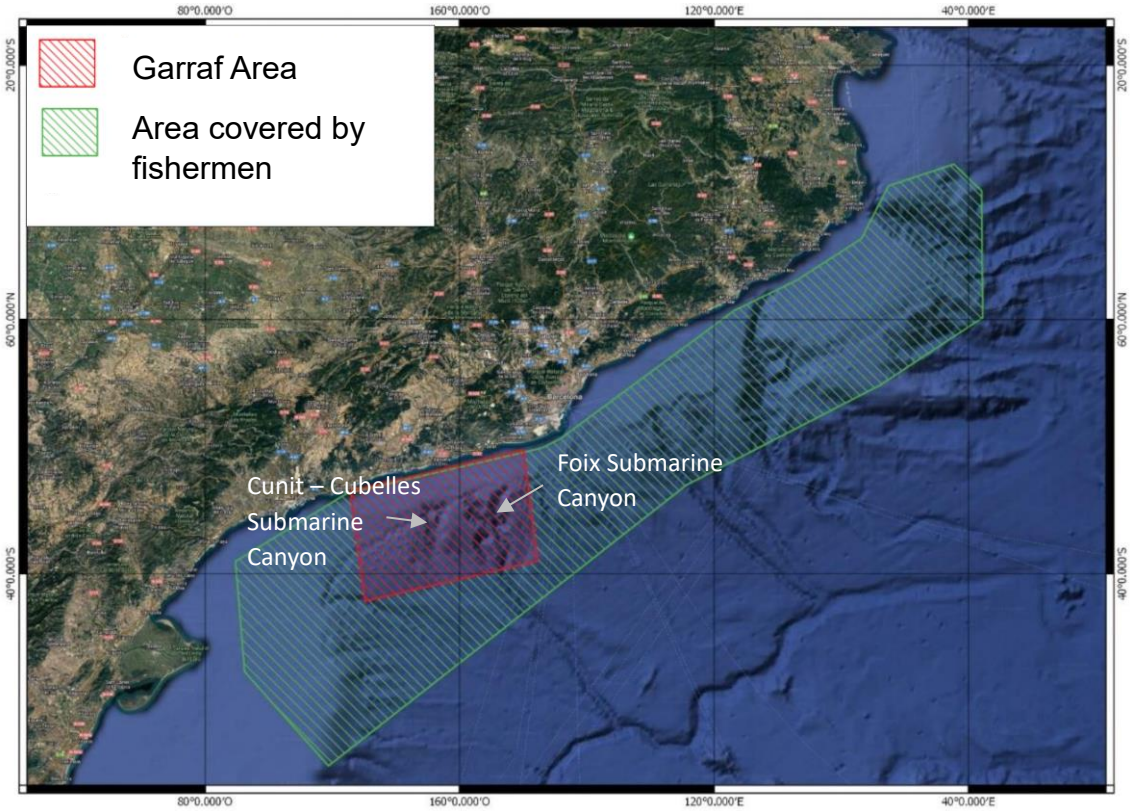
Image taken by the research drone after the fin whale we were monitoring made a dive.

A number of sampling points have been identified for the collection of oceanographic and plankton samples. Including the collection of samples in areas where fin whales are present whenever possible and considered relevant to the research.

Study area

The Fin Whale Project mainly covers the coastal area between Barcelona and Tarragona. This area is a **marine zone of 1944 km^2 located between the towns of Castelldefels and Torredembarra, extending up to 12-15 miles offshore**. The base port for the project's marine campaigns is Vilanova i la Geltrú. In order to increase the knowledge of the presence of fin whales on the Catalan coast, the last seasons of the project have extended the area of the Catalan coast and the Catalan-Balearic Sea, focusing on the area of Blanes and Palamós mainly between the end of May and the beginning of June. **In 2017, 2022 and 2023 expeditions have been carried out in Denia, extending this 2023 also in the waters of the Strait of Gibraltar and Galicia** in order to monitor the population of fin whales that migrate towards the Atlantic in summer.

The Garraf coast is an area characterised by a short coastal platform, which reaches up to 5 nautical miles out to sea, and by the presence of two submarine canyons, the Foix submarine canyon, which is located between Vilanova i la Geltrú and Sitges, and the Cunit - Cubelles canyon. The area is also within the influence of the Llobregat river and the Garraf streams.

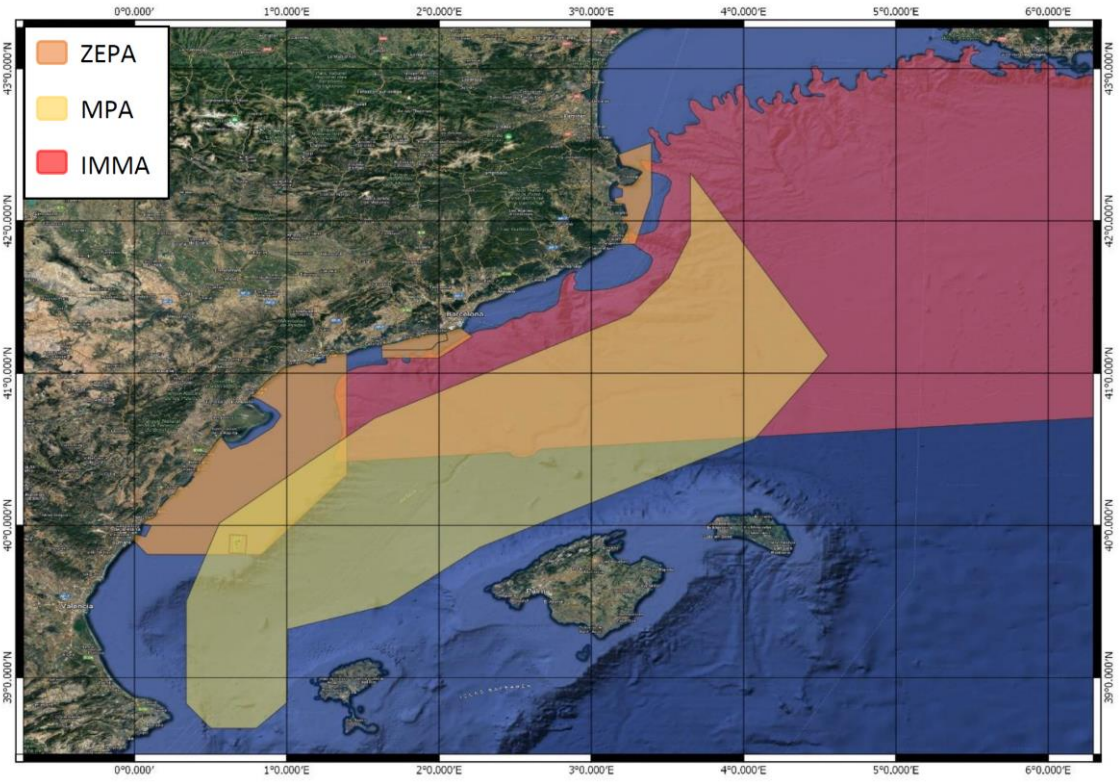


Study area of the Garraf coasts located between Torredembarra and Castelldefels and which extends up to 15 nautical miles offshore, in red. Area covered by professional fishermen, in green.

The **submarine canyons** are involved in a series of oceanographic dynamics that generate rising currents of water from the sea floor, which is loaded with nutrients. This phenomenon combined with the input of nutrients from the coast makes this area a **high production area** which favours a high biodiversity of seabirds and cetaceans, including the fin whale.

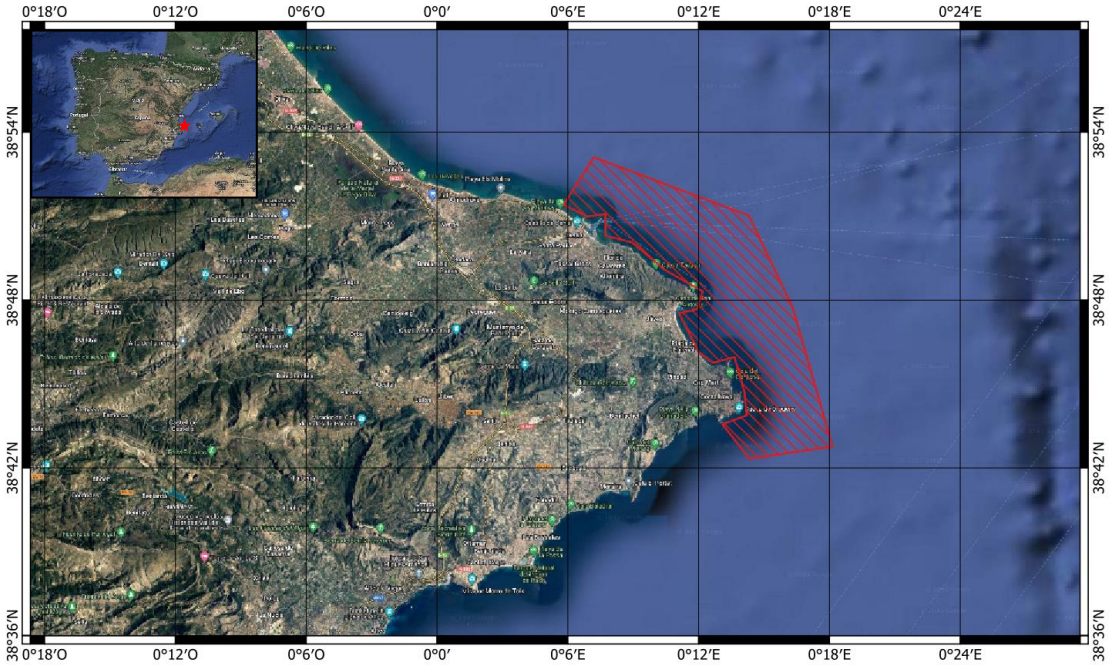
The network of contacts established with fishermen and sailors in the area allows us to know the ecological situation and the presence of cetaceans, especially fin whales, in the area between **Palamós and Ametlla de Mar**. They also give us information on the Balearic basin, on a more occasional basis.

This area described is an area of recognised ecological importance: it is part of a space declared Site of Community Importance (LIC) and Special Protection Area for Birds (ZEPA) of the Garraf coast, it belongs to the Natura 2000 Network, the ZEPA area of the Baix Llobregat - Garraf marine space, it belongs to the Network of Marine Protected Areas of Spain (RAMPE), and the Plan for Areas of Natural Interest (PEIN). A new Important Marine Mammal Area (IMMA) of the northwest Mediterranean, the system of submarine slopes and canyons, has recently been incorporated. Outside the area described by the Rorqual Project is the migratory corridor of cetaceans, established as a Marine Protected Area (MPA) in 2019.



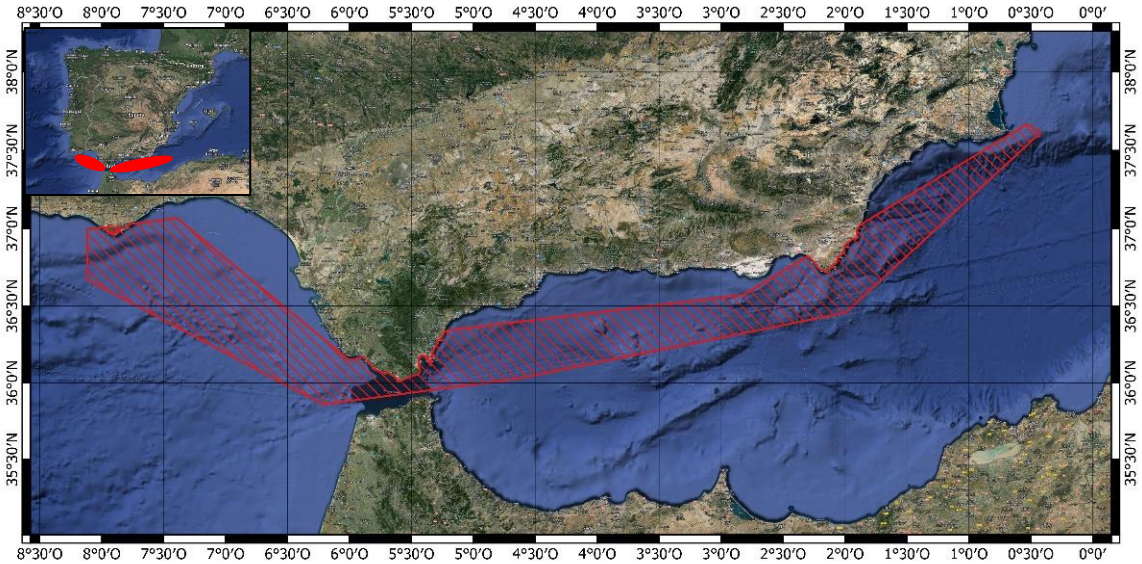
Map showing the protected areas on the Catalan coast. In orange are represented the ZEPA areas (Special Protection Areas for Birds), in yellow is represented the cetacean corridor MPA, and in red is represented the Important Marine Mammal Area (IMMA).

On the **coast of Denia**, the study area includes an area very close to the coast, **between the port of Denia and the cape of La Nao**, a zone of **115 km²**.



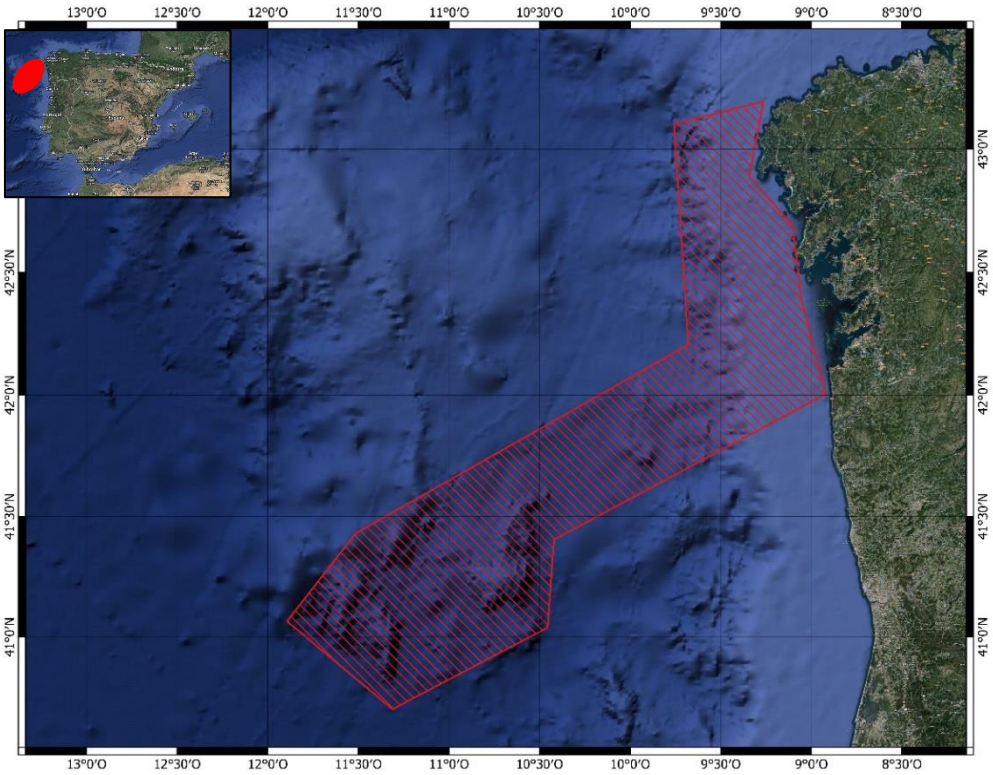
Study area on the coast of Denia. The area is marked in red. In the upper left corner is the map of the Iberian Peninsula with a red star corresponding to the location of the study area.

On the **southern coasts of the peninsula**, the study area includes an area very close to the coast, **between Cape Palos and the city of Faro**, a **26.432 km² area**.



Study area on the southern coasts of the peninsula and the Strait of Gibraltar. The area is marked in red. In the upper left corner, the map of the Iberian Peninsula is shown with a red mark corresponding to the location of the study area.

In the **area of Galicia**, the study area is centred on the area of the continental shelf boundary, at depths of between 100 and 500 metres. **It also extends to the Galicia Bank, covering a total of 21.996 km^2**.



Study area on the coasts of Galicia. The area is marked in red. In the upper left corner is shown the map of the Iberian Peninsula with a red mark corresponding to the location of the study area.

With all this journey through the different study areas, it has been possible to monitor the fin whale, on reaching the feeding area of the Garraf coasts and on its migratory route back to the Atlantic, ending up on the Galician coasts, which seem to be a feeding area for the fin whale during the summer months.

Survey carried out during the course of the marine campaigns of the 2023 Fin Whale Project.

The Fin Whale

The fin whale (*Balaenoptera physalus*) is a species of cetacean belonging to the suborder of mysticetids (baleen whales). The second largest animal in the world (up to 24 m in length), it is the only whale species that regularly inhabits the Mediterranean.

The fin whale in the Garraf coast.

Fin whales are pelagic filter-feeding whales that feed mainly on krill (small crustaceans of the order Euphausiacea, which are part of the zooplankton) but also on copepods, small fish (mackerel, anchovies or sardines) and squid.

Its appearance is slender, with a pointed snout and a dorsal fin set back in the dorsal area, proportionally the largest dorsal fin in the whale family. It has a characteristic facial asymmetry: the colouring of the jaw is white on the right side of the head and black on the left. As we have already mentioned, it is a species about which there is still little knowledge and which is in danger of extinction according to the IUCN.

Right facial image of fin whale showing the white right jaw, the blazer, on the right side of the head and behind the blowhole, and the start of the chevron further back from the blazer.

Like all balenopterids, it migrates for breeding or feeding, moving seasonally to lower, warmer latitudes in winter and to colder, more productive waters with abundant food in summer. The fin whale is characterised by its high swimming speed, which can exceed 30 km/h.

Distribution of fin whales in the Mediterranean Sea

There are considered to be two populations in the Mediterranean, one Atlantic and one Mediterranean. The Atlantic population enters through the Strait of Gibraltar mainly from December to February and leaves again from June to September. On the other hand, the Mediterranean population remains in the Mediterranean all year round, being found in the Ligurian Sea in summer, from July to September, in the area of the island of Lampedusa in winter and in the Tyrrhenian Sea area in spring and autumn.

Map showing the migration patterns of fin whales in the Mediterranean. The Mediterranean population is shown in orange while the Atlantic population is shown in blue. The questions are due to lack of knowledge.

Lately, the migration of fin whales in the Mediterranean has been questioned because variations in their latitudinal distribution have been found, mainly linked to the presence of food. For this reason, it is now being confirmed that the migration of the fin whale in the Mediterranean is a constant movement in search of food, which marks these movements.

As far as the Catalan coast and the Balearic Sea are concerned, thanks to the Fin Whale Project, it has been discovered that these individuals concentrate in this area in spring to feed. It is not yet known to which population these individuals belong, but the main hypothesis at present is that two populations are present in the area, the Atlantic population, which is seen travelling south along the coasts of Denia mainly in June and July, and the Mediterranean population, which would go to the Ligurian Sea at the end of the feeding season along the Catalan coast.

Presence of fin whales in the study areas

Throughout the 10 years of the project, it has been possible to describe a situation not previously described, **the presence of fin whales on the Catalan coast during the spring months to feed**.

These years have seen variations in the presence and distribution of fin whales on our coasts. 2021 was the year with the highest number of sightings and 2019 the year with the lowest number of sightings. The year 2023 was also marked by a low presence of fin whales in the study area of the Catalan coast.

Table of fin whale sightings over the course of the Project Fin Whale 2023 campaign.

	Catalonia	Denia	Gibraltar Strait	Galicia	Total
Days of campaign	51	21	16	19	**107**
Fin whale sightings	35	17	7	74	**133**
Nº Animals sighted	46	30	18	171	**265**

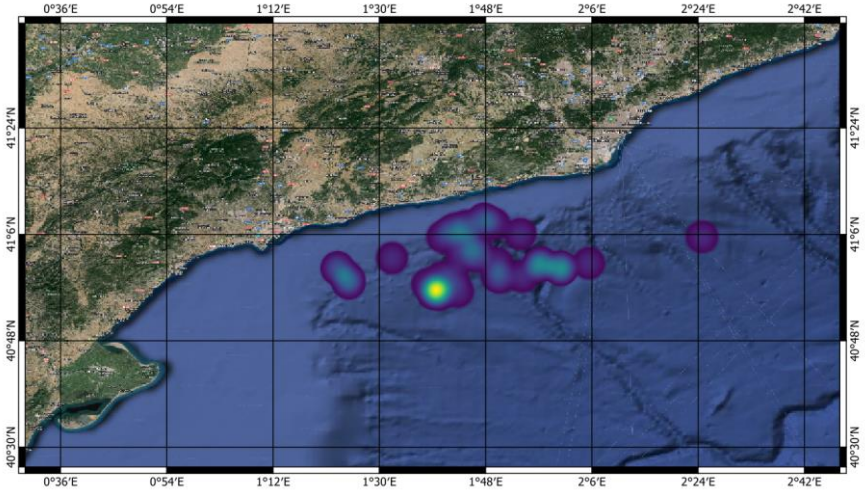
Throughout the year we have received a total of 45 warnings from fishermen and sailors about the presence of fin whales off the Catalan coast. April and May were the months with the highest number of sightings. The sightings in May and June were mainly concentrated in the north of the Catalan coast.

Table of notices from fin whale fishermen and navigators throughout the year.

	February	March	April	May	June	Out of the season	Total
Fishermen	3	7	15	10	6	2	**43**
Sailors	0	0	1	1	0	0	**2**

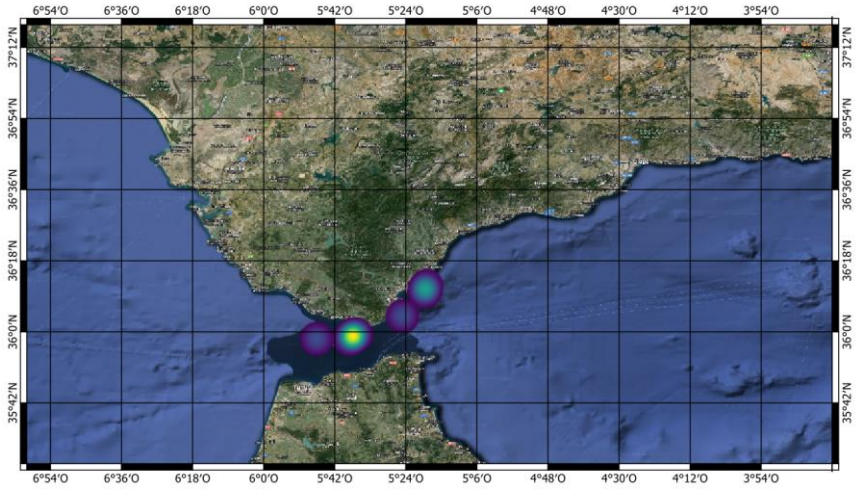
We also receive more than 100 sightings of odontocetes, mainly striped dolphins and bottlenose dolphins throughout the year.

The following are the maps showing the presence of these fin whales in the different study areas: Catalan Coast, Denia, Strait of Gibraltar and Galicia.

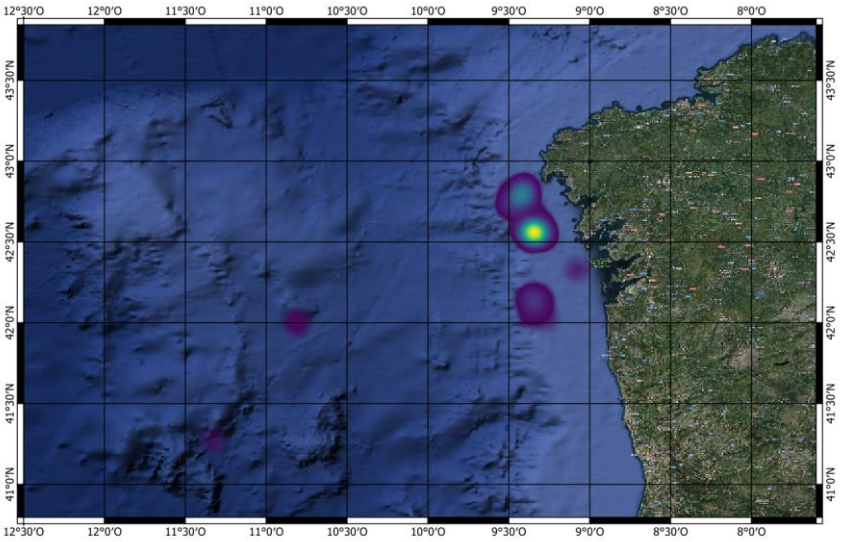


Map of fin whale presence on the Catalan coast. Purple are the areas with the lowest abundance of sightings while blue and then yellow are the areas with the highest number of sightings.

Map showing the presence of fin whales off the coasts of Denia and Cabo de San Antonio. The purple are the areas with the lowest abundance of sightings while the blue and then the yellow are the areas with the highest number of sightings.

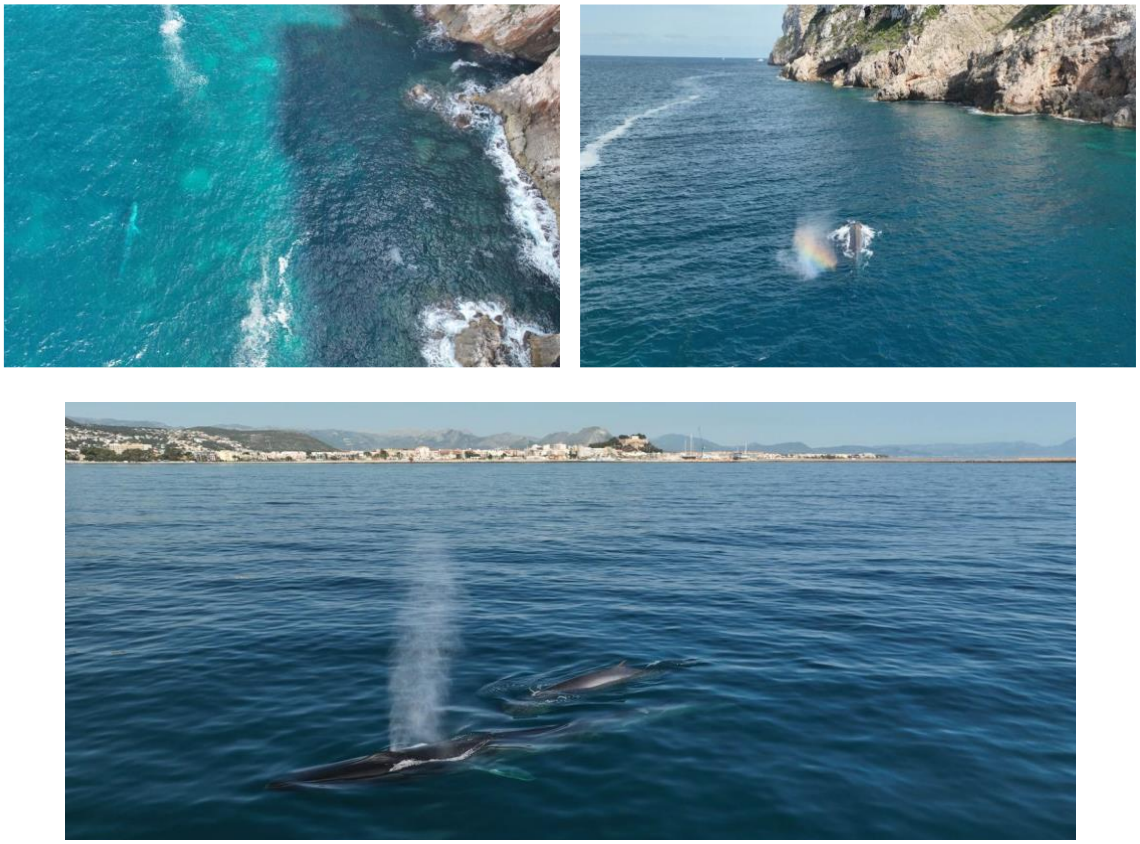


Map of fin whale presence in the Strait of Gibraltar. The purple are the areas with the lowest abundance of sightings while the blue and then the yellow are the areas with the highest number of sightings.



Map of fin whale presence in the coasts of Galicia. The purple are the areas with the lowest abundance of sightings while the blue and then the yellow are the areas with the highest number of sightings.

In these maps it can be seen how the animals are concentrated in the areas at the edge of the shelf or high seas in areas that seem to be used for feeding, but that have no problem getting close to the coast when they are travelling. They can be observed in Denia and in the Strait of Gibraltar a few metres from the coast and in shallow area.



Images of fin whales travelling in a southerly direction off Cape San Antonio.

In both regions, Denia and Gibraltar, as the animals pass so close to the coast, an effort is made with lookouts from land. The EDMAKTUB association, during

the campaign seasons in both regions, had lookouts from the EUCRANTE association in Denia and ECOLOCALIZA in the Strait of Gibraltar, which gave warnings to the boats that facilitated the location of the animals.

It should also be noted that in these areas, small groups of 2 to 4 individuals are much more common. While in the feeding areas it is more common to find solitary animals, aggregations of individuals are found only in areas of high productivity.

This year, the whales arrived in the study area at the end of March, and we mainly found them travelling until mid-April. Feeding episodes this season occurred in more offshore areas. We were able to see individual animals feeding but also groups of up to 4 animals feeding in the same area.

Picture of three fin whales feeding. Striped dolphins can also be seen interacting with the whales.

Concentrations of larger numbers of animals could be observed on the Galician coasts in summer. Although they were generally more dispersed, they were concentrated in greater numbers in the area, with the majority of animals recorded between 9 and 20 per day.

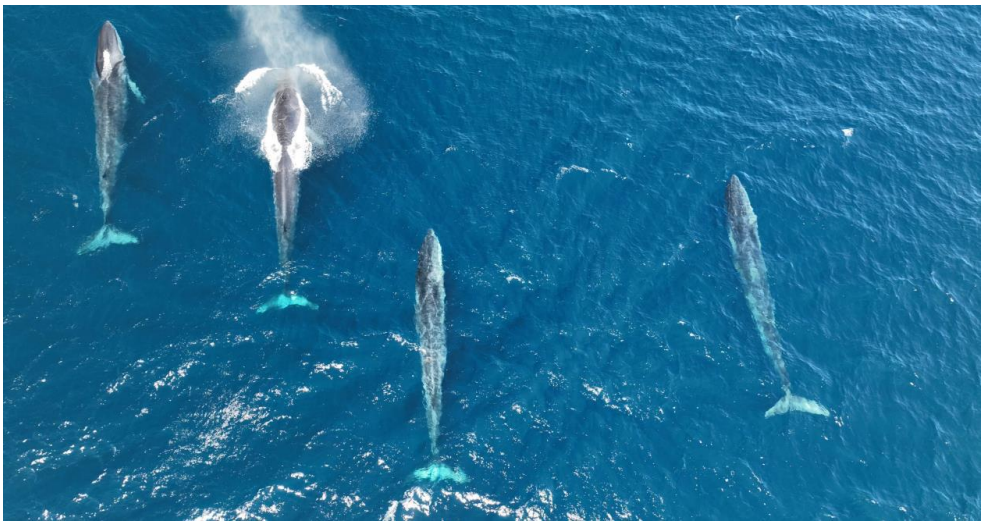


Image of 4 animals travelling off the coast of Denia.

Throughout this season, the presence of mothers with calves has been observed on several occasions, which had not been sighted since 2017, which was quite worrying for the health of the population living in the area. Calves were observed in the 4 four study areas.

Image of a mother and child coming up for air.

On some occasions, fin whales were observed interacting with other species, such as striped dolphins, bottlenose dolphins and humpback whales.

Image of a fin whale with 6 striped dolphins playing on the whale's head.

Image of a fin whale with a group of 3 bottlenose dolphins swimming on its head.

Image of two fin whales and a humpback whale. The rorquals are the two whales at the top and right of the image and the humpback whale is the whale seen breathing in the middle left of the image, if you look closely you can see the large white pectoral fins and a more rounded complexion.

Photo-Identification of fin whales

Photo-identification is one of the main techniques used to study cetaceans. It consists of identifying an individual and being able to recognize it on another occasion and in another place and year. This identification, for this species, is usually made from an analysis of the shape, coloration, notches and scars of the dorsal fin. Therefore, it is very important to obtain photographs with a good resolution and at an angle of 90 degrees to the individual. However, it also gives us individual information of their characteristic pigmentation patterns, called;

chevron and blazer, which are very identifiable thanks to the zenithal position images extracted with the drone. It is also important to obtain images of the individual's characteristic features, such as scars, parasites, malformations, etc. These can be permanent or temporary, in the latter case, it can help us to identify individuals in the short term (in the same season).

The photo-identification of fin whales by drone is a pioneering technique developed by the EDMAKTUB association throughout the years of the project and is giving excellent results. The automation of this technique has allowed us to recognize the animals in a much more efficient and reliable way, since the pigmentation of the chevron and blazer does not change over the years while the fin can be modified with new markings that can make it difficult to identify the individual between seasons.

This season **a total of 204 fin whales** have been identified through drone images. Currently, the EDMAKTUB association has already accumulated a **catalogue of more than 400 individuals**.

Table showing the total number of individuals identified in each study area in 2023.

	Catalan coast	Denia	Gibraltar	Galicia
Nº Animals identified	36	30	10	128

As shown in the table, Galicia was the area with the highest number of individuals identified, and also the area with the highest number of sightings due to high productivity.

Thanks to the new technologies and photo-identification techniques adopted, an identification rate of over 90% is achieved. It must be taken into account that all individuals sighted more than once during the season are counted only once as identified individuals but appear in more than one sighting.

Zooplankton & Microplastics

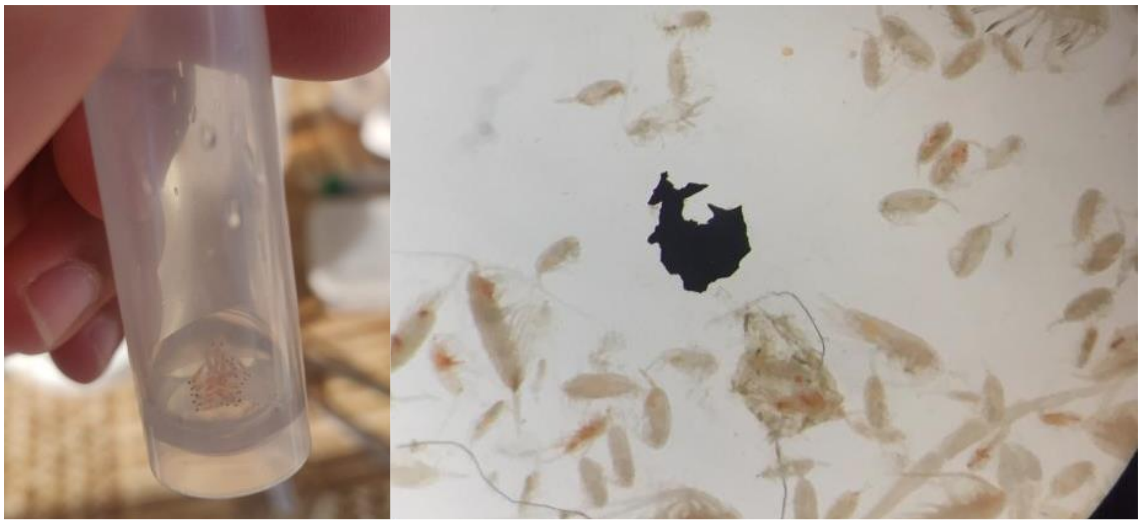
In order to study the zooplankton in the study area and to know if there is food for the whales or not we use two tools: the echo sounder and the plankton net.

The echo sounder is located on the starboard skid of the Maktub and indicates the changes in density of the water column regarding plankton, fish, the bottom,... Reading these images sent by the sounder we can detect the presence of plankton masses, which are often related to areas where whales are observed feeding.

Echo sounder image showing two density spots referring to plankton masses in an area where whales are feeding. The blue refers to the water and the light blue to red dots to areas of higher to lower density.

In these areas of presence of spots on the echo sounder and also in other areas where we can find the animals feeding or where we consider that there could be good conditions for the feeding of fin whales, we carry out plankton sampling with the plankton net.

In these plankton collections we often extract copepods, salpa and sometimes krill, the main food of the fin whale.



Plankton samples collected with the plankton net. The image on the left shows a tube with several krill, the image on the right shows what a plankton sample looks like through the microscope. In this sample several copepods can be observed, but also some microplastics like the black piece in the middle of the image.

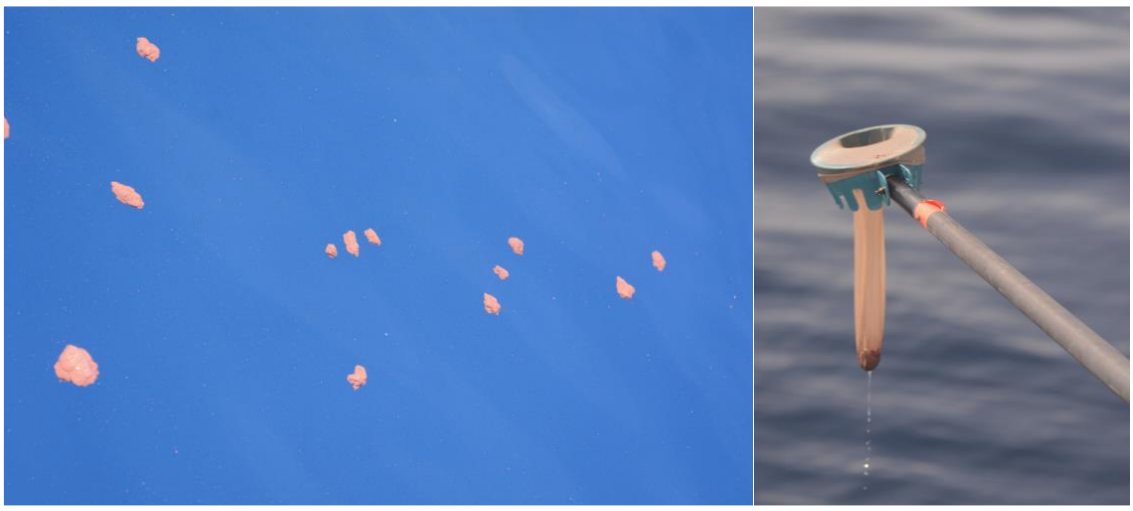
In these samples, as seen in the image, we often find microplastics. This is a rather worrying fact as it implies a presence of microplastics in the feeding zone of the fin whales, which implies an ingestion of these microplastics by the fin whales, a fact that can cause health problems for the animals.

Throughout the season we study both the presence of different species of plankton, focusing on krill, but also the presence of microplastics in order to be able to determine the effect on the feeding zone.

Biological samples collection

Since 2018, we have been collecting **biological samples of skin** and fat from some of the animals sighted in order to extract **genetics, hormones and stable isotopes**. Throughout these years we have managed to take about 100 samples which are being analyzed by different laboratories in each of the fields to be studied.

In some cases, as in May this year, it is possible to collect **feces samples** from some animals. This normally happens when the animals are feeding well and, therefore, make solid defecations that can be collected. These defecations are analyzed by **studying the DNA of the sample** to find out what the animal has been feeding on.

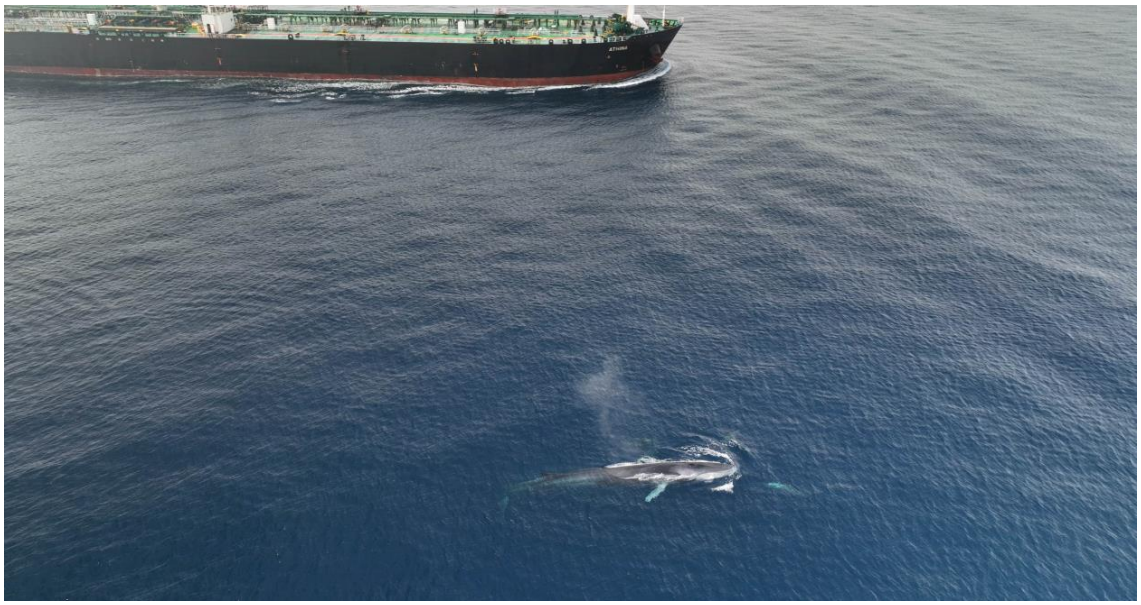


Faeces sample of a fin whale. On the left we can see the pieces of faeces in the water and on the right the mesh that has been used to collect these remains of faeces.

Marine traffic

Maritime traffic is one of the main dangers faced by fin whales all over the world, being quite high in the Mediterranean due to the density of traffic.

In the different study areas, it has become evident that the presence of boats is the main threat in all the study areas, being the Strait of Gibraltar the area with the highest maritime traffic. Even so, the areas of the Catalan coast and the Galician coast would be the areas with the highest risk due to feeding behavior, which is known to greatly increase the risk of collision with vessels.



Sighting of a fin whale trevelling next to a tanker ship.

It is also necessary to **point out the nuisance caused by the harassment of recreational boats, which are guilty of lack of responsibility, little sensitivity and ignorance of the law that protects cetaceans and prohibits their approach** (Royal Decree 1727/2007, of December 21, which establishes measures for the protection of cetaceans).

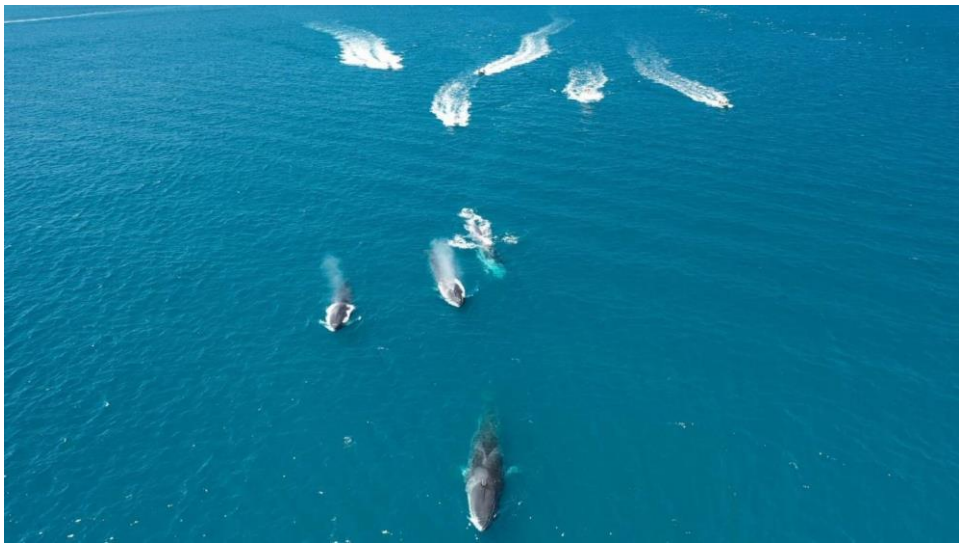


Image showing 4 fin whales being chased by 5 motor boats off the coast of Denia.

Throughout the season, **the study of the feasibility of the thermal camera for the automatic detection of fin whales** has continued.

The thermal camera used is a FLIR M364C LR camera installed at the top of the mast, about 21 meters above sea level. TimeZero software was used to visualize and control the images transmitted by the camera.

Location of the thermal camera on top of the Maktub mast.

During the sighting, the thermal camera images were recorded for later analysis and to study their detectability in different weather and sea conditions.

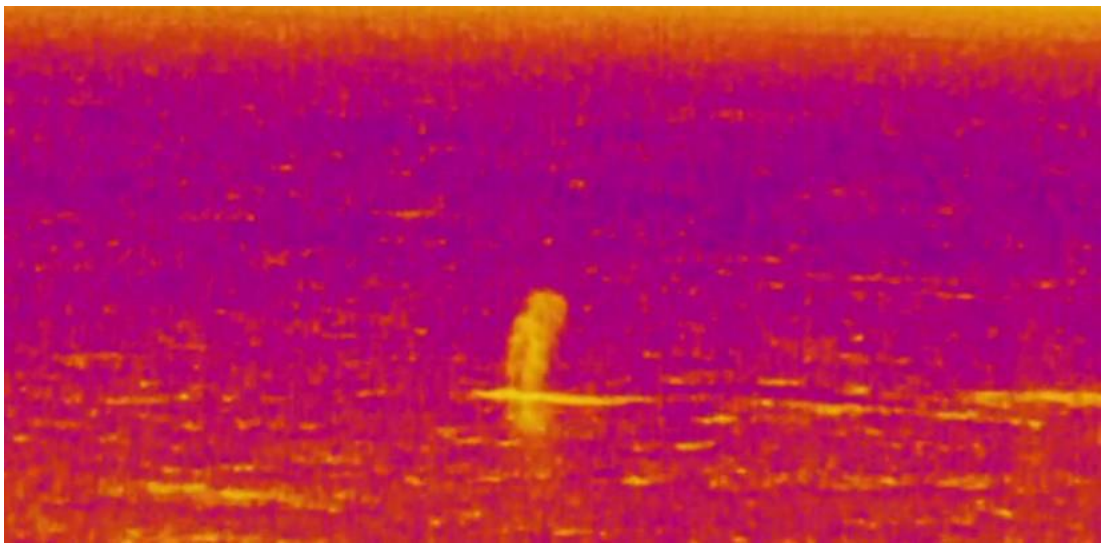


Image of a blow of a fin whale observed by the thermal camera.

The detection of fin whales was achieved up to a distance of 1500 meters. It was possible to observe some difficulty in detecting fin whales in high temperature conditions. But it has once again proved to be a new tool for the detection of fin whales in the area, especially at night, when it is not possible to detect them visually.

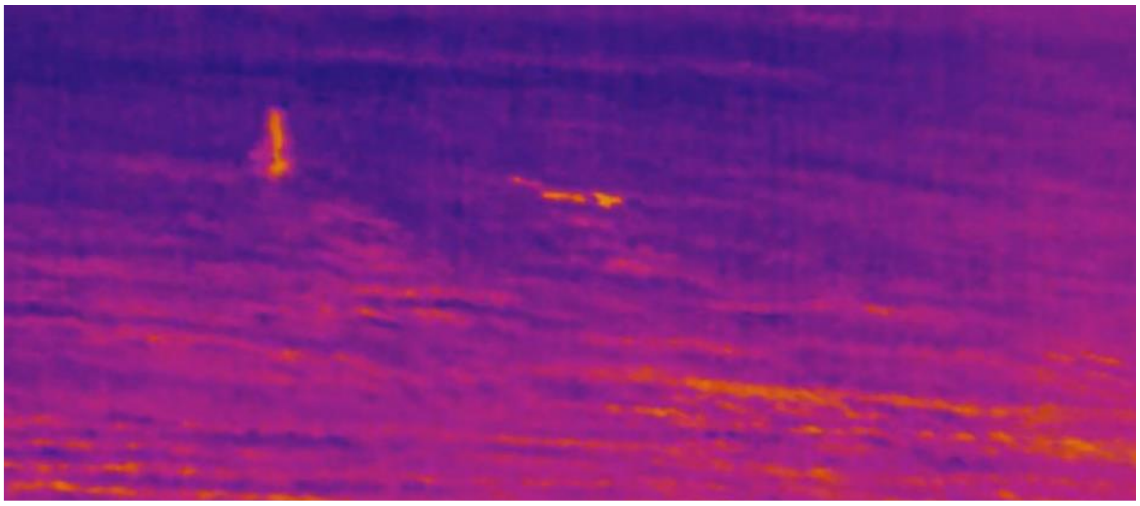


Image of a blow of a fin whale observed by the thermal camera.

Biodiversity

In the Mediterranean we can find **8 species of cetaceans**, 7 of which belong to the group of odontocetes. Throughout this season we have been able to see the **7 species of odontocetes** that inhabit the Catalan coast; the striped dolphin (*Stenella coeruleoalba*), the bottlenose dolphin (*Tursiops truncatus*), the common dolphin (Delphinus delphis), the Risso's dolphin (*Grampus griseus*), the short-finned pilot whale (*Globicephala melas*), the sperm whale (*Physeter macrocephalus*) and Cuvier's beaked whale (*Ziphius cavirostris*). The **most sighted species** was the **striped dolphin**, followed by the bottlenose dolphin and the Risso's dolphin.

Table of sightings of the 7 species of odontocetes in the Catalan coast and the Catalan-Balearic sea.

	Striped dolphin	Bottlenose dolphin	Common dolphin	Risso's dolphin	Short-finned pilot whale	Cuvier's beaked whale	Sperm whale
Sightings	129	16	6	9	1	4	1

Striped dolphins have been sighted in groups of various sizes and in different behaviours throughout the season. We were also able to observe some calves in some of the groups sighted.

Image of two striped dolphins, an adult and a calf, jumping.

Bottlenose dolphins have been sighted mostly following trawlers, resting, socializing and traveling. The groups have been mostly of about 10 animals and, in general, they did not interact much with the boat, some individuals did interact, but in all cases it was a reduced part of the group and for a short period of time.

Image of a bottlenose dolphin breathing off the coast of Garraf.

Risso's dolphins are deep diving animals, which feed mainly on squid. They are usually found in submarine canyons in groups of 5 to 25 individuals. One of the peculiarities of this dolphin species is that at birth they are completely grey and accumulate scars with age until they end up being practically white when they are older. In the groups of Risso's dolphins we have also been able to see some breeding, which is a good indicator of the health of the population.

Image of an adult Risso's dolphin with its calf coming out to breathe.

Common dolphins have been sighted in small groups and sometimes mixed within groups of striped dolphins. In general, they have not been interacting much with the boat.

Risso's dolphins have only been sighted on one occasion this season. A group of about 20 individuals was sighted, which were mostly divided into two subgroups, one interacting very close to the boat and the other was more relaxed a little further away. The group consisted of adults, juveniles and a few calves.

Image of several black pilot whales relaxing at the surface.

As for Cuvier's beaked whales, we were able to see them on several occasions during the month of May in the Foix submarine canyon. They were sighted in small groups of two or three individuals.

Image of Cuvier's beaked whales from drone view.

A small group of two sperm whales was sighted in a deeper and farther offshore area in front of Barcelona. We found them relaxing and playing on the surface. One of them jumped a few times. At the end of the sighting both animals showed their tails. Another group of sperm whales was sighted on the route to Denia, in this case they were feeding.

Image of a sperm whale resting on the surface.

Regarding the route towards the Atlantic, it is worth mentioning the presence of **common dolphin**s in the area of the **Alboran Sea**. Groups of 200 - 300 animals are sighted. In the northwestern Mediterranean area the common dolphin is rare

and the striped dolphin is very abundant, on the other hand, in the area of southern Spain, we find the opposite effect, common dolphins are very abundant while striped dolphins are less common.

Once across the Atlantic, on the way to Galicia, we find other Atlantic cetacean species, which are not found in the Mediterranean, such as the **Atlantic spotted dolphins**. They are tropical dolphins, about 2 - 2.5 meters long, and they usually move in very large groups.

Image of a group of Atlantic spotted dolphins traveling fast.

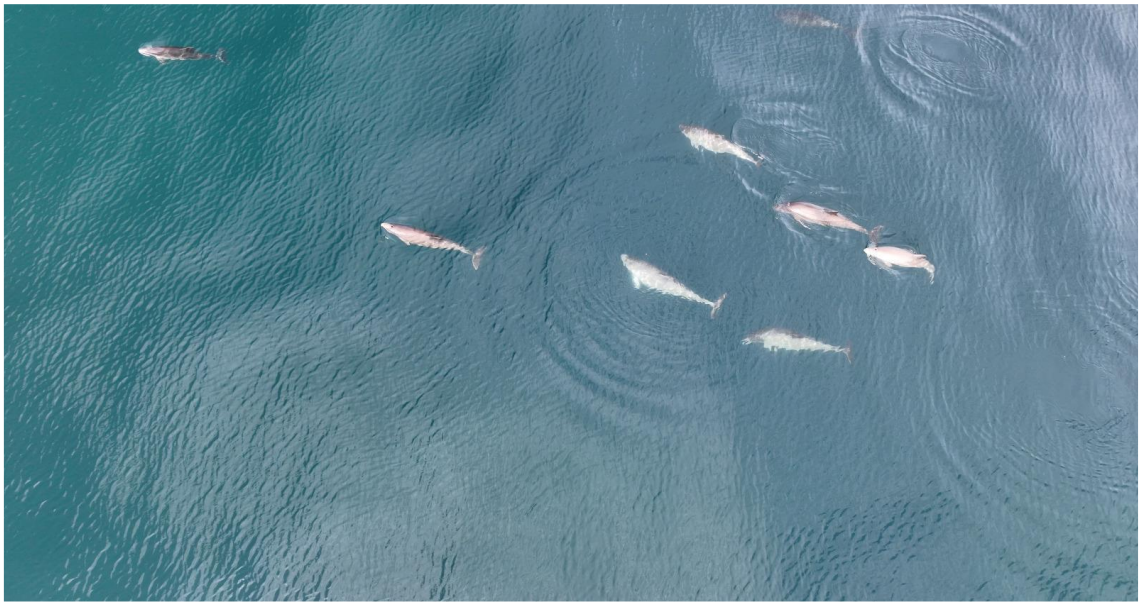
Once in Galicia, we were able to see groups of bottlenose dolphins in the Galician estuaries. We were also able to record a large number of sightings of common dolphins, especially in the shelf areas outside the estuaries.

Image of two bottlenose dolphins, an adult and a calf, playing on the bow of the Maktub catamaran.

In mid-August we were able to record a sighting of a **small group of two killer whales**, one adult and one juvenile. At the time of filming with the drone the juvenile individual was carrying a sunfish in its mouth.

Image of two killer whales, an adult and a juvenile. The juvenile individual carries a sunfish in its mouth.

On one occasion in August we were also able to see a **group of 8 harbor porpoises**. They are elusive and difficult to follow.



Aerial image of a group of 8 harbor porpoises.

In Galician waters we were also able to see other species of whales that inhabit the Atlantic, such as the blue whale, the minke whale and the humpback whale. The different species of whales were sighted in the areas where we also found fin whales feeding.

Blue whale breathing near the catamaran Maktub.

Image of a minke whale coming up for air, on the left, and a humpback whale about to make a dive.

In the case of the minke and blue whales, the individuals were sighted alone. The humpback whale was sighted together with two fin whales feeding.

In addition to the different species of cetaceans, birds, fish, jellyfish and turtles were also sighted in the study areas.

At the beginning of the season, in the Garraf area, large groups of birds and tuna were observed feeding. The groups consisted mainly of little gulls, black-headed gulls and shearwaters.

Picture of a group of seagulls and tuna feeding.

As the season progressed, especially during the month of April, aggregations of velellas and sunfish could be sighted. These aggregations and sunfish could also be observed in Galician waters in August and September.

Image of an aggregation of adult velella together with pollen, on the left, and a sunfish swimming laterally on the surface, on the right.

In May, other species such as hawksbill turtles, blue sharks and manta rays were also sighted.

Image of a hawksbill turtle, a blue shark and a manta swimming very close to the surface.

Finally, in addition to all the birds that were sighted in the different study areas throughout the season, it is worth mentioning the presence of large groups of gannets, adults and juveniles, feeding and resting off the south coast of Portugal in October, when we returned to the Mediterranean Sea.

Image showing a group of gannets, adults and juveniles, resting and feeding.

Education and outreach activities

In addition to our research work, this season we have continued with the dissemination of our work through the website, social networks and also from the various activities we have carried out; one-day research, research assistants course and attendance at fairs, lectures and press releases.

On a scientific level, we have participated in the European cetacean congress that took place in April in O'Grove, Galicia. In January we were also able to publish a new scientific article in the journal drones, *A novel technique for Photo-Identification of the Fin Whale, Balaenoptera physalus, as Determined by Drone Aerial Images*.

One-Day Research

Since the beginning of the Fin Whale Project, during the months of March, April and May, research days are held. This activity aims to give the opportunity to interested people to learn about what we do and how is the field research and data collection in the marine campaigns of the fin whale project, as well as the opportunity to enjoy a day aboard the Maktub, our research catamaran, and enjoy the sightings that are given the day of the survey.

Research Assistant Course (RAC)

The main objective of the research assistants course is to extend the knowledge and study practices carried out throughout the fin whale project to students so that they can learn new study techniques, how a research with cetaceans is carried out and acquire knowledge about the situation of the fin whale in the Catalan coast.

Although it is a course designed for students, it is adaptable to all audiences. And it can be done with a duration of between 1 and 4 weeks during the months of March, April and May.

Attendance at fairs and talks

At the beginning of the year, a talk was given at the Thau school to bring the scientific knowledge of cetaceans on the Catalan coast, especially the fin whale, closer to the primary school children. This activity consists of an initial talk on the cetaceans of the Catalan coast and the subject matter requested by the school and a second part of workshops in which students perform a series of activities that serve to achieve the knowledge obtained.

At the end of the season, we participated in the VI Calafell Sea Festival from June 8 to 11. To participate in this fair we took the Maktub catamaran to the port of Calafell and held 4 days of open doors on the catamaran with guided tours to show our work and the knowledge we have of the fin whale in the area. This fair was a great success, we made multiple visits every day with different groups of people of all ages.

Image of the vessel with the panels and various materials on display.

Image of one of the talks at the exhibition in Calafell.

Finally, in June 2023 we were given the honorary national award Roig Toqués from the council of Vilanova i la Geltrú. This award was given in recognition of the research work done in recent years, especially since the beginning of the Fin Whale Project in 2013.

Roig Toqués National Honorary Prize Award Ceremony.

Press

Throughout the season we have been reported in the press, on television, radio and newspapers. If you are interested in visualizing our participations in the press you can visit our web page: [Press - EDMAKTUB]

Scientific outreach

This year we participated in the European Cetacean Society Congress (ECS) held in mid-April. We participated in the publication of the following posters:

- Using vessel-located thermal cameras to detect fin whales on the Catalan coast, northwest Mediterranean. Authors: Tort, B.; Degollada, E.

- Advances in the knowledge of the Mediterranean-Atlantic migration of the fin whale (Balaenoptera physalus) in the Iberian Mediterranean corridor. Data collection, migration periods and swimming speeds. Authors: Espada, R.; Feliu-Tena, B.; Tort, B.; Martín, E.; Olaya-Ponzone, L.; Patón, D.; Belda, E.; Anfruns, I.; Onrubia, A.; Degollada, E.; García-Gómez, J.C.
- Highlighting fin whale important areas in Mediterranean Spanish waters using passive acoustic monitoring. Authors: Feliu-Tena, B.; Miralles, R.; Bou-Cabo, M.; Rodilla, M.; Lara, G.; Degollada, E.; Tort, B.; Espinosa, V.; Pérez, I.; Belda, E.
- Monitoring of hormones in blubber of Balaenoptera physalus from Catalan coast. Authors: Zaccaroni, A.; Tort, B.; Degollada, E.

Earlier this year, a scientific paper was published in the journal drones titled: *A Novel Technique for Photo-Identification of the Fin Whale, Balaenoptera physalus, as Determined by Drone Aerial Images*.

You can read the abstracts of the various publications as well as the posters and the article on our website: Publications and Work - EDMAKTUB

Collaborators and Volunteers

We thank our scientific team for the effort and time dedicated to the project throughout the months of the campaign. If you want to meet them you can visit our website: [Who are we? - EDMAKTUB]

We would also like to thank the fishermen of the fishermen's associations of Palamós, Blanes, Arenys de Mar, Barcelona, Vilanova i la Geltrú, Tarragona, Cambrils and Ametlla de Mar, who have been informing us of sightings of fin whales and other cetacean species as well as changes in oceanographic conditions in different areas and presence of ecosystem bioindicators.

We also thank our collaborators for their support throughout the Fin Whale Project 2023.