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PROGRESS REPORT 2025
ON THE MEDITERRANEAN DATABASE OF CETACEAN STRANDINGS (MEDACES)
-
Updated December 2025

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Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area

ACCOBAMS

Progress Report 2025 on the Mediterranean Database of Cetacean Strandings (MEDACES)

MEDACES
Mediterranean Database of Cetacean Strandings

December 2025

Progress Report 2025 on the Mediterranean Database of Cetacean Strandings (MEDACES)

Study required and financed by:

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With the participation of:

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1. INTRODUCTION: THE MEDACES PROJECT

1.1. Origin and history of MEDACES

The study of cetacean strandings is an important tool for developing scientific programmes on cetacean conservation. They also raise social awareness of these animals and marine biodiversity. Stranded dolphins and whales provide a valuable opportunity to investigate causes of death and the impact of human interactions, assess the importance of potential threats by analysing accumulated pollutants and toxins, and gain insights into aspects of their population biology, such as reproduction, development and feeding habits. In recent years, the development of molecular techniques has also made it possible to collect small tissue samples from stranded cetaceans for population genetic studies. Together, these data can be used to determine the health status of cetacean populations, identify conservation issues and reveal unusual episodes of mass mortality (Geraci and Lounsbury, 1993).

In countries where there is greater concern for the protection of cetaceans, stranding networks have been established over the last few decades. The establishment of these networks and submission of data to a centralised database facilitates the collection and dissemination of information. It also allows health trends in marine mammal populations to be monitored by relating health data to available information on physical, chemical, environmental and biological parameters, and enables effective responses to unusual mortality events to be coordinated (UNEP/MAP – RAC/SPA & ACCOBAMS. (2004).

Also, working groups dealing with marine mammal unusual mortality events have been established, in some countries, to delineate criteria for determining when such an event is underway and to provide guidance to respond to them (Wilkinson 1996). In addition, national marine mammals tissue banks have been created in connection with national stranding networks. Such banks have the purpose of providing samples for future retrospective analyses, for new analyses of interest and for future analyses using improved analytical techniques. Marine Mammal Tissue Banks constitute a resource of samples that have been collected and stored in a systematic and well-documented manner to compare results over time and to identify whether environmental trends exist (UNEP/MAP – RAC/SPA & ACCOBAMS. (2004).

In some countries, working groups have been established to deal with marine mammal unusual mortality events. These groups are responsible for delineating criteria for determining when such an event is underway and providing guidance on how to respond to them (Wilkinson, 1996). In addition, national marine mammal tissue banks have been created in conjunction with national stranding networks. These banks provide samples for retrospective analyses, new analyses of interest, and future analyses using improved techniques. These banks constitute a resource of samples collected and stored systematically and in a well-documented manner, enabling results to be compared over time and environmental trends to be identified (UNEP/MAP – RAC/SPA & ACCOBAMS. (2004).

According to the recommendations listed in Annex VII of the 11th Ordinary Meeting of the Contracting Parties to the Barcelona Convention and its Protocols of the Mediterranean Action Plan (UNEP, Malta, 27–30 October 1999), relating to the further implementation of the Action Plan for Cetacean Conservation in the Mediterranean Sea and other initiatives, the coordination of information on stranded cetaceans along the coasts of Mediterranean countries is required to improve our knowledge of these animals and ensure their protection and conservation.

Therefore, establishing standards for storing information and samples from cetacean strandings in Mediterranean waters is important. In this context, it is necessary to compile details of all cetacean strandings, including an inventory of samples taken, in a single database maintained by a Mediterranean Cetacean Strandings Database (MEDACES).

At the 12th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution and its Protocols, held within the 'Biological Diversity and Specially Protected Areas' section in November 2001, it was recommended that the Action Plan for the Conservation of Cetaceans in the Mediterranean Sea be implemented, and that the offer by Spain to establish a Mediterranean database on cetacean strandings (MEDACES) in Valencia be approved. The Regional Activity Centre for Specially Protected Areas (RAC/SPA) is the database's depositary, and its management has been entrusted to the Cavanilles Biodiversity Institute (ICBIBE) at the University of Valencia, with financial support from the Spanish Ministry of the Environment, Rural and Marine Affairs (MMA) and ACCOBAMS. The ICBIBE provides the necessary human and material resources to implement MEDACES. The database strictly adheres to a code of ethics (see About MEDACES/Code of ethics).

The Mediterranean Database of Cetacean Strandings has been expanded to cover regions adjacent to the Mediterranean, including the Black Sea and contiguous Atlantic waters, as defined in the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic Area.

The ACCOBAMS Work Programme for 2023-2025 included the establishment and strengthening of official national stranding networks, involving all relevant national institutions. Furthermore, it fosters collaboration between the national networks of the ACCOBAMS Parties. These actions are being carried out in close cooperation with SPA/RAC. In this framework, collaboration between MEDACES and NETCCOBAMS is now underway. The NETCCOBAMS platform is ready to enhance accessibility and facilitate the visualisation of regional information relevant to cetacean conservation.

1.2. MEDACES Database and webpage

The MEDACES database (http://medaces.uv.es) has undergone several changes over the last decade, adapting to the needs and peculiarities of the data obtained. Initially, the database was designed with the aim of obtaining accurate information on each stranding record, requiring the completion of an extensive form with data on the stranding, the necropsy, and the samples collected in these cases. Perhaps due to the amount of work this entailed, as well as the reluctance to provide information that had been painstakingly compiled by institutions without any reward, these forms were not always sent, and in some cases, institutions sent their own databases instead.

A simple database was therefore designed with basic data and an associated reference number for each stranding, and this was shared to the ACCOBAMS focal points. This simplified both the design of the database and the submission of information by the institutions.

The idea behind this new database is that MEDACES users can have an overview and can contact the institutions that have compiled the specific data appearing in MEDACES.

The main page of MEDACES is a geodatabase that shares the information associated with the stranding location of each of the records. Users connect to these maps to use the shared content in the ArcGIS Online. The main advantage of using this program is the ease with which users can filter

and display specific content they want to access, as well as the ease with which the database can be kept up to always date.

The website also contains on its homepage a *News* section related to cetacean conservation in the Mediterranean This section aims to collect scientific information obtained thanks to stranding data and make it accessible to the publica. News also includes ACCOBAMS events, which directs users to the ACCOBAMS website (https://accobams.org/).

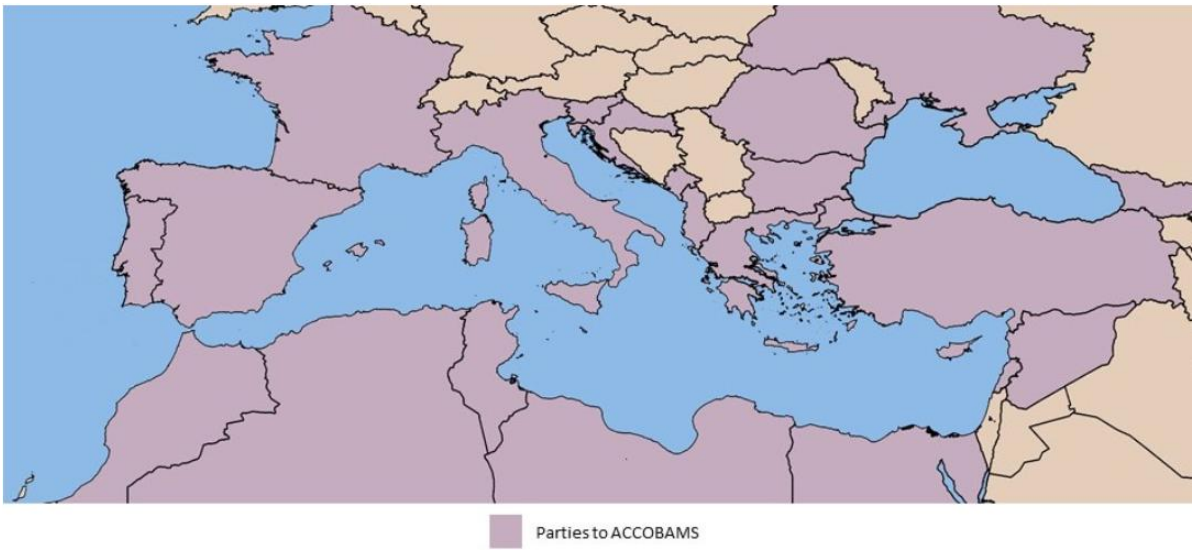

Figure 1. Map showing the ACCOBAMS Agreement Area

1.3. Obtaining the data

Since 2015, RAC-SPA has been contacting the National Focal Points of each country to request stranding data. Stranding data has been sent to MEDACES by national stranding networks, national authorities, research institutions, conservation institutions, as well as by RAC-SPA and ACCOBAMS. The MEDACES website provides three different options to facilitate the gathering of stranding data from the various institutions.

- Database Extract: This option allows large data sets to be submitted in the form of extracts. This is particularly useful for institutions with extensive experience and many records on strandings in their own databases. Submitted data are later transferred to the MEDACES database.
- Paper form (MEDACES form.pdf): Stranding data can be entered into a PDF document that has been prepared for this purpose. This option is intended for institutions with limited access to computer facilities.
- MEDACES Form Excel: The MEDACES Excel form allows data to be entered and stored in Excel file format. The Excel file can be sent to MEDACES by email.

In recent years, all data has been submitted in database extract format (.xls). If institutions provide additional information relating to the stranding, it is added as a comment to the MEDACES data form. The basic data included are:

- Species
- Province/State/County
- Locality
- Site of stranding (name of the beach, harbour, etc.)
- Coordinates (latitude, longitude)
- Date
- Sex
- Animal length (cm)
- Stranded alive (status) / Stranded dead (carcass status)
- Necropsy (yes/no?)
- Biological samples collected
- Cause of death
- Human interaction: none/boat collision/fishing gear/intentional/unknown
- Comments

ACCOBAMS members agreed on the rules governing the use and intellectual property of the information in the database, in accordance with the code of ethics (DEONTOLOGICAL CODE):

- MEDACES is an international scientific service related to research and management for the conservation of cetaceans in the Mediterranean Sea. With the support of ACCOBAMS and the UNEP-MAP-SPA/RAC, the Database will cover the whole ACCOBAMS area.
- The SPA/RAC will act as depository and trustee of the database. The SPA/RAC might delegate its management to a public institution of any Mediterranean country.
- The main objective of MEDACES is to gather the basic information of all the cetacean stranding in the Agreement Area.
- The information will be submitted to the database annually by individual contributors or, preferably, through the local stranding networks managers or the National Focal Points of SPA/RAC and ACCOBAMS.
- Each author will have the right to free use of the information submitted by him after submission to the database.

- A report will be periodically published with the information provided to MEDACES, in which all contributors will be listed.
- The public, through an Internet web site, will have access to basic data deposited by researchers of the different states.
- Persons other than contributors will not make use of the data registered to MEDACES for scientific publications, unless permission is given in written by the contributors and MEDACES managers. To safeguard the property of the data, MEDACES will record the contributors of every data. If publishing, the acknowledgment of the data providers and MEDACES with explicit quotation in the publication is required.

2.THE STRANDING DATA

2.1. Collaborating institutions

The MEDACES database currently contains stranding information from the coasts of Albania, Algeria, Bulgaria, Croatia, Cyprus, France, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Morocco, Romania, Slovenia, Spain, Syria, Tunisia, Türkiye and Ukraine.

ALBANIA

Department of Biology-Chemistry, Faculty of Natural Science, University of Shkodra

ALGERIA

Chargee d'Estudes et de Synthèses au Cabinet du Ministre

Laboratorie de Biologie et Pollution Marines (BIOPOLMARINE)

BULGARIA

Green Balkans NGOs

Institute of Fish Resources (IFR)

Regional Inspection from Environment and Water (RIEW)

CROATIA

Faculty of Veteriray Medicine, Uniersity of Zagreb

CYPRUS

Department of Fisheries and Marine Research. Ministry of Agriculture, Natural Resources and Enviroment (DFMR)

FRANCE

Groupe d'Etude des Cetaces de Mediterranee (GECEM)

Miraceti

GREECE

ARION- Cetacean Rescue & Rehabilitation Research Center

Fisheries Research Institute (FRI), National Agricultural Research Foundation (NAGREF)

ISRAEL

Israel Marine Mammals Research and Assistance Center (IMMRAC)

ITALY

Centro Studi Cetacei (CSET)

LEBANON

Centre de Recherches Marines (CNRS)

LIBYA

Faculty of Natural Resources and Environmental Science (FNRES)

Nature Conservation Department, Environment General Authority (EGALIBY)

MALTA

Malta Environment and Planning Authority (MEPA)

MONACO

ACCOBAMS Communication/ Laboratoire Départemental Vétérinaire de Sophia-Antipolis

MOROCCO

Association de Gestion Integree des Ressources (AGIR ENV)

Whale and Dolphin Conservation Society (WDCS)

ROMANIA

MARE NOSTRUM. Organizatia Ecologista Neguvernamentala

National Institute for Marine Research and Development Grigore Antipa (NIMRD)

SLOVENIA

Marine Mammal Reseach and Conservation Society (Morigenos)

SPAIN

División para la Protección del Mar. D.G. Sostenibilidad de la Costa y del Mar Ministerio de Agricultura, Alimentación y Medio Ambiente, Spain. Data from:

AMBAR ELKARTEA

Asociación EQUINAC

Centro de Conservación del Medio Marino (CREMA)

Centro de Gestión del Medio Marino Andaluz (CEGMA)

Centro de Recuperacion de Fauna Silvestre El Valle de la región de Murcia (CRFS)

Colegio Oficial de Farmacéuticos de las Islas Baleares (COFIB)

Consejería de Medio Rural y Política Agraria Asturias

Coordinación para el Estudio de los Mamíferos Marinos (CEMMA)

Coordinadora para el Estudio y la Protección de las Especies (CEPESMA)

CREM Ibiza

Fundació per a la Conservació i Recuperació d'Animals Marins (CRAM)

Fundación Aspro Natura

Fundación para la Protección de Cetáceos Atlánticos (FUOASTUR), Universidad de Oviedo

Consellería de Medio Ambiente y Cambio Climático Xunta de Galicia

Consejería Medio Ambiente Illes Balears

Generalitat Valenciana (GVA)

Gobierno de la Comunidad Autónoma de la Región de Murcia (CARM)

Gobierno del Principado de Asturias

Instituto de Estudios Ceutíes (IEC)

Palma Aquarium Baleares

Parque Nacional de Doñana

Programa de Gestión Sostenible del Medio Marino Andaluz (PGSMMA)

Servicio Fauna Silvestre Cantabria. Gobierno de Cantabria

Universidad del Pais Vasco

Universitat de Valencia

Xarxa de Rescat de Fauna Marina (XRFM). Generalitat de Catalunya

SYRIA

Biodiversity and Protected Areas Directorate. Ministry of Local Administration and Environment

TUNISIA

Institut National des Sciences et Technologie de la Mer (INSTM)

Türkiye

Turkish Marine Research Foundation (TUDAV)

UKRAINE

BREMA Laboratory

Ukranian Scientific Center of Ecology of Sea (UkrSCES)

2.2. Stranding data Numbers

2.2.1. Total data in MEDACES / Contribution of each collaborating country

Almost all Mediterranean countries and Black Sea coastal regions have contributed to the database to date (see Tables 1 and 2). The database contains information on strandings dating back to 1941 (from Tunisia). In total, data from 25,498 strandings are registered in the MEDACES database.

Table 1. List of countries contributing to MEDACES, period (years) and number of stranding records included.

	PERIOD		NUMBER OF STRANDING DATA	
COUNTRY	**YEAR BEGINING**	**YEAR END**	**LAST REPORT**	**THIS REPORT**
Albania			2	2
Algeria	1975	2016	240	240
Bulgaria	2009	2023	210	1,400
Croatia	1990	2013	290	290
Cyprus	1999	2015	49	49
Egypt				
France	1968	2023	2,474	3,113
Georgia				
Greece	1944	2006	1,186	1,186
Israel	1993	2019	236	285
Italy	1997	2008	1,112	1,112
Lebanon		2013	3	3
Libya	2009	2013	5	5
Malta		2015		7
Monaco	1989	2008	7	7
Montenegro				
Morocco	2005	2017	1	2
Portugal				
Romania	2002	2022	973	1,727
Slovenia	2005	2008	4	4
Spain	1960	2024	10,304	14,452
Syria			1	1
Tunisia	1941	2015	194	193
Türkiye	2000	2008	5	5
Ukraine	1980	2017	1,251	1,415
TOTAL			18,556	25,498

The countries with the highest number of submitted records are Bulgaria, France, Greece, Italy, Romania, Spain and Ukraine. However, only few countries have updated their records in recent

years, including Bulgaria, France, Israel, Romania, Ukraine and Spain. Countries with a high number of records in the past are no longer updating them, such as Croatia, Italy and Greece.

Updating the data for all countries would provide a clearer picture of stranding patterns in the Mediterranean. However, must have into account that the number of strandings depends on various factors, including the length of the coastline, the size of cetacean populations in adjacent waters, and the effectiveness of existing stranding networks, etc. The economic and political situation in some Mediterranean countries makes establishing a national stranding network very difficult. This hinders data collection and subsequent reporting to MEDACES.

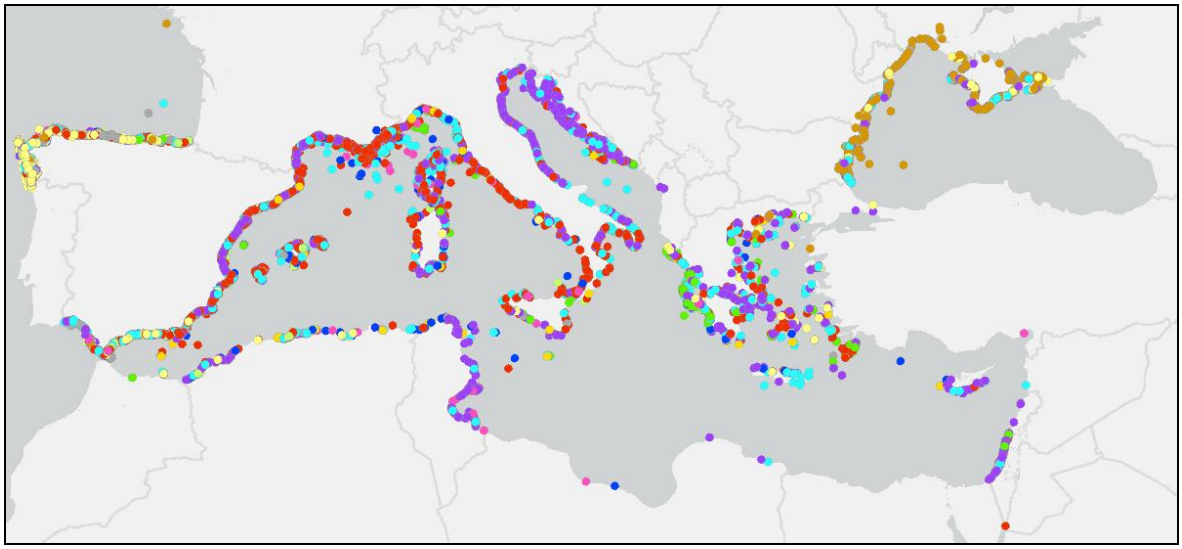

Figure 2. Cetacean stranding located along the Mediterranean and Black Sea coast using the data collected so far.

2.2.2. Stranding species and numbers

Stranding data from MEDACES are consistent with the available information about the distribution of cetacean species in the Mediterranean and Black Seas (Notarbartolo and Birkum, 2010, Notarbartolo di Sciara, 2002 and references therein), being the more frequent species at sea are the species with higher number of strandings (Figure 3).

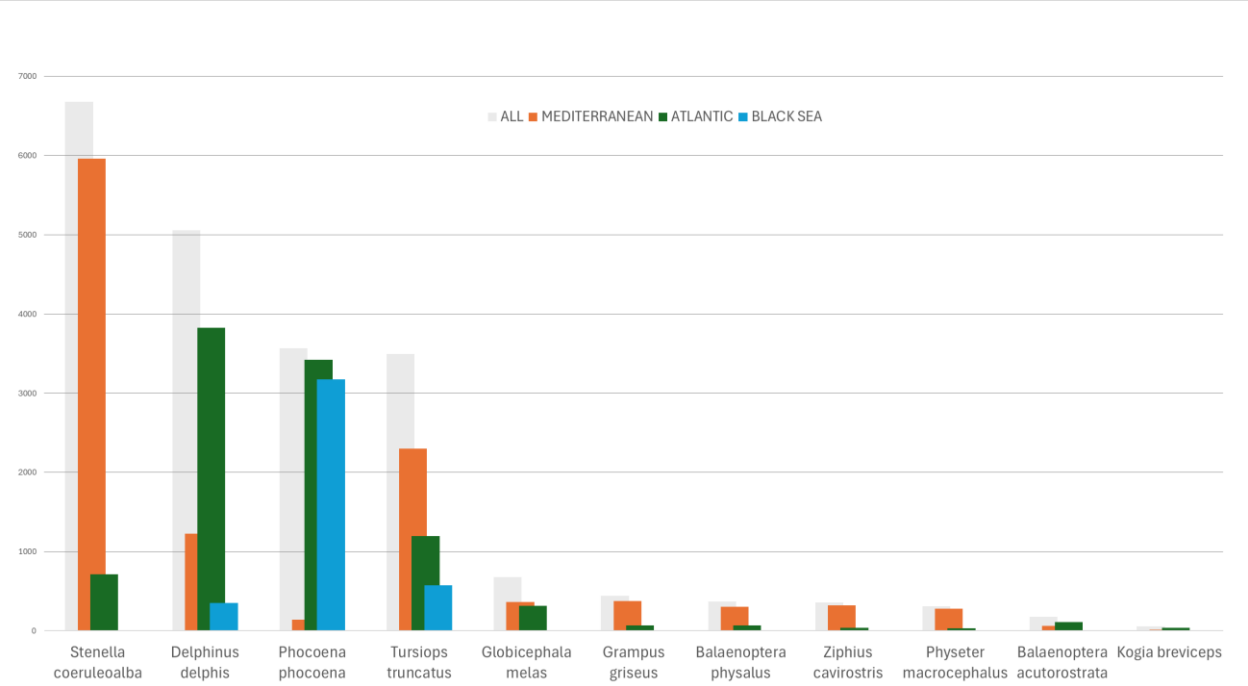

Figure 3. Number of strandings of the most frequent cetacean species recorded in MEDACES database along the coasts of all the riparian countries of the Mediterranean and Black Seas. Reports have been divided in Atlantic, Mediterranean and Black Sea strandings.

The MEDACES database includes information on 31 species of cetacean. 10 of these species are common and have been recorded over several years and in several countries. The other species have only stranded on a few occasions. The Black Sea is home to three endemic subspecies of small odontocetes (Birkun, 2008b; Notarbartolo di Sciara & Tonay, 2021; Ben Chehida et al., 2020; Paiau et al. 2024). The cetacean species present in the MEDACES database are listed in Table 2.

Table 2. Cetacean Species included in MEDACES.

SCIENTIFIC NAME	COMMON NAME	NUMBER OF REGISTERS
Balaenoptera acutorostrata	minke whale	174
Balaenoptera borealis	sei whale	2
Balaenoptera edeni	Bryde's whale	1
Balaenoptera musculus	blue whale	2
Balaenoptera physalus	fin whale	373
Delphinus capensis	long-beaked common dolphin	1
Delphinus delphis	short-beaked common dolphin	5061
Eschrichtius robustus	Gray Whale	2
Globicephala macrorhynchus	long-finned pilot Whale	28
Globicephala melas	short-finned pilot whale	678
Grampus griseus	Risso's dolphin	443
Hyperoodon ampullatus	Northern bottlenose whales	2
Kogia breviceps	pygmy sperm whale	43
Kogia sima	dwarf sperm whale	8
Lagenodolphis hosei	Fraser's dolphin	2
Lagenorhynchus acutus	Atlantic white-sided dolphin	4
Lagenorhynchus albirostris	White-beaked dolphin	1
Megaptera novaeangliae	humpback whale	25
Mesoplodon bidens	Sowerby's beaked whale	8
Mesoplodon densirostris	Blainville's beaked whale	6
Mesoplodon europaeus	Gervais' beaked whale	4
Mesoplodon mirus	True's beaked whale	13
Orcinus orca	killer whale	5
Phocoena phocoena	harbour porpoise	3566
Physeter macrocephalus	sperm whale	307
Pseudorca crassidens	false killer whale	22
Stenella clymene	Clymene dolphin	2
Stenella coeruleoalba	striped dolphin	6709
Steno bredanensis	rough-toothed dolphin	17
Tursiops truncatus	common bottlenose dolphin	3498
Ziphius cavirostris	Cuvier's beaked whale	359

MEDACES includes records of other marine mammal species that do not belong to the order Cetacea, such as four species of pinnipeds and one species of Mustelidae, shown in Table 3. These species are not common in the Mediterranean, but sporadic sightings have been recorded thanks to the stranding networks that work with cetaceans and, therefore, they also appear in MEDACES.

Table 3. Pinniped Species included in MEDACES.

SCIENTIFIC NAME	COMMON NAME
Cystophora cristata	hooded seal
Halichoerus grypus	gray seal
Lutra lutra	otter
Odobenus rosmarus	walrus
Phoca vitulina	harbour seals

Overall, the most frequently recorded species are the striped dolphin, which is particularly high in Mediterranean countries. It is also the most frequently observed species at sea (Raga & Pantoja, 2004; Notarbartolo & Birkun, 2010). Furthermore, the two morbillivirus epizootic episodes that occurred in 1990 and 2007 especially affected striped dolphin populations in Spain, France and Italy (Aguilar & Raga, 1993; Di Guardo et al., 1992; Domingo et al., 1995; Raga et al., 2008; Soto et al. 2011; Van Bressem et al., 1993; Cebrian, 1995), which increased the number of strandings in those years.

The short-beaked common dolphin and the harbour porpoise are the species that are most frequently stranded on the Atlantic coast, followed by the common bottlenose dolphin.

In the Black Sea, three species of cetacean: *D. delphis ponticus, T. truncatus aduncus* and *P. phocoena relicta*, have been reported in Bulgaria, Romania and Ukraine.

2.2.3. Distribution of the stranded species

Cetacean species

The distribution of strandings varies among different cetacean species. An analysis of the available data sets reveals distinct patterns of distribution along the Mediterranean coast (see maps and heat maps in Figures 6 and 7). For instance, strandings of *S. coeruleoalba* are more abundant in the Western Mediterranean, whereas those of D. *delphis* is distributed mainly in the Alboran Sea and the Hellenic Republic. The species G. melas has been found to be predominantly located in the Atlantic coastal regions and the south-eastern regions of Spain. Other species, including T. truncatus and G. griseus, are distributed along the Mediterranean coast.

Occasional strandings of other species have been reported in the Mediterranean Sea. These include Sowerby's beaked whale (*Mesoplodon bidens*), humpback whale (Megaptera novaeangliae), killer whale (Orcinus orca), false killer whale (*Pseudorca crassidens*), dwarf sperm whale (*Kogia sima*), pygmy sperm whale (Kogia breviceps) and Blainville's beaked whale (Mesoplodon densirostris). The stranding of rough-toothed dolphins (*Steno bredanensis*) is an infrequent occurrence within the Mediterranean basin. However, a concentration of strandings in the Eastern Mediterranean has been observed, as evidenced by the documented cases in Israel (see Kerem et al. 2016).

The adjacent Atlantic waters (i.e. the Atlantic coast of Spain) have been documented as a site of stranding for a variety of species typically associated with the Atlantic Ocean. These include minke whale (*Balaenoptera acutorostrata*), harbour porpoise (*Phocoena phocoena*), short-beaked common dolphin (*Delphinus delphis*), short-finned pilot whale (*Globicephala macrorhyncus*), and numerous species of ziphiids.

Regarding the Black Sea (for which data from Bulgaria, Romania, and Ukraine is available), three species of cetacean have been reported: *D. delphis ponticus*, *T. truncatus aduncus* and *P. phocoena relicta* (see Figure 5). The latter species is the most frequently stranded in this region. It is noteworthy that strandings of this species have also been recorded in the Mediterranean waters adjacent to the Black Sea, particularly in the northern Greek region.

Figure 4. Strandings of *Balaenoptera acutorostrata* recorded in MEDACES database.

Figure 5. Strandings of *Balaenoptera borealis* recorded in MEDACES database.

Figure 6. Strandings of *Balaenoptera edeni* recorded in MEDACES database.

Figure 7. Strandings of *Balaenoptera musculus* recorded in MEDACES database.

Figure 8. Strandings of *Balaenoptera physalus* recorded in MEDACES database.

Figure 9. Strandings of *Delphinus capensis* recorded in MEDACES database.

Figure 10. Strandings of *Delphinus delphis* recorded in MEDACES database.

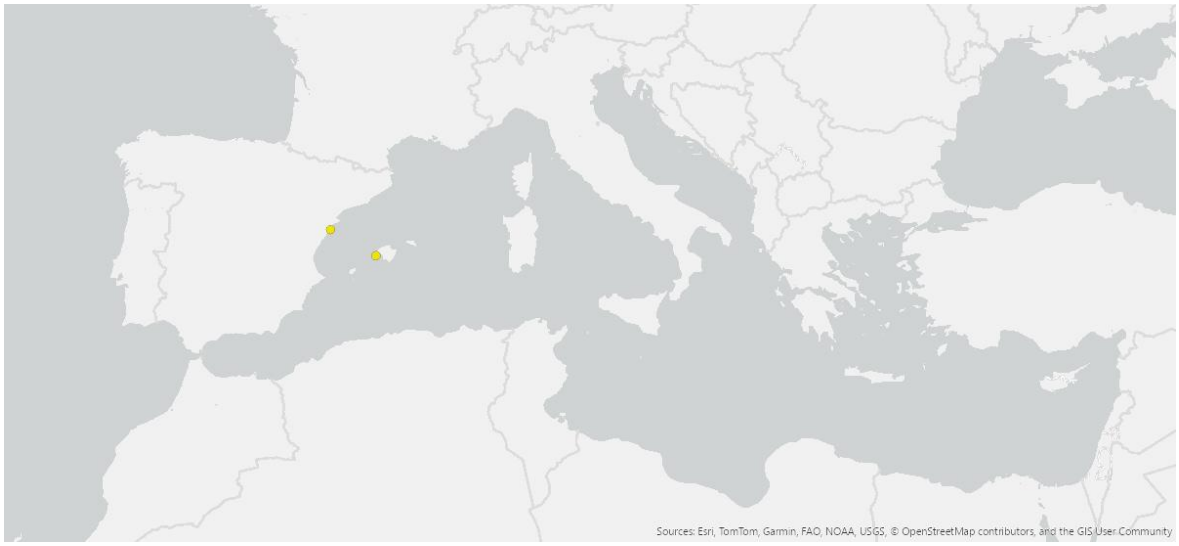

Figure 11. Strandings of *Eschrichtius robustus* recorded in MEDACES database.

Figure 12. Strandings of *Globicephala macrorhynchus* recorded in MEDACES database.

Figure 13. Strandings of *Globicephala melas* recorded in MEDACES database.

Figure 14. Strandings of *Grampus griseus* recorded in MEDACES database.

Figure 15. Strandings of *Hyperoodon ampullatus* recorded in MEDACES database.

Figure 16. Strandings of *Kogia breviceps* recorded in MEDACES database.

Figure 17. Strandings of *Kogia sima* recorded in MEDACES database.

Figure 18. Strandings of *Lagenodolphis hosei* recorded in MEDACES database.

Figure 19. Strandings of *Lagenorhynchus acutus* recorded in MEDACES database.

Figure 20. Strandings of *Megaptera novaeangliae* recorded in MEDACES database.

Figure 21. Strandings of *Mesoplodon bidens* recorded in MEDACES database.

Figure 22. Strandings of *Mesoplodon densirostris* recorded in MEDACES database.

Figure 23. Strandings of *Mesoplodon europaeus* recorded in MEDACES database.

Figure 24. Strandings of *Mesoplodon mirus* recorded in MEDACES database.

Figure 25. Strandings of Orcinus orca recorded in MEDACES database.

Figure 26. Strandings of *Phocoena phocoena* recorded in MEDACES database.

Figure 27. Strandings of *Physeter macrocephalus* recorded in MEDACES database.

Figure 28. Strandings of *Pseudorca crassidens* recorded in MEDACES database.

Figure 29. Strandings of *Stenella clymene* recorded in MEDACES database.

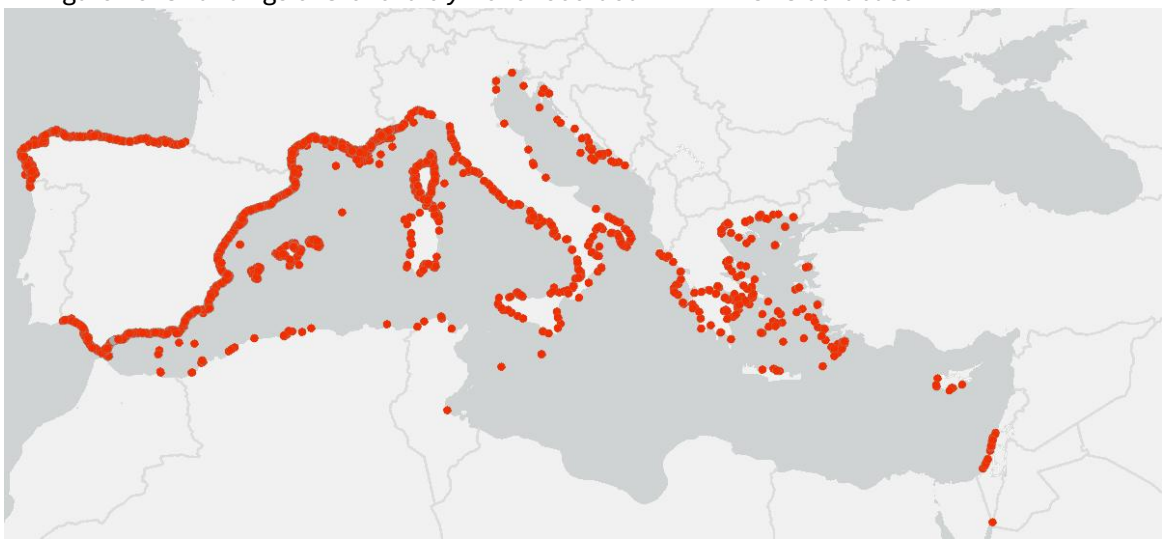

Figure 30. Strandings of *Stenella coeruleoalba* recorded in MEDACES database.

Figure 31. Strandings of *Steno bredanensis* recorded in MEDACES database.

Figure 32. Strandings of *Tursiops truncates* recorded in MEDACES database.

Figure 33. Strandings of *Ziphius cavirostris* recorded in MEDACES database

Other species

Distribution maps of other marine mammals are shown below.

Figure 34. Strandings of *Cystophora cristata* recorded in MEDACES database.

Figure 35. Strandings of *Halichoerus grypus* recorded in MEDACES database.

Figure 36. Strandings of *Lutra lutra* recorded in MEDACES database.

Figure 37. Strandings of *Odobenus rosmarus* recorded in MEDACES database.

Figure 38. Strandings of *Phoca vitulina* recorded in MEDACES database

2.2.4 Heat density maps for the most frequent cetacean species

Heat maps provide a clear and efficient way to visualize complex data by using color to represent values. They enable quick identification of patterns, trends, and anomalies, supporting more informed and data-driven decisions across various strandings patterns.

Below are the heat maps for the most abundant species.

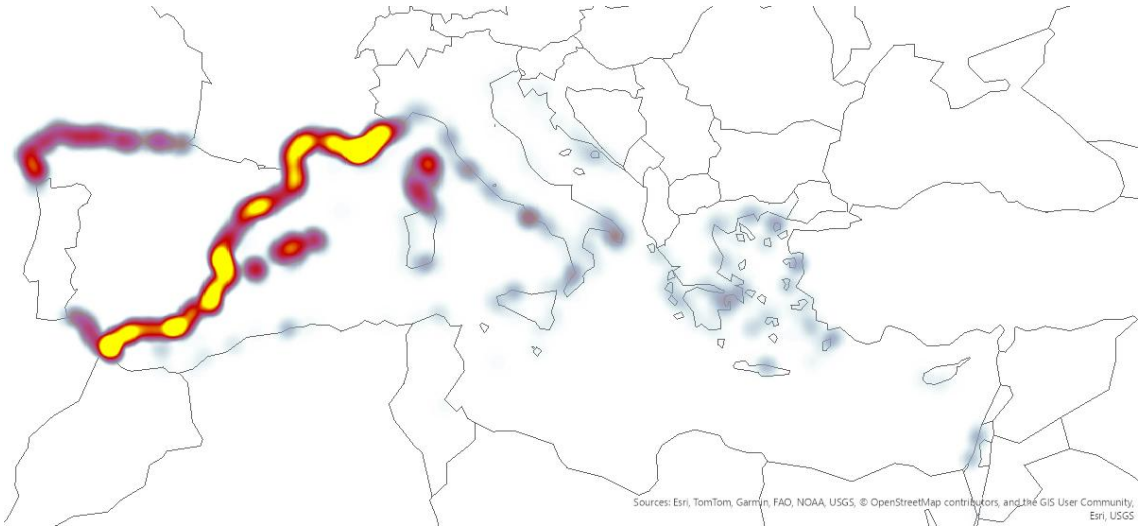

Figure 39. Heat map of strandings of *Stenella coerulealba* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

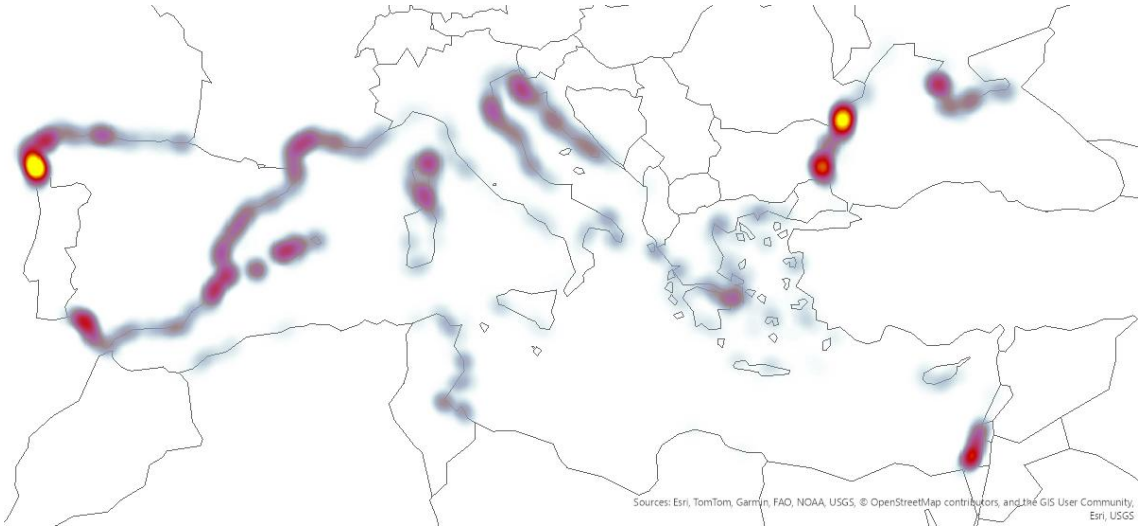

Figure 40. Heat map of strandings of *Tursiops truncatus* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

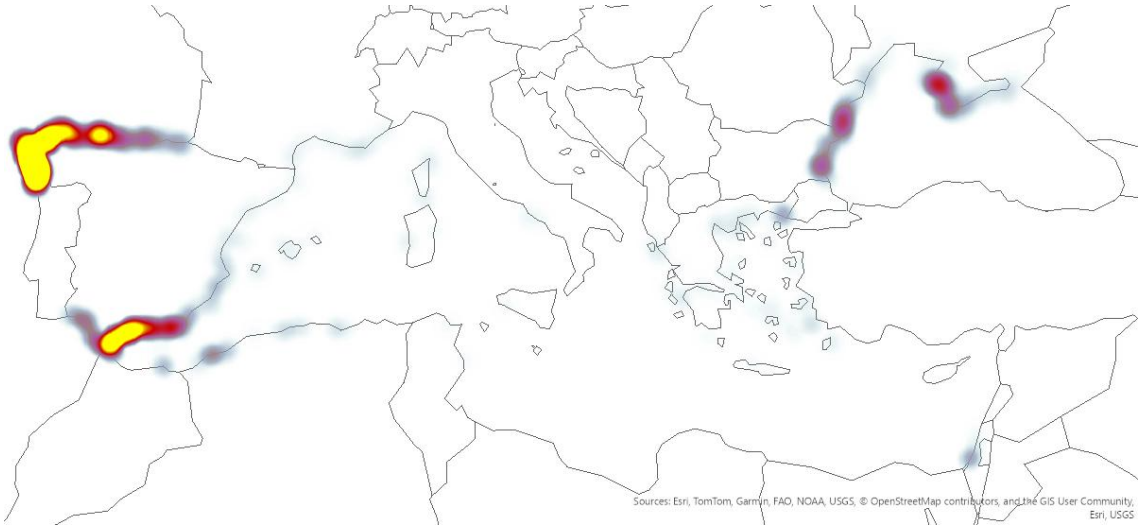

Figure 41. Heat map of strandings of *Delphinus delphis* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

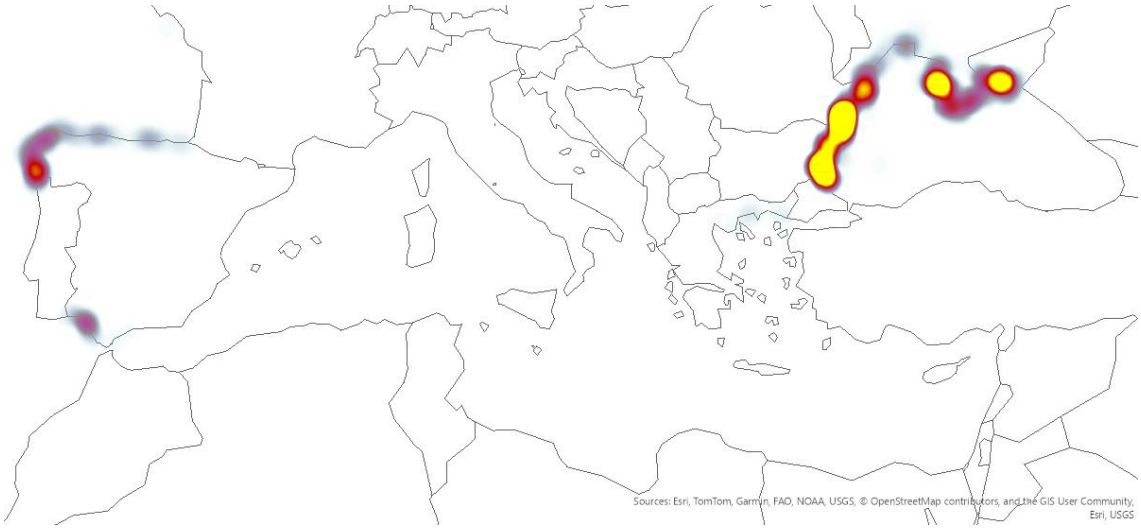

Figure 42. Heat map of strandings of Phocoena phocoena recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

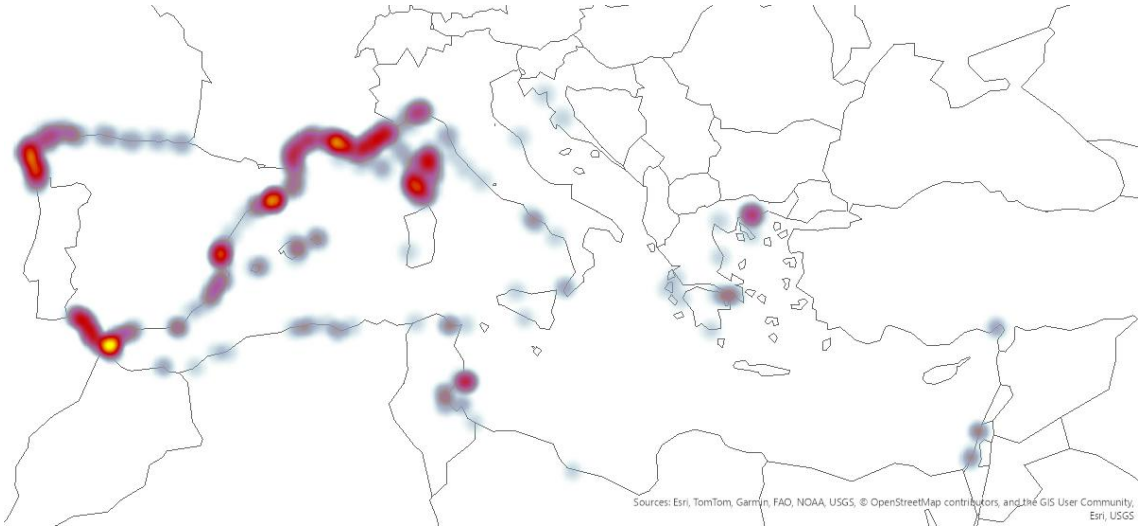

Figure 43. Heat map of strandings of *Balaenoptera physalus* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

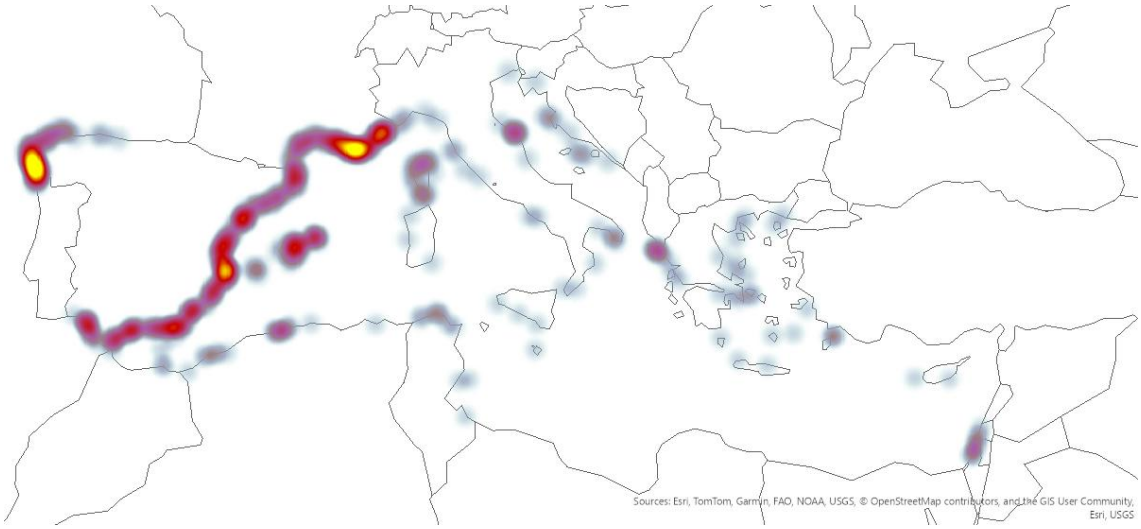

Figure 44. Heat map of strandings of *Grampus griseus* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

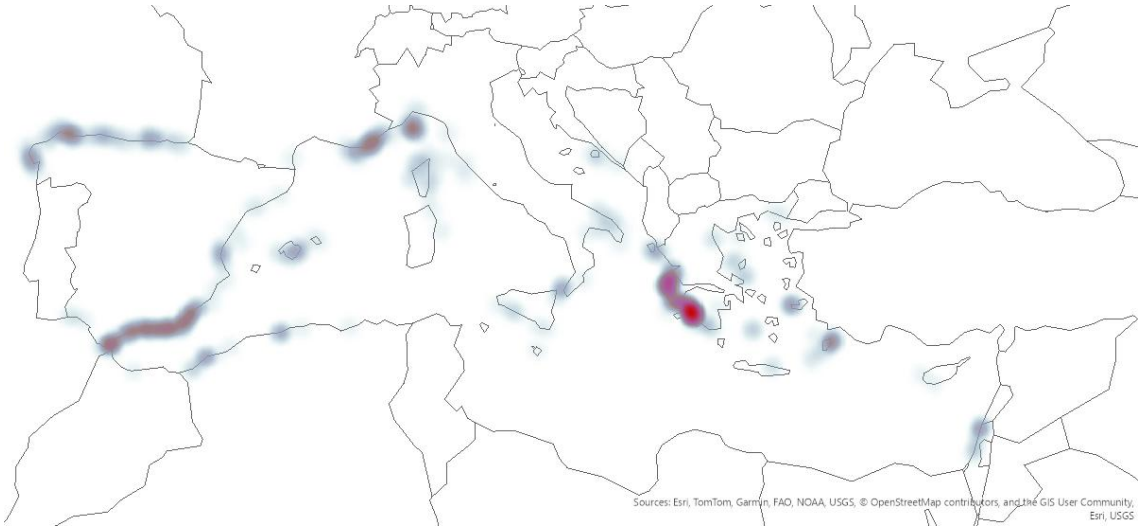

Figure 45. Heat map of strandings of *Ziphius cavirostris* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

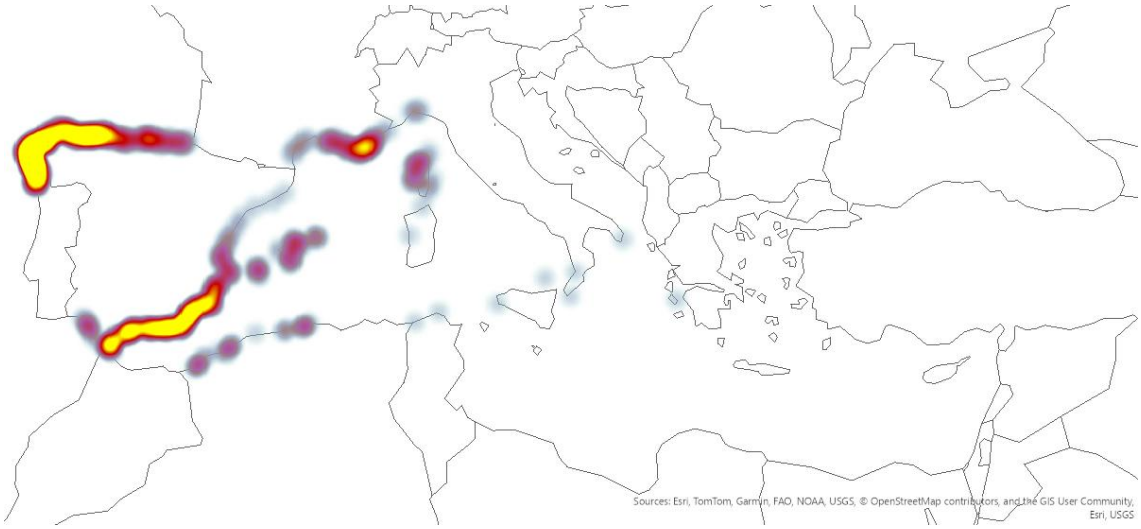

Figure 46. Heat map of strandings of *Globicephala melas* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

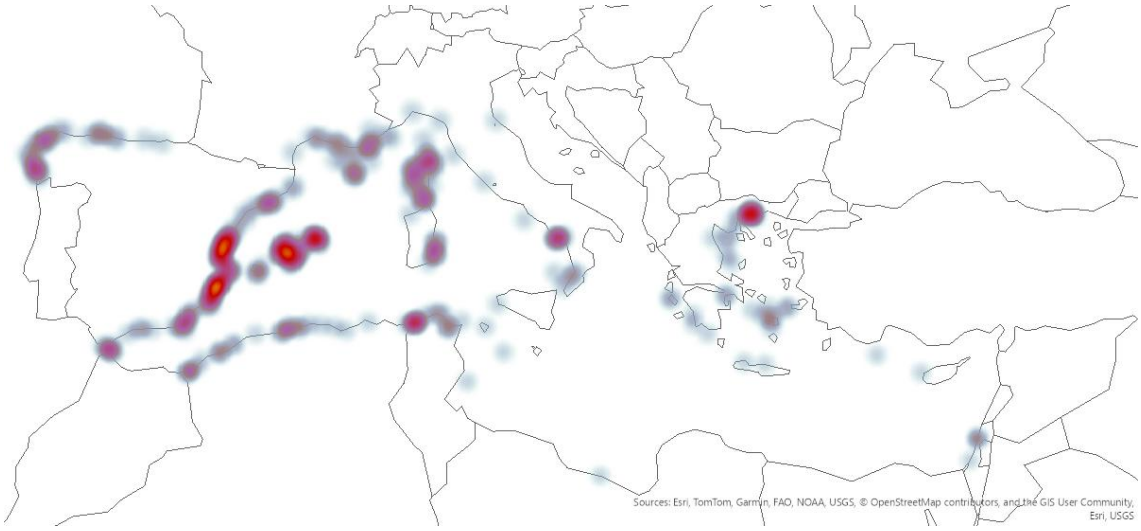

Figure 47. Heat map of strandings of *Physeter macrocephalus* recorded in MEDACES database. Higher probability of stranded in yellow, and lower in dark grey.

2.2.5. Stranding rate

MEDACES would play a key role in identifying changes in the rate of cetacean strandings in the Mediterranean and Black Seas over time. However, this will only be possible if the database is continuously updated with the latest information. To date, MEDACES has not been able to demonstrate general trends in the number of strandings due to gaps in the available information. Only a few countries appear to have comprehensive records of strandings from 1990 to 2022 in the Mediterranean and Black Seas. The stranding trends for countries in the Mediterranean and Black Sea regions are shown below.

Figure 48. Trends in strandings of the six most common species in France and Spain.

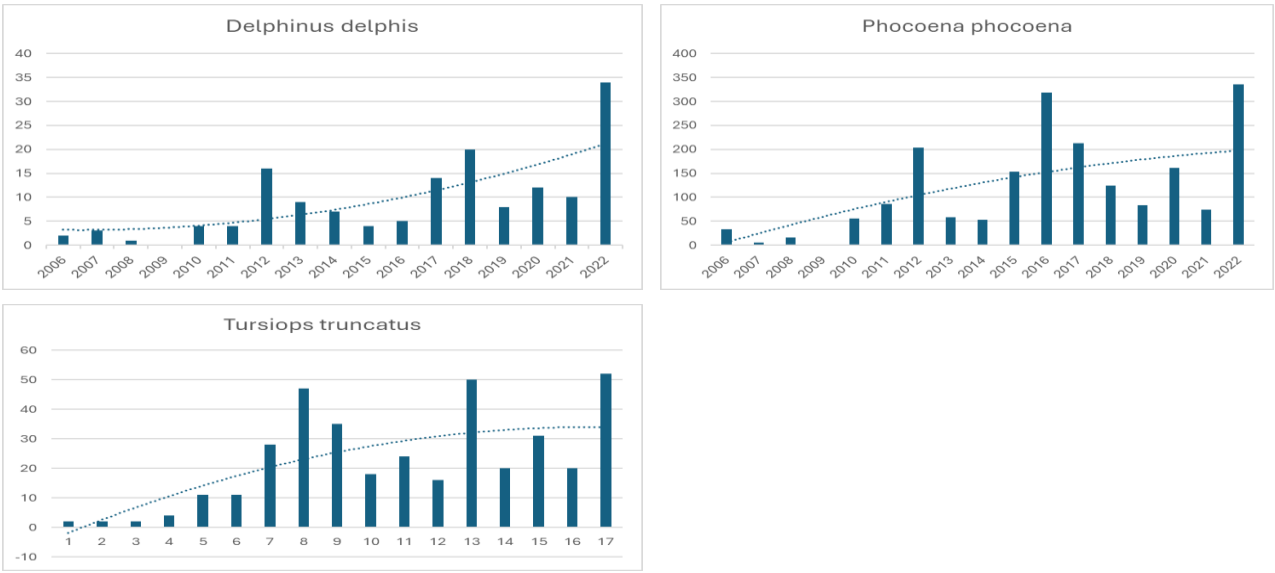

Figure 49. Trends in strandings of the common species in Bulgaria and Romania coast.

These graphs illustrate the stranding patterns of the most abundant species of cetacean in regions where continuous records have been updated:

•These patterns demonstrate that changes in the rate of strandings is different for each species (see bottlenose dolphin and striped dolphin, p.e), which may be due to changes in distribution or population size, or to different mortality rates (for example, due to disease or human activity), among other factors. This shows the usefulness of stranding data for investigating changes in cetacean populations.

•The number of striped dolphins stranded was significantly higher in 2007 and 2008 due to Morbillivirus-related mortality. This number has since decreased and reached pre-2007 levels (Raga et al., 2008). Two further peaks can be seen in the graphs, in 2003 and 2011 (Soto et al., 2011; Rubio-Guerri et al., 2012).

•The number of strandings of common dolphins and harbour porpoises varies significantly over the years. High number of harbour porpoises (1,525) were registered stranded in the Black Sea A large proportion of these strandings are associated with bycatch of these two species in the Black Sea (Tonay, 2016) and in Galician waters (Goetz et al., 2014). Harbour porpoises were affected by morbillivirus (Müller et al., 2002), the same virus that previously affected common dolphins in the Black Sea (Birkun, 1999). As the bycatch data does not reflect the biological factors, these should be considered independently of the stranding data. In any case, special attention should be paid to this fact.

3. MEDACES DATA IN SCIENTIFIC PAPERS

The Mediterranean Cetacean Strandings Database (MEDACES) has become a key resource for scientific research on cetaceans in the Mediterranean Sea. MEDACES facilitates the provision of comprehensive and standardised stranding records from multiple countries, allowing researchers to conduct robust analyses of species distribution, population dynamics and mortality patterns. The database has supported numerous peer-reviewed studies addressing threats such as bycatch, pollution and ship strikes, and has helped identify key habitats and seasonal hotspots for cetaceans. In addition, MEDACES' centralisation of data fosters collaborative research across the region, facilitating meta-analyses and comparative studies that inform conservation strategies. Its contribution to the scientific literature serves to strengthen evidence-based decision-making processes for the management and protection of Mediterranean cetacean populations.

The most relevant references to the use of MEDACES found in the scientific literature are listed below:

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4. COMMENTS AND RECOMMENDATIONS

The database contains basic information on cetacean strandings occurred in ACCOBAMS riparian countries. It also contains information about organisations and institutions collaborating with MEDACES, including their contact details. Therefore, although submitted data are protected by a Deontological Code, MEDACES makes cetacean stranding information available to anyone interested in cetaceans.

The MEDACES website plays a crucial role in achieving the following objectives:

1) collecting stranding information on cetaceans from all collaborating countries in a single database.
2) providing access to information collected on each stranded animal.
(3) facilitating contact between individuals and organisations working on cetacean biology and conservation in the Mediterranean and Black Seas.

Previous MEDACES revisions have demonstrated the usefulness of the system in retrieving information on the geolocation of these strandings (see Sixth Meeting of the Parties to ACCOBAMS, Monaco, 22–25 November 2016). As previously mentioned, the Mediterranean Cetacean Strandings Database has become a vital resource for scientific research on cetaceans in the Mediterranean Sea. The centralisation of data by MEDACES facilitates collaborative research across the region, enabling meta-analyses and comparative studies. Its contribution to the scientific literature strengthens evidence-based decision-making processes for the management and protection of Mediterranean cetacean populations.

MEDACES provides scientists and competent government officials from riparian countries with the opportunity to establish emergency protocols in anticipation of a possible die-off. Additionally, standardised methods for necropsies and tissue sampling, as well as coordination procedures, can be established. MEDACES also provides contact information for relevant scientists and institutions, enabling the rapid and straightforward exchange of knowledge and advice.

This review highlights the importance of keeping MEDACES updated. Therefore, the following recommendations are included:

1) Run efficient awareness campaigns for Focal Points and scientific communities.
2) Encourage countries around the Mediterranean and Black Seas to collaborate with the database.
3) Support national organisations and institutions working in stranding networks.
4) Assign a MEDACES coordinator to request data from National Focal Points annually.
5) Direct access to MEDACES via the ACCOBAMS website.
6) Encourage the idea of a citizen participation study in stranding networks.

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