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And

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

Progress Report 2016 on the Mediterranean Database of Cetacean Strandings
(MEDACES)



MEDACES

Mediterranean Database of Cetacean Strandings

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Title of the report

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- Institute of Fish Resources, Varna, Bulgaria
- Institut National des Sciences et Technologies de la Mer – INSTM, Sfax, Tunisia
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Centro Studi Cetacei, Italy
- Brema Laboratory. Simferopol, Ukraine
- Italian Stranding on-line Database (BDS), Italy
- The Mediterranean Marine Mammals Tissue Bank, Italy
- Department of Biology-Chemistry, Faculty of Natural science, University of Shkodra. Albania

- University of Oran Es Senia, Algeria
- Centre de Recherche sur les Mammifères Marins de la Rochelle (CRMM) ; Groupe d'Etude des Cétacés de Méditerranée, France
- ARION-Cetacean Rescue & Rehabilitation Research Centre, Greece
- Israel Marine Mammals Research and Assistance Center (IMMRAC), Israel
- Marine Conservation, Nature Conservation Department, Environment General Authority, Libya
- ACCOBAMS, Monaco
- "Naturalist group Guelaya", Morocco
- National Institute for Marine Research and Development "Grigore Antipa", Romania
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- AMBAR ELKARTEA (País Vasco), Aula del Mar de Málaga (Andalucía); Centro de Recuperación de Fauna Silvestre "El Valle" (Murcia); Conselleria d'Agricultura i Pesca del Govern de les Illes Balears; Consejería de Medio Ambiente de la Ciudad Autónoma de Ceuta; Consejería de Medio Ambiente (Melilla); CRAM - Fundació per a la Conservació i Recuperació d'Animals Marins; Conselleria de Medio Ambiente de las Comunidad Valenciana, GRAMPUS (Colectivo para el Estudio y Conservación del Medio Marino, Huelva); Guardia Civil de Melilla; Sociedad Española de Cetáceos, CREMA, CEMMA, CEPESMA, UV (Spain)
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1. INTRODUCTION: THE MEDACES PROJECT

1.1. Origin and history of MEDACES

Cetacean strandings represent an important tool for the development of scientific programs on cetacean conservation. The occurrence of stranded dolphins and whales provides an invaluable opportunity to gain insight on aspects of their population biology, as well as to investigate causes of natural or anthropogenic mortality that will help to assess the impact of potential threats. Altogether, these data can be used to determine the health status of cetacean populations and to identify conservation problems and reveal unusual mass mortality episodes (Geraci and Lounsbury 2005; Peltier et al. 2009).

Stranding networks have been developed over the last decades in countries concerned about cetacean conservation. The establishment of these stranding networks with centralized databases has facilitated the collection and dissemination of relevant information on these marine vertebrates and their conservation status.

According to the recommendations listed on Annex VII of the 11th Ordinary Meeting of the Contracting Parties of the Barcelona Convention and its Protocols of the Mediterranean Action Plan, UNEP (Malta, 27-30 October 1999), related to the ulterior implementation of the Action Plan for Cetacean Conservation in the Mediterranean Sea and other initiatives, the co-ordination of the information of stranded cetaceans on the coast of the Mediterranean countries is required for a better knowledge of cetaceans and their eventual protection and conservation.

In November 2001, the 12th Ordinary Meeting of the Contracting Parties to the Convention for the Protection of the Mediterranean Sea against Pollution and its Protocols, within the "Biological Diversity and Specially Protected Areas" section, recommended the implementation of an Action Plan for the Conservation of Cetaceans in the Mediterranean Sea, to approve the offer made by Spain with regards to the establishment in Valencia of a Mediterranean database on cetacean strandings (MEDACES). The Regional Activity Centre for Specially Protected Areas (**RAC/SPA**) is the depository of the database, whose management is entrusted to the University of Valencia's Cavanilles Institute of Biodiversity and Evolutionary Biology (ICBIBE), with the initial financial support of the Spanish Ministry of Agriculture and Fisheries, Food and Environment (**MAGRAMA**) and later supported exclusively by RAC

SPA. In 2016, MEDACES was supported by RAC-SPA and ACCOBAMS. This database strictly adheres to a deontological code.

The Mediterranean Database of Cetacean Strandings has been expanded to cover regions adjacent to the Mediterranean, i.e. the Black Sea and the contiguous Atlantic waters, as defined in the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (**ACCOBAMS**).

1.2. MEDACES Database and web-page

The information of every stranding record is stored in different, related tables. The main table of the database, Cetacean, contains the basic information, and the geographical location of the stranding. The tables related to this entity contain the basic information which includes the institution sending the data, the cetacean species, body measurements, etc. The advanced data contains information on the organs and samples taken and preserved for different types of life-history studies (toxicology, histology, reproductive state, feeding ecology and diet based on digestive contents, etc.).

MEDACES is managed as a geodatabase (*Geographic database*), of the ArcGis™ family from ESRI®, using the Microsoft Access software. The geodatabase represents the geographical data of the strandings, being possible to get the location of any event in a map. MEDACES keeps the information sent by the collaborating institutions regarding to the strandings in a relational database.

The MEDACES web-page provides information about the MEDACES project and the collaborating institutions. Moreover, the web-page allows downloads which give users access to forms that help to submit stranding data to the MEDACES database. The MEDACES web-page has two specific tools that are accessible for users: (1) the searching of information related to the strandings. The search tool contains different criteria by species, sex, date, country, province and locality. The output is a printable list of records fulfilling the search criteria. Moreover, by clicking the number of the report, all the information of a stranding on the list is available. and (2) the stranding distribution on maps.

MEDACES database and its web-page (<http://medaces.uv.es>) are both operational. Nevertheless, the geodatabase server is not operational, and the data shown through

the MEDACES webpage, although georeferenced, cannot be seen through the interface of the map. Georeferenced data can be provided via e-mail if this is required by a MEDACES user.



Figure 1. Map showing the ACCOBAMS Agreement Area

1.3. Obtaining the data

In December 2015, RAC-SPA formally contacted to the National Focal Points of each country in order to ask for the stranding data. Stranding data has been sent to MEDACES by national stranding networks, national authorities, research and conservations institutions as well as RAC-SPA and ACCOBAMS. MEDACES provides in the web page three different options to facilitate the gathering of stranding data from the different institutions:

- Database Extract: The *Database Extract* option allows submission of extracts of large data sets. This is especially relevant for institutions with an extended experience and large amount of records on strandings in their own databases. Submitted data are later transferred to the MEDACES database.
- Paper Form (MEDACES form.pdf): Stranding data can also be filled into a paper copy of a PDF document prepared. This possibility is aimed for institutions with limited access to computer facilities.
- MEDACES Form Excel: The *MEDACES Form Excel* option allows data to be filled in and stored in excel file format. The excel file can be sent to MEDACES by e-mail or by ordinary post.

In the last years, all data has been submitted in database extract (xls.) In fact, since 2009, MEDACES database contains the basic information of each stranding. No advanced information is filled now. In the case that the institutions give extra information associated to the stranding, it is added as a comment in 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

2. THE STRANDING DATA

1.Data included in MEDACES since last report (2015).

- ALGERIA. Chargee d'Estudes et de Synthèses au Cabinet du Ministre. Ministre de l'Agriculture, du Développement rural et de le Pêche
- BULGARIA. Green Balkans NGOs
- CYPRUS. Fisheries and Marine Research Officer. Ministry of Agriculture, Natural Resources and Environment.
- FRANCE. Centre de Recherche sur les Mammifères Marins de la Rochelle (CRMM)
- ISRAEL. Israel Marine Mammals Research and Assistance Center. The Recanati Institute for Maritime Studies. University of Haifa
- ROMANIA. Mare Nostrum. Organizatia Ecologista Neguvernamentala.
- SPAIN. División para la Protección del Mar. D.G. Sostenibilidad de la Costa y del Mar. Ministerio de Agricultura, Alimentación y Medio Ambiente.
- TUNISIA. Institut National des Sciences et Technologies de la Mer (INSTM), Sfax.

2.1. Collaborating institutions

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

The following institutions have collaborated with their stranding data:

Albania

- Department of Biology-Chemistry, Faculty of Natural science, University of Shkodra (Denik Ulqini)

Algeria

- University of Oran Es Senia (Data provided by Regional Activity Centre for Specially Protected Areas (RAC/SPA))
- Chargee d'Estudes et de Synthèses au Cabinet du Ministre. Ministre de l'Agriculture, du Développement rural et de le Pêche

Bulgaria

- Institute of Fish Resources (Varna)
- Green Balkans NGOs

Cyprus

- Fisheries and Marine Research Officer. Ministry of Agriculture, Natural Resources and Environment. Department of Fisheries and Marine Research. Nicosia

Croatia

- Blue World Institute of Marine Research and Conservation
- Faculty of Veterinary Medicine, University of Zagreb
- State Institute for Nature Protection (SINP)

France

- Groupe d'Etude des Cétacés de Méditerranée (Marseille)
- Centre de Recherche sur les Mammifères Marins de la Rochelle (CRMM)

Greece

- ARION-Cetacean Rescue & Rehabilitation Research Centre (Petroupolis)
- Environmental Research Bureau (Milos)
- Fisheries Research Institute, National Agricultural Research Foundation (Kavala)
- Hellenic Centre for Marine Research

Italy

- Museo di Storia Naturale di Milano and Dipartimento di Biologia Animale Università degli Studi di Pavia. Italy.
- Centro Studi Cetacei
- Museo di Storia Naturale di Milano
- Italian Stranding on-line Database (BDS)

Israel

- Israel Marine Mammals Research and Assistance Center (IMMRAC)

Lebanon

- Centre de Recherches Marines/CNRS. Batroun

Libya

- Marine Conservation, Nature Conservation Department, Environment General Authority
- Faculty of Natural Resources and Environmental Science. FNRES, Omar Mukhtar University. El-Beyda

Monaco

- Groupe d'Etude des Cétacés de Méditerranée (Marseille)
- ACCOBAMS (Monaco)

Morocco

- Naturalist group Guelaya: data sent by Niki Entrup (Whale and Dolphin Conservation Society)

Romania

- MARE NOSTRUM. Organizatia Ecologista Neguvernamentala.
- National Institute for Marine Research and Development "Grigore Antipa" (Constanta)

Slovenia

- Morigenos-Marine Mammal Research and Conservation Society (Ljubljana)

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 País Vasco, CEMMA Galicia, CEPESMA Asturias, Departament de Medi Ambient de la Generalitat de Catalunya, Conselleria de Territori i Habitatge de la Generalitat Valenciana, Universitat de València (Comunitat Valenciana), Conselleria d'Agricultura i Pesca del Govern de les Illes Balears, Fundació Marineland (Illes Balears), Centro de Recuperación de Fauna Silvestre "El Valle" (Murcia), Consejería de Medio Ambiente de Murcia, Aula del Mar de Málaga (Andalucía), Consejería de Medio Ambiente de la Junta de Andalucía, Consejería de Cantabria, Ecologistas en Acción Almería-PROMAR, CRAM - Fundació per a la Conservació i Recuperació d'Animals Marins (Cataluña), GRAMPUS (Colectivo para el Estudio y Conservación del Medio Marino, Huelva), Consejería de Medio Ambiente de la Ciudad Autónoma de Ceuta, Septem Nostra (Ciudad Autónoma de Ceuta), Consejería de Medio Ambiente (Melilla), Equinac (Almería).

Syria

- Biodiversity and Protected Areas Directorate, General Commission for Environmental Affairs, Ministry of Local Administration and Environment (Damascus)
- General Establishment of Fisheries in Syria

Tunisia

- Faculté des Sciences de Sfax
- Institut National des Sciences et Technologie de la Mer -INST
Regional Activity Centre of Special Protected Areas. UNEP-MAP

Turkey

- Turkish Marine Research Foundation (Istanbul)

Ukraine

- Brema Laboratory (Simferopol)

2.2. Stranding data

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

Twenty riparian countries are contributing with their data to MEDACES (see Table 1 and 2). The database contains information on strandings dating back to 1941 (from Tunisia). In total, data from 18,556 strandings are registered in the MEDACES database.

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

			NUMBER OF STRANDING DATA
COUNTRY	YEAR BEGINING	YEAR END	
Albania		?	2
Algeria	1975	2016	240
Bulgaria	2009	2014	210
Croatia	1990	2013	308
Cyprus	1999	2015	49
Egypt			
France	1968	2015	2,474
Gerogia			
Greece	1944	2006	1,175
Israel	1993	2015	236
Italy	1997	2008	1,114
Lebanon		2013	3
Libya	2009	2013	5
Malta			
Monaco	1989	2008	7
Montenegro			
Morocco	2005	2005	1
Portugal			
Romania	2002	2015	973
Slovenia	2005	2008	4
Spain	1960	2016	10,304
Syria		?	1
Tunisia	1941	2015	194
Turkey	2000	2002	5
Ukraine	1980	2010	1,251
TOTAL			18,556

To date, almost all Mediterranean countries and the Black Sea coasts have contributed to the database. France, Greece, Italy, Spain, Ukraine and Romania are the countries with the highest number of submitted records. It should be noted that some of these countries are not up to date (for example Greece, Italy and Ukraine) that would increase substantially the number of records.

Other countries that have submitted stranding data series are Algeria, Bulgaria, Croatia, Israel and Tunisia. It should be taken into account that stranding numbers depend on the length of coast line, size of cetacean species populations in adjacent waters, period of time from which data have been submitted, performance of the existing stranding networks. The economic and political situation of some of the Mediterranean riparian countries make a national stranding network very difficult, therefore the data collection and the subsequent report to MEDACES.

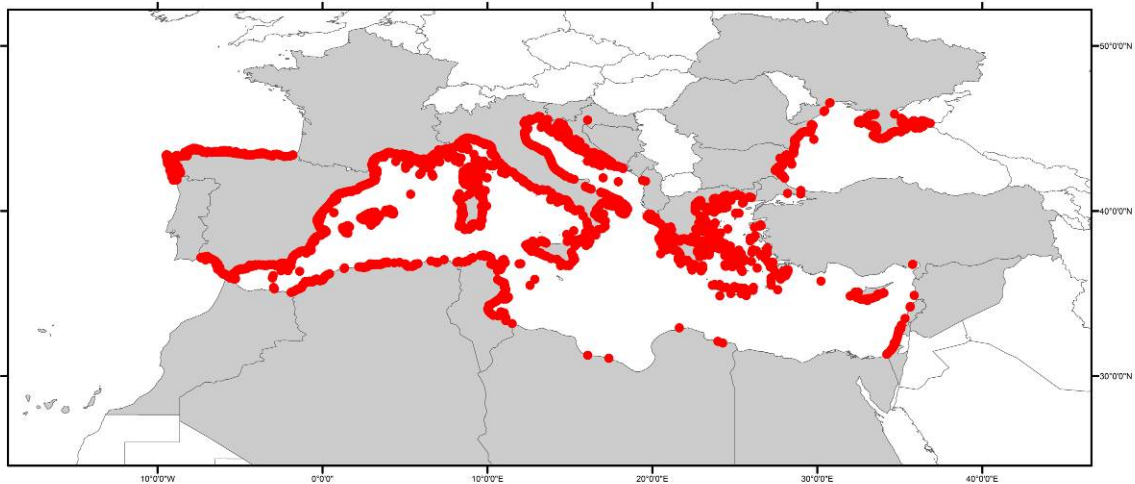


Figure 2. Cetacean stranding located along the Mediterranean and Black Sea coast using the data collected so far. Countries contributing with data to MEDACES are shown in dark grey colour. Red dots correspond to the stranding records.

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).

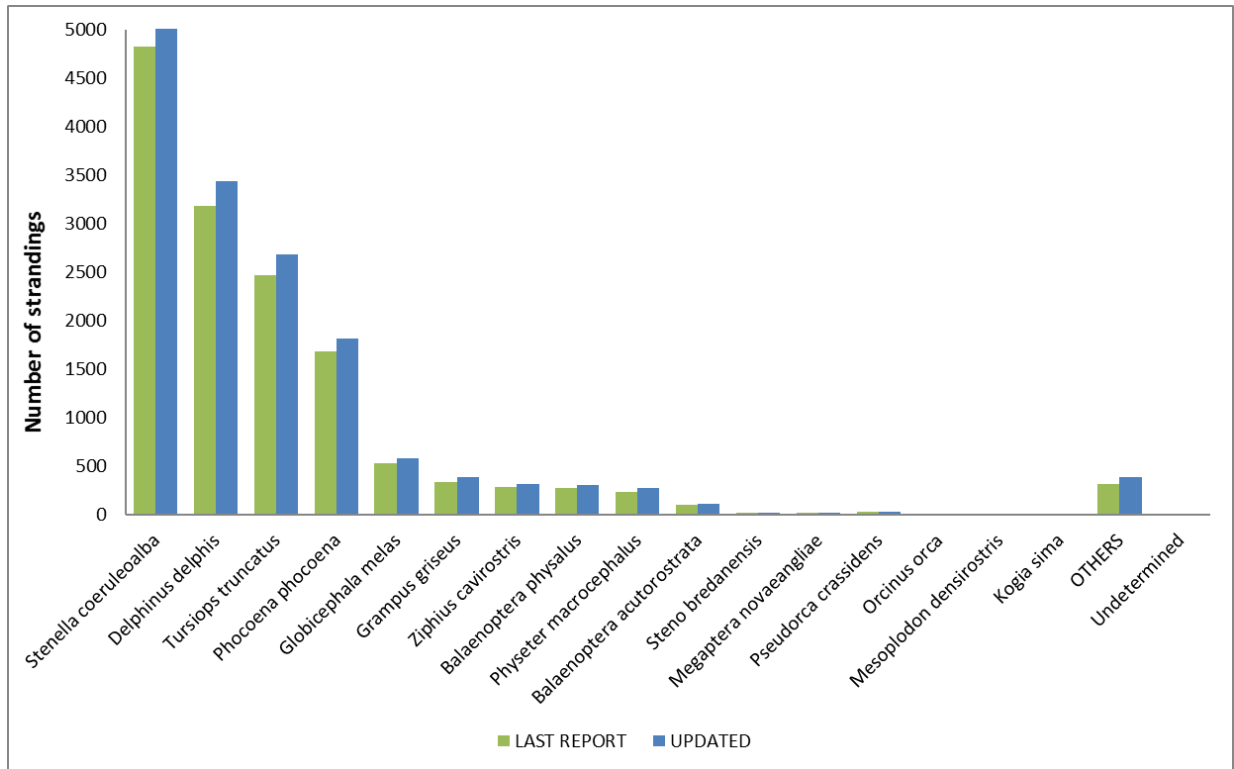
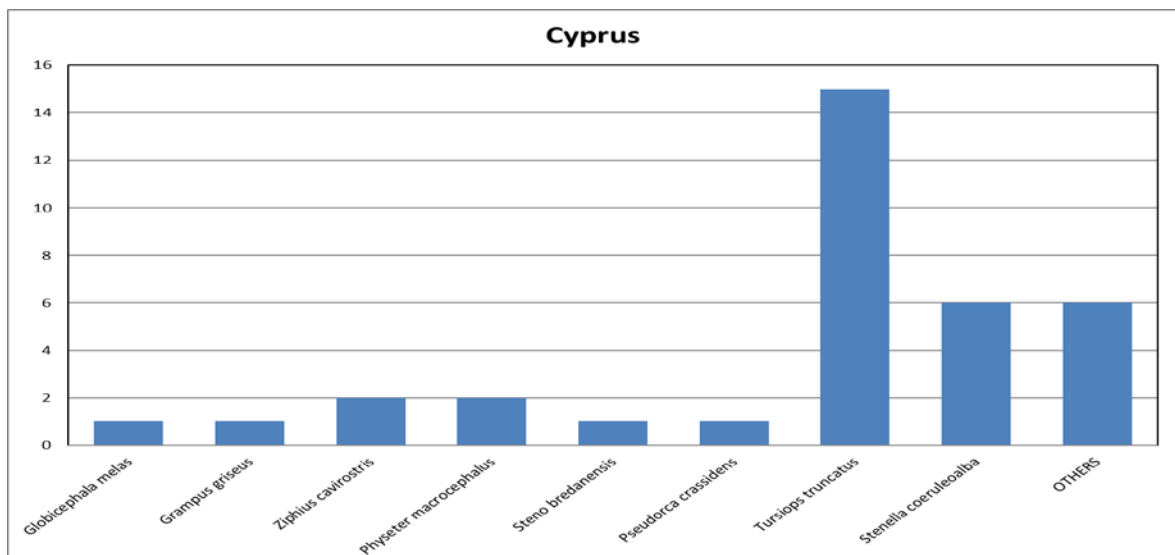
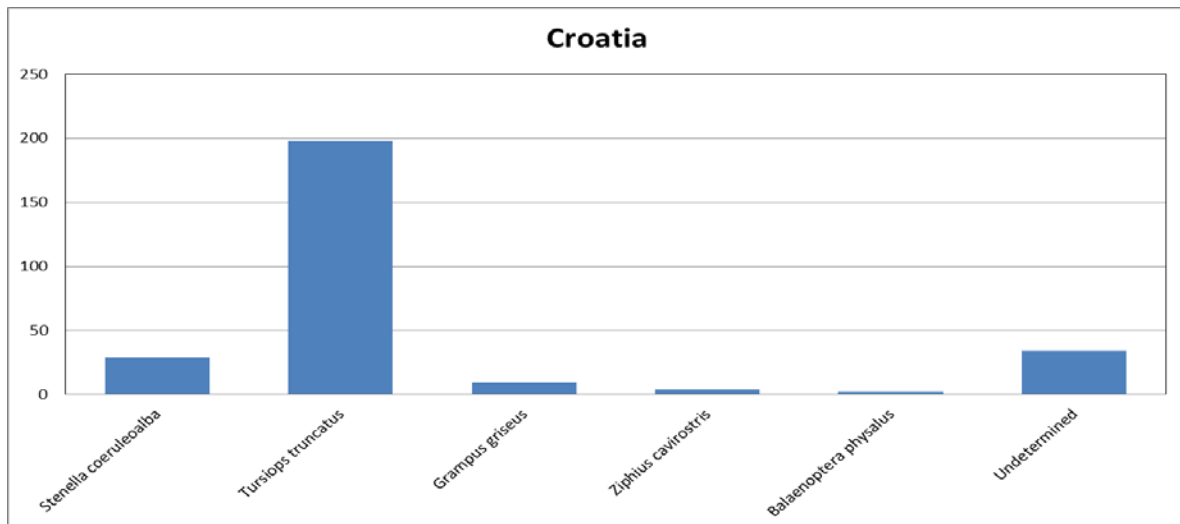
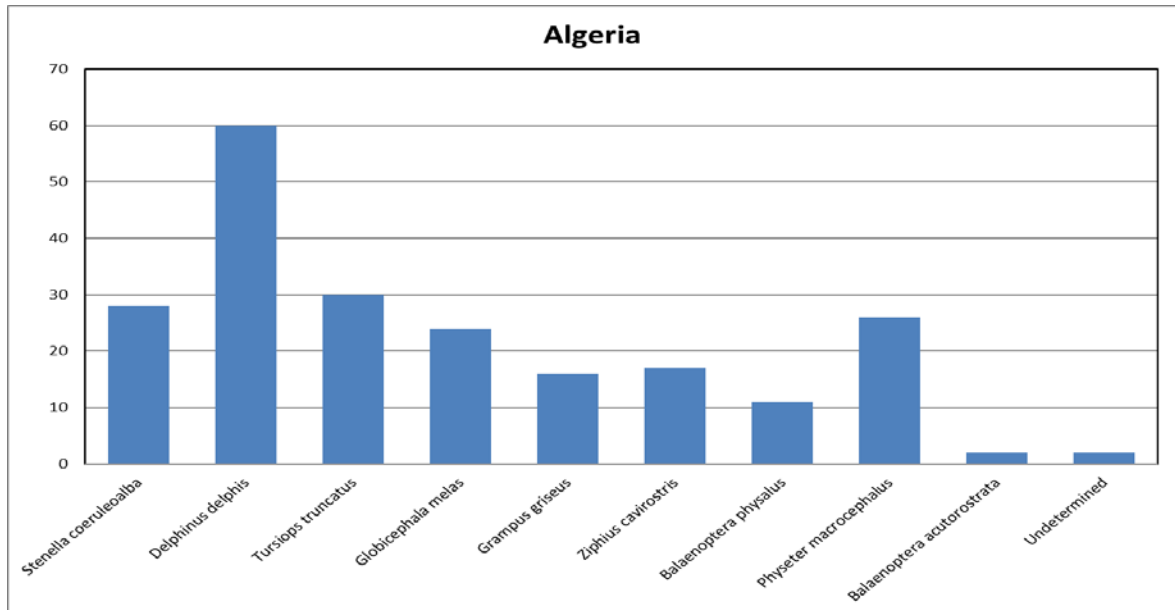
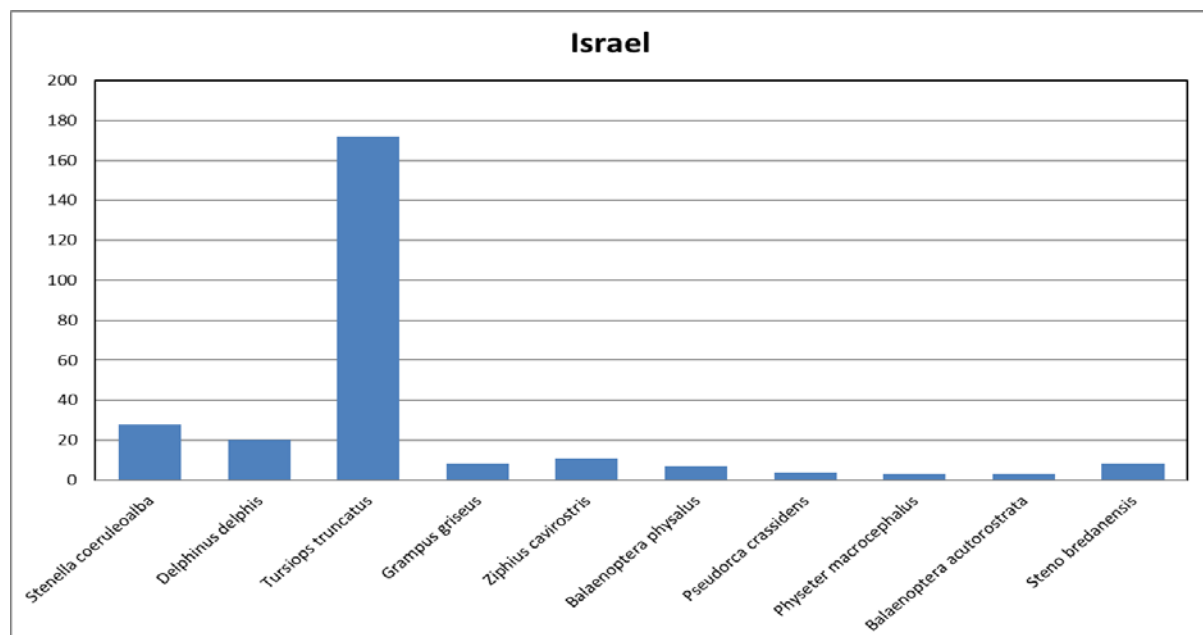
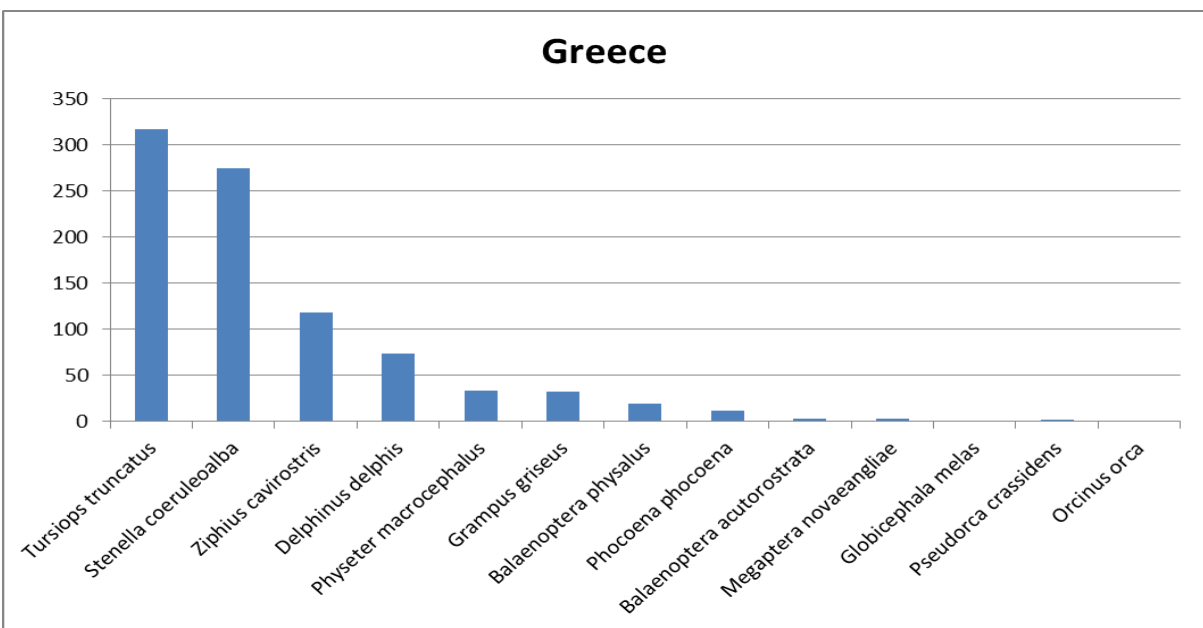
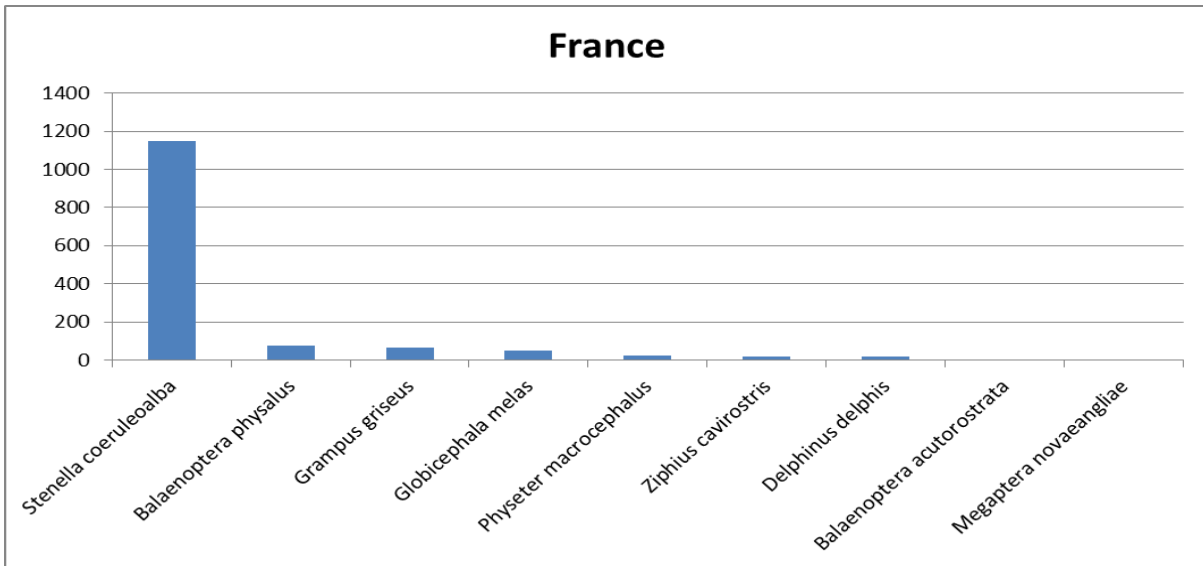


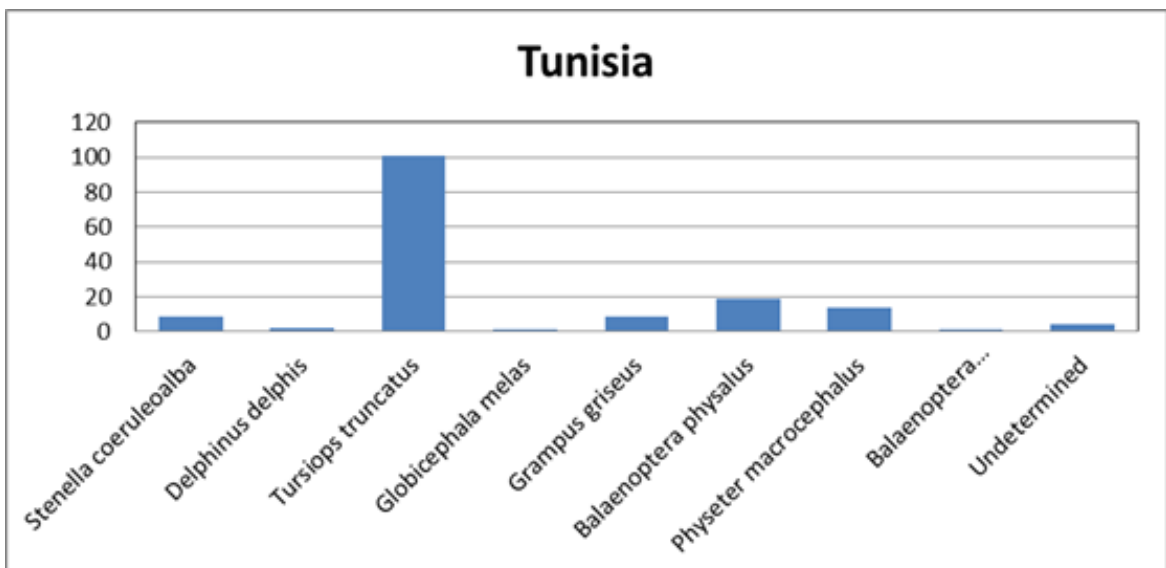
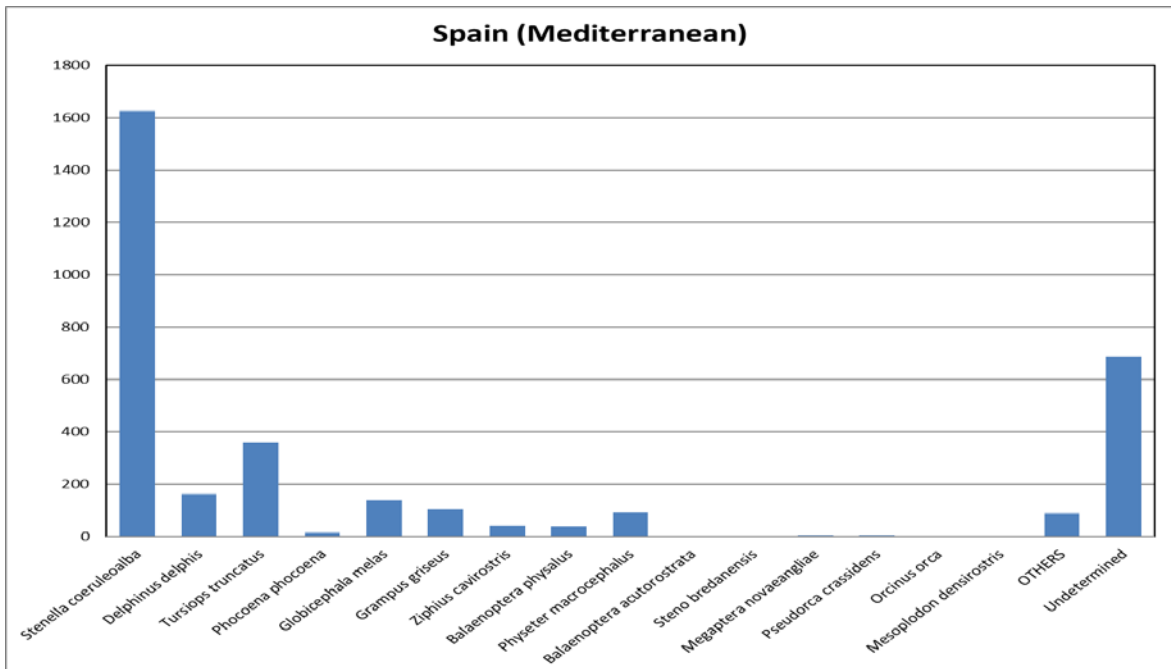
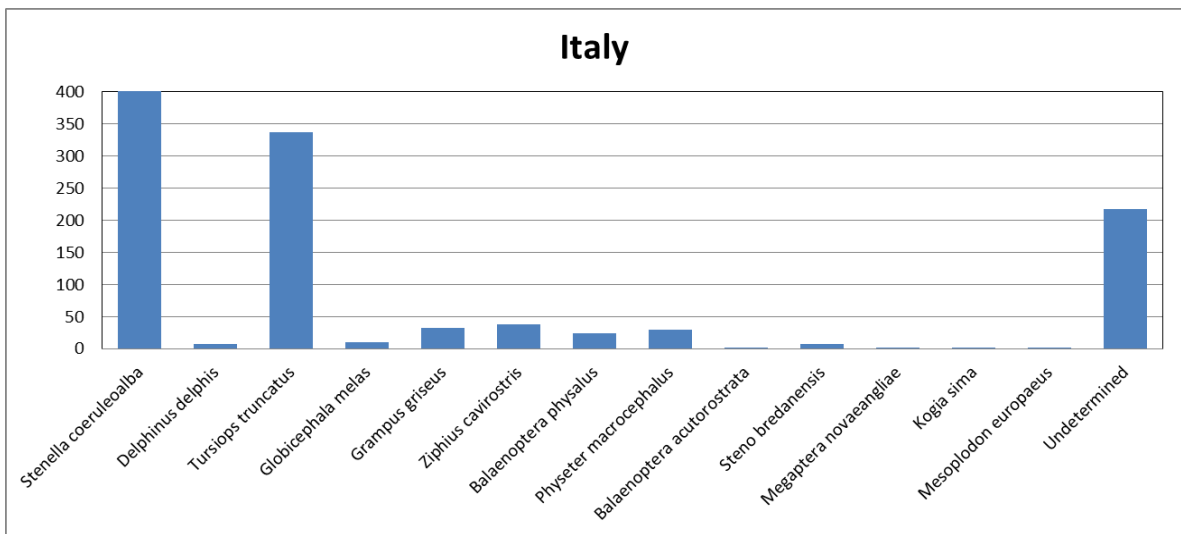
Figure 3. Number of strandings of each cetacean species recorded in MEDACES database along the coasts of all the riparian countries of the Mediterranean and Black Seas.

Figure 4 shows the number of species strandings for each riparian Country.

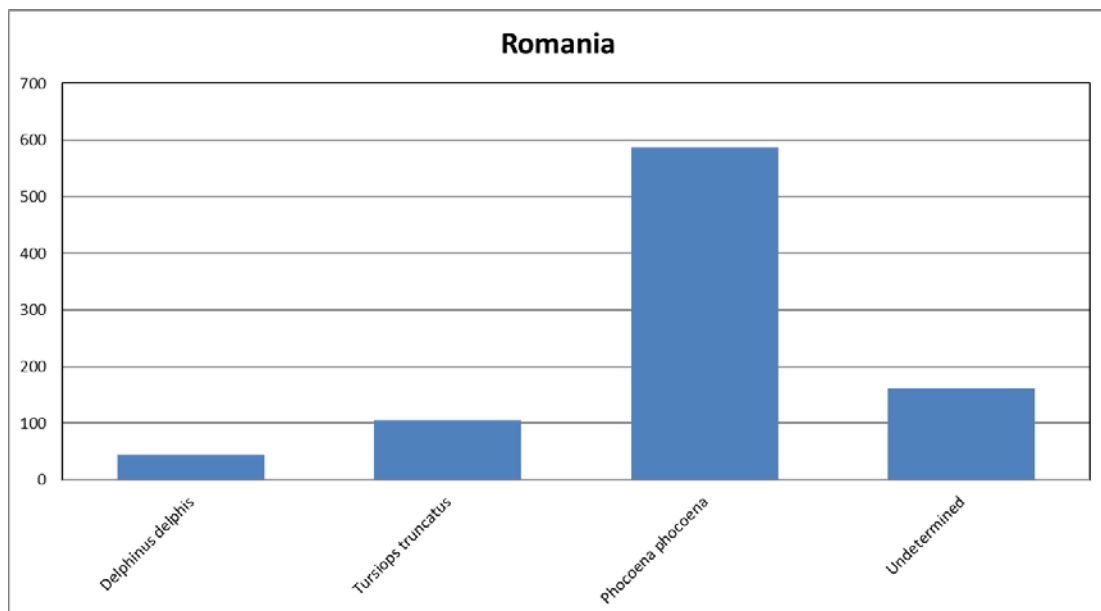
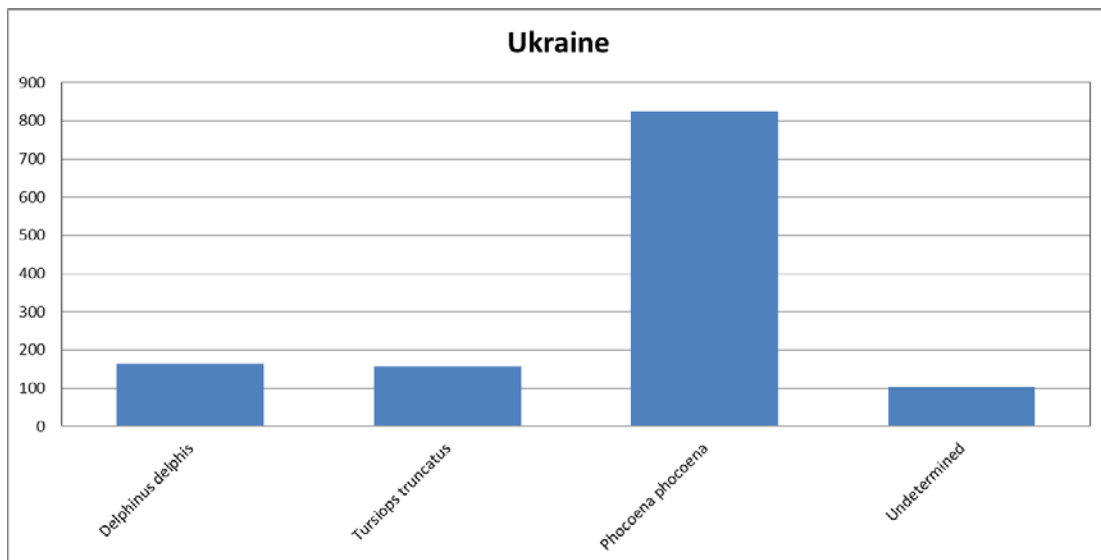
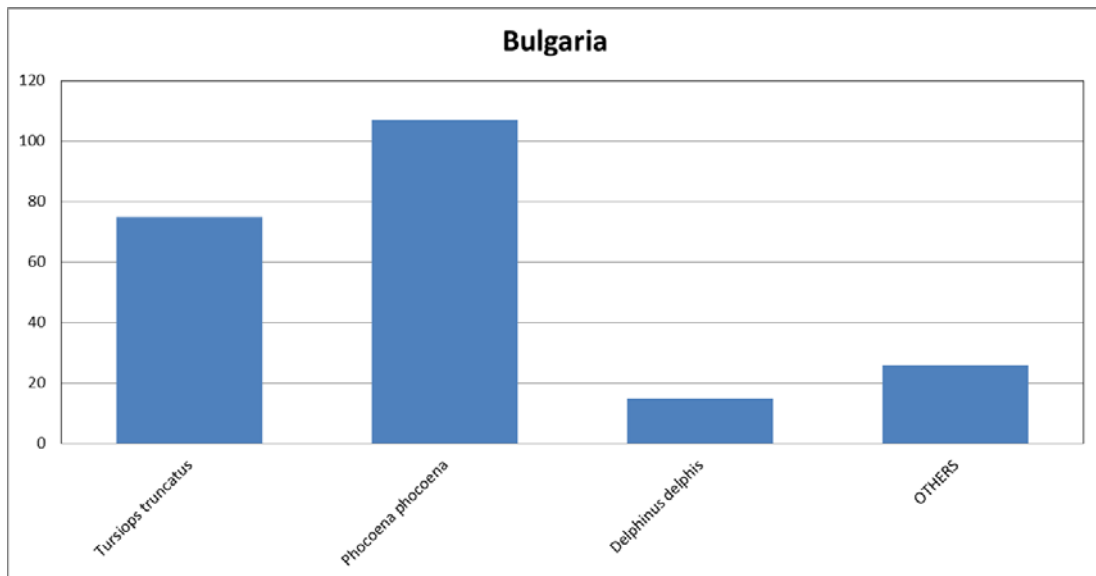
MEDITERRANEAN SEA







BLACK SEA



ATLANTIC WATERS

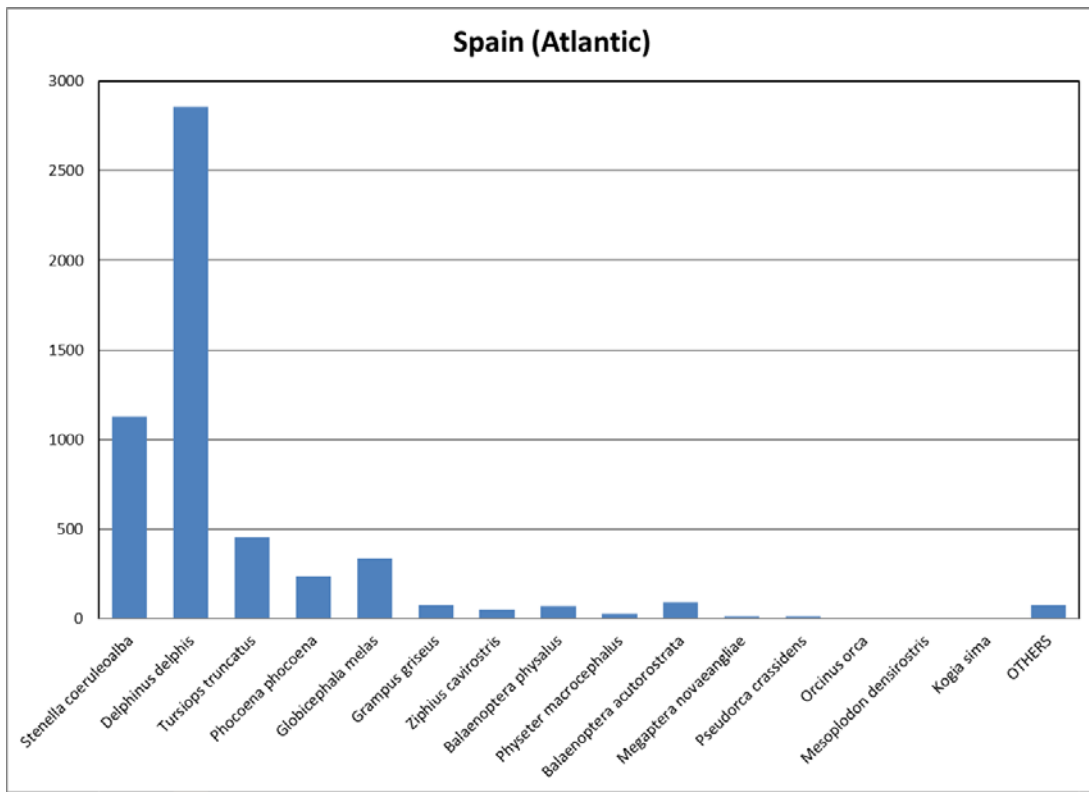


Figure 4. Number of specimens of each cetacean species stranded and reported in MEDACES individually by each of the riparian countries of the Mediterranean and Black Seas. Spanish reports have been divided in Atlantic (Galicia, Asturias, Cantabria, País Vasco, Huelva, Cádiz and Granada) and Mediterranean strandings (rest of Spain)

MEDACES database includes information of 25 cetacean species, 13 of them recorded in several countries of the Mediterranean (Table 3) and the rest only stranded either in the Atlantic coast or either in few occasions. The list of the cetacean species present in MEDACES database are shown in Table 2.

Table 2. Cetacean Species included in MEDACES.

<i>Balaenoptera acutorostrata</i>	minke whale
<i>Balaenoptera borealis</i>	sei whale
<i>Balaenoptera edeni</i>	Bryde's whale
<i>Balaenoptera musculus</i>	blue whale
<i>Balaenoptera physalus</i>	fin whale
<i>Delphinus delphis</i>	short-beaked common dolphin
<i>Grampus griseus</i>	Risso´s dolphin
<i>Globicephala macrorhynchus</i>	short-finned pilot whale
<i>Globicephala melas</i>	long-finned pilot Whale
<i>kogia breviceps</i>	pygmy sperm whale
<i>Kogia sima</i>	dwarf sperm whale
<i>Lagenorhynchus acutus</i>	atlantic white-sided dolphin
<i>Mesoplodon europaeus</i>	Gervais' beaked whale
<i>Mesoplodon mirus</i>	True´s beaked whale
<i>Mesoplodon densirostris</i>	Blainville's beaked whale
<i>Mesoplodon mirus</i>	True's beaked whale
<i>Megaptera novaengliae</i>	humpback whale
<i>Orcinus orca</i>	killer whale
<i>Pseudorca crassidens</i>	false killer whale
<i>Physeter macrocephalus</i>	sperm whale
<i>Phocoena phocoena</i>	harbour porpoise
<i>Steno bredanensis</i>	rough-toothed dolphin
<i>Stenella coeruleoalba</i>	striped dolphin
<i>Tursiops truncatus</i>	common bottlenose dolphin
<i>Ziphius cavirostris</i>	Cuvier's beaked whale
<i>Delphinus delphis ponticus</i>	Black Sea common dolphin
<i>Phocoena phocoena relicta</i>	Black sea harbour porpoise
<i>Tursiops truncatus ponticus</i>	Black Sea bottlenose dolphin

Table 3. Presence of species stranded along the coasts of the riparian countries of the Mediterranean and Black Seas. Ba, *Balaenoptera acutorostrata*; Bp, *Balaenoptera physalus*; Dd, *Delphinus delphis*; Gg, *Grampus griseus*; Gm, *Globicephala melas*; Ks, *Kogia sima*; Md, *Mesoplodon densirostris*; Mn, *Megaptera novaengliae*; Oo, *Orcinus orca*; Pc, *Pseudorca crassidens*, Pm, *Physeter macrocephalus*; Pp, *Phocoena phocoena*; Sb, *Steno bredanensis*; Sc, *Stenella coeruleoalba*; Tt, *Tursiops truncatus*; Zc, *Ziphius cavirostris*; U. unknown. Other species recorded, i.e. *Balaenoptera musculus*, *Globicephala macrorhynchus*, *kogia breviceps*, *Lagenorhynchus acutus*, *Mesoplodon densirostris* and *Mesoplodon mirus* only recorded in Spain.

COUNTRY	ba	bp	dd	gg	gm	ks	mn	oo	pc	pm	pp	sb	sc	tt	zc	u
Albania														x		
Bulgaria			x								x			x		x
Cyprus				x	x				x	x		x	x		x	
Algeria	x	x	x	x	x					x			x	x	x	x
Spain	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
France	x	x	x	x	x		x			x		x	x	x	x	x
Greece	x	x	x	x	x		x	x	x	x	x		x	x	x	x
Croatia		x		x									x	x	x	x
Italy	x	x	x	x	x	x	x			x		x	x	x	x	x
Israel	x	x	x	x					x	x		x	x	x	x	
Lebanon														x		
Libya		X								X				X		X
Morocco																X
Monaco													X			X
Romania			X								X			X		X
Slovenia														x		x
Syria																
Tunisia	x	x	x	x	x					x			x	x		x
Turkey		x	x											x		
Ukraine			x							x				x		x

Spain is the country with the highest reported stranded species (n=22), explained by the high diversity of species present in the Atlantic Ocean. Moreover, 3 species of pinnipeds are recorded (*Halichoerus grypus*, *Phoca vitulina*, and *Cystophora cristata*), and one mustelidae (*Lutra lutra*). Next country is Greece with 14 species, followed by Italy (12), France with 11, Israel with 10, Tunisia and Algeria with 8 and Croatia with 5 (Table3).

Striped dolphin is the most species stranded in France (1524 strandings recorded), Italy (403) (although the number of bottlenose dolphin in Italy is very similar), and Spanish Mediterranean (1625). Bottlenose dolphin is more abundant in Cyprus (15), Croatia (198), Greece (315), Israel (172) and Tunisia (101). Short beaked common dolphin has higher number of strandings than other species in Algeria (60) and Spanish Atlantic (2857), meanwhile harbour porpoise is the most abundant in Bulgaria (107), Ukraine (825) and Romania (587). Some countries have little records in order to know trends (Turkey, Libya, Lebanon, Slovenia, Syria, Morocco, and Monaco).

Overall, the two species most frequently recorded are firstly the striped dolphin, especially in countries like Spain, France, and Italy, being the most frequent species present at sea (Raga & Pantoja 2004, Notarbartolo and Birkun 2010). Moreover, the two Morbillivirus epizootic episodes that occurred in 1990 and 2007, especially affected populations of striped dolphins 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 Bressemer et al. 1993, Cebrian 1995). Increasing the number of strandings.

Secondly, it is important to notice that some countries like Greece, Tunisia, Algeria, Israel, and Croatia do not follow this pattern, as there are more records of bottlenose dolphin than those of striped dolphins. This could be explained by the kilometres of coast of these countries, and the coastal habitat of bottlenose dolphins compared to striped dolphins.

In the Black Sea three cetacean species: *D. delphis ponticus*, *T. truncatus aduncus* and *P. phocoena relicta* were reported by Bulgaria, Romania, and Ukraine. It must be taken into account the high number of harbour porpoises (1,525) that are registered stranded in the Black Sea (Table 4).

Table 4. Number of strandings of Harbour porpoise.

	<i>Phocoena phocoena phocoena</i> Mediterranean	<i>Phocoena phocoena relicta</i> Black Sea
2000	13	
2001	16	
2002	17	30
2003	19	143
2004	24	27
2005	12	41
2006	8	99
2007	10	13
2008	10	32
2009	17	25
2010	14	74
2011	24	101
2012	11	214
2013	21	56
2014	14	53
2015	10	60

2.2.3. Distribution of the stranded species

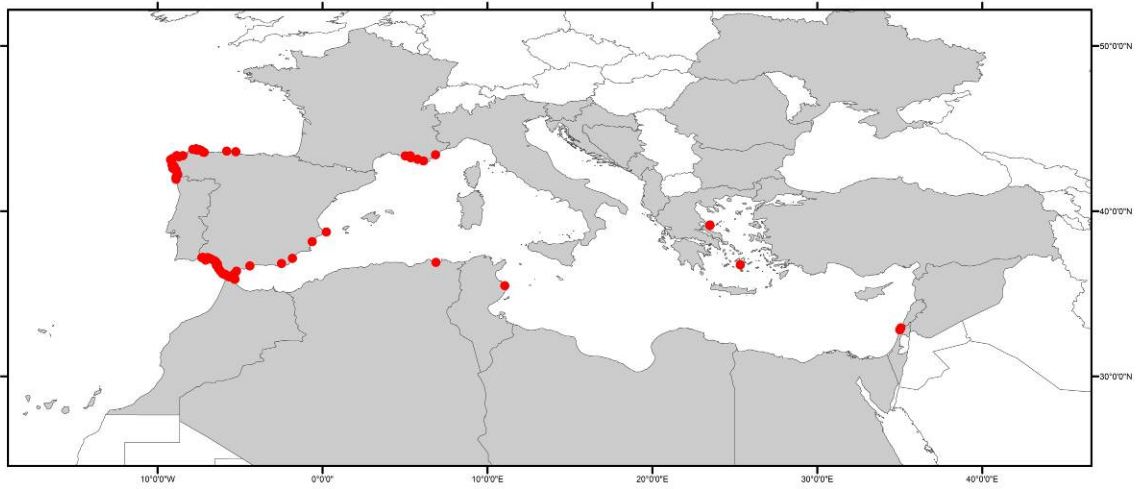
Every species stranding is distributed differently along the Mediterranean coast (see maps and Kernel density maps in Figures 5 and 6): strandings of *G. melas* are almost exclusive from the Western Mediterranean, whereas strandings of *D. delphis* are more abundant in the south of Spain (Alboran Sea) and in Greece. *Z. cavirostris* is distributed mainly in Alboran Sea and Greece. *G. melas* has mainly stranded in Atlantic side and South East of Spain. Other species such as *T. truncatus* and *G. griseus* are distributed along the Mediterranean Coast.

Strandings of other species have been reported occasionally in the Mediterranean: 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*). Strandings of rough-toothed dolphin (*Steno bredanensis*) are not common in the Mediterranean basin but records seem to concentrate it in the Eastern Mediterranean (see Israel strandings) (Kerem et al. 2016).

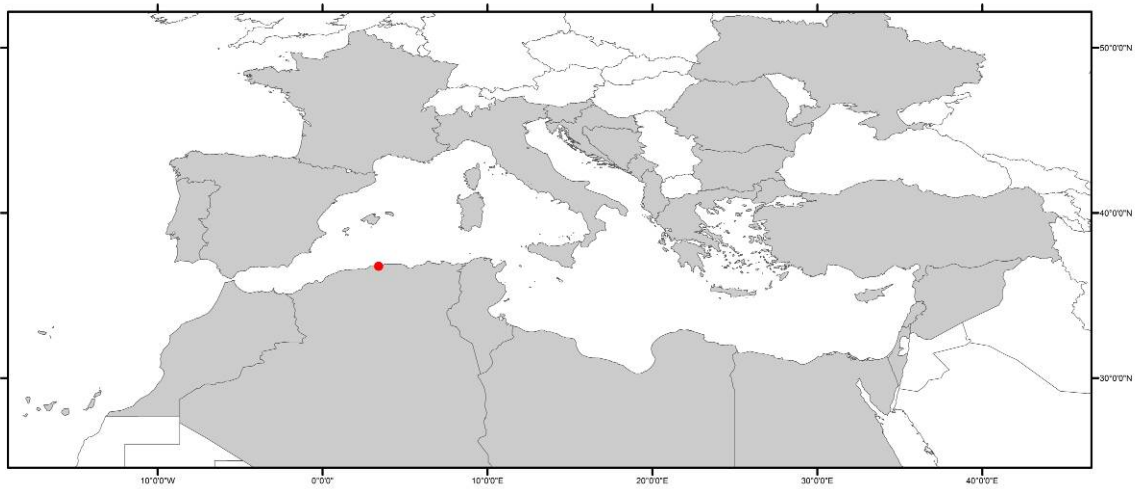
The adjoining Atlantic waters (Atlantic coast of Spain), strandings of several typically Atlantic species have been reported from this area, as minke whale (*Balaenoptera acutorostrata*) and harbour porpoise (*Phocoena phocoena*), Short beaked common dolphin (*Delphinus delphis*), short finned pilot whale (*Globicephala macrorhyncus*), and several species of ziphiids.

For the Black Sea (data from Bulgaria, Romania, and Ukraine), three cetacean species have been reported: *D. delphis ponticus*, *T. truncatus aduncus* and *P. phocoena relicta* (Figure 5). The latter species is the most frequently stranded in this region. Some strandings of this species occurred also in Mediterranean waters contiguous to the Black Sea (Northern Greek waters).

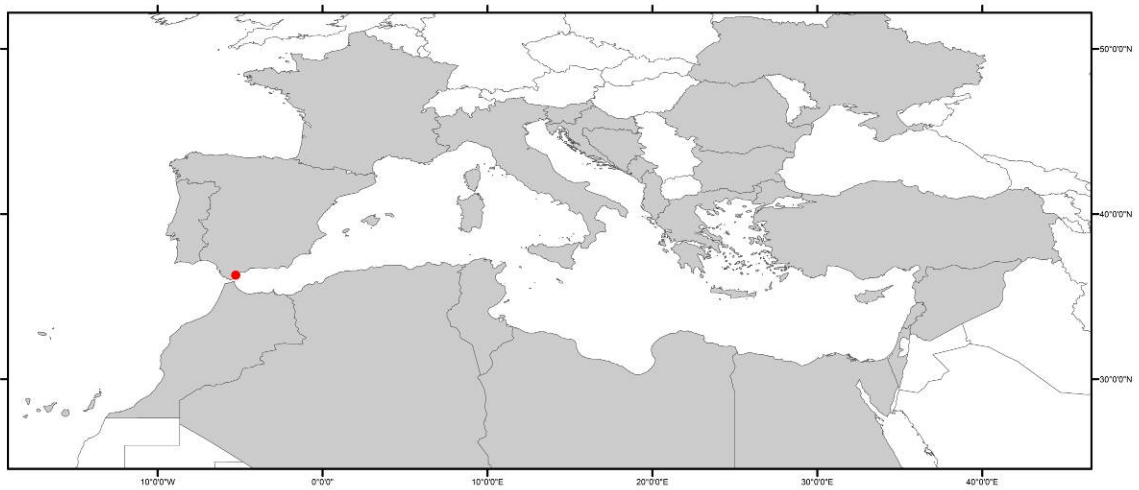
Balaenoptera acutorostrata



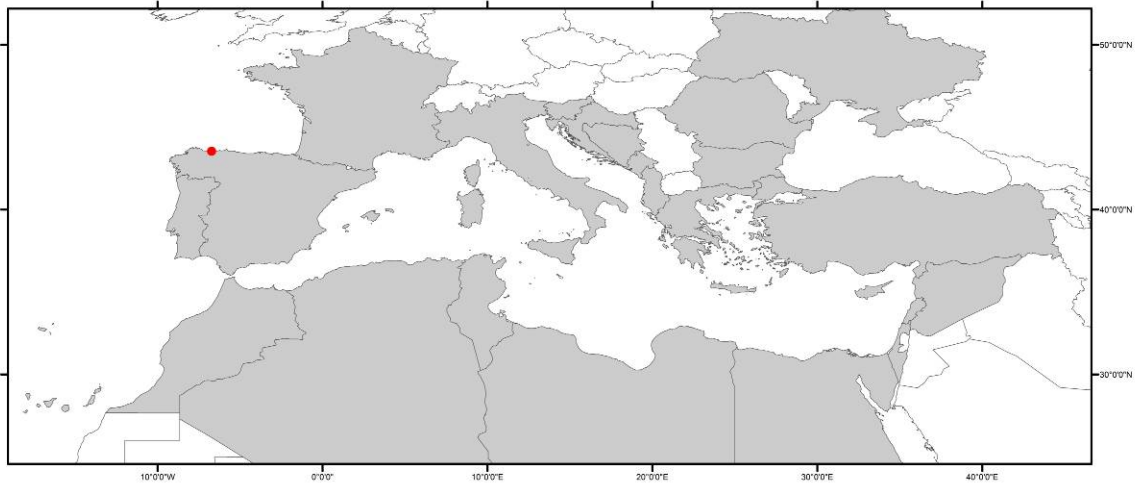
Balaenoptera borealis



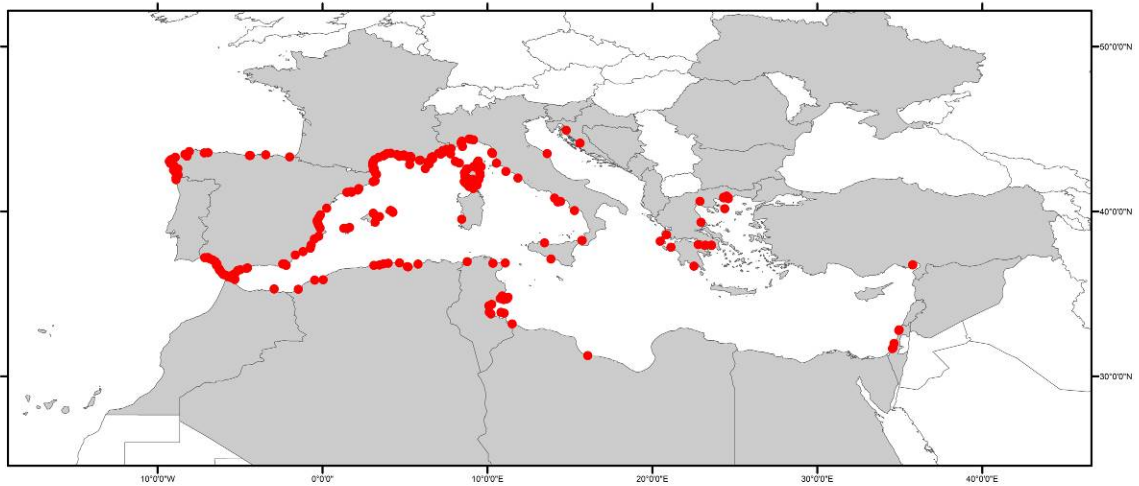
Balaenoptera edeni



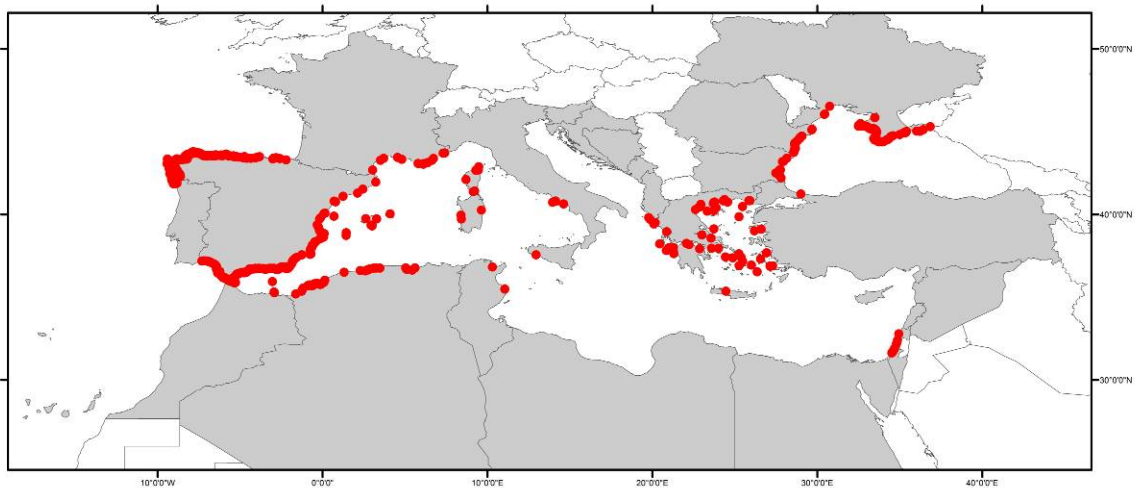
Balaenoptera musculus



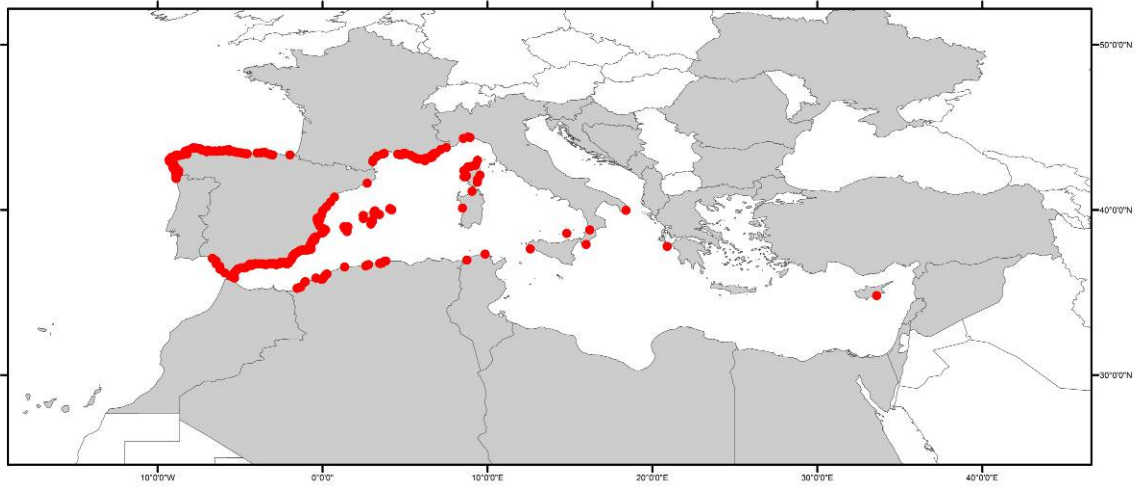
Balaenoptera physalus



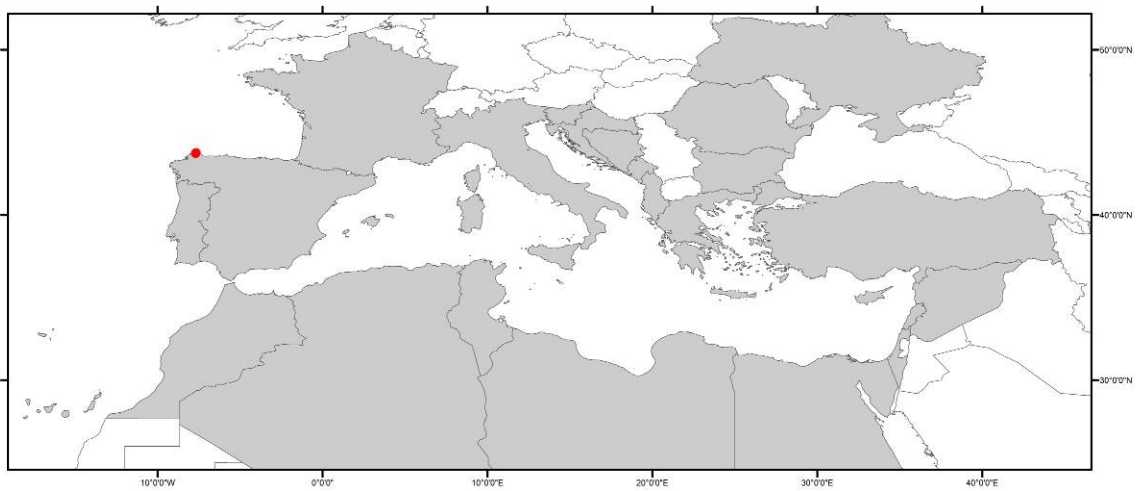
Delphinus delphis



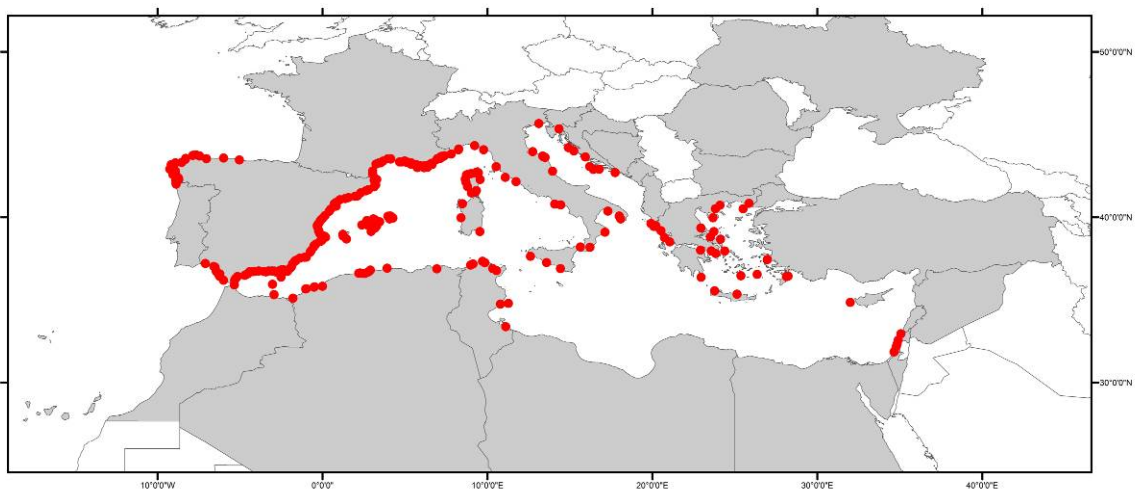
Globicephala melas



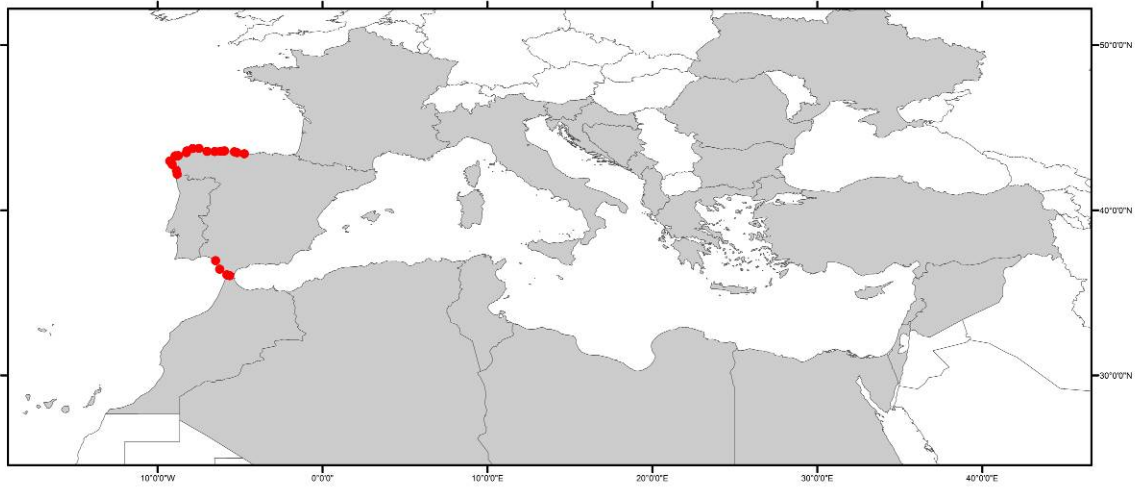
Globicephala macrorhynchus



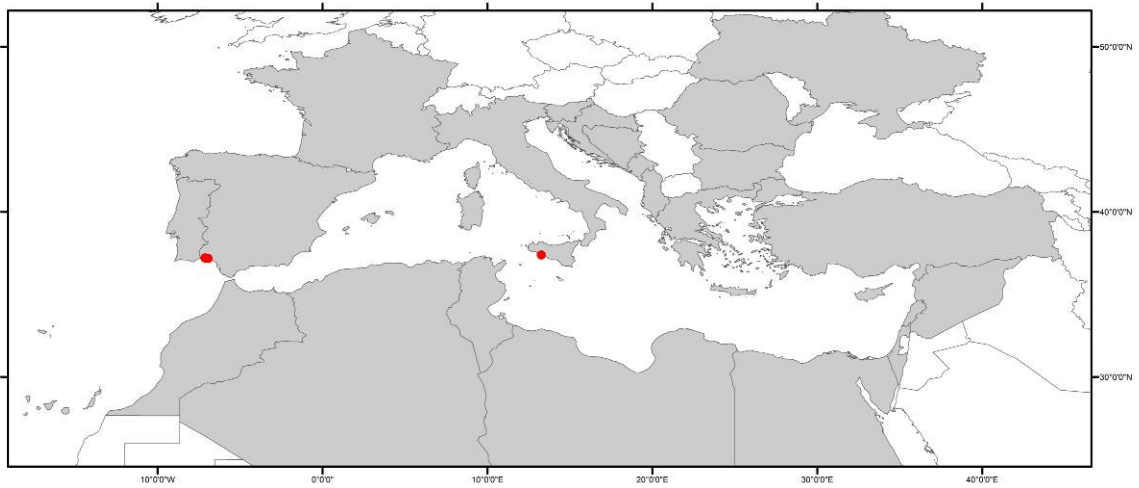
Grampus griseus



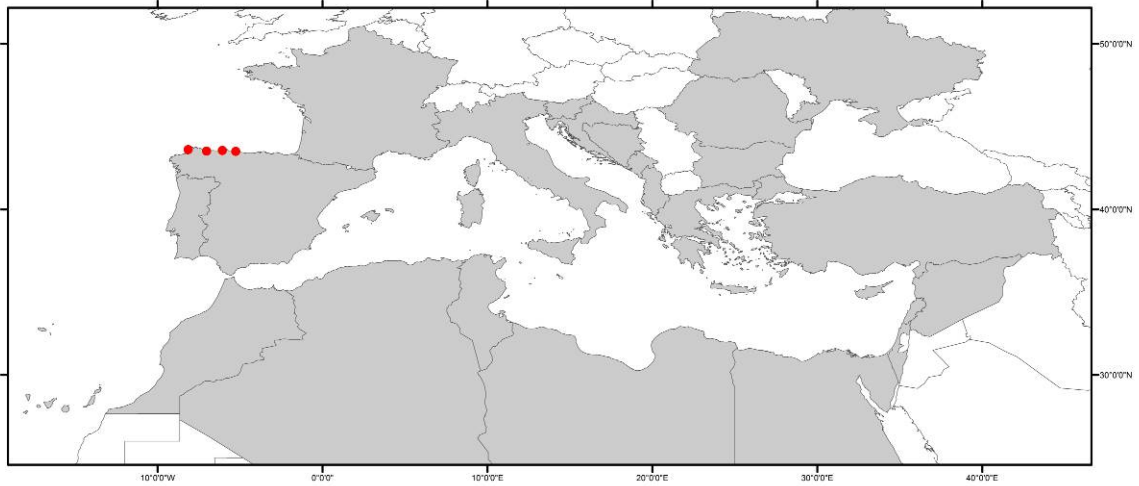
Kogia breviceps



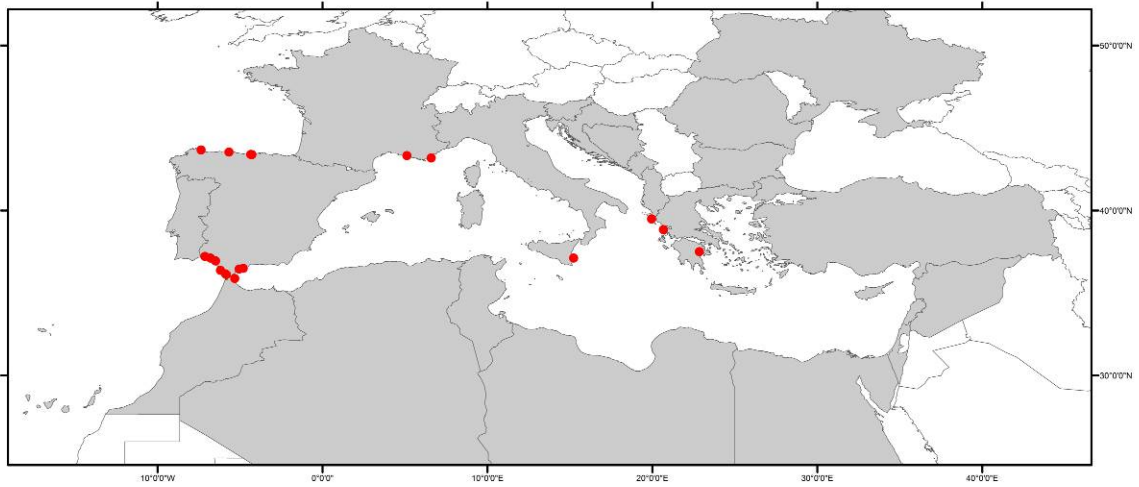
Kogia sima



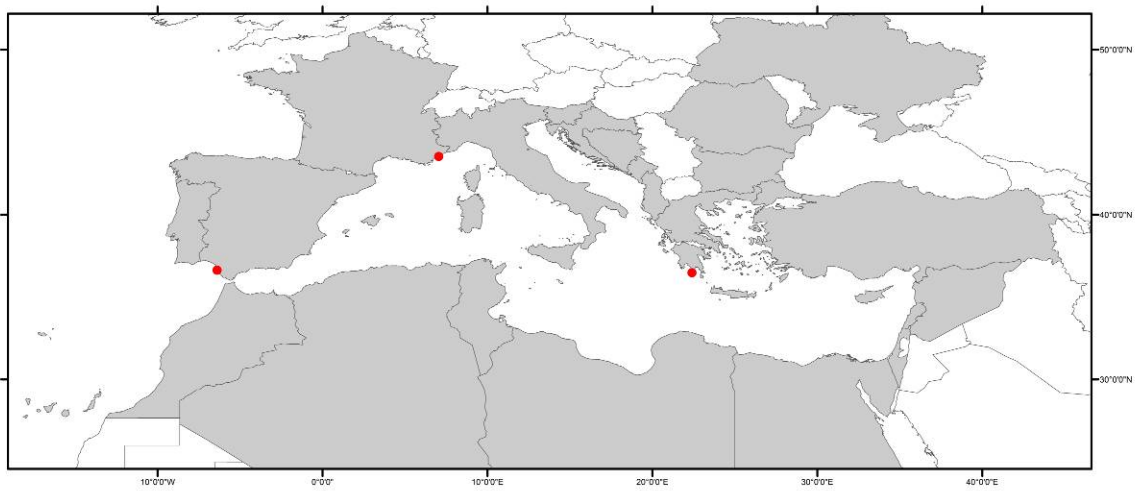
Lagenorhynchus acutus



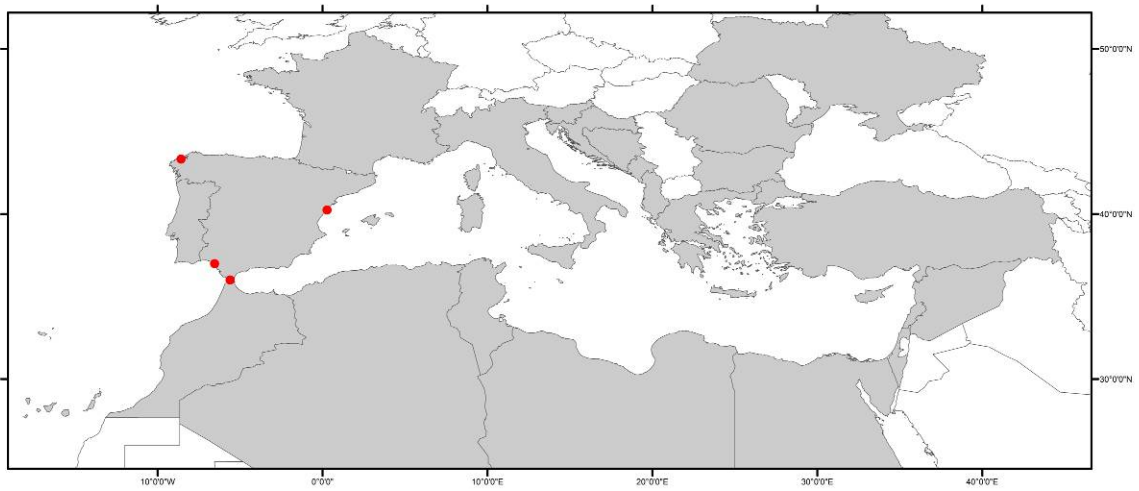
Megaptera novaengliae



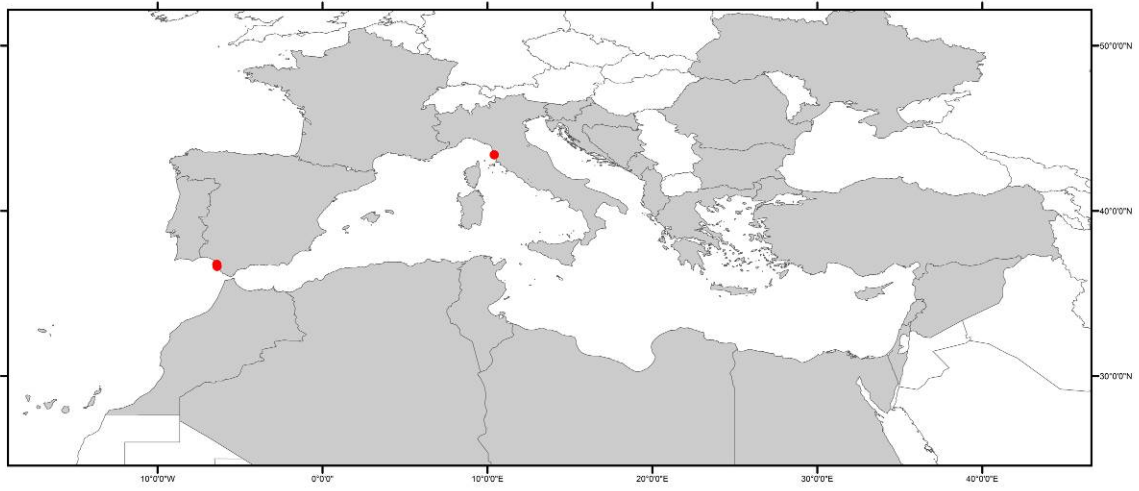
Mesoplodon bidens



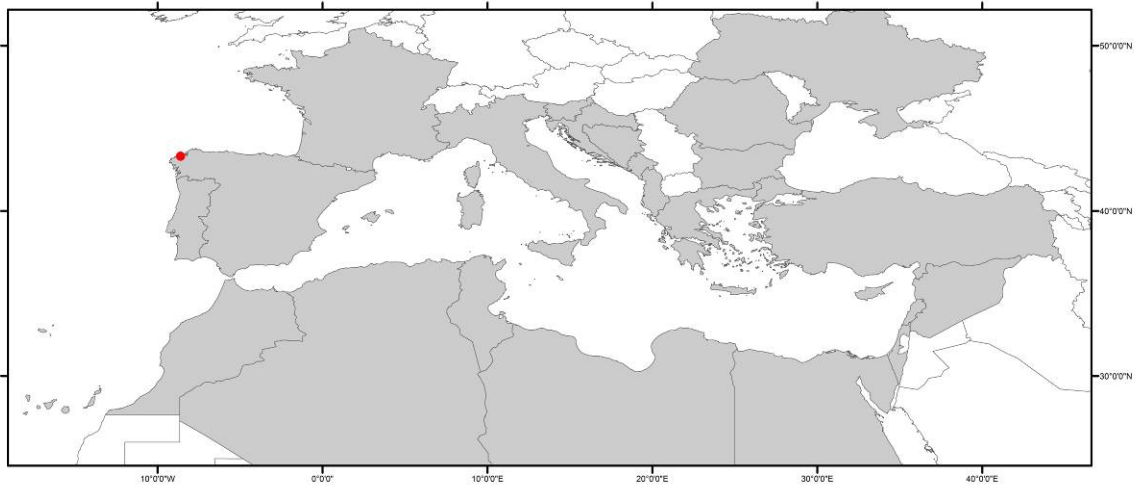
Mesoplodon densirostris



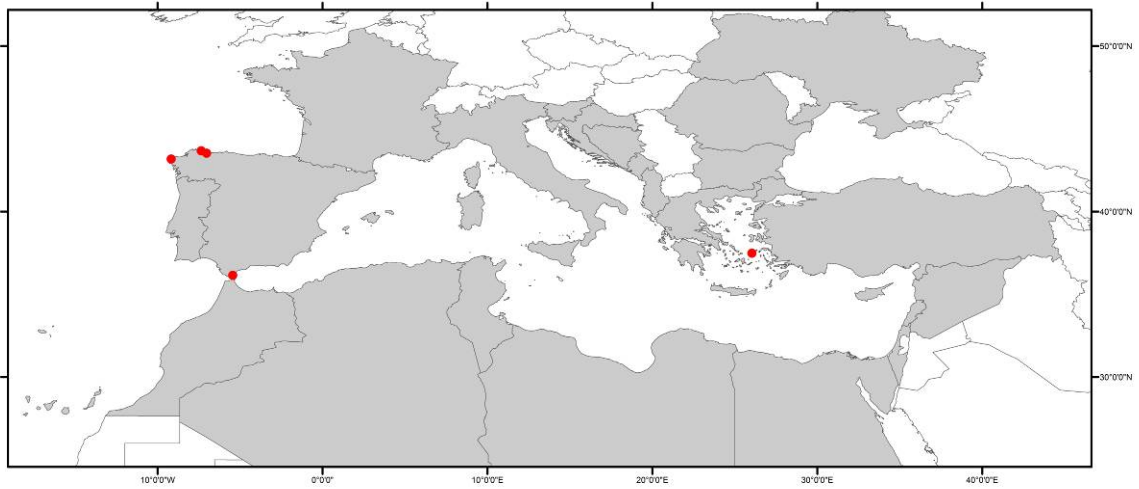
Mesoplodon europaeus



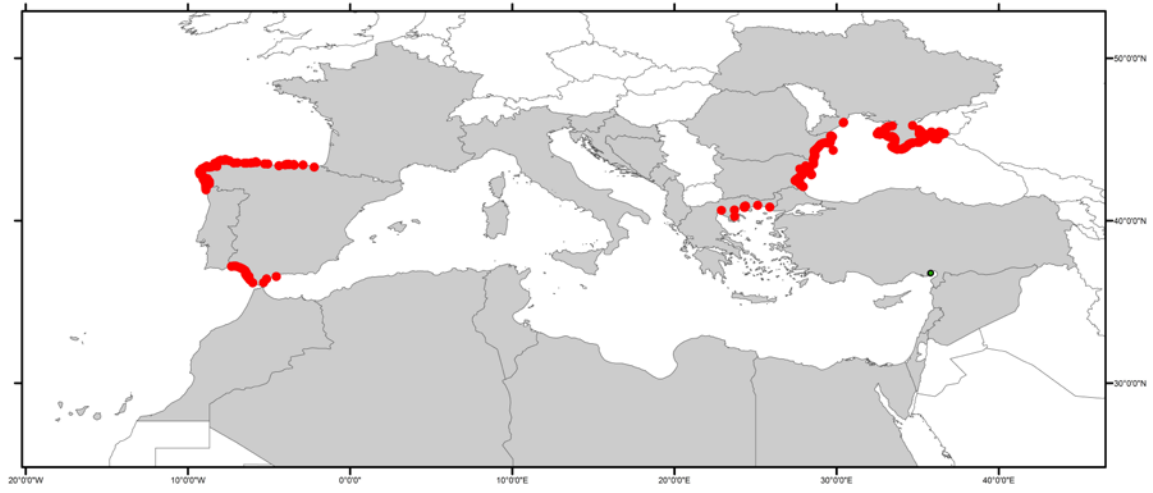
Mesoplodon mirus



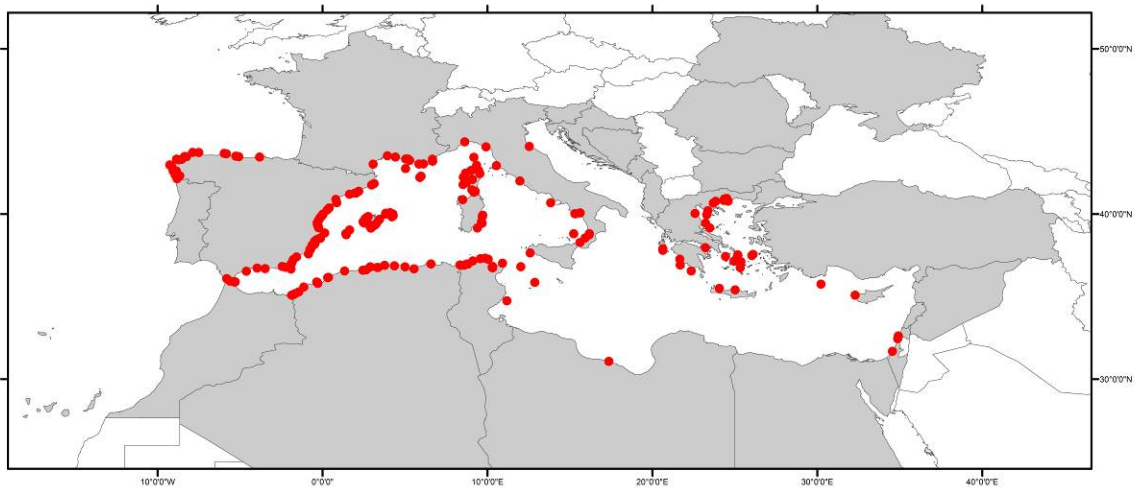
Orcinus orca



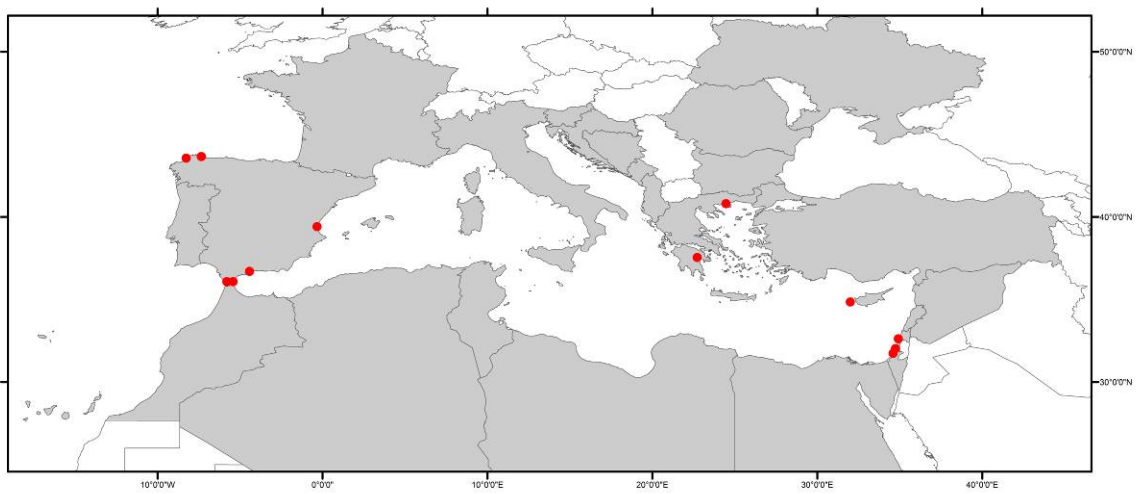
Phocoena phocoena



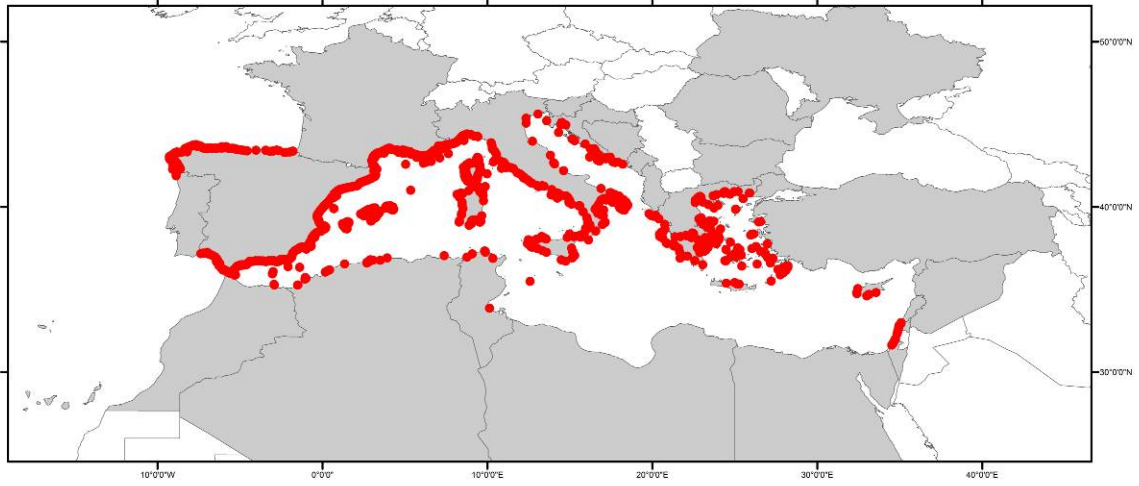
Physeter macrocephalus



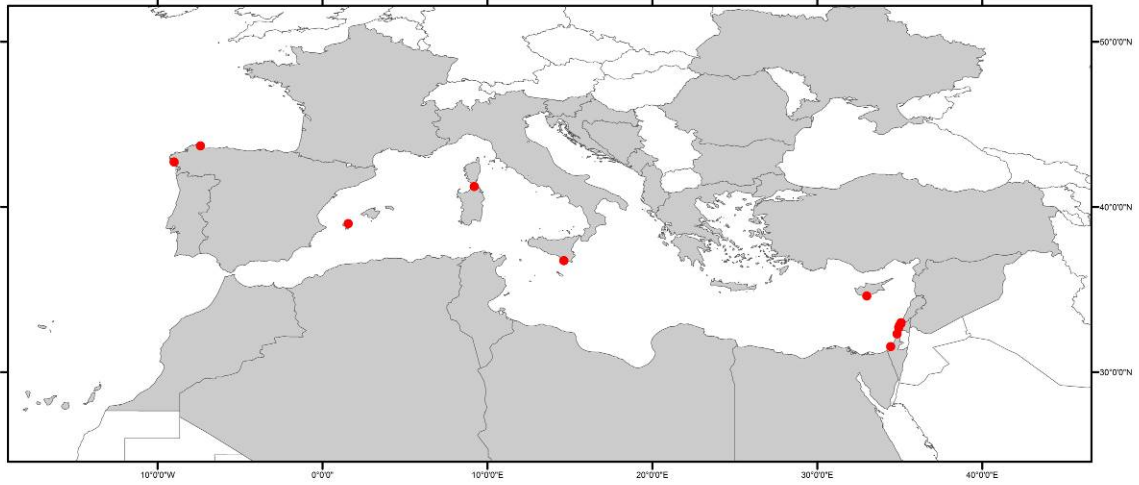
Pseudorca crassidens



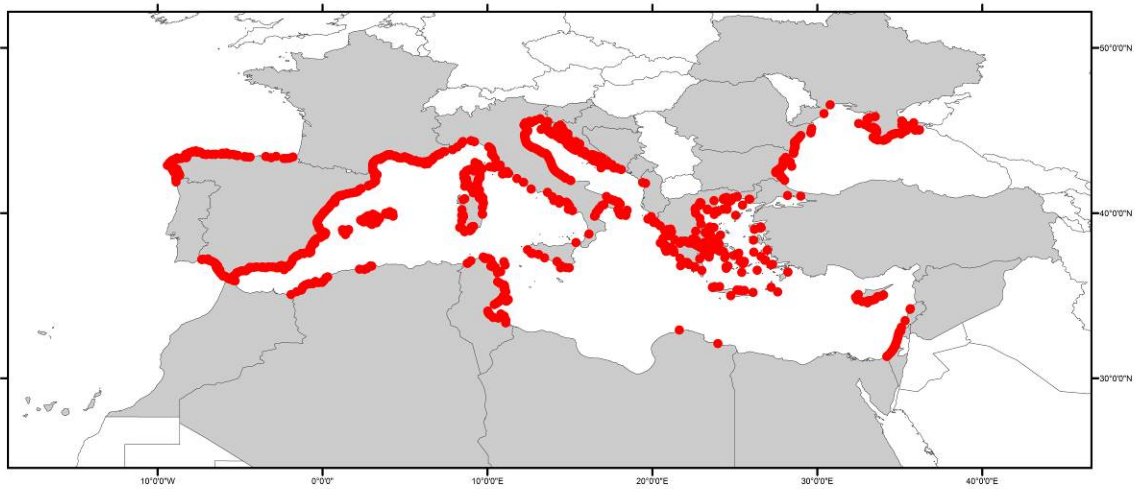
Stenella coeruleoalba



Steno bredanensis



Tursiops truncatus



Ziphius cavirostris

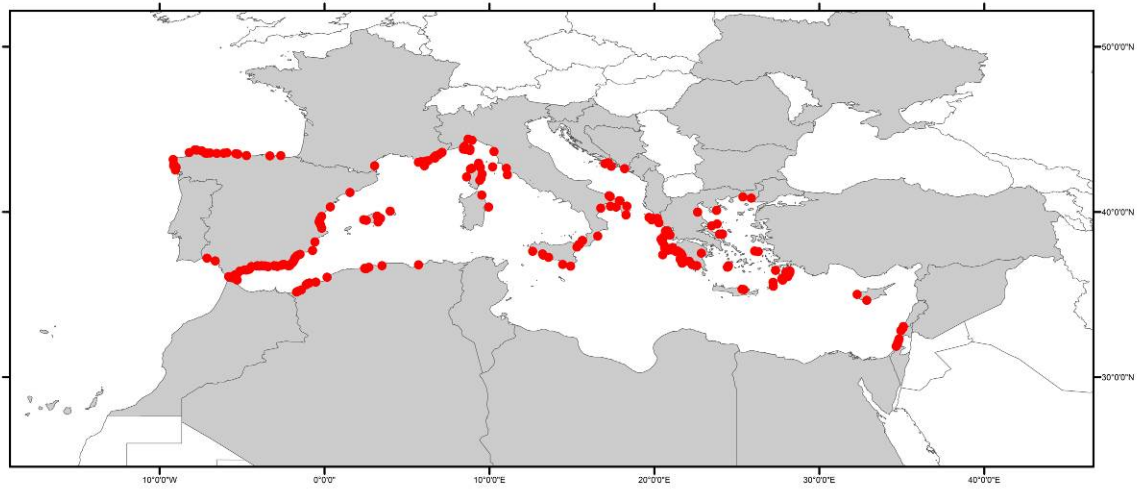
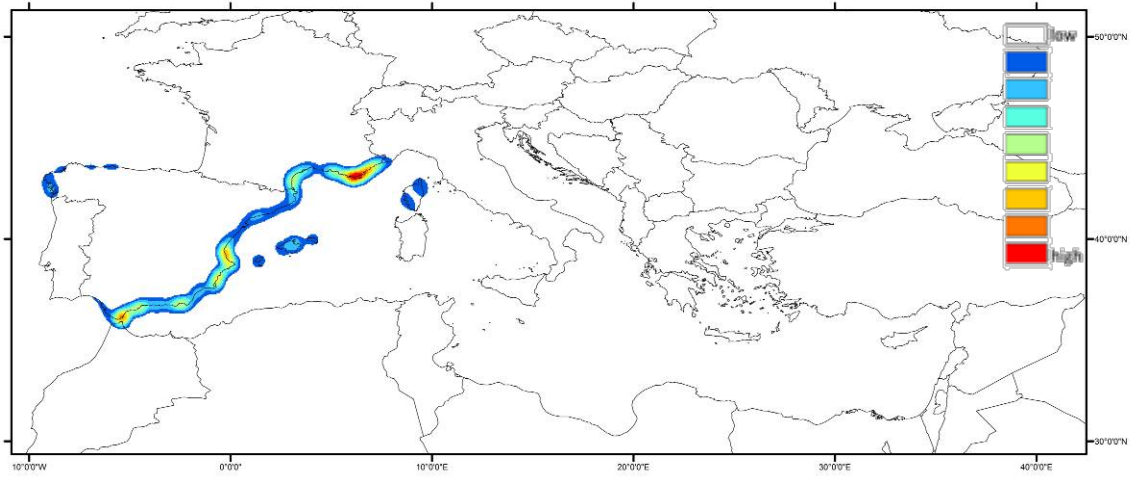


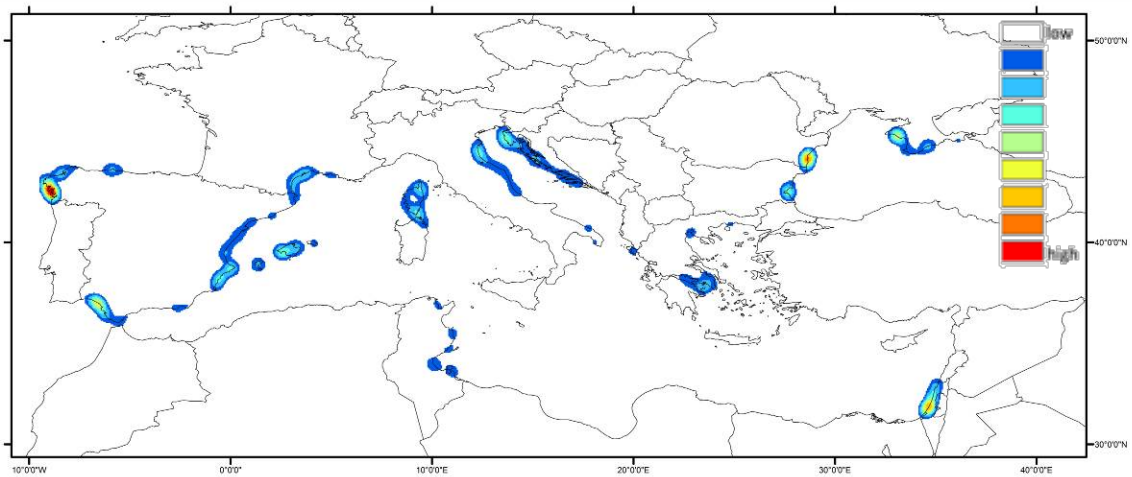
Figure 5. Each of the cetacean species strandings distributed along the coasts of each of the riparian countries of the Mediterranean and Black Seas.

2.2.4 Kernel density maps for the most frequent cetacean species

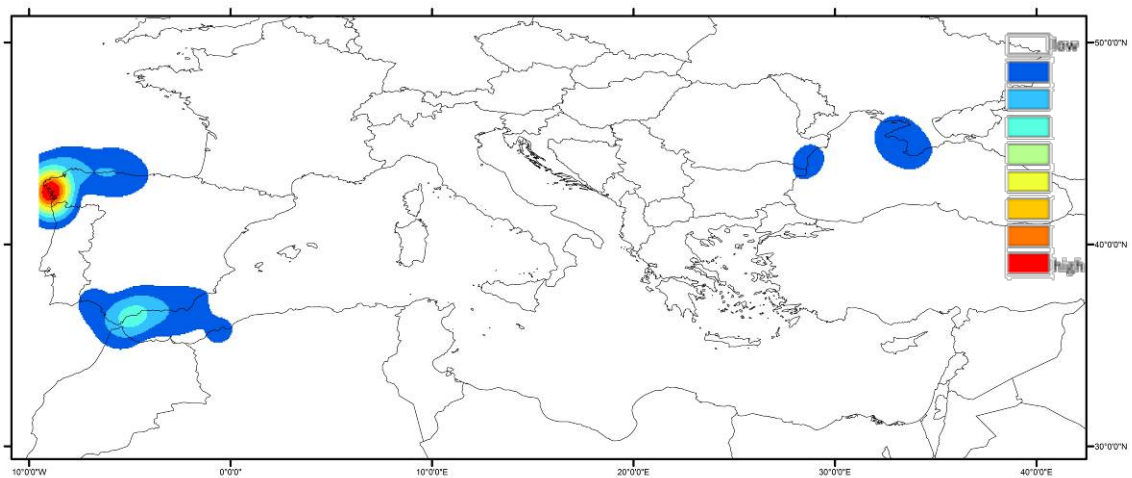
Kernel Density Estimate of striped dolphin strandings



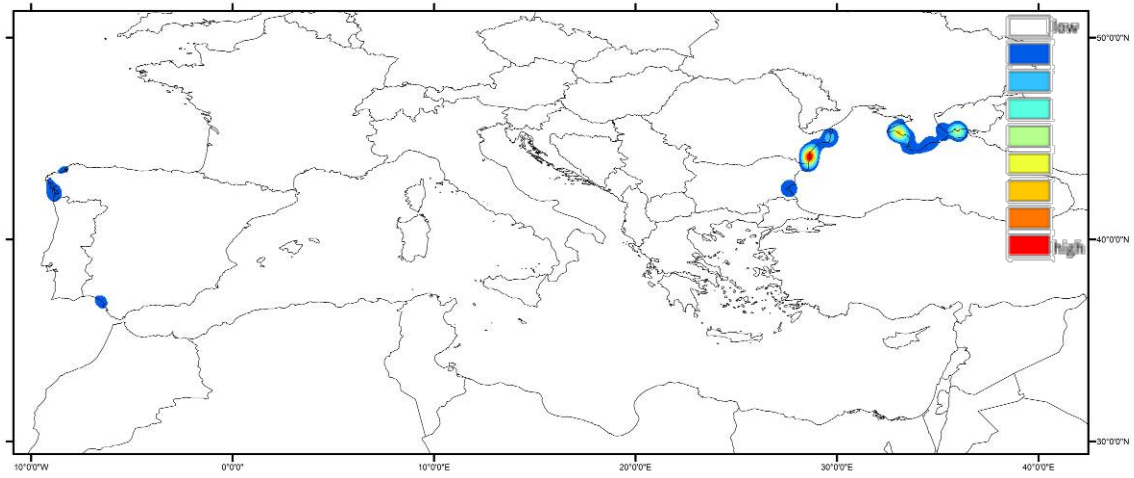
Kernel Density Estimate of bottlenose dolphin strandings



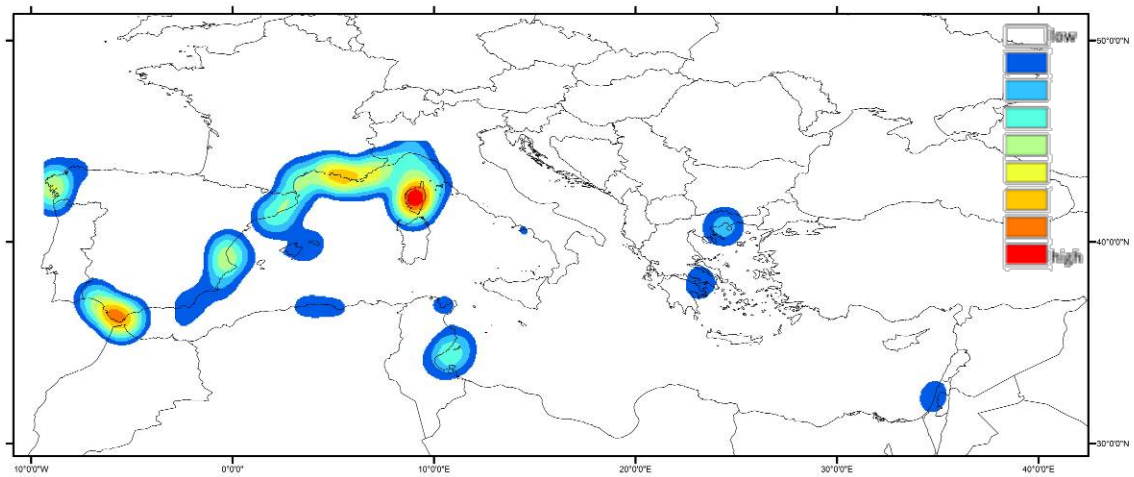
Kernel Density Estimate of common dolphin strandings



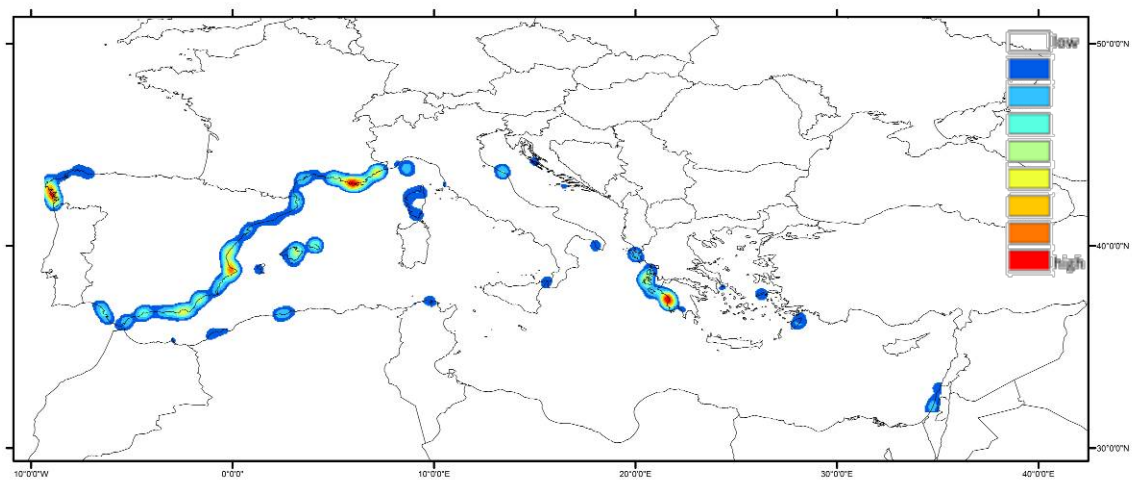
Kernel Density Estimate of harbour porpoise strandings



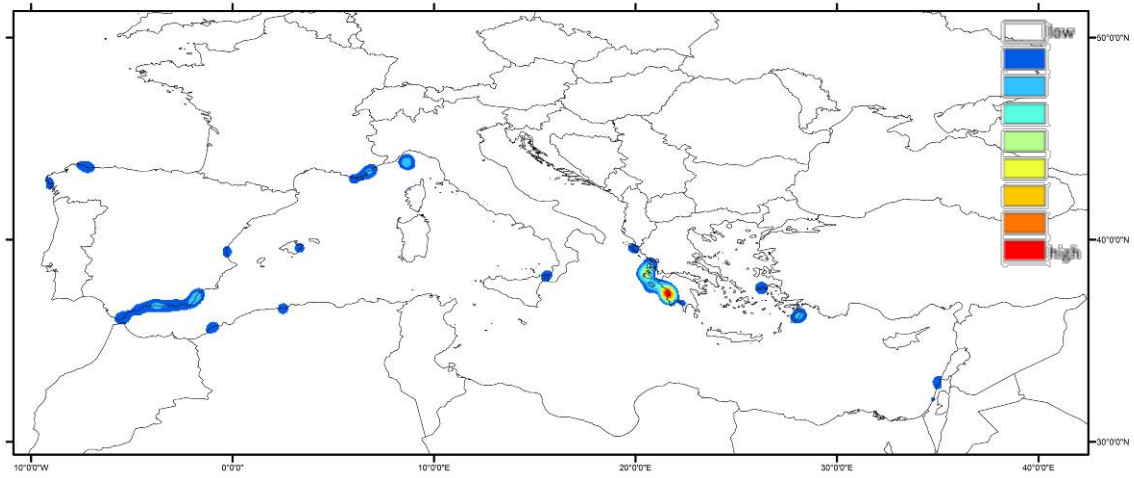
Kernel Density Estimate of fin whale strandings



Kernel Density Estimate of Risso's dolphin strandings



Kernel Density Estimate of Cuvier's beaked whale strandings



Kernel Density Estimate of pilot whale strandings

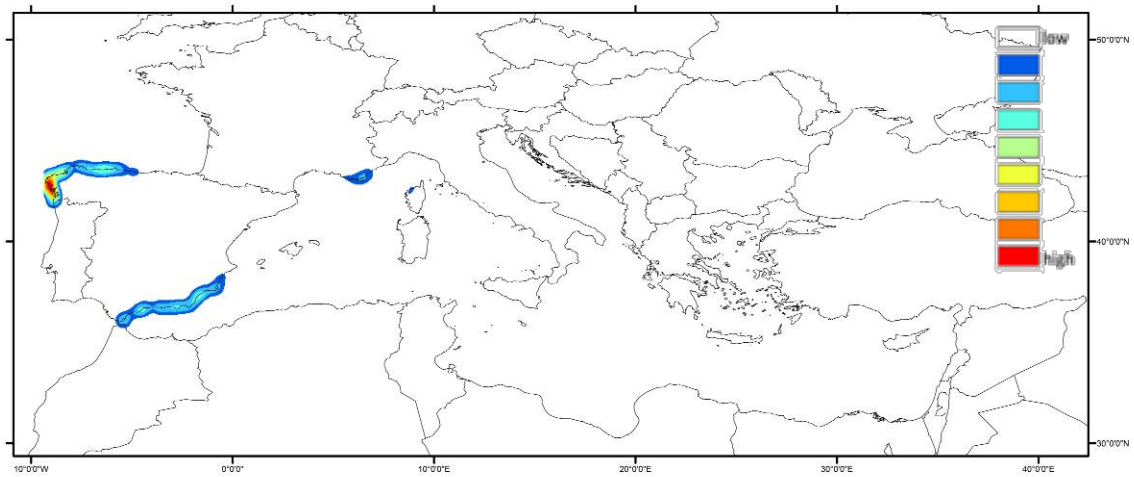


Figure 6. Kernel Density Maps for the most stranded species. Higher probability of stranded in red, and lower in dark blue.

2.2.5. Stranding rate

The average number of cetacean strandings is 800 ± 120 per year. Lower numbers have been recorded in 2014 (689) and 2015 (501). MEDACES would play an important role in detecting anomalies in the rate of cetacean strandings at the Mediterranean and Black Seas across time. However, this will be only possible if the database is continuously updated with the latest information. To date, MEDACES has not been able to show general trends in the number of strandings, as there are still some gaps in the information. Only Croatia, France, Italy, Israel, and Spain seem to have complete stranding records from 1990 to 2015 in the Mediterranean, and Ukraine, Romania and Bulgaria for the Black Seas.

Table 4 shows the number of cetacean strandings of each species by year. Even though the total number of strandings does not show trends along time due to the lack of data in some years, there are some relevant points that could be extracted from these stranding rates in the Mediterranean presented in table 4 and Figure 8:

- The number of Unknown cetacean species has decreased, probably due to the use of new technologies in the identification of the species carcasses by pictures.
- The number of striped dolphin stranded was significantly higher in 2007 and 2008, due to the mortality caused by the Morbillivirus infection, and this number seems to be decreasing, reaching numbers before 2007 mortality (Raga et al. 2008). Two more peaks can be observed in graphics (2003 and 2011) (Soto et al. 2011, Rubio-Guerri et al. 2012).
- The number of common dolphins and harbour porpoises strandings varies significantly along the years. Great number of these data is associated to the by catch in these two species in the Black Sea (Tonay 2016) and in Galicia waters too (Goetz et al. 2014). Harbour porpoises were affected by Morbillivirus (Müller et al. 2002), the same virus that previously affected to common dolphins from the Black Sea (Birkun 1999). Since data from by catch does not respond the biological factors should be considered independently to the stranding data. Anyway, special attention should be paid to this fact.

- The number of pilot whale strandings showed an increase in 2007 and 2008, due to the mortality caused by the Morbillivirus infection, and is decreasing nowadays (Fernandez et al. 2008).

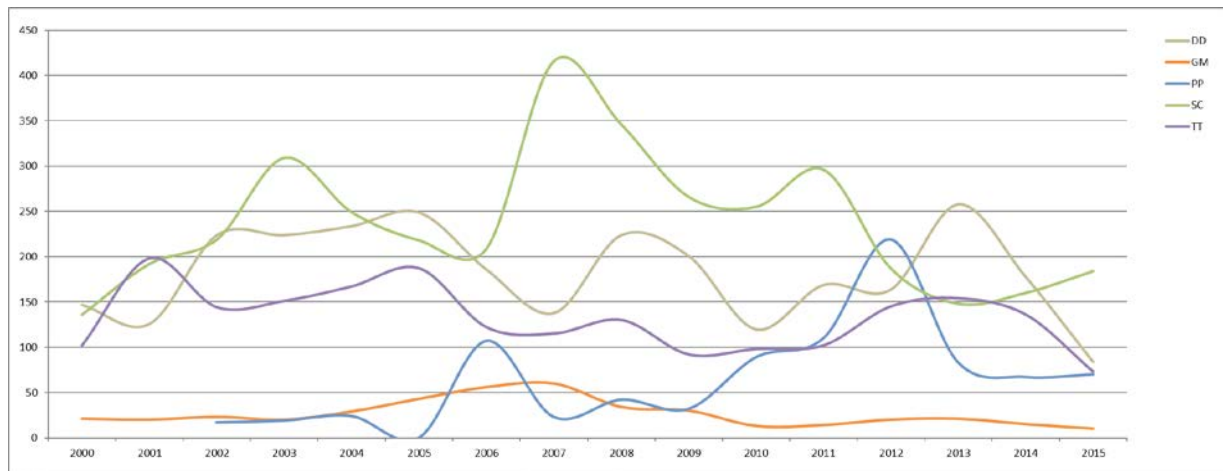


Figure 7. Trends in the number of strandings of the main cetacean species present in the ACCOBAMS area.

Table 5. Number of strandings recorded for each cetacean species in all partner countries recorded by year. Ba, *Balaenoptera acutorostrata*; Bp, *Balaenoptera physalus*; Dd, *Delphinus delphis*; Gg, *Grampus griseus*; Gm, *Globicephala melas*; Ks, *Kogia Sima*; Md, *Mesoplodon densirostris*; Mn, *Megaptera novaengliae*; Oo, *Orcinus orca*; Pc, *Pseudorca crassidens*; Pm, *Physeter macrocephalus*; Pp, *Phocoena phocoena*; Sb, *Steno bredanensis*; Sc, *Stenella coeruleoalba*; Tt, *Tursiops truncatus*; Zc, *Ziphius cavirostris*, O, others; U, unknown.

	BA	BP	DD	GG	MN	GM	KS	MD	OO	PM	PC	PP	SB	SC	TT	U	ZC
2000	2	19	147	16	0	21	0	0	0	12	0	13	0	136	102	113	10
2001	7	7	126	22	1	20	0	0	0	12	1		1	192	198	133	14
2002	4	21	224	28	0	23	1	1	1	11	0	17	7	219	144	159	16
2003	11	10	224	17	0	20	1	1	0	8	10	19	2	309	151	169	7
2004	11	10	234	16	0	29	0	0	0	16	1	24	2	249	167	207	7
2005	12	15	249	27	0	43	0	0	1	22	12	0	0	218	187	207	16
2006	3	12	186	16	0	56	0	0	1	15	0	107	1	209	122	160	16
2007	4	18	138	18	0	60	0	0	1	16	2	23	0	416	115	207	11
2008	10	9	224	21	0	34	0	0	0	9	0	42	1	346	130	172	9
2009	3	9	201	20	0	30	0	0	0	11	7	32	0	266	92	66	5
2010	4	8	120	6		13	0	0	0	9	0	89	1	255	98	66	6
2011	2	7	169	16	4	14	0	1	0	8	0	110	0	296	102	71	4
2012	9	12	164	11	19	20	0	0	0	6	3	219	0	187	145	11	6
2013	6	8	258	9	0	10	1	0	0	7	1	80	1	117	148	82	5
2014	3	15	178	9	0	15	0	0	0	5	1	67	0	160	136	53	4
2015	5	7	84	11	0	10	0	0	0	5	0	70	1	184	73	32	11

3. MEDACES DATA IN SCIENTIFIC PAPERS

- Arrigoni, M., Manfredi, P., Panigada, S., Bramanti, L. & Santangelo, G. (2011) Life history tables of the Mediterranean fin whale from stranding data. *Marine Ecology*, 32 (Suppl. 1): 1–9.
- Bearzi, G., Reeves, R.R., Remonato E., Pierantonio, N. & Airoidi, S. (2011) Risso's dolphin *Grampus griseus* in the Mediterranean Sea. *Mammalian Biology*, 76: 385–400.
- Gannier, A. (2011) Using existing data and focused surveys to highlight Cuvier's beaked whale favourable areas: A case study in the central Tyrrhenian Sea. *Marine Pollution Bulletin*, 63: 10–17.
- Kerem, D., Goffman, O., Elasar, M., Hadar, N., Scheinin, A. Lewis, T. (2016). Chapter Eight - The Rough-Toothed Dolphin, *Steno bredanensis*, in the Eastern Mediterranean Sea: A Relict Population? In: Giuseppe Notarbartolo Di Sciara, Michela Podestà and Barbara E. Curry, Editor(s), *Advances in Marine Biology*, Academic Press, 2016, Volume 75, Pages 233-258.
- Kerem, D., Hadar, N., Goffman O., Scheinin, A., Kent, R. Boisseau O. & Schattner., U. (2012) Update on the Cetacean Fauna of the Mediterranean Levantine Basin. *The Open Marine Biology Journal*, 6: 6-27.
- Maio, N., Giovannotti, M., Barucchi, VC., Petraccioli, A., Pollaro, F., Guarino, F.M., Splendiani, A., De Stasio, R., Odierna, G. (2016) Haplotype characterization of a stranded Common Minke Whale calf (*Balaenoptera acutorostrata* Lacépède, 1804): is the Mediterranean Sea a potential calving or nursery ground for the species? *Hystrix, the Italian Journal of Mammalogy*. Online
- Podestà, M., Azzellino, A., Cañadas, A., Frantzis, A., Moulins, A., Rosso, M., Tepsich, P., Lanfredi, C. (2016) Chapter Four - Cuvier's Beaked Whale, *Ziphius cavirostris*, Distribution and Occurrence in the Mediterranean Sea: High-Use Areas and Conservation Threats, In: Giuseppe Notarbartolo Di Sciara, Michela Podestà and Barbara E. Curry, Editor(s), *Advances in Marine Biology*, Academic Press, 2016, Volume 75, Pages 103-140.
- Nortarbartolo di Sciara, G. & Birkun, A. Jr. (2010) Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas: an ACCOBAMS status report. ACCOBAMS, Monaco, 212 pp.
- Sharir, Y., Kerem, D., Gol'din, P. & Spanier, E. (2011) Small size in the common bottlenose dolphin *Tursiops truncatus* in the eastern Mediterranean: a possible case of Levantine nanism. *Marine Ecology Progress Series*, 438: 241-251.

COMMENTS/RECOMMENDATIONS

The MEDACES web-page plays a very important role towards the achievement of the following objectives: 1) To collect the stranding information of cetaceans from all the collaborating countries in a unique database; 2) To provide access to the different information that has been collected from each stranded animal; 3) To facilitate the contact information among people and institutions working on cetacean biology and conservation at the Mediterranean and Black Seas. The database joins also information about the organizations/institutions collaborating with MEDACES, including data of contact-persons. Hence, MEDACES makes the cetacean stranding information available to everyone interested in cetaceans (although submitted data are protected by a Deontological Code).

Data recorded in MEDACES show abnormal stranding rates in the Mediterranean in recent years. Several species have been affected: striped dolphins, common dolphins, harbour porpoises and bottlenose dolphins. It would be very interesting to follow up on these observations in order to test for possible infections or an increase in human interactions.

The fact that this kind of events can be reflected through the MEDACES web page is an opportunity for scientists as well as for competent members of the different governments of the riparian countries for setting up an emergency protocol to anticipate a possible die-off. In addition, standardized methods for necropsies and tissue sampling, as well as coordination procedures can be prepared. MEDACES is also providing contact information about relevant scientists and institutions, allowing fast and easy exchange of experience, and advices.

A review of the functioning of MEDACES was carried out in the Sixth Meeting of the Parties to ACCOBAMS (Monaco, 22 - 25 November 2016) (van Klaveren 2016). Here, the existence in MEDACES of only basic stranding data was found useful to retrieve information on the geo-localization of these strandings. This information is recognized as very useful. Further use of advanced data needs direct relation with the data providers.

In this review, it was found positive the regular inputs of data from Countries of the Black Sea and Atlantic waters, although some countries only report to National stranding networks. It is satisfactory the use of MEDACES by the non-Mediterranean countries under the ACCOBAMS as complementing the use under the RAC/SPA for the Mediterranean.

As some National networks are not uploaded to MEDACES, this review recommends efficient awareness campaigns, toward Focal Points and scientific communities. The key recommendations of this report are included further:

- in 2016, ACCOBAMS and RAC/SPA have encouraged the different countries around the Mediterranean and Black Sea to collaborate with the database. But still, in every riparian country wishing to collaborate, the different National Focal Points should increase the support to the national organizations and institutions working in stranding networks. So, national stranding database would transfer their data to MEDACES.
- it could be useful the identification of a MEDACES national coordinator in capacity to transmit directly data to the databank.
- the ACCOBAMS web-site could show a portal to access to MEDACES
- encouragement should be done to the idea of a study of a citizen participation to the stranding networking and the feasibility of a smartphone application to this purpose (van Klaveren 2016).

5. REFERENCES

- Aguilar A., Raga J.A. (1993) The striped dolphin epizootic in the Mediterranean Sea. *Ambio* 22(8): 524-528.
- Bearzi G., Reeves R., Notarbartolo-Di-Sciara G., Politi E., Canadas A., Frantzis A., Mussil B. (2003) Ecology, status and conservation of short-beaked common dolphins *Delphinus delphis* in the Mediterranean Sea. *Mammal Review*, 33(3): 224-252.
- Bearzi G., Notarbartolo di Sciara G., Reeves R.R., Cañadas A., Frantzis A. (2004) Conservation Plan for short-beaked common dolphins in the Mediterranean Sea. ACCOBAMS, Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area. 90 pp.
- Birkun Jr., A., Kuiken, T., Krivokhizhin, S., Haines, D.M., Osterhaus, A.D.M.E., Van De Bildt, M.W.G., Joiris, C.R., Siebert, U. (1999) Epizootic of morbilliviral disease in common dolphins (*Delphinus delphis ponticus*) from the Black Sea. *Veterinary Record*, 144 (4): 85-92.
- Bortolotto A., Casini L., Stanzani A.L. (1992). Dolphin mortality along the Southern Italian coast (June-September 1991). *Aquatic Mammals*, 18:56-60.
- Cebrian D. (1995) The striped dolphin *Stenella coeruleoalba* epizootic in Greece, 1991-1992. *Biological Conservation*, 74 (2): 143-145.
- Di Guardo, G., Agrimi, U., Amaddeo, D., McAliskey, M., Kennedy, S. (1992) Morbillivirus infection on a striped dolphin (*Stenella coeruleoalba*) from the coast of Italy. *Veterinary Record*, 130: 579-580.
- Domingo M., Vilafranca M., Visa J., Prats N., Trudgett A., Visser I. (1995) Evidence for chronic morbillivirus infection in the mediterranean striped dolphin (*Stenella coeruleoalba*). *Veterinary Microbiology* 44:229-239.
- Fernandez, A., Esperon, F., Herraiez, P., Espinosa, A., Clavel, C., Bernabe, A., Sanchez-Vizcaino, J., Verborgh, P., De Stephanis, R., Toledano, F., Bayon, A. (2008) Pilot whales (*Globicephala melas*) mortality due to Morbillivirus in the Mediterranean Sea. *Emerging Infectious Diseases*, 14: 792-794.
- Geraci, J.R. and Lounsbury, V.J. (2005) *Marine Mammals Ashore: A Field Guide for Strandings*, Second Edition. National Aquarium in Baltimore, Baltimore, MD.
- Goetz, S., Read F, M. Santos, B., Pita, C. and Pierce. G.J. (2014) Cetacean–fishery interactions in Galicia (NW Spain): results and management implications of a face-to-face interview survey of local fishers. *ICES Journal of Marine Science*, 71(3), 604–617.
- Müller, G., A. Wünschmann, W. Baumgärtner, A. Birkun, A. Komakhidze, T. Stanev, C.R. Joiris (2002) Immunohistological and serological investigations of morbillivirus infection in Black Sea harbour porpoises (*Phocoena phocoena*). *Veterinary Microbiology*, 87: 183–190.
- Notarbartolo di Sciara, G. (2002) Cetacean species occurring in the Mediterranean and Black Seas. In: G. Notarbartolo di Sciara (Ed.), *Cetaceans of*

the Mediterranean and Black Seas: state of knowledge and conservation strategies. A report to the ACCOBAMS Secretariat, Monaco, February 2002. Section 3, 17p.

Notarbartolo di Sciara, G., Birkun, A. (2002) Conservation needs and strategies. In: G. Notarbartolo di Sciara (Ed.), Cetaceans of the Mediterranean and Black Seas: state of knowledge and conservation strategies. A report to the ACCOBAMS Secretariat, Monaco, February 2002. Section 18, 21p.

Notarbartolo di Sciara G., Birkun A., Jr. (2010). Conserving whales, dolphins and porpoises in the Mediterranean and Black Seas: an ACCOBAMS status report, 2010. ACCOBAMS, Monaco. 212 p.

Peltier, H., Certain, G., Van Canneyt, O., Daniel, P., Ridoux, V. (2009) How stranding records can inform on cetacean at sea: an attempt to model and validate drift and discovery rates. Book of Abstracts of the 23rd Annual Conference of the European Cetacean Society. 2-4 March 2009, Istanbul, Turkey. Pp. 17.

Raga, J.A. and Pantoja, J. (2004), Proyecto Mediterráneo. Zonas de especial interés para la conservación de los cetáceos en el Mediterráneo español. J. A. Raga y J. Pantoja (Eds.), Naturaleza y Parques Nacionales Serie técnica. Ministerio de Medio Ambiente. pp: 67-131.

Raga, J.A., A. Banyard, M. Domingo, M. Corteyn, M.F. Van Bresseem, M. Fernández, F.J. Aznar, T. Barrett (2008) Dolphin Morbillivirus Epizootic Resurgence, Mediterranean Sea. *Emerging Infectious Diseases*, 14 (3): 471-473.

Rubio-Guerri C., Melero M., Rivera B., Belliere E.N., Crespo J.L., Garcia-Parraga D., Esperon F. & Sanchez-Vizcaino JM. (2012) Simultaneous diagnosis of Cetacean morbillivirus infection in dolphins stranded in the Spanish Mediterranean sea in 2011 using a novel Universal Probe Library (UPL) RT-PCR assay. *Veterinary Microbiology*. S0378-1135(13)00040-0. 2013.

Soto, S.; Alba, A., Ganges, L.; Vidal, E.; Raga, J.A.; Alegre, F.; González, B.; Medina, P.; Zorrilla, I.; Martínez, J.; Marco, A.; Pérez, M.; Pérez, B.; Pérez De Vargas Mesas, A.; Martínez Valverde, R.; Domingo, M. (2011). Post-epizootic chronic Dolphin Morbillivirus (DVM) infection in Mediterranean striped dolphins (*Stenella coeruleoalba*). *Diseases of Aquatic Organisms*, 96: 187-194.

Tonay, A.M. (2016) Estimates of cetacean by-catch in the turbot fishery on the Turkish Western Black Sea Coast in 2007 and 2008. *Journal of the Marine Biological Association of the United Kingdom*, 96(4), pp. 993–998.

Van Bresseem, M.F., I. K. G. Visser, R. L. De Swart, C. Örvell, L. Stanzani, E. Androukaki, K. Siakavara, A. D. M. E. Osterhaus (1993) Dolphin morbillivirus infection in different parts of the Mediterranean Sea. *Archives of Virology*, 129: 235-242.

Van Bresseem, M.F., K. Van Waerebeek, J.A. Raga (1999). A review of virus infections of cetaceans and the potential impact of morbilliviruses, poxviruses and papillomaviruses on host population dynamics. *Diseases of Aquatic Organisms*, 38: 53-65.

Van Klaveren, P. (2016) Review of the functioning of MEDACES. ACCOBAMS-MOP6/2016/Inf27. Sixth Meeting of the Parties to ACCOBAMS. Monaco, 22 - 25 November 2016.