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- Department of Biology-Chemistry, Faculty of Natural science, University of Shkodra (**Albania**)
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- Institute of Fish Resources, Varna (**Bulgaria**)
- Faculty of Veterinary Medicine, University of Zagreb; Blue World Institute of Marine Research and Conservation; State Institute for Nature Protection (SINP) (**Croatia**)
- 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**)
- Morigenos-Marine Mammal Research and Conservation Society (**Slovenia**)
- 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; GRAMPUS (Colectivo para el Estudio y Conservación del Medio Marino, Huelva); Guardia Civil de Melilla; Sociedad Española de Cetáceos (**Spain**)
- Biodiversity and Protected Areas Directorate, General Commission for Environmental Affairs, Ministry of Local Administration and Environment t; General Establishment of Fisheries in Syria (**Syria**)
- Faculté des Sciences de Sfax; Institut National des Sciences et Technologie de la Mer –INSTM (**Tunisia**)

- Turkish Marine Research Foundation (**Turkey**)
- Green Balkans NGOs (**Greece**)
- Fisheries and Marine Research Officer. Ministry of Agriculture, Natural Resources and Environment. Department of Fisheries and Marine Research. Nicosia (**Cyprus**)
- Centro Studi Cetacei (**Italy**)
- Centre de recherches Marines. CNRS: Betraun (**Lebanon**)
- Faculty of Natural Resources and Environmental Science. FNRES, OMAR MUKHTAR UNIVERSITY. EI-Beyda (**Lybia**)
- Brema Laboratory. Simferopol (**Ukraine**)
- Italian Stranding on-line Database (BDS) (**Italy**)
- The Mediterranean Marine Mammals Tissue Bank (**Italy**)

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1. INTRODUCTION: THE MEDACES PROJECT

1.1. Origin and history of MEDACES

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), relating 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.

Cetacean strandings represent an important tool for the development of scientific programmes 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 with high concern for cetacean conservation. The establishment of these stranding networks with centralised databases has facilitated the collection and dissemination of relevant information on these marine vertebrates and their conservation status.

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

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 by Spain with regard 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 depositary for the database, whose management is entrusted to the University of Valencia's Cavanilles Institute of Biodiversity and Evolutionary Biology (**ICBI**BE), with the initial financial support of the Spanish Ministry of Environment and Rural and Marine Affairs (**MMA**). Nowadays, MEDACES database is supported exclusively by RAC SPA since 2010-11. 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**).

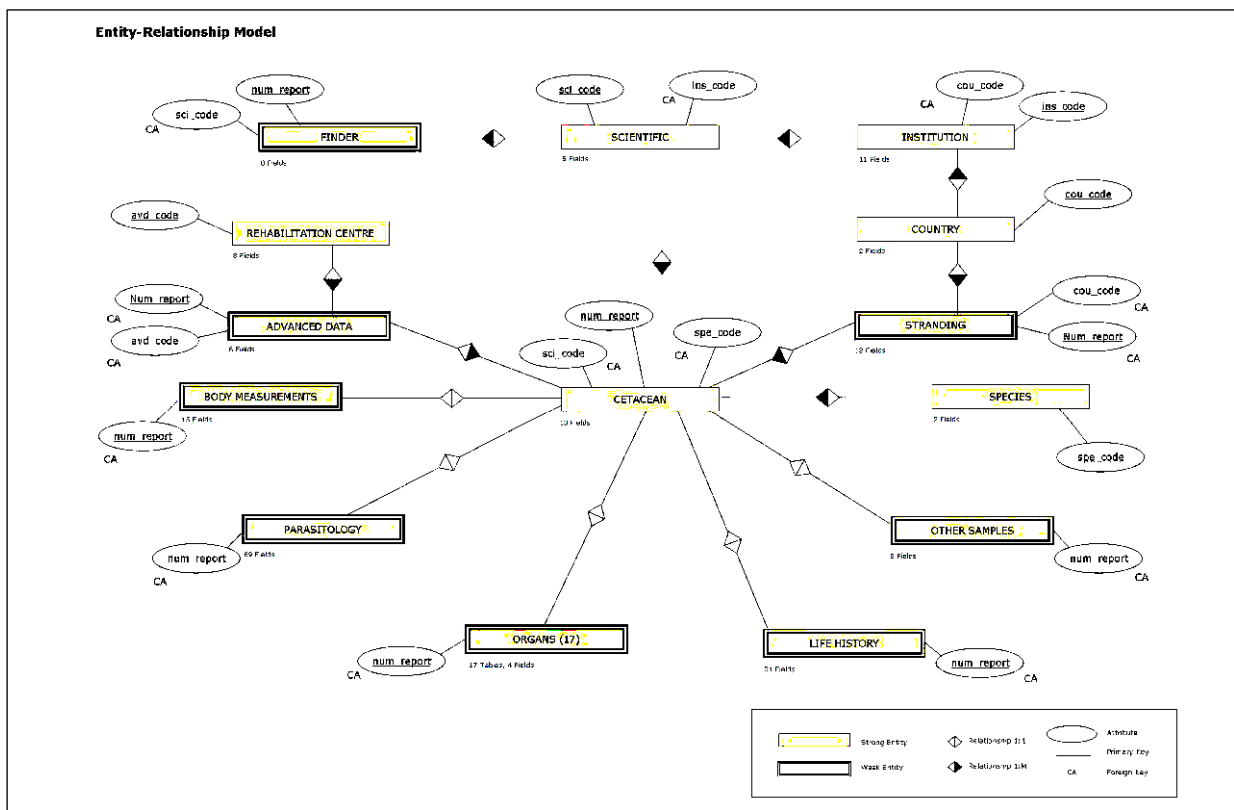
1.2. The Database

The construction of the MEDACES database and its web-page (<http://medaces.uv.es>) are both operational. MEDACES is a relational database, i.e., the information of every stranding record is stored in different, related tables. For instance, data regarding the institution sending the stranding information, cetacean measurements as well as samples taken for life history studies will be stored in three different tables. The main advantage of using a relational database is that it facilitates the search of complex information within the database that otherwise would be difficult. The structure and characteristics of the database are shown in the Figure 1. "Cetacean" has been established as the main entity of the database, containing the basic information along with the geometry for the geographical location of the stranding. The tables related to this entity contain the basic information regarding 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.). The stranding records are unambiguously identified by the primary key "num_report" (report number), and other keys allow the relation among the different tables containing the stranding information.

MEDACES is managed as a geodatabase (*Geographic database*), of the ArcGis™ family from ESRI®, and is made using the Microsoft Access software. The geodatabase is able to represent geographical data of the strandings, being able to get the location of any event in a map. It is also possible to get the information of this stranding through the interface of the map.

Nevertheless, the geodatabase server is not operational since 2009, 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. Structure and characteristics of the MEDACES database.



1.3. The MEDACES web-page

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 and programs that help to submit stranding data to the MEDACES database. The MEDACES web-page has two specific tools that are accessible for users: a search function for information related to the strandings.

The search tool contains searching criteria by species, sex, date, country, province and locality. The output is a printable list of records fulfilling the searching criteria.

Moreover, by clicking the number of the report, all the information of a stranding on the list is available.

During the last year, the MEDACES web-page has been updated with additional information:

- New documents and press official notices on cetacean strandings, including those related with the striped dolphin die off have been added (Figure 2).
- The section 'Collaborators' (from 'About MEDACES') has been updated with the Organizations/Institutions collaborating and sending their data to MEDACES.
- The database has been updated with the last records available.
- The section 'Data-Dataset', that shows the stranding data on maps, has been updated with the available data provided and the collaborating countries (Figure 3).
- The section "Mapping" has been unable as it is not possible to access to the geodatabase through internet
- In order to submit data the user has to contact to the MEDACES managers.

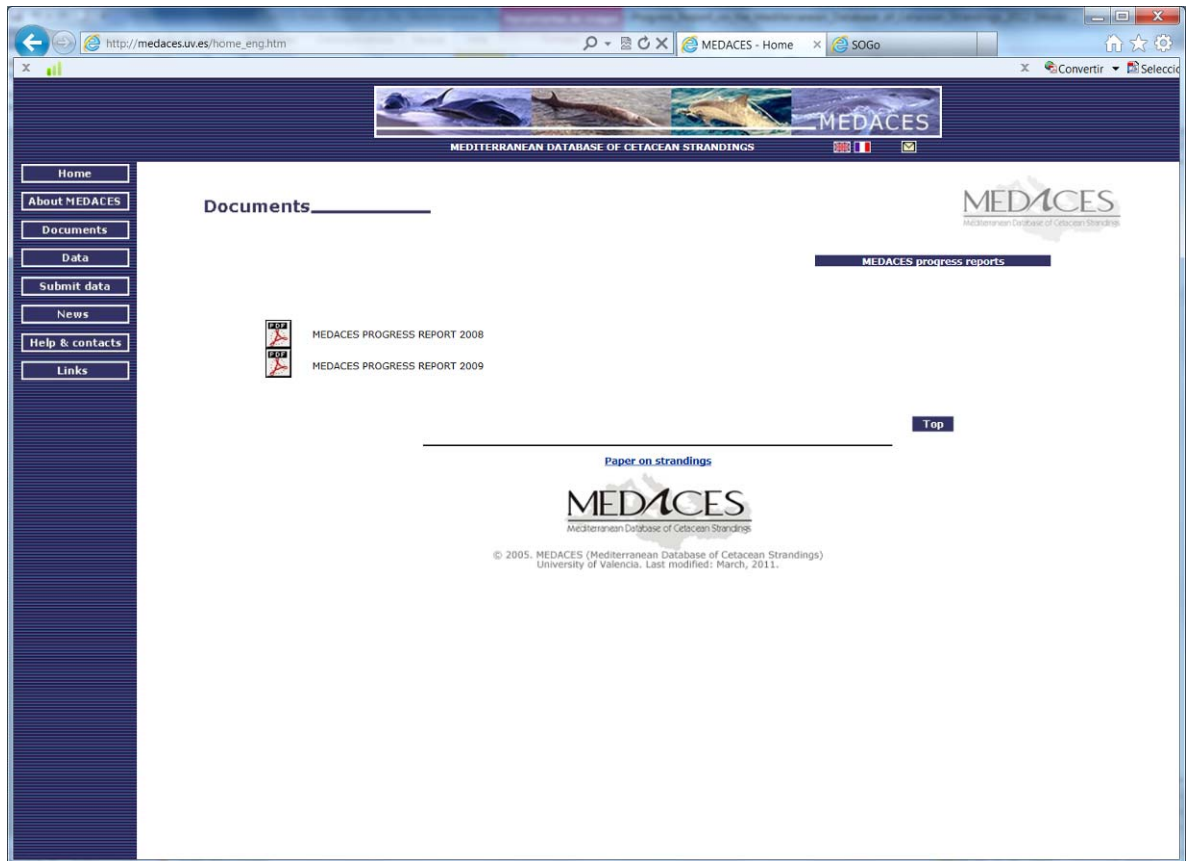


Figure 2. Update of the section 'Documents' from the MEDACES web-page.

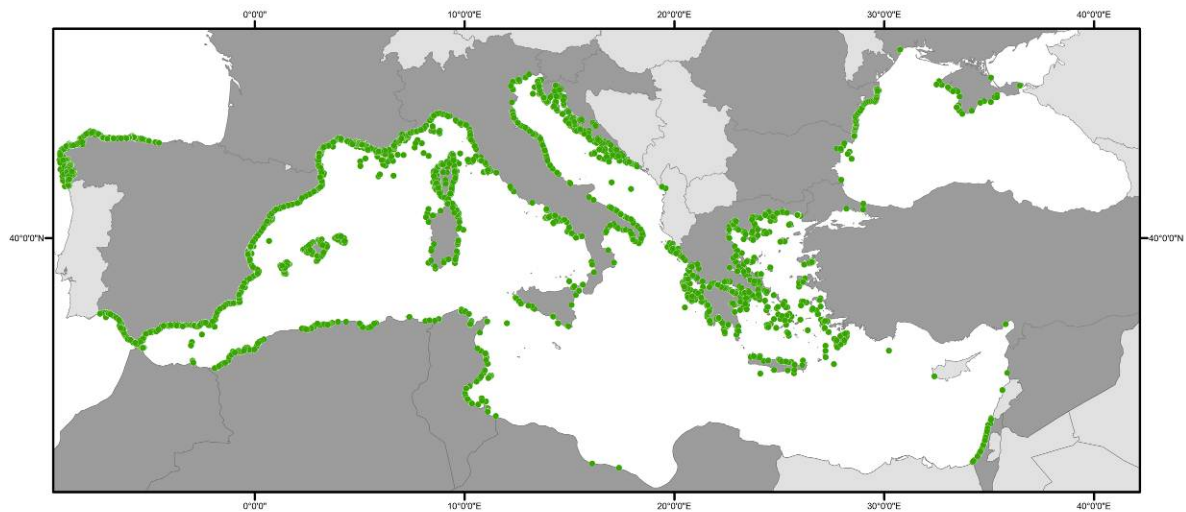



Figure 3. Map shown at 'Data set' ('Data') from MEDACES web-page where available cetacean stranding maps can be seen.

1.4. Obtaining the 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 three different options to facilitate the gathering of stranding data from the different institutions:

1) 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.

2) MEDACES Form Excel:

The *MEDACES Form Excel* option allow data to be filled in and stored in a excel file format. The excel file can be sent to MEDACES by e-mail or by ordinary post (floppy disk or CD). This last option is particularly useful for institutions or organisations without access to Internet. The excel file can be downloaded directly from the MEDACES web-page or obtained by request to the MEDACES managers.

3) Paper Form (MEDACES form.pdf):

Stranding data can also be filled into a paper copy of a PDF document prepared. This possibility is aimed at institutions with limited access to computer facilities.

So far, the more used option for sending data to MEDACES has been the *Database Extract* form, i.e., the different countries have sent an extract of their own database in Excel or Word format.

Since 2009 all the data submitted to MEDACES has been sent in MEDACES form excel, which seems to be the quickest way of gathering the own institution data. In fact, since 2009 the data included to MEDACES database is the basic information of each stranding. The basic data included is:

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)

Biological samples collected

Cause of death

Human interaction: none/boat collision/fishing
gear/intentional/unknown

Comments

2. THE STRANDING DATA

2.1. Collaborating institutions

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

So far, the following institutions are actively collaborating with their stranding data with MEDACES:

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))

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

- Centro Studi Cetacei
- Museo di Storia Naturale di Milano
- Dipartimento di Biologia Animale Università degli Studi di Pavia
- 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

- National Institute for Marine Research and Development "Grigore Antipa" (Constanta)

Slovenia

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

Spain

- Sociedad Española de Cetáceos (SEC)
- CRAM - Fundació per a la Conservació i Recuperació d'Animals Marins (Cataluña)

- 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
- Ecologistas en Acción Almería-PROMAR
- Aula del Mar de Málaga (Andalucía)
- Consejería de Medio Ambiente de la Junta de Andalucía
- 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)
- Equipo de Protección de la Naturaleza (SEPRONA), Guardia Civil de Melilla, Consejería de Medio Ambiente (Melilla).

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).

Since 2009, MEDACES has been updating the database in order to include the new stranding data that has been sent to the MEDACES administrators. These data include:

1. The institutions that have sent data of strandings in 2009, 2010 and 2011

- Universitat de València and Conselleria de Territori i Habitatge de la Generalitat Valenciana. Spain.
- CRAM - Fundació per a la Conservació i Recuperació d'Animals Marins and Departament de Medi Ambient de la Generalitat de Catalunya. (Cataluña). Spain.
- Institute of Fish Resources, Varna. Bulgaria
- General Establishment of Fisheries in Syria. Syria
- Faculty of Natural Resources and Environmental Science. FNRES, Omar Mukhtar University. El-Beyda. Lybia.
- Faculty of Veterinary Medicine, University of Zagreb. Croatia.
- Israel Marine Mammals Research and Assistance Center (IMMRAC). Israel.
- Centre de recherches marines/CNRS. Batroun. Lebanon.

2. Have communicated the absence of reported strandings between 2009 and 2010

- Morigenos-Marine Mammal Research and Conservation Society, Ljubljana. SLOVENIA

3. The institutions that have collaborated sending their historical stranding databases

- Museo di Storia Naturale di Milano and Dipartimento di Biologia Animale Università degli Studi di Pavia. Italy. Stranding data from 2001 to 2008
- Brema Laboratory. Simferopol. Ukraine. Stranding data from 1989 to 2010
- University of Shkodra. Algeria. Stranding data from 1976 to 2007
- RAC SPA. Tunisia. Stranding data from 2006 to 2009.

4. Israel has sent its historical stranding database in February 2012, and it is planned to include these data soon in the MEDACES database.

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 10,722 strandings are registered in the MEDACES database.

Nevertheless, some countries have sent stranding data series to MEDACES but have not been included yet because the big amount of information. These countries are: Italy (from year 2005 to 2000), Israel (1994 to 2011), and Ukraine (from 2006 to 2000).

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

COUNTRY	YEARS	NUMBER OF STRANDING DATA (%)
Albania	2005	2
Algeria	1975-2008	158
Bulgaria	2009- 2010	29
Cyprus	1999	2
Croatia	1990-2010	210
France	1968-2008	1,876
Greece	1944-2006	1,175
Italy	1997-2008	527
Israel	1993-2008	147
Lebanon	2010	1
Libya	2009-2012	2
Monaco	1989-2008	7
Morocco	2005	1
Romania	2002-2008	375
Slovenia	2004-2008	4
Spain	1960-2010	6,086
Syria	2005	1
Tunisia	1941-2009	111
Turkey	2000-2002	5
Ukraine	2010	2*
TOTAL		10,772

*Being included at the moment of the report.

The figure 4 shows relative contribution of stranding record submissions from each of the participating countries. France, Greece and Spain are the countries with the highest number of submitted records. Italy seems to have similar number of stranding records as these three countries. Although Italy contributed in 2011 with 1,098

stranding records since 1997, only records from 2008 to 2006 have been introduced in MEDACES.

It should be taken into account that stranding numbers depend on the length of coast line, the size of cetacean species populations in adjacent waters, the period of time from which data have been submitted, the performance of the existing stranding networks, and other eventual factor.

The figure 5 shows relative contribution of stranding record submitted from each of those countries with more than ten stranding records sent to MEDACES.

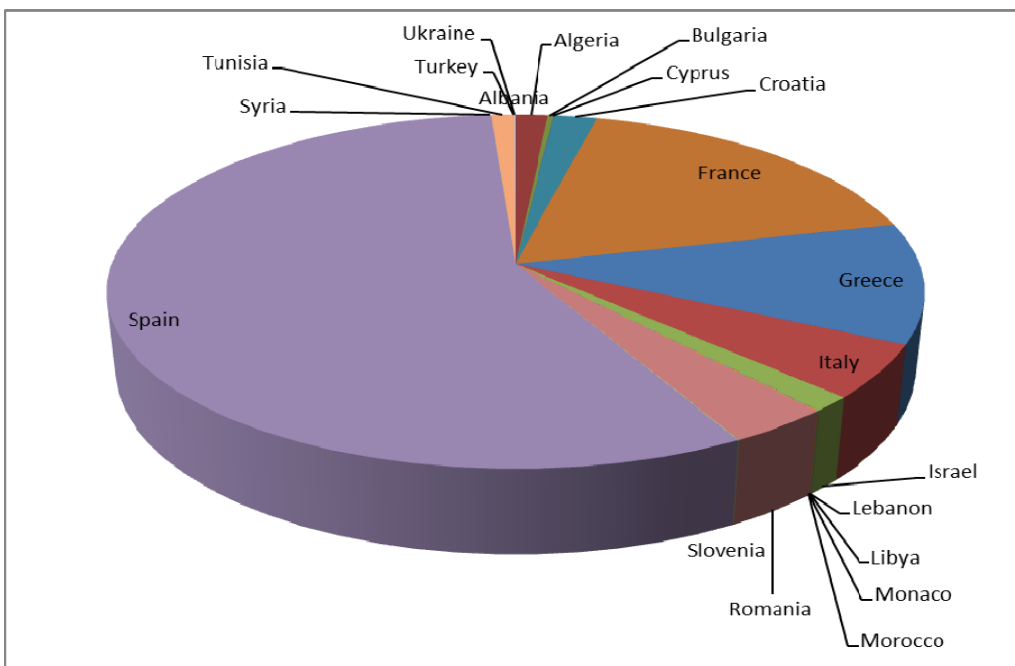


Figure 4. Strandings percentage sent to MEDACES by each country.

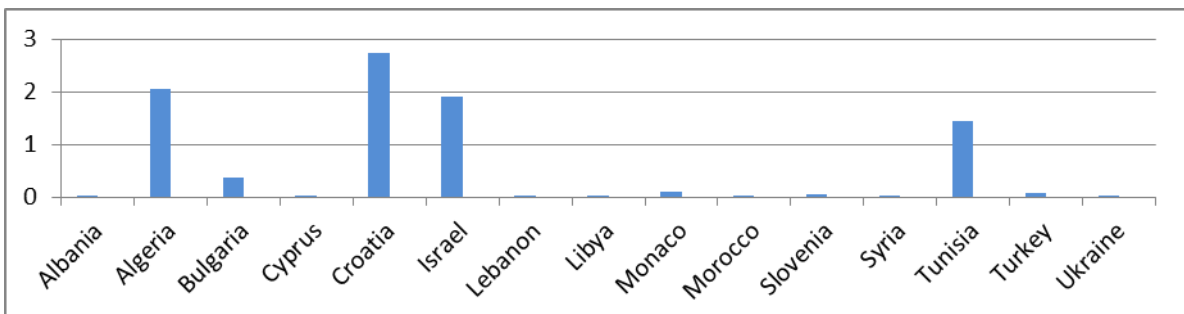


Figure 5. Strandings percentage of countries with minor contribution sent to MEDACES.

To date, almost all the Mediterranean countries and some of the Black Sea coasts have contributed to the data base. The figure 6 shows the distribution of the strandings registered in MEDACES.

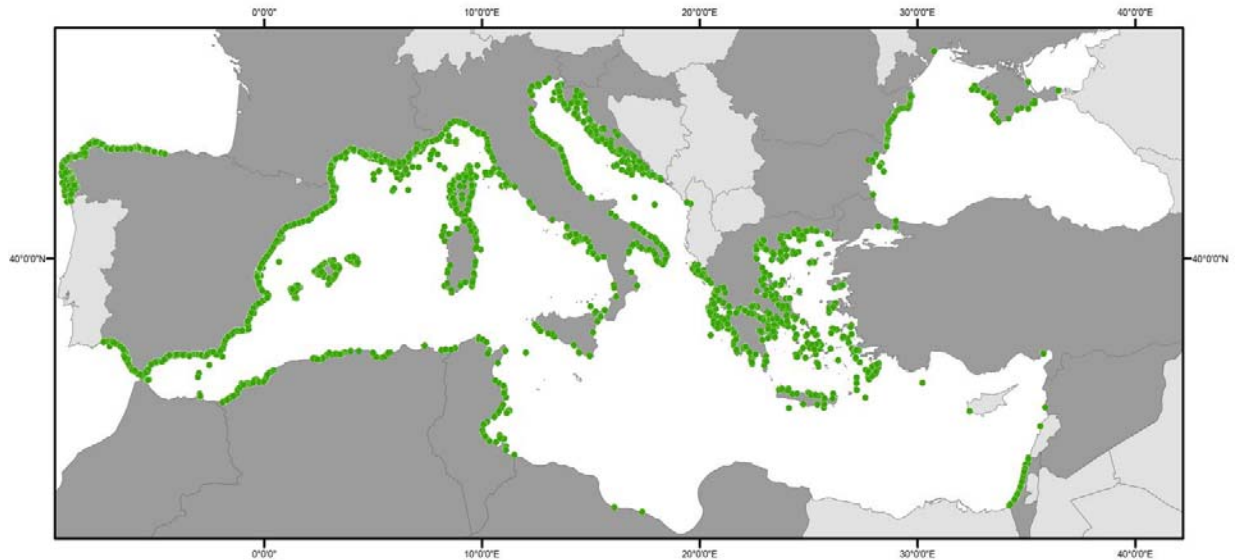


Figure 6. Location of the cetacean strandings along the Mediterranean and Black Sea coast using the data collected so far. The countries contributing with data to MEDACES are shown in darkened colour. Green dots correspond to the records.

2.2.3. 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). The most common **cetacean species stranded** in the **Mediterranean sea** are (see Figure 7): fin whale, *Balaenoptera physalus*; sperm whale, *Physeter macrocephalus*; Cuvier's beaked whale, *Ziphius cavirostris*; long-finned pilot whale, *Globicephala melas*; Risso's dolphin, *Grampus griseus*; striped dolphin, *Stenella coeruleoalba*; common dolphin, *Delphinus delphis* and bottlenose dolphin, *Tursiops truncatus*.

The following graphics (Figure 7 and 8) and Table 2 show the different **cetacean species and the number of specimens of each species** recorded stranded along the coasts of every collaborating country.

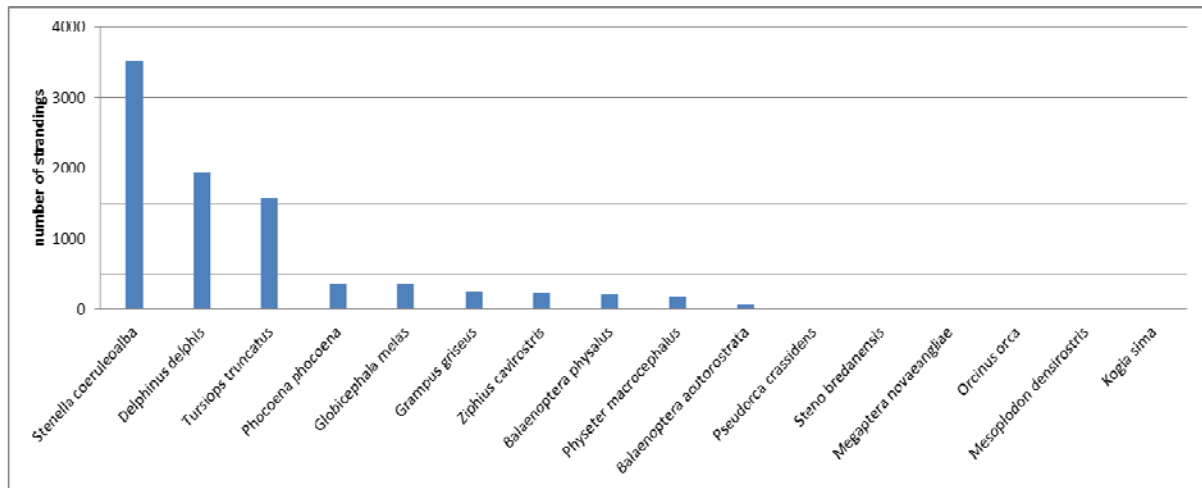
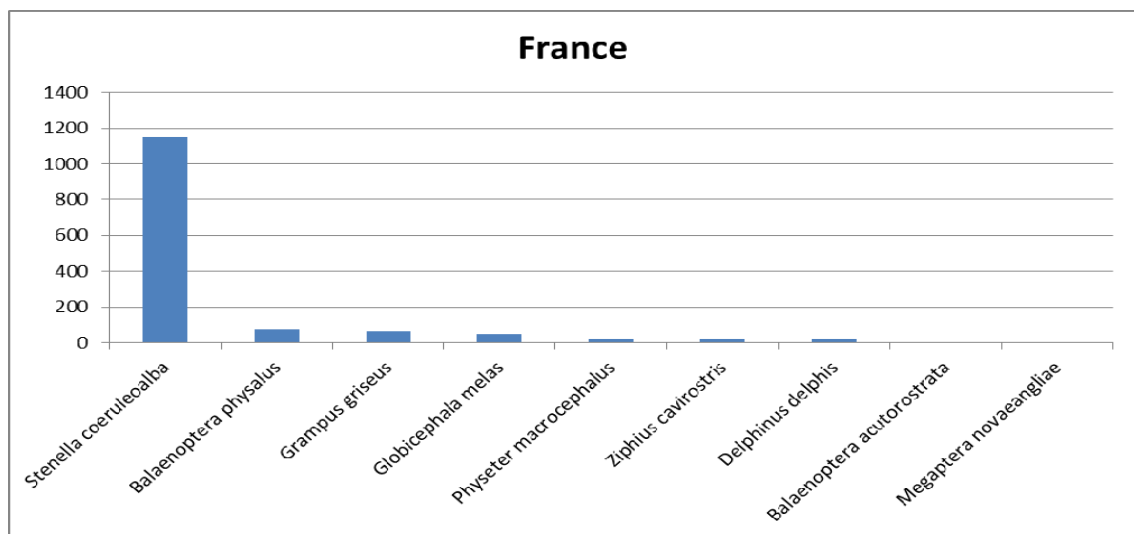
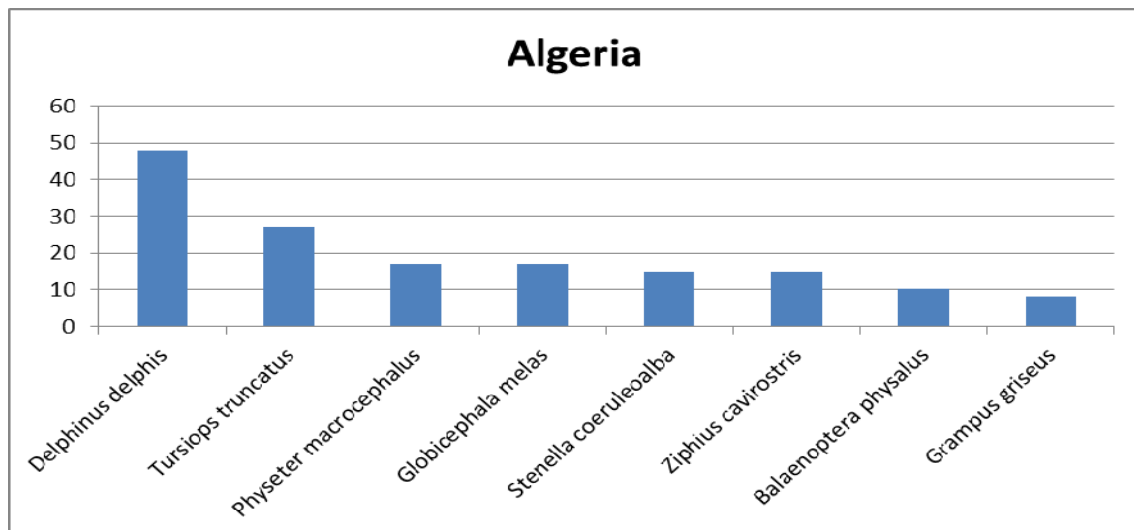
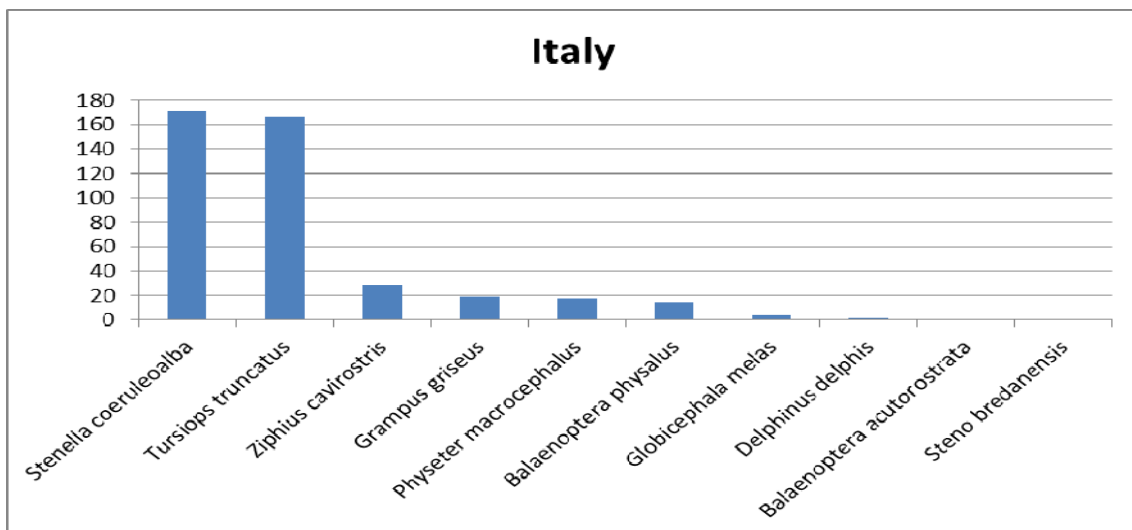
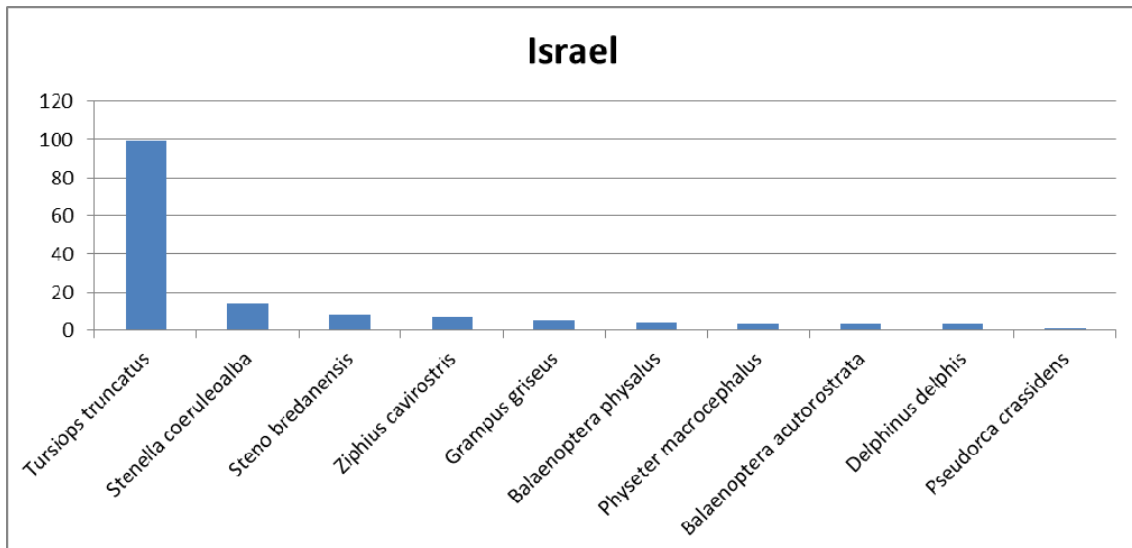
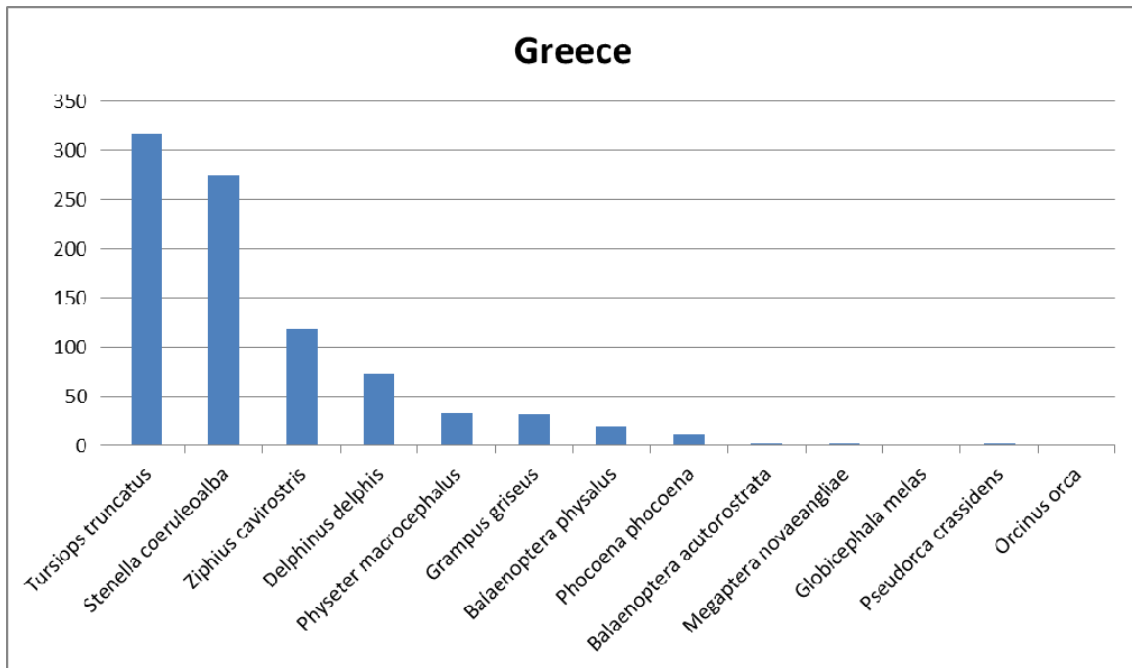
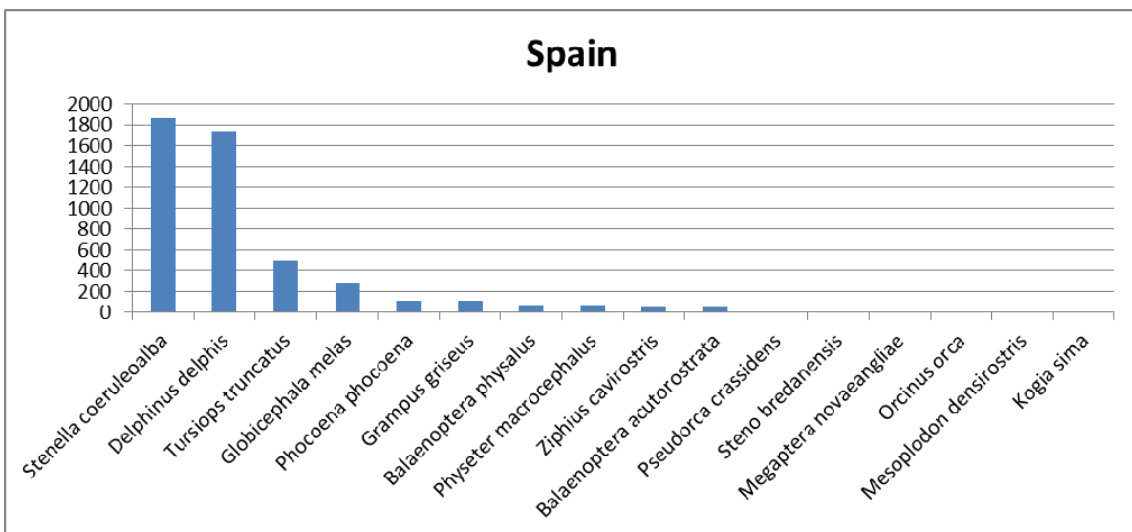
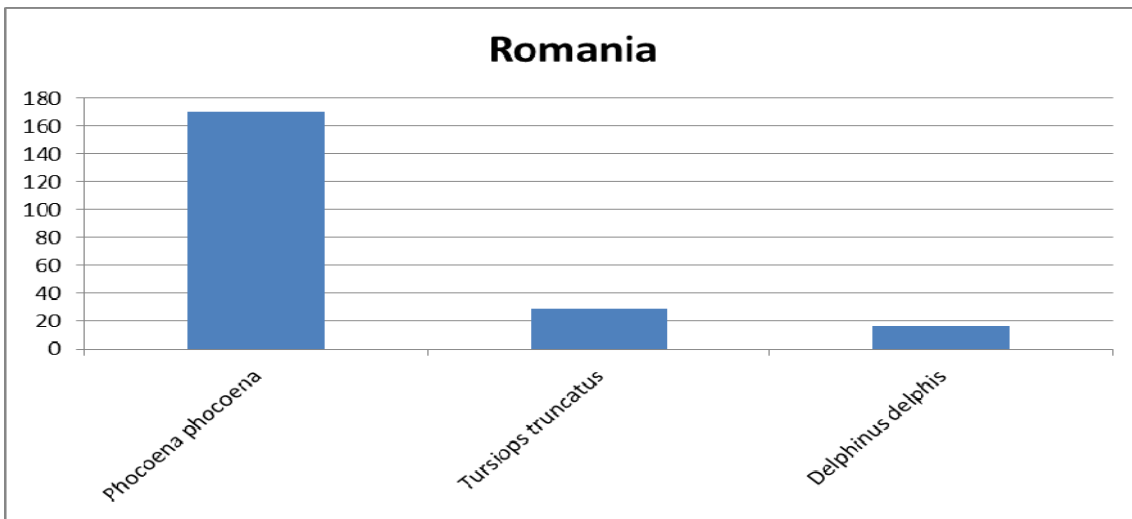
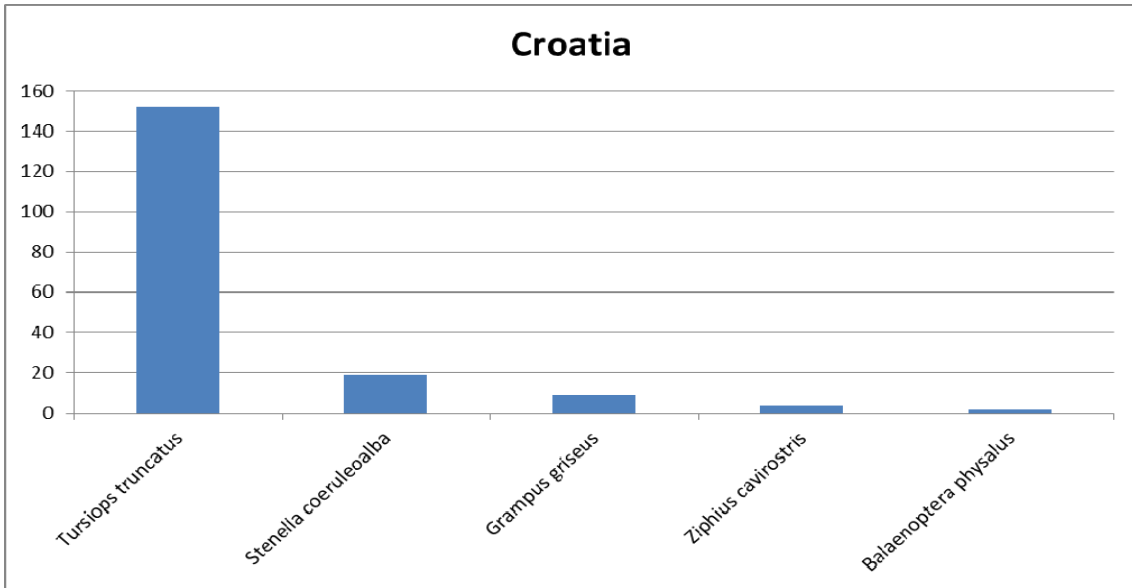


Figure 7. Cetacean species and number of specimens of each species stranded along the coasts of all the riparian countries of the Mediterranean and Black Seas.







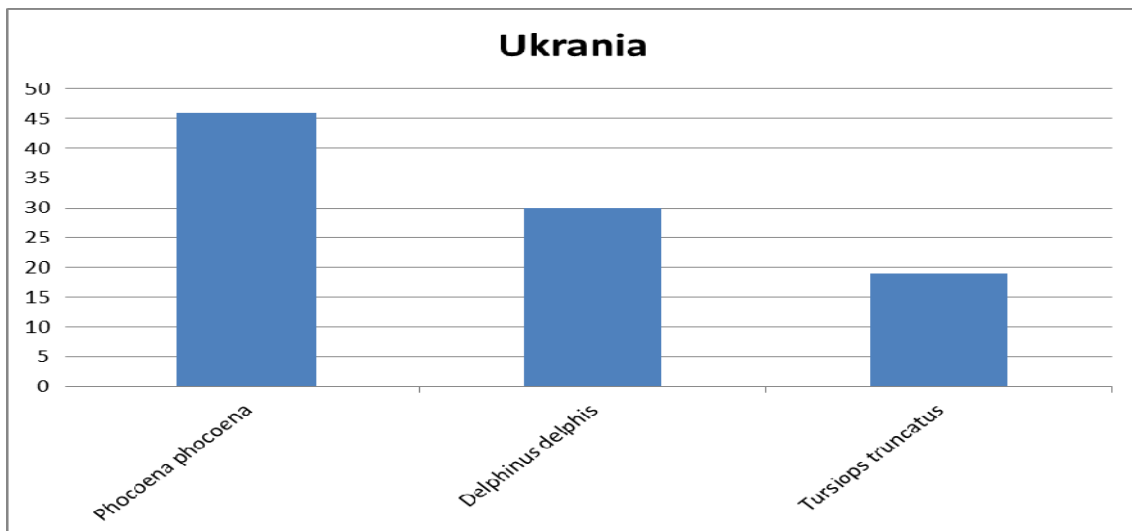
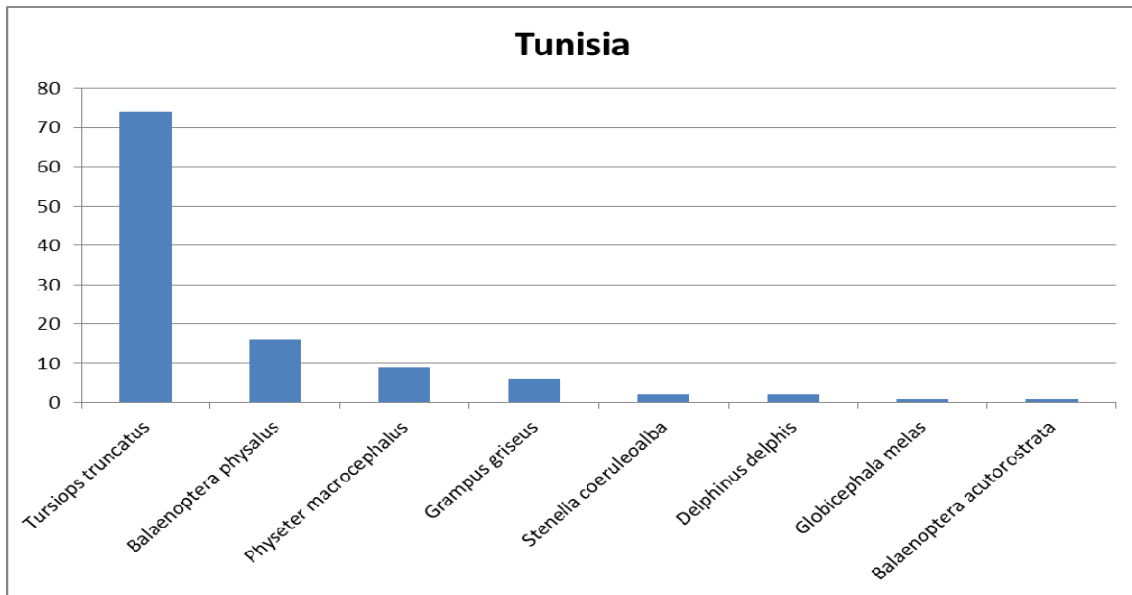


Figure 8. Cetacean species and number of specimens of each species stranded along the coasts of each of the riparian countries of the Mediterranean and Black Seas.

When comparing countries with more than ten stranding data submitted to MEDACES, it can be observed that Spain has the highest **species diversity** with a total of 18 stranded species (which is probably related to the vicinity of the Atlantic Ocean with higher diversity). Greece follows with 14 species, France 11, Israel 10, Tunisia and Algeria 8 and Croatia with 5 species (Figure 7 and Table 2).

The number of strandings and the diversity of cetacean species stranded along the coast of Tunisia have increased during the last 3 years (2006-2008) (Figure 8). During 2007-2008 the increase in stranding numbers is related to a considerable increase in bottlenose dolphin strandings (more than 3 folds than previous years). Moreover, in 2006-2007 striped dolphin and long-finned pilot whale strandings have been reported for the first time along Tunisian coast. These dates and species match with the epizootic episode suffered by these two species in the Mediterranean in 2007 (see section 2.3).

The two species most frequently recorded are the striped dolphin and the bottlenose dolphin. However, in the Mediterranean it is important to notice that in some of the countries there are more strandings recorded of bottlenose dolphin (Greece, Tunisia, Algeria, Israel, and Croatia) than of striped dolphin (Spain, France, Italy). This could be explained by the km of coast of these countries, as bottlenose dolphin is a more coastal species than striped dolphin. Other explanation would be the two Morbillivirus epizootic episodes occurred in 1990 and 2007 affecting striped dolphin specially in Spain, France and Italy (see figure 11).

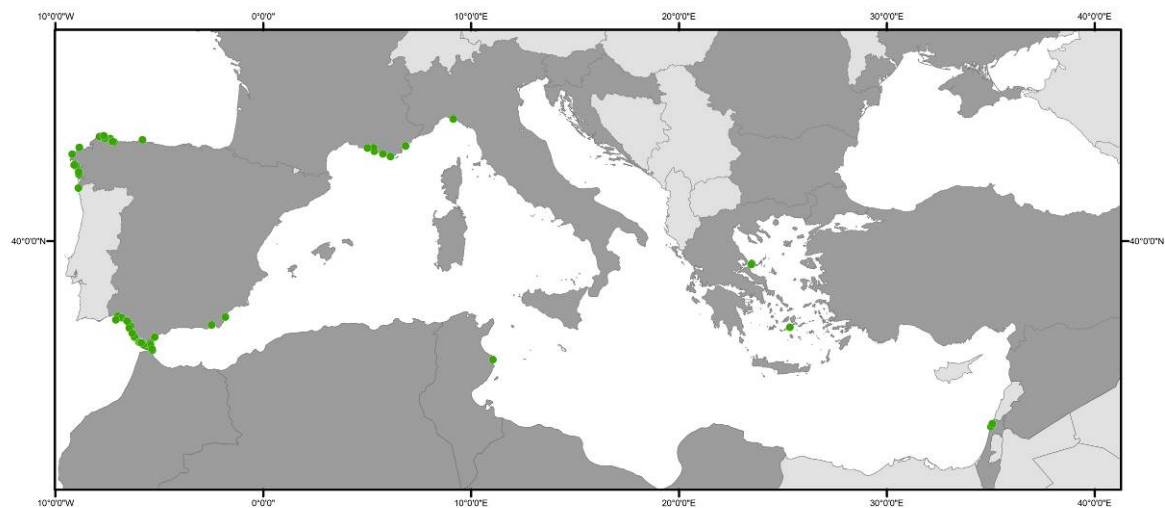
2.2.4. Distribution of the species stranded

Not every species is uniformly distributed along the Mediterranean coast: 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. 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 in the Eastern Mediterranean (see Israel strandings). As the MEDACES database includes the adjoining Atlantic waters (South-Atlantic coast of

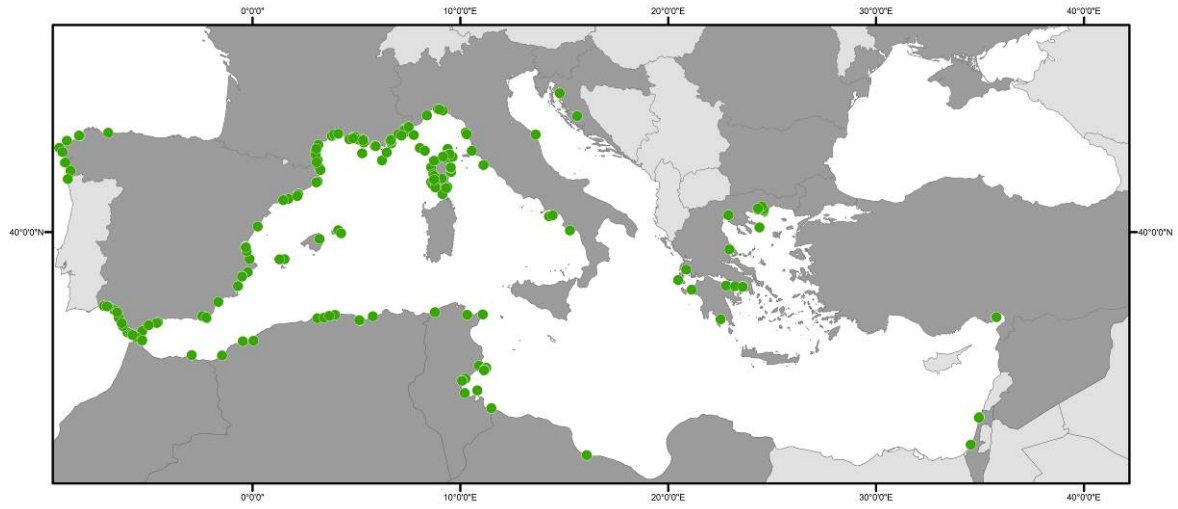
Spain), strandings of several typically Atlantic species have been reported from this area, as minke whale (*Balaenoptera acutorostrata*) and harbour porpoise (*Phocoena phocoena*).

In the Black Sea (data from Bulgaria, Romania, and recently Ukraine), three cetacean species have been reported: *D. delphis ponticus*, *T. truncatus ponticus* and *P. phocoena relicta* (Figure 7). 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).

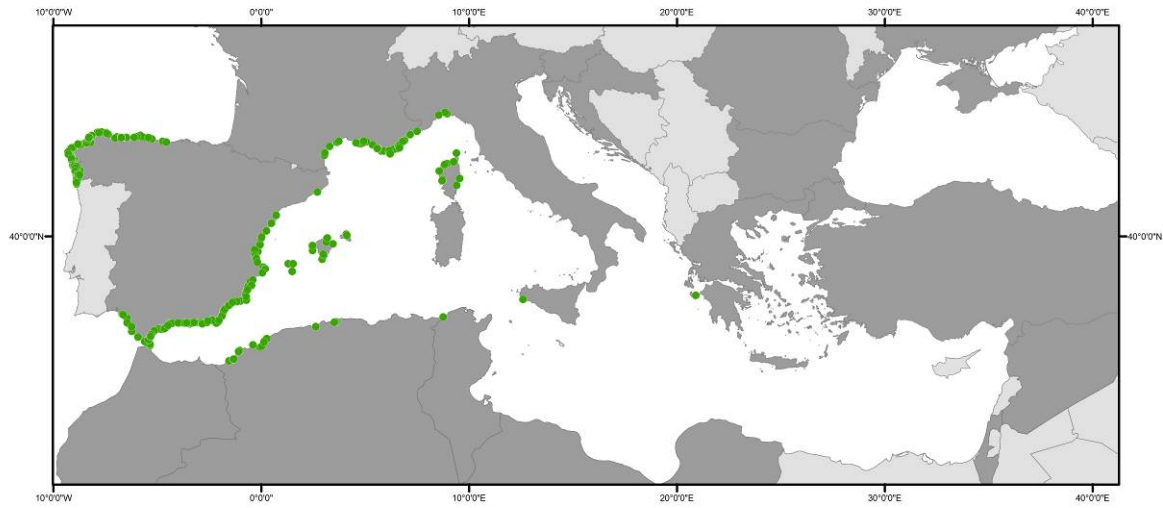
Balaenoptera acutorostrata



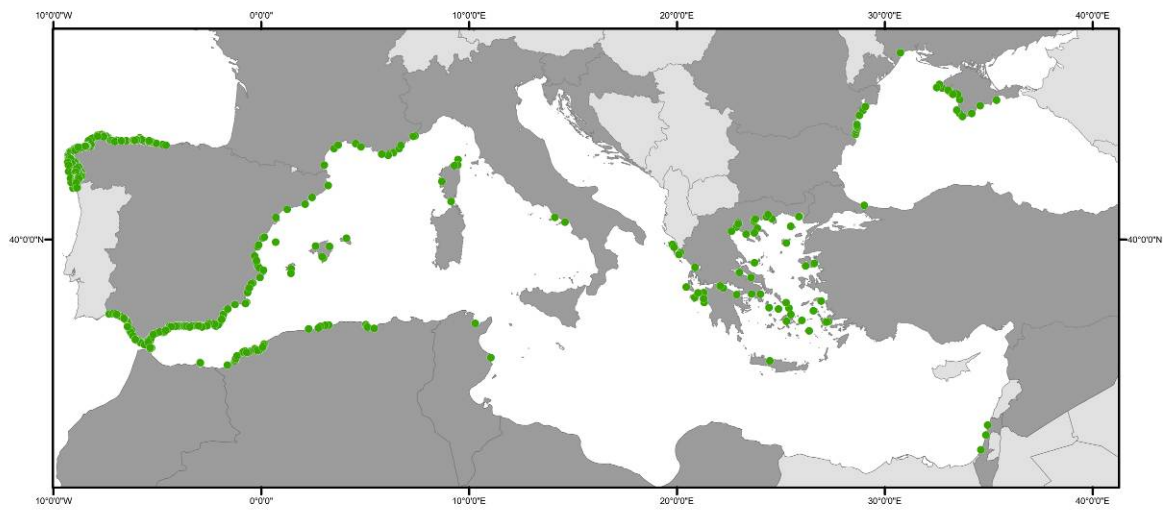
Balaenoptera physalus



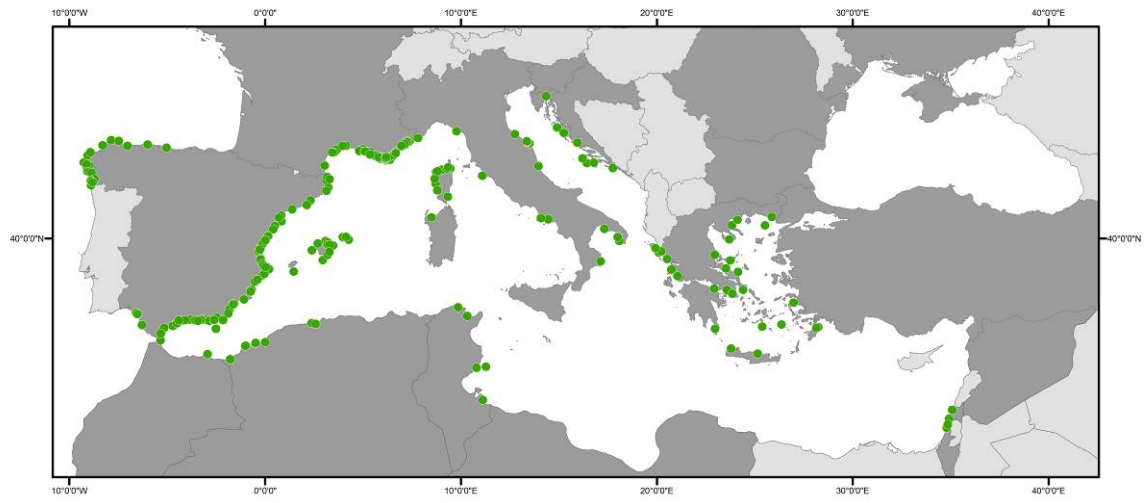
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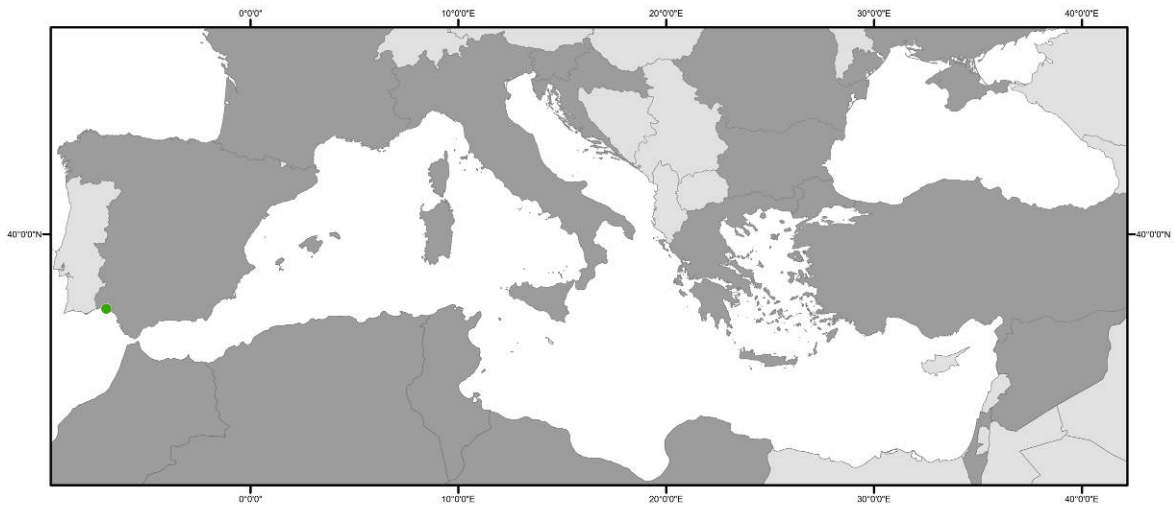
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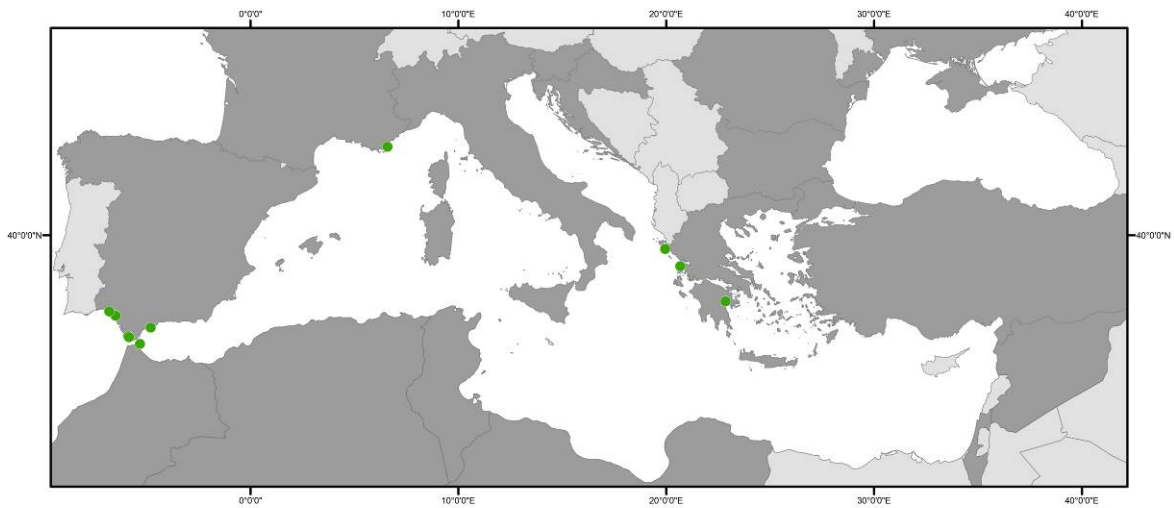
Grampus griseus



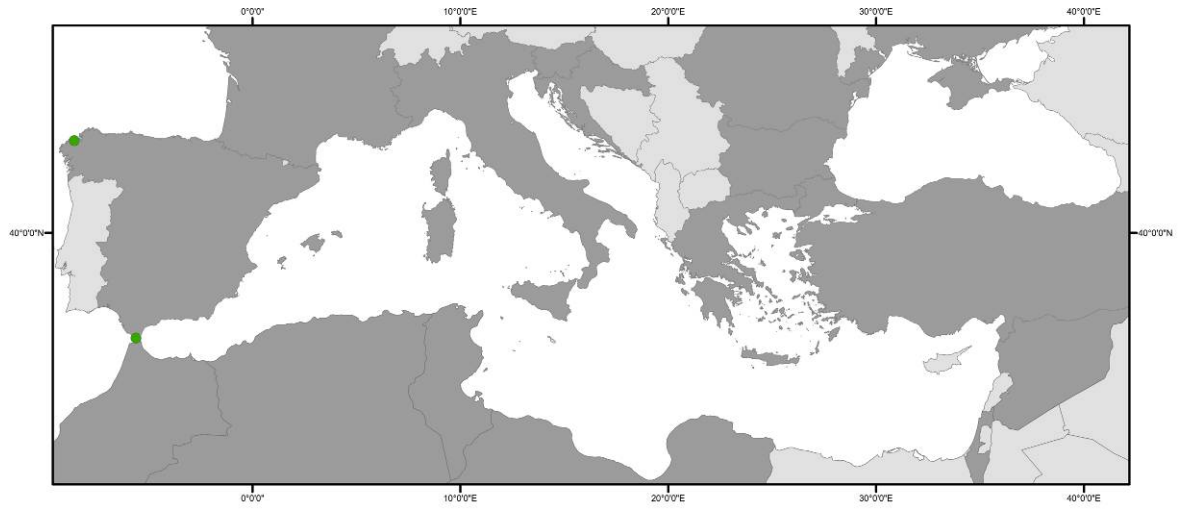
Kogia sima



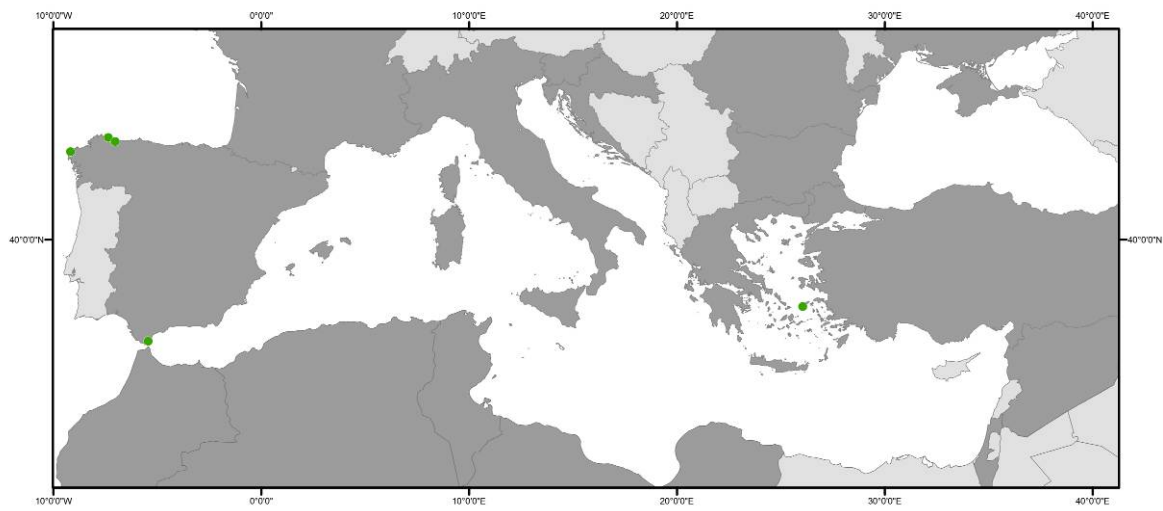
Megaptera novaengliae



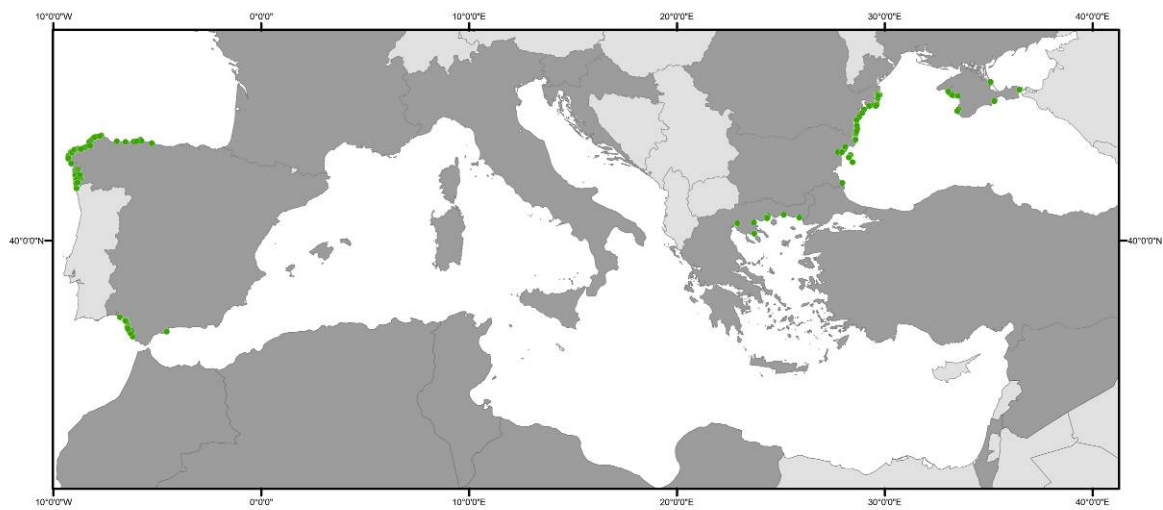
Mesoplodon densirostris



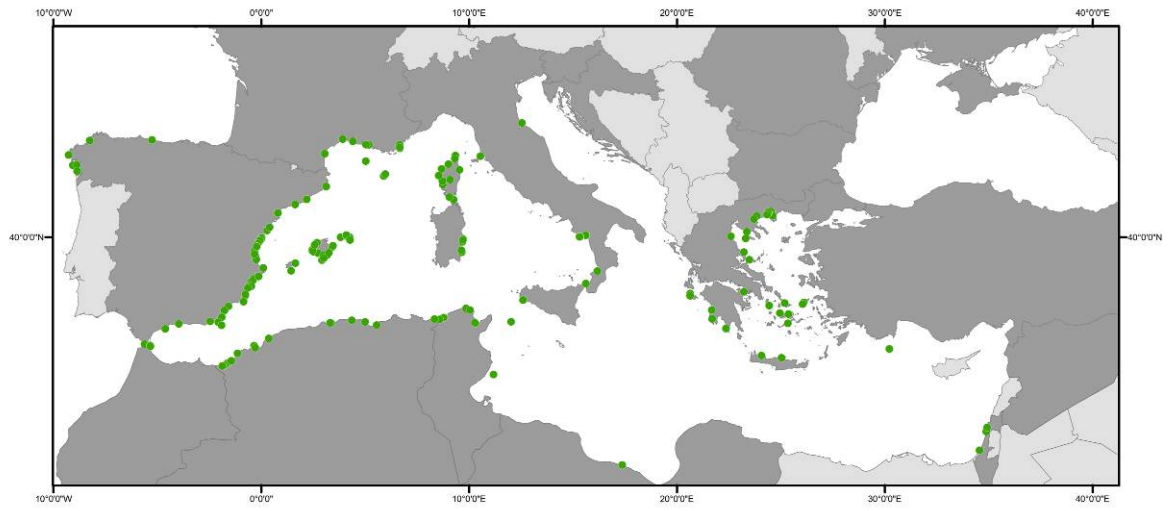
Orcinus orca



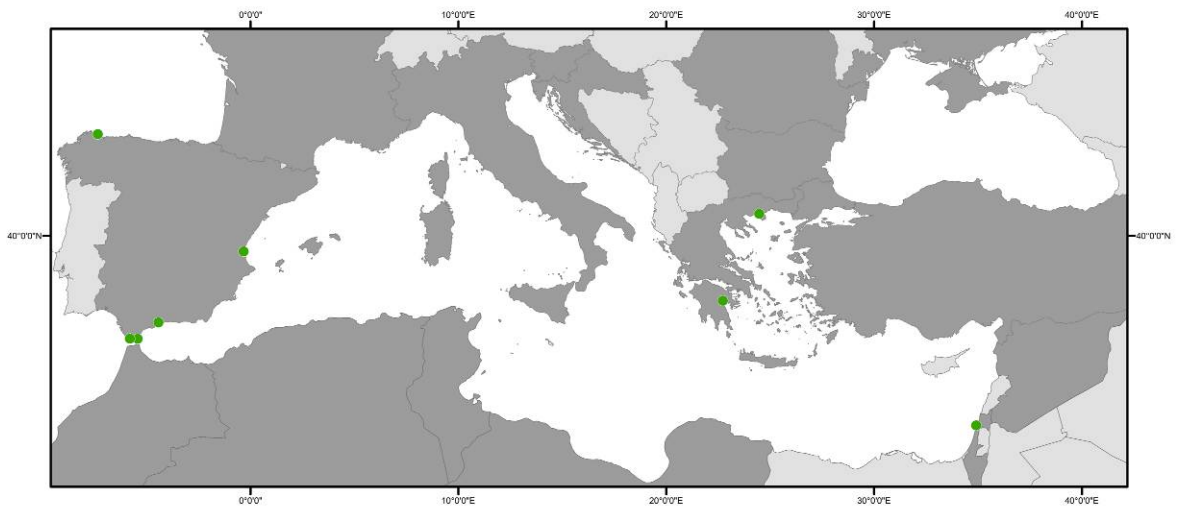
Phocoena phocoena



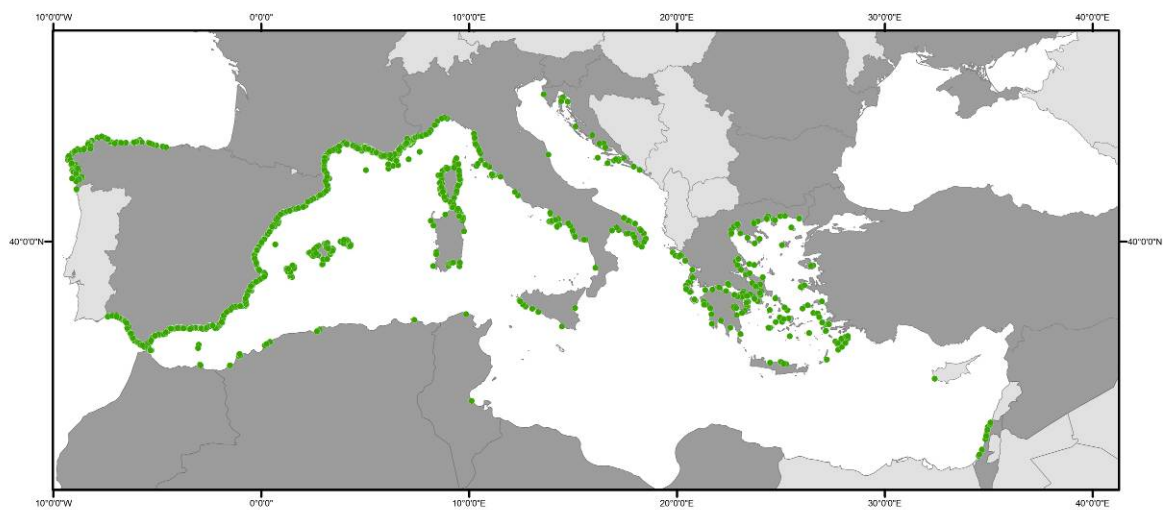
Physeter macrocephalus



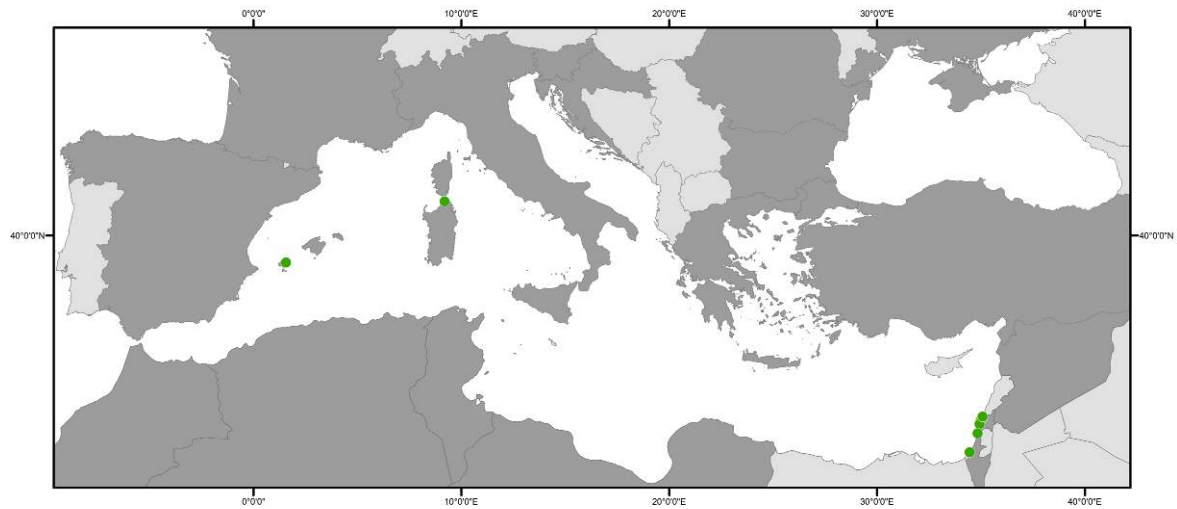
Pseudorca crassidens



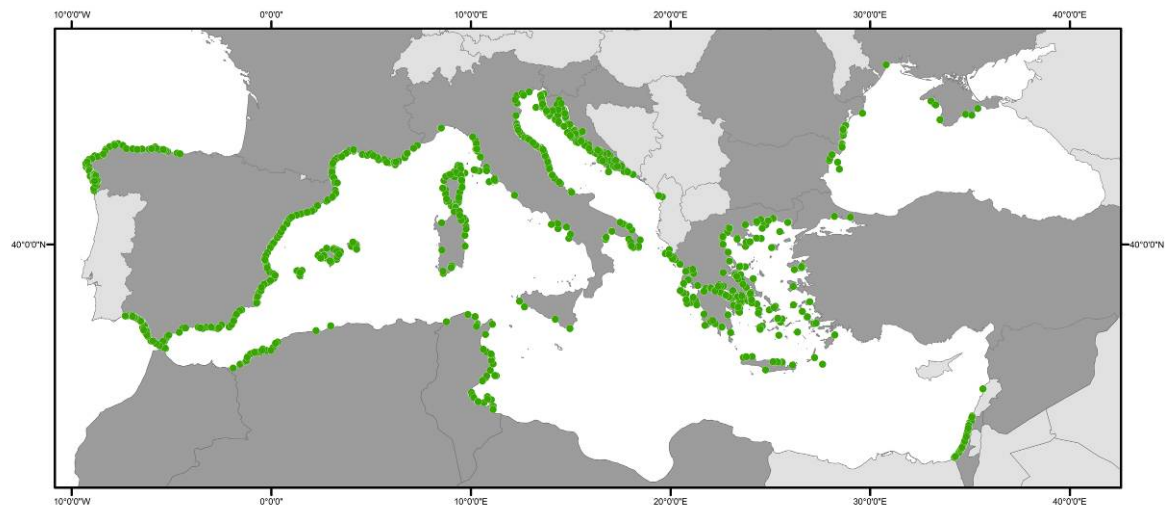
Stenella coeruleoalba



Steno bredadensis



Tursiops truncatus



Ziphius cavirostris

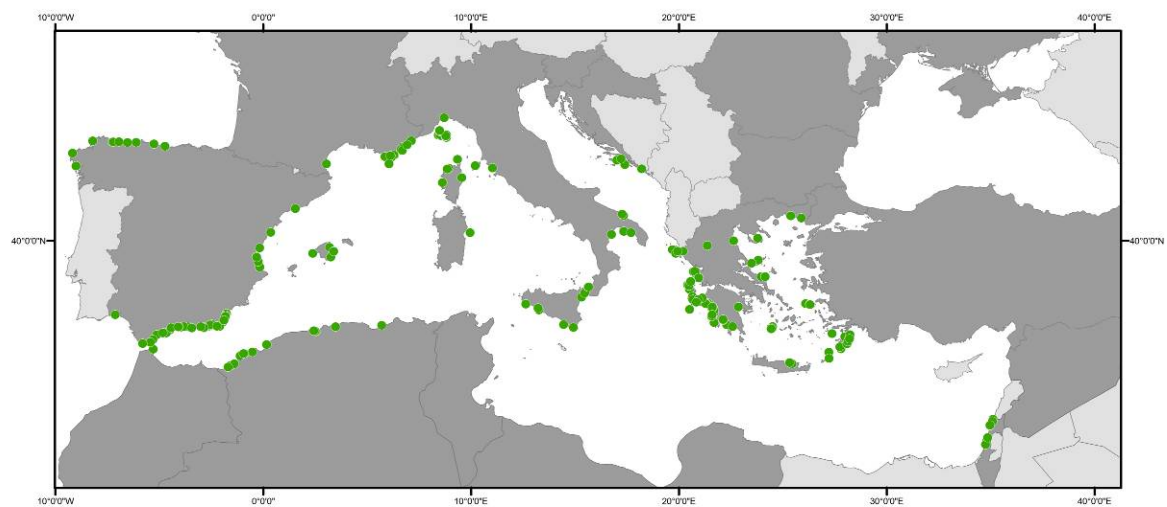


Figure 9. Cetacean species distribution stranded along the coasts of each of the riparian countries of the Mediterranean and Black Seas.

2.2.5. Stranding rate

MEDACES plays an important role in detecting anomalies in the **rate of cetacean strandings** at the Mediterranean and Black Seas, taking into consideration the direct implications that such events may have for these endangered species. However, this is only possible if MEDACES is continuously updated with the latest information. To date, MEDACES is not able to show new trends in the number of strandings than the previous report (Carrillo et al, 2009). Only Croatia and Spain have complete stranding records from 1990 to 2010. However, this report includes the general trend in stranding numbers in the Mediterranean (Figure 10, table 3) and in the Black Sea (Figure 11). Data sent by Italy is shown in figure 12.

The trends in stranding numbers by each country is extracted from the 2009 report (Figure 13). Only countries with more than ten records submitted to MEDACES and the most common cetacean species in each country were used for the analysis.

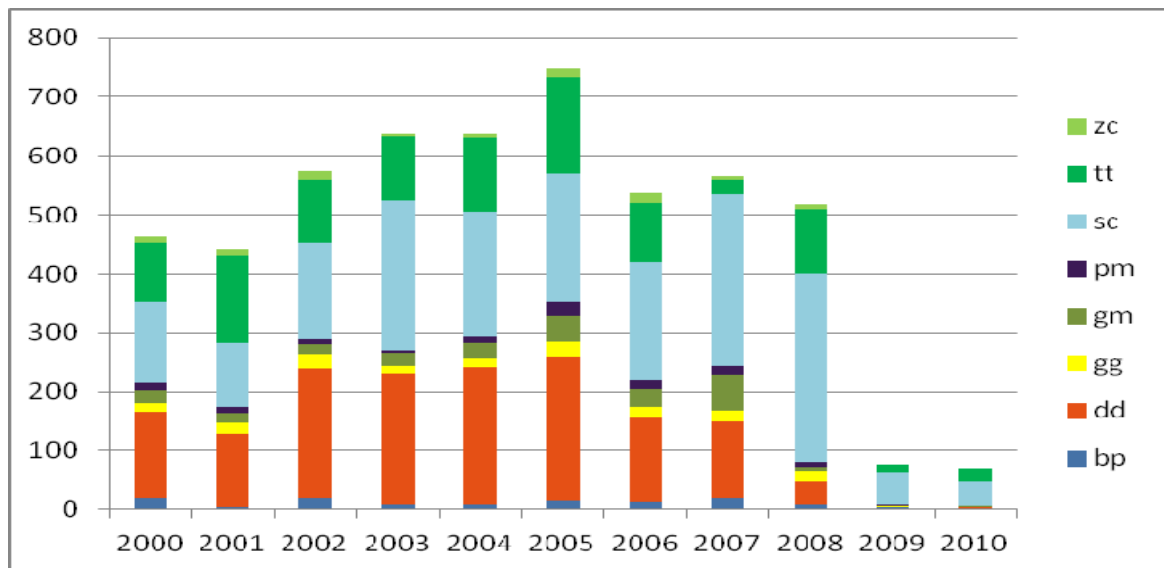


Figure 10. Mediterranean Countries. Records of cetacean strandings between 2000 and 2010. Abbreviations: Zc, *Ziphius cavirostris*; Tt, *Tursiops truncatus*; Sc, *Stenella coeruleoalba*. Pm, *Physeter macrocephalus*; Gm, *Globicephala melas* Gg, *Grampus griseus*; Dd, *Delphinus delphis*; Bp, *Balaenoptera physalus*.

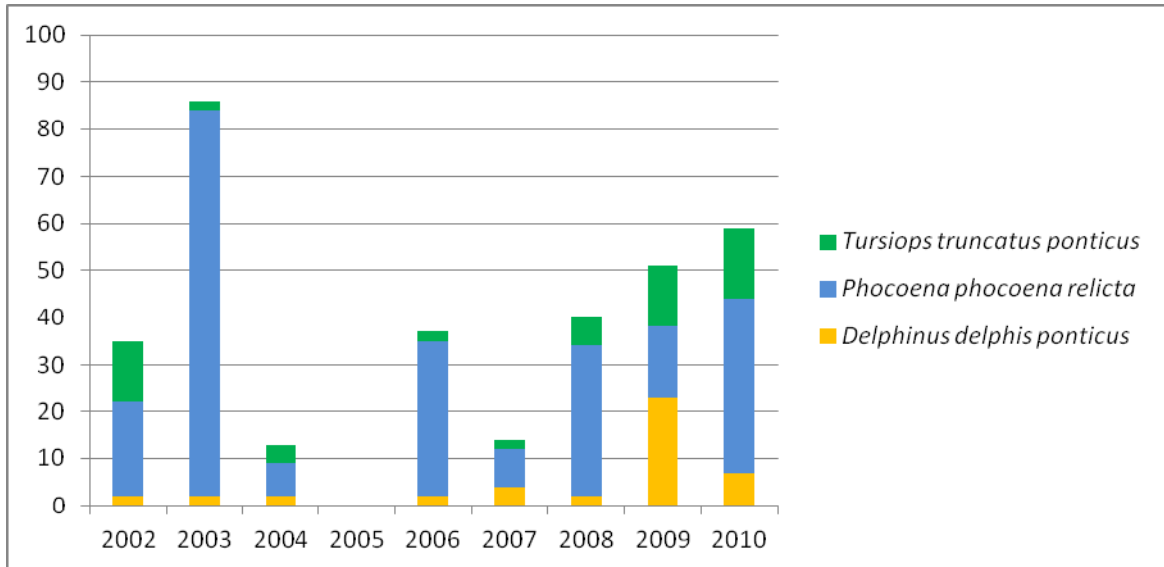


Figure 11. Black Sea countries. Records of cetacean strandings between 2002 and 2010.

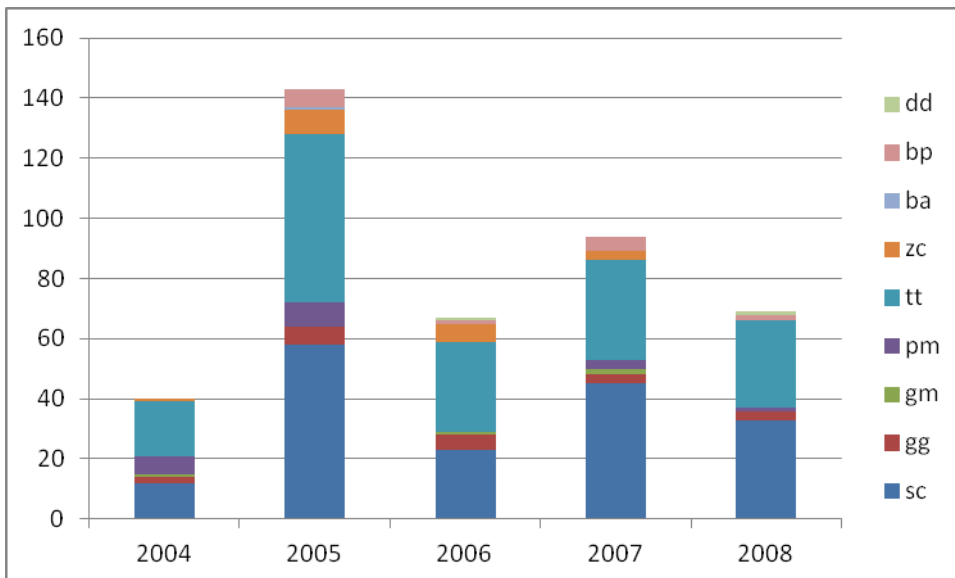


Figure 12. Italy. Records of cetacean strandings between 2004 and 2010. Abbreviations: Dd, *Delphinus delphis*; Bp, *Balaenoptera physalus*; Ba, *Balaenoptera acutorostrata*; Zc, *Ziphius cavirostris*; Tt, *Tursiops truncatus*; Pm, *Physeter macrocephalus*; Gm, *Globicephala melas*; Gg, *Grampus griseus*; Sc, *Stenella coeruleoalba*.

Table 3. Total number strandings of each species recorded in the Mediterranean.
 Abbreviations: Ba, *Balaenoptera acutorostrata*; Bp, *Balaenoptera physalus*; Dd, *Delphinus delphis*; Gg, *Grampus griseus*; Gm, *Globicephala melas*; Kg, *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*.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
ba	2	7	4	11	11	12	3	4	3		
bp	19	3	18	8	8	15	12	18	8	4	1
dd	147	125	221	223	233	244	146	132	39		2
gg	16	19	23	13	14	27	16	18	18	2	
gm	21	18	20	20	28	43	31	60	7		2
ks				1							
md			1	1							
mn		1	1		2			2			
oo			2			1	1				
pc		1		10	1			2			
pm	12	9	7	7	12	22	14	16	8	3	1
pp	13	6	17	19	24	12	5	10	1		
sb		1	1	2	2		1		1		
sc	136	109	164	254	210	218	201	292	320	55	40
tt	102	148	107	109	126	165	101	22	110	13	23
zc	10	10	14	4	7	16	16	8	8		

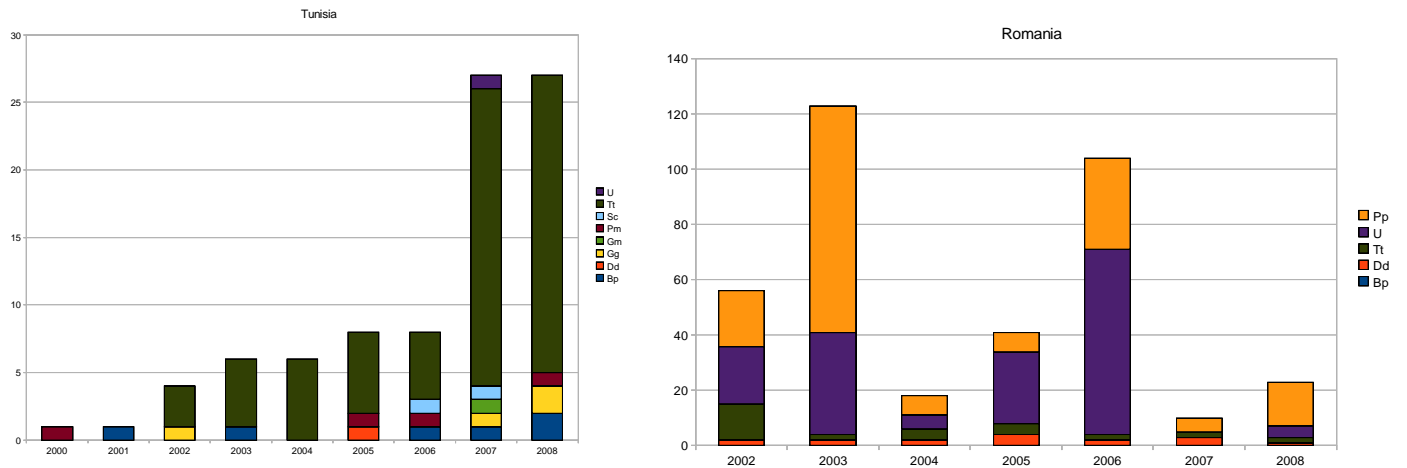


Figure 13. Extracted from Carrillo et al, 2009. Cetacean stranding rate in seven riparian countries during the period 2000-2008. Note that the order of the subdivisions on each bar of the histograms follows the order of the legend, i.e. from up to down. Abbreviations: U, unidentified species; Zc, *Ziphius cavirostris*; Pm, *Physeter macrocephalus*; Bp, *Balaenoptera physalus*; Ba, *Balaenoptera acutorostrata*; Pp, *Phocoena phocoena*; Gm, *Globicephala melas*; Gg, *Grampus griseus*; Dd, *Delphinus delphis*; Tt, *Tursiops truncatus*; Sc, *Stenella coeruleoalba*; Sb, *Steno bredanensis*.

A number of relevant observations can be extracted from the stranding rates presented in Figures 10, 11, 12 and 13:

(1) Mediterranean:

- The total number of strandings in the Mediterranean shows a similar pattern of each cetacean species stranded along the years (figure 10). The number of striped dolphin and bottlenose dolphin strandings are similar each year. Nevertheless, the number of striped dolphin stranded was significantly higher in 2007 and 2008.
- The number of strandings of short-beaked common dolphin was significant until 2006, and since this year, this number is lower. This information is very relevant as the population of short beaked common dolphin is in clear decline in the Mediterranean.

Western Mediterranean:

- Two stranding peaks appear in France, one in 2003 and another in 2007. In these two years, the recorded stranding numbers were approximately double of those observed in the other years. Strandings of striped dolphins contributed significantly to the observed increase in those years. It should be mentioned that the peak of 2007 probably is consequence of the epizootic episode on striped dolphins caused by a morbillivirus infection (DMV) (see section 2.3). However, the number of striped dolphins stranded was even higher in 2003. It would be very interesting to follow up on this observation, primarily by analysis of tissue samples from some 2003-stranded carcasses in order to test for possible infection with DMV. The increase in the strandings of bottlenose dolphins during 2003 and 2005 is also noteworthy. As the striped dolphin, the bottlenose dolphin is also susceptible to DMV (Van Bressemer et al., 1999), and the increased stranding number may indicate a DVM infection also on this species.
- Stranding rate in Spain shows marked fluctuations during the last years, varying from about 200 strandings in 2001 to 500. The striped dolphin stranding rate follows these fluctuations probably because is the most abundant species in the area (Raga and Pantoja, 2004). A considerable increase in the total stranding numbers can be noticed as for 2003, with peaks in 2004 and 2007. It is remarkable that the number of striped dolphin records

in 2007 is approximately twice that of the other years, reflecting probably the epizootic episode due to DMV (see section 2.3) (Raga et al., 2008). During 2007, an increase in the long-finned pilot whale stranding number was also detected. As shown in section 2.3, some of these animals were infected with the same virus affecting striped dolphins (Fernández et al., 2008). The number of unidentified cetaceans reported during 2004 was very high, being able to mask a possible increase of striped dolphin strandings similar to that which occurred in France during 2003. The number of strandings of short beaked common dolphins during 2003 and 2004 was higher than in the rest of the years, with records of almost one hundred individuals per year. As this dolphin species also seems susceptible to DMV (Birkun et al., 1999; Van Bressemer et al., 1999), the increased strandings may indicate a DVM infection. It is important to take this fact into account, due to the endangered conservation status of this species in the Mediterranean (Bearzi et al., 2003, 2004). Again, it would be very interesting to analyse tissue samples from dolphins stranded in Spain during 2003-2004 in order to check for possible infection with DMV. Stranding cetacean numbers in 2008 seem to be similar to 2005-2006, decreasing substantially from 2007, although the striped dolphin numbers keeps higher. Moreover, the stranding rate in the last six years is considerably higher than in the period 2000-2002. Possible causes to this significant increase should be investigated in order to promote the conservation of these protected species (Notarbartolo di Sciara and Birkun, 2002; Prideaux, 2003; Reeves et al., 2003; Urquiola, 2004).

Central Mediterranean:

- Stranding data from Croatia and Slovenia and Italy registered in MEDACES are the only available data from Adriatic Sea to date. The stranding rate fluctuates among years, but a peak can be observed in 2002. During this year the stranding numbers of several species increased, especially of striped and bottlenose dolphin. Bottlenose dolphin is the species with more strandings reported for the period 2000-2007, probably showing its abundance in the area.
- In Tunisia, the number of cetacean strandings has increased sharply in the last 2 years (2007-2008), being bottlenose dolphin strandings the species causing this increase (more than 3 folds than previous years). This increase could be consequence of the improvement of stranding networks in the country, but it is

worth to investigate the causes of these strandings in order to check possible hazards and threats affecting this protected species. The diversity of species stranded has also risen in 2006-2007: striped dolphin and long-finned pilot whale strandings have been reported for the first time along Tunisian coast according to MEDACES data during these 2 years.

Eastern Mediterranean:

- In Greece, the number of strandings of bottlenose dolphins was higher during 2000-2001 compared to those from 2002-2005. Stranding data from 2006 and 2008 should be analysed along with future data for the correct implementation of conservation measures on this dolphin species. Moreover, stranding data of striped dolphins during these years would help to follow the development of the current epizootic episode.
- Not important differences among years can be observed in the strandings numbers of Israel. Bottlenose dolphin is the more common stranded species, probably because it is the most abundant cetacean in the area.

(2) Black Sea:

- In 2003, a spectacular increase on cetacean strandings appears in Romania, this time affecting harbour porpoises. During 2006, another peak in the records is shown, with more than one hundred animals recorded. It would be very interesting to analyse whether or not a similar pattern appears also in other riparian countries of the Black Sea. The porpoise morbillivirus (PMV) was the likely cause of the death of harbour porpoises in northern Europe in the past (Van Bresse et al., 1999). However, Müller et al. (2002) did not find clinical/immunohistological evidences for morbillivirus disease in harbour porpoises from the Black Sea, although serological data indicated the presence of antibodies against the virus.
- The number of short beaked common dolphin (*Delphinus delphis ponticus*) stranded in 2009 is higher than in previous years, although it seems that this number decreased again in 2010.

2.3. Special events

As shown in the previous section, an increase in the number of cetacean strandings has been detected in the last years in Spanish Mediterranean coasts and at the coast of France and Corsica (Western Mediterranean Sea). Striped dolphins were the most affected species. The figure 14 shows the trend of striped dolphin stranding records

along the Mediterranean basin for the period 2000-2008. Two peaks can be observed, one in 2003 and other in 2007-2008. The figure clearly shows that the majority of the stranding events occurred at the Western Mediterranean (France and Spain).

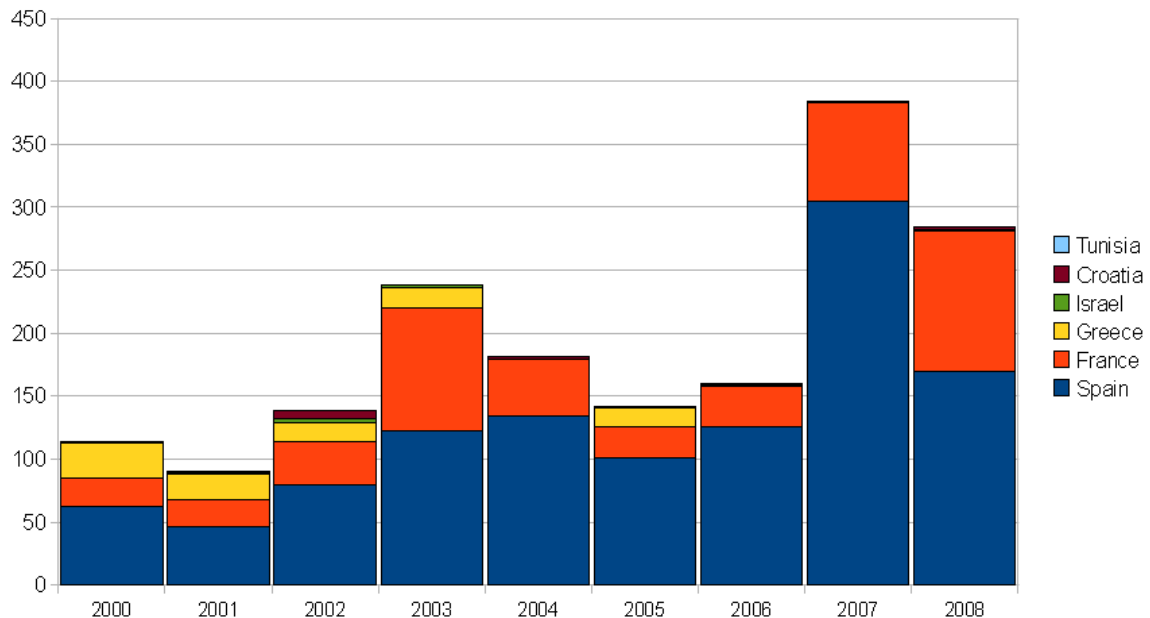


Figure 14. Striped dolphin stranding rate for the period 2000-2008. Note that the order of the subdivisions on each bar of the histograms follows order of the right legend, up to down.

In order to establish the cause of mortality, several diagnostic analyses of tissues from ten striped dolphins stranded along Spanish coast in 2007 were carried out. The associated pathologies and molecular evidence found in most of the animals were compatible with a morbillivirus infection (DMV - Dolphin Morbillivirus) (Raga et al., 2008). Some pilot whales stranded at the Mediterranean coast of Spain during 2007 were also infected by the virus (Fernandez et al., 2008).

This is not the only epizootic episode suffered by Mediterranean cetaceans in the last two decades (Figure 15). During 1990-1992 the DMV caused the death of thousands of striped dolphins in the Mediterranean Sea (Bortolotto et al., 1992; Di Guardo et al., 1992; Van Bressemer et al., 1993; Cebrian D., 1995; Domingo et al., 1995; Van Bressemer et al., 1999). The first infected dolphins were detected in the Gulf of Valencia (East Spain) in July 1990, but the die-off extended to the Central Mediterranean in 1991 and to the Eastern Mediterranean in 1992 (Aguilar and Raga, 1993; see Figure 16).

Moreover, in 1994 the epizootic affected to the common dolphins inhabiting the Black Sea (Birkun et al., 1999).

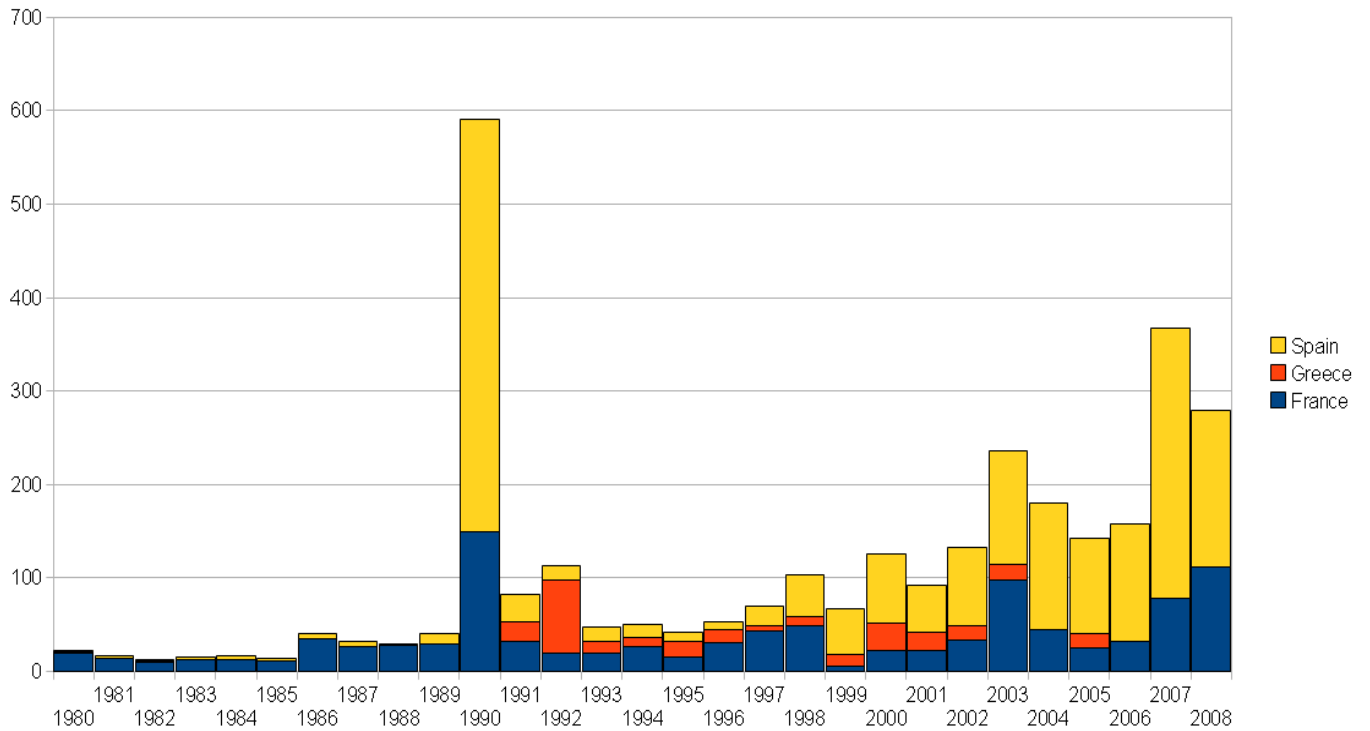


Figure 15. Striped dolphin stranding rate for the period 1988-2008 for France, Greece and Spain (see legend).

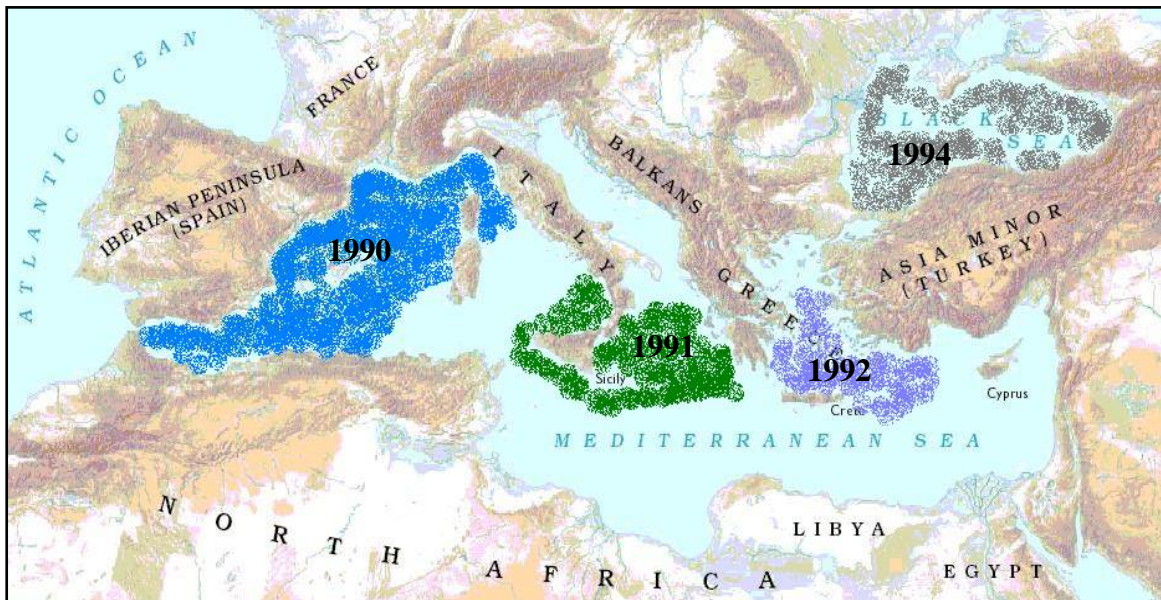


Figure 16. Progression of the epizootic episode suffered by the striped dolphin from 1990-1992 in the Mediterranean and by common dolphins during 1994 in the Black Sea. Modified from Aguilar and Raga (1993) and Birkun et al. (1999).

Considering these past epizootic events, it may be **expected** that the present epizootic that some cetacean species are suffering in the Mediterranean in the last years, will follow the dispersal pattern as occurred in 1990-1992 and 1994. However, with data available so far, some differences can be observed: First, a much lower peak than in 1990 appeared in 2007; second, another peak appeared in 2008, but this time with more contribution of animals stranded along the French coast; third, if the number of animals stranded in 2007 is added to the numbers in 2008, the total amount (646) is higher than those in 1990 (591). Moreover, it is also remarkable that the number of strandings from 2003 is higher than in previous years, except for 1990. In Spain, the number of striped dolphin after the 2007 mortality has been regularized, but is still higher than previous years before the last mortality episode. New investigations about the epidemiology of *Morbillivirus (DMV)* are being carried out, showing that the striped dolphin displays a higher predisposition than other species for suffering chronic latent DMV infections in nervous tissue (Soto et al, 2011). This would indicate the higher number of striped dolphin stranded in the Western Mediterranean, however, it shows that individuals are still immunized and other mortality episode is not going to occur in the next years.

Therefore, information on number and distribution of striped dolphin stranding records during the next years at the Mediterranean basin is extremely necessary in order to follow the development and behaviour of the current die-off.

3. COMMENTS/RECOMMENDATIONS

- The MEDACES web-page plays a very important role for the fulfillment the following objectives: To collate the stranding information from all the collaborating countries in a unique database; to provide access to the different information that has been collected from each stranded animal; to facilitate the contact 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).
- During 2010 and 2011, the number of collaborating countries with MEDACES has increased: Italy sent its complete database (from 1997 to 2008) as well as Ukraine (from 2000 to 2006) and Israel (from 1994 to 2011). Updated data has been sent by Bulgaria, Croatia, Libya, Slovenia, Israel, Spain, Romania, and Tunisia.
- Regular contacts have been and are established regularly From MEDACES, ACCOBAMS and RAC/SPA to encourage 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. This should be conducted through the RAC/SPA or/and ACCOBAMS.
- Data analyses presented in this report have identified the occurrence of abnormal stranding rates in the Mediterranean in recent years. Several species has been affected: striped dolphins and pilot whales in Western Mediterranean, bottlenose dolphins in Central Mediterranean (Tunisia) and harbour porpoises in the Black Sea. It would be very interesting to follow up on these observations in order to test for possible infection with DMV or an increase in human interactions.
- MEDACES report will be posted online in MEDACES webpage during the present year. The analysis of MEDACES data, i.e.: stranding trends and their interpretation are now available through these reports.

- The fact that this kind of events can be reflected through MEDACES web page is an opportunity for scientists as well as competent members of the different governments of the riparian countries, and other stakeholders, to set 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.

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