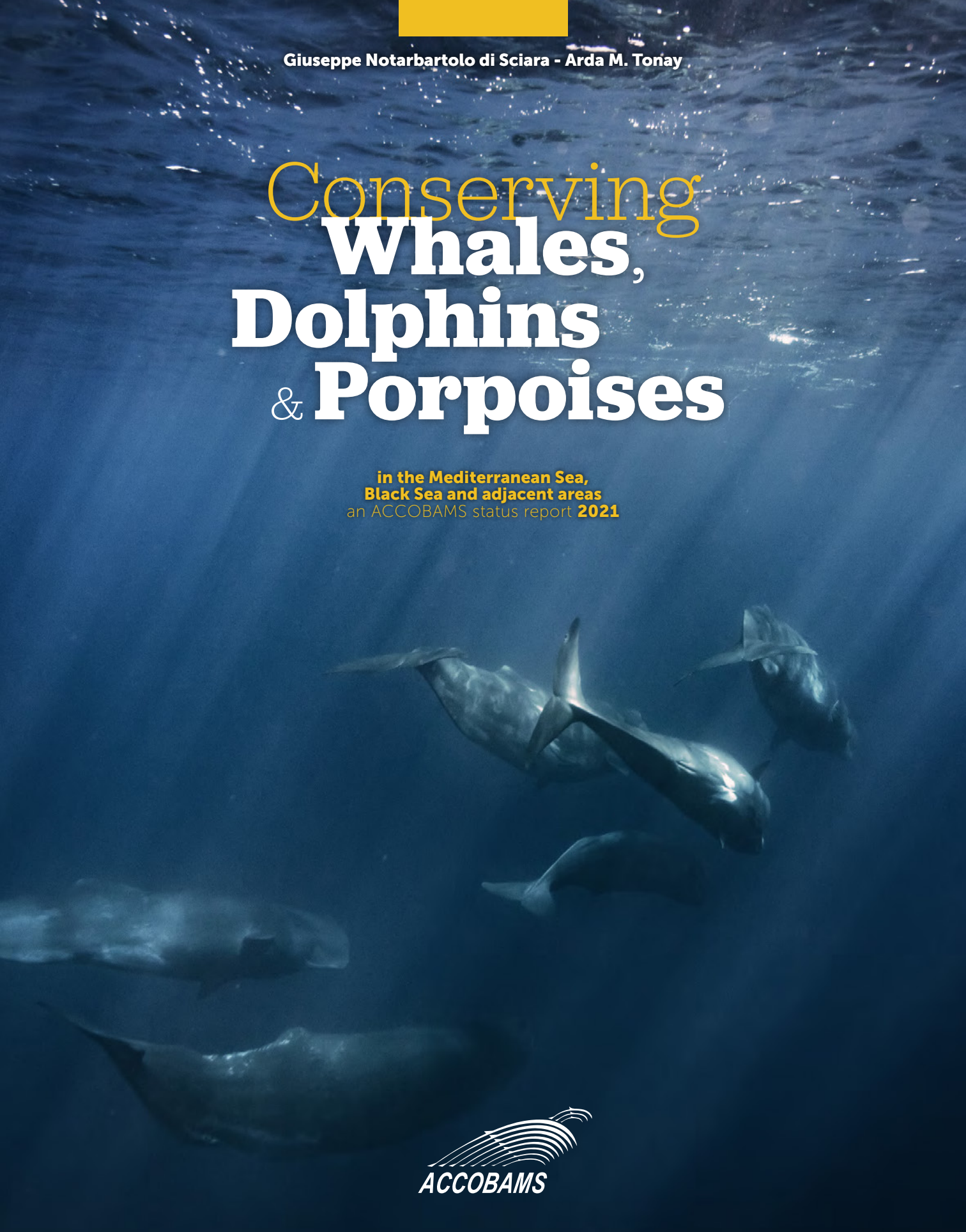
Giuseppe Notarbartolo di Sciara - Arda M. Tonay

Conserving Whales, Dolphins & Porpoises

in the Mediterranean Sea,
Black Sea and adjacent areas
an ACCOBAMS status report **2021**



ACCOBAMS

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ACCOBAMS

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Table of contents

Cetacean species in the ACCOBAMS area: non regular species

Foreword by HSH Prince Albert II

Palais de Monaco

Whales and dolphins are fascinating and iconic creatures which have been playing the role of ambassadors of the seas for a long time. Living symbols of the remarkable biodiversity of our precious regions of the Mediterranean and Black Seas, they remain fragile and subject to excessive anthropogenic pressures.

These nomadic species do not recognise any borders or jurisdictions and can only be understood, monitored and protected through effective regional cooperation.

This is what ACCOBAMS is all about and what has characterised its successful efforts for 25 years. As of today, 24 countries jointly strive to protect these marine mammals through intensive research and the discovery of solutions that mitigate the adverse impact of human activity.

With the fervent and continued support of Monaco which has hosted the ACCOBAMS Secretariat since the beginning of this journey, ACCOBAMS has become a leading example of a regional cooperation mechanism bringing together different committed actors: scientists and experts, decision makers, International Organisations, NGOs, the private sector and civil society.

A perfect illustration of the strong collaborative spirit that drives the ACCOBAMS community is the unprecedented aerial and vessel-based ACCOBAMS Survey Initiative campaign which provided a priceless scientific foundation on the biology, abundance and distribution of these species across the region. I am honoured that My country has supported this adventure, as this joint quest for scientific knowledge enabled a new evaluation of the conservation status of cetaceans in the Mediterranean and Black Seas.

Building on the results of such a ground-breaking collaborative approach, Giuseppe Notarbartolo di Sciara and Arda M. Tonay, the distinguished authors of the present 2021 status report compiled the available knowledge on cetaceans to offer a re-assessment of the conservation status of the different species, as well as an overview of challenges conquered and a review of remaining gaps in knowledge while highlighting the need to implement conservation actions.

It is no longer possible to ignore the pressures posed on cetaceans and choose to do nothing. It is no longer possible to ignore the value of cetaceans and their life-support role on Earth in terms of marine biodiversity.

I hope this 2021 status report will raise everyone's awareness of what has been achieved so far and of the amount that still needs to be accomplished in order to improve the life and biological status of cetaceans in the ACCOBAMS region.

We all have a role to play in protecting marine wealth.

Preamble

by the ACCOBAMS Executive Secretary

Cetaceans are majestic animals that have an irreplaceable role in our marine ecosystems and our lives. They provide humans a powerful link to the ocean and play a vital role on Earth. But their lives depend on clean healthy waters. The Mediterranean Sea, the contiguous Atlantic area and the Black Sea are exceptionally rich in biodiversity and habitats for cetaceans. Nonetheless, the region is highly impacted by a range of intense and overlapping activities at sea. ACCOBAMS has a single mission - protecting cetaceans in the Black Sea, the Mediterranean Sea and the adjacent Atlantic area.

Over the last 25 years ACCOBAMS has strived for transformative behavior solutions, providing scientific information, promoting educative programs and collaborative actions. ACCOBAMS current objective is to improve the conservation status of cetaceans and their habitats by 2025, particularly of those species that are classified as endangered.

ACCOBAMS mission is also about the mitigation of adverse effects that put at risk the life and survival of these animals. While some are noticeable, other effects easily escape the common perception despite being highly damaging to cetaceans. They vary from ship strikes and incidental catch in fishing gear to the devastating impacts of marine litter and underwater noise, amongst many others. Because ACCOBAMS is branded by a complex framework from a geographical and geopolitical perspective adding up to a variety of thematic areas, the need to pool the data collected on cetaceans and to capitalize the existing expertise assumes greater relevance.

In 2021 ACCOBAMS is celebrating 25 years of collective hard work, with emblematic achievements such as the ACCOBAMS Survey Initiative – the so called ASI – which was a breakthrough for the assessment of the distribution and abundance of cetacean populations. This unprecedented aerial and vessel-based campaign demonstrated the collaborative strength of ACCOBAMS and reinforced its key role as a knowledge hub.

Informed by the ASI results, as well as by a decade of monitoring and research work conducted by dedicated experts and scientists throughout the area, the present book provides the most up-to-

date status of knowledge of Mediterranean and Black Sea cetaceans.

It has been a great honor for the Secretariat to have assisted bringing to light this remarkable overview on the conservation status of cetaceans in the Mediterranean, the Black Sea and the contiguous Atlantic area, at the occasion of ACCOBAMS 25th anniversary.

On behalf of the ACCOBAMS Secretariat, I congratulate and thank the authors – Dr. Giuseppe Notarbartolo di Sciara and Dr. Arda M. Tonay – for turning such comprehensive knowledge collection into an enjoyable reading. Their assessment includes the known impacts of human activities on cetaceans, offering as well an outstanding foundation for further reflection including on priority actions.

A special appreciation word goes to the ACCOBAMS Scientific Committee and to all the experts for their devoted contributions, and the IUCN Team for the coordinated work on the reassessment of cetacean species.

And lastly, our sincere greetings to all those who have been part of the ACCOBAMS family for 25 years now, and who have devotedly helped gathering unprecedented amounts of data on cetaceans and marine wildlife, and thus contributed to the ACCOBAMS strategic objective of improving knowledge on cetacean species and their habitats.

In its quest for reducing pressures on cetaceans and conserving their habitats, ACCOBAMS is not – and cannot be – on its own. This is a collective call only achievable through continuous institutional dialogue and cross-sectoral interchange.

It is a joint trial posed to all and each one of us because knowledge sharing has become an ethical necessity.

Susana Salvador
Executive Secretary

Intro duction

The goal of this work is to take a fresh look at the cetacean fauna in the remit of the "Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area", also known as ACCOBAMS, to provide an updated picture of what is known about its status, and an assessment of the effectiveness of conservation efforts in the region.

Similar assessments had already been made in two previous significant moments in the life of the Agreement. The first was at the time ACCOBAMS came into force (Notarbartolo di Sciara 2002a), and the second in the occasion of the 4th Meeting of its Parties (Notarbartolo di Sciara & Birkun 2010). This third assessment comes as the region's nations get ready to celebrate the 25th anniversary of the signature of the Agreement, and consider challenges met and successes obtained during this journey across time.

These periodical reassessments and updates are a good practice, made necessary by a situation which is in constant flux. The nature of such change is manifold. First, the status and the ecology of the animals themselves are far from being stationary. Populations keep expanding or contracting through movements within their range; their distributions can fluctuate wildly between one year and the other in response to environmental change, fluctuations in prey availability, or the influence of other competing species, most notably of humans. Absolute numbers of populations can also change, not only due to mortality events, but also with increases when their ecological niche becomes wider for any reason, or – more likely – decreases when conditions become less favourable, as it often happens under the effect of human activities.

Another source of change which warrants periodical reassessments involves the gaining of ever deeper knowledge of the various species' ecology through the continuation of longitudinal studies, which allows more robust inference and makes trends more evident. This causes the rapid improvement of heuristic abilities of the concerned scientific community, which gains in experience and in the build-up and maturation of its professional capacity, clearly evident even within the short time span of a decade. Meanwhile, increasingly effective research methods, techniques and technologies are becoming available and applicable.

Third, a source of change which warrants updating is the most ominous one: the evolving use of the marine environment by humans.

For instance, humanity's dependence on energy continues to increase hydrocarbon exploration and extraction at sea in parts of the ACCOBAMS area, in contradiction with the ambitions agreed in the Paris Agreement; in the process, the consequences for the marine biota of the region are significant. Furthermore, the geo-political context and the tense situation experienced in some parts of the region do not contribute to improving the conservation of cetaceans.

Naval exercises involving the use of noxious sonar emissions are deployed in cetacean habitats, as well as driftnets whose deployment persist in some zones despite the formal ban of this gear from the region twenty years ago, and the list could continue (see section on Threats).

Despite these challenges, cetaceans continue to exist in the ACCOBAMS area. A quarter of a century has passed since ACCOBAMS came into force, and the questions everyone has is, how have things changed in this period, and ultimately, what have been the results of all this effort?

Certainly, cetaceans are still not swimming in peaceful waters in the region; many problems remain, and are unlikely to go away anytime soon. Orcas near Gibraltar are still *Critically Endangered*, and with a population consisting of less than 50 individuals they are teetering on the edge of a cliff; the Strait of Gibraltar subpopulation of long-finned pilot whales, the Gulf of Ambracia subpopulation of bottlenose dolphins, and the Gulf of Corinth subpopulation of common dolphins all are in a similar condition. Sperm whales, common dolphins, Black Sea bottlenose dolphins and harbour porpoises continue to be *Endangered*, recently joined in the same status by fin whales, long-finned pilot whales, and Risso's dolphins. Cuvier's beaked whales are listed as *Vulnerable*, and the Gulf of Corinth subpopulation of striped dolphins is proposed for the same status. Finally, the Mediterranean subpopulation of rough-toothed dolphins is assessed as *Near Threatened*. All these species, subspecies, and subpopulations continue to live at various levels of precariousness because the intense human presence and activities in this marine region are the source of a variety of pressures which threaten these mammals' survival.

The Mediterranean and Black Sea nations have expressed their commitment to conserve cetaceans in their waters, and having ratified ACCOBAMS is the embodiment of such commitment. This conservation goal is a hard one, because those same waters are the theatre of economically, strategically and socially relevant activities that conflict, or can conflict, with cetacean wellbeing.

However, if ways can be found to harmonise activities with conservation, or if compromise can be sought to ensure that unavoidable human use of the sea will not prevent cetaceans from continuing to exist in the region, no forum to identify solutions is potentially more appropriate than ACCOBAMS. Results will not satisfy everyone in absolute terms, but will hopefully bear fruit in the longer term. We find very significant the fact that striped dolphins and common bottlenose dolphins, which were both listed as Vulnerable in the recent past, are now *Least Concern* – something that might have been considered unthinkable twenty-five years ago.

Despite many cetacean species continuing to navigate in dire straits in the ACCOBAMS area, some of the signs are encouraging. Besides, it is becoming increasingly difficult for the region's nations to ignore the environmental question, under the pressure from a public opinion that shows great concern for its future living conditions. The common language is changing, with "respect" gaining ground on "domination", and "stewardship" becoming a cooler word than "exploitation". This change provides a tremendous opportunity for ACCOBAMS to capitalize on the grounds so hardly conquered until now, and to make real strides in the future.

List of acronyms and abbreviations

ABNJ	Area Beyond National Jurisdiction
ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
ASI	ACCOBAMS Survey Initiative
ATA	Area to be Avoided
CBD	Convention on Biological Diversity
CCH	Cetacean Critical Habitat
cIMMA	candidate Important Marine Mammal Area
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CMP	Conservation Management Plan
CR	Critically Endangered
CSG	Cetacean Specialist Group
CV	Coefficient of Variation
DDT	Dichlorodiphenyltrichloroethane
DDX	A collective name for DDT and its breakdown products DDE and DDD
EBSA	Ecologically or Biologically Significant Area
EC	European Commission
EcAp	The Ecosystem Approach
EEZ	Exclusive Economic Zone
EN	Endangered
EU	European Union
GFCM	General Fisheries Commission for the Mediterranean
HCH	Hexachlorocyclohexane
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICMMPA	International Committee on Marine Mammal Protected Areas
IMMA	Important Marine Mammal Area
IMO	International Maritime Organisation
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
KBA	Key Biodiversity Area
LC	Least Concern
MAP	Mediterranean Action Plan
MEDACES	Mediterranean Database of Cetacean Strandings
MOP	Meeting of Parties
MPA	Marine Protected Area
MSP	Maritime/Marine Spatial Planning
NGO	Non-Governmental Organisation
nm	Nautical mile
NT	Near Threatened
PBDEs	Polybrominated diphenyl ethers
PCB	Polychlorobiphenyl
Photo-ID	Photo-identification
POP	Persistent Organic Pollutant
PSSA	Particularly Sensitive Sea Area
PVA	Population Viability Analysis
RAC/SPA	Regional Activity Centre for Specially Protected Areas
SPA/BD Protocol	Protocol to the Barcelona Convention concerning Specially Protected Areas and Biological Diversity in the Mediterranean
SPAMI	Specially Protected Areas of Mediterranean Importance
SST	Sea Surface Temperature
TSS (1)	Turkish Straits System
TSS (2)	Traffic Separation Scheme
UNEP	United Nations Environment Programme
VU	Vulnerable

Important notes

Map legends

The distribution of the various species is represented in the maps with different colours to indicate different levels of presence. Differences between levels are not strictly quantifiable due to the current imperfect state of ecological knowledge of cetaceans in the region, so they should be considered as having a qualitative value. Furthermore, cetacean species are highly mobile and amenable to be transiting amongst all the three distributional categories at some time during their existence; however, some areas can be more important than others because of the habitat characteristics they contain, and this affects the time that cetaceans will spend in them.

■ **Regular** (intense blue): areas in which the species is consistently found (although there may be seasonal variations), and where encounter rates (visual and/or acoustic) are highest because they contain the species' prime habitat.

■ **Present** (light blue): areas in which the presence of the species is not unusual, but with lower encounter rates than in "regular" areas.

☐ **Rare** or **absent** (white): areas in which the presence of the species is unusual because the conditions (ecological or human-determined) are unsuitable for it. Considering the relatively small surface of the Mediterranean and the high mobility of cetaceans, it is impossible to differentiate between rarity and absence.

● **Single occurrence** (coloured circle): indicates a location where a non-regular species was recorded. Can also be applied to regular species in portions of the region where they are indicated as rare or absent.

Parentheses around species' author's names

The author's name of a species is placed in parentheses if the species was subsequently transferred to a genus which is not the one in which it was originally described (International Code of Zoological Nomenclature, Art. 51c).
For example: the common dolphin was described by Linnaeus as *Delphinus delphis*, and since the species is still associated with the genus *Delphinus* as originally published by the author, the common dolphin is indicated as *Delphinus delphis* Linnaeus 1758. But: the false killer whale is *Pseudorca crassidens* (Owen 1846) because the species was originally described by Owen as *Phocaena crassidens*, and moved by Reinhardt to the genus Pseudorca in 1862.

QR Codes

QR codes are available on the pages dedicated to Regular Species. By scanning the QR codes with a smartphone, the reader will access short videos on the ACCOBAMS Youtube account that will allow him/her to see the species in motion. Those videos were kindly provided by cetacean conservation organisations and experts from the ACCOBAMS Area.

The ceta fauna

cean

of the Mediterranean Sea,
Black Sea and Turkish Straits System

The 27 species and subspecies of Cetacea[1] found in the ACCOBAMS area, listed in Table 1, include: a) 14 species or subspecies regularly present in the Black Sea, in the Mediterranean Sea or in the Contiguous Atlantic; b) three species considered visitors or occasional to the region; and c) ten species that are very rare in the region, or vagrant (see Box). Only the regular species deserve status assessment, given that the others are represented by populations living outside of the region.

Although the ACCOBAMS marine area's surface is only a small portion (about 1%) of the world's oceans, the cetacean diversity it contains is significant. However, and despite the reduced space compared to the planetary expanse, species are not uniformly distributed across the region, their presence in the different parts of the area being influenced by a combination of their specific needs and ecological heterogeneity, further modified by the composite effects of human activities.

Proceeding from west to east, in general it can be said that Mediterranean waters are characterised by decreasing levels of primary productivity, with notable, localised exceptions (e.g., in the Ligurian Sea, the northern Adriatic, the northern Aegean, and part of the Levantine Sea near the Nile's Delta). The Strait of Gibraltar area and in large part the Alborán Sea are in fact ecologically still a portion of Atlantic Ocean, separated from the more typically Mediterranean waters by an oceanographic front connecting Almeria (Spain) and Oran (Algeria). Accordingly, the Alborán Sea is a productive and dynamic environment hosting a variety of cetacean species, found there in abundance, including the entire complement of the region's resident cetacean taxa, except the rough-toothed dolphin and those that are restricted to the Black Sea and adjacent waters. Cetacean presence eastward, into the vast Algero-Provencal Basin, is found at densities generally observed to be declining, despite local exceptions (e.g., sperm whales around the Balearic Islands; fin whales and striped dolphins between the Ligurian Sea and the Gulf of Lion;

[1] Having been ascertained that Cetaceans genetically and morphologically fall within the Artiodactyl clade, they are today included under the Order Cetartiodactyla, with Cetacea, Mysticeti and Odontoceti as unranked taxa (Committee on Taxonomy 2021). However, we recognise that most readers are more familiar with the customary classification of whales and dolphins under the former Order Cetacea, and therefore we prefer to maintain this taxonomic denomination here.

Regional occurrence categories

Regular: a species represented by a population having its native distributional range within the region.

Visitor: a species represented by individuals found outside their native distributional range, which repeatedly, albeit irregularly, appear in a given region.

Vagrant: a species represented by individuals found outside their native distributional range, appearing in a given region with high or extreme rarity.

Cuvier's beaked whales in the Ligurian Sea). Long-finned pilot whales and common dolphins become increasingly rare, and almost totally disappear in the Tyrrhenian Sea, where in general terms cetacean density becomes patchy.

The shallow but productive Strait of Sicily is mostly avoided by deep divers, but hosts smaller odontocetes and probably serves as a corridor for fin whales, which are observed there feeding during winter. Diving species such as sperm whales prefer instead to use the Strait of Messina, between the Italian mainland and Sicily, as a corridor between deep western and eastern Mediterranean areas. The Ionian Sea, which contains the Mediterranean most extreme depths (>5,200m) on the Greek side, hosts most species with the exception of pilot whales and the Black Sea-associated taxa; fin whales, however, do not seem to like venturing much further to the east from there. The Adriatic Sea extends northwards from the Ionian Sea as an elongated cul-de-sac, where cetacean diversity becomes progressively reduced to a single species - the bottlenose dolphin - in its extremely shallow northern end.

Not much can still be said about cetaceans along the coast of northern Africa east of Tunisia, despite progresses achieved in recent years in some countries. To the north, the deep Hellenic Trench provides suitable habitat for sperm whales and Cuvier's beaked whales. Further to the east into the Levantine Sea, maverick geoengineering initiatives such as the opening (and recent widening) of the Suez Canal, and the curtailment of the Nile's flow caused by the Aswan Dam, both in Egypt, have profoundly modified the subregion's ecosystems, flinging open the door to thousands of Lessepsian invaders and dramatically reducing marine productivity in correspondence of the Nile's Delta. Add to the mix the effects of global warming, with SST raises that have been more extreme in the eastern Mediterranean, and the impact of extensive seismic surveys in search of oil & gas off Turkey, Cyprus, Lebanon, Israel and Egypt, to complete the picture of the challenges that marine species living in the Levantine Sea, cetaceans included, likely had to meet.

North of Crete, in the shallower Aegean Sea, productivity of the waters is observed to vary from very low levels in the south to higher conditions in the north, where several species of smaller odontocetes are found. These include bottlenose, common and striped dolphins and, more rarely, Black Sea harbour porpoises. The north-eastern Aegean Sea is

connected, across the Turkish Straits System (TSS), to the Black Sea. The narrow Çanakkale (Dardanelles) Strait leads into the Marmara Sea, the antechamber to the Black Sea, which is accessed from there through the Bosporus (or Bosphorus or Istanbul Strait). The three small Black Sea odontocetes that make the entire complement of this region's cetacean fauna - the Black Sea subspecies of common dolphin, bottlenose dolphin, and harbour porpoise - are also found throughout the TSS.

The Black Sea marine ecosystems relevant to cetaceans represent a clear departure from those in the Mediterranean. In the Black Sea the waters enjoy a productivity, facilitated by the inflow of some of Europe's largest rivers, that has no equal in the Mediterranean. However, due to the region's waters anoxic conditions below about 100 m, its ichthyofauna is confined to the upper layers and therefore easily accessible to its cetacean predators. These conditions are permitting the survival of cetacean densities of all three species that are totally unheard of in the Mediterranean. This has allowed for extremely high number of dolphins and porpoises to be industrially caught, and severely depleted, by the Black Sea coastal nations up to the second half of the 20th century.

Table 1
Cetacean species and subspecies occurring, or having occurred, in the Mediterranean Sea, Black Sea and adjacent areas. Regular species outlined in grey. MED = Mediterranean Sea; BS = Black Sea and Turkish Straits System; CAA = Contiguous Atlantic Area. Habitat (preferred in bold) and status are indicated only for species listed as regular

	Species/ subspecies	English name	Classification	Sub-Area	Presence	Habitat	Current or proposed status
1	*Eubalaena glacialis*	North Atlantic right whale	Mysticeti, Balaenidae	MED, CAA	vagrant		
2	*Balaenoptera a. acutorostrata*	North Atlantic minke whale	Mysticeti, Balaenopteridae	MED, CAA	visitor		
3	*Balaenoptera b. borealis*	Northern sei whale	Mysticeti, Balaenopteridae	MED, CAA	vagrant		
4	*Balaenoptera p. physalus*	North Atlantic fin whale	Mysticeti, Balaenopteridae	MED, CAA	regular	**oceanic,** slope, neritic	Endangered
5	*Megaptera n. novaeangliae*	North Atlantic humpback whale	Mysticeti, Balaenopteridae	MED, CAA	visitor		
6	*Eschrichtius robustus*	grey whale	Mysticeti, Eschrichtiidae	MED, CAA	vagrant		
7	*Physeter macrocephalus*	sperm whale	Odontoceti, Physeteridae	MED, CAA	regular	**slope,** oceanic	Endangered
8	*Kogia sima*	dwarf sperm whale	Odontoceti, Kogiidae	MED, CAA	vagrant		
9	*Hyperoodon ampullatus*	northern bottlenose whale	Odontoceti, Ziphiidae	MED, CAA	vagrant		
10	*Mesoplodon bidens*	Sowerby's beaked whale	Odontoceti, Ziphiidae	MED, CAA	vagrant		
11	*Mesoplodon densirostris*	Blainville's beaked whale	Odontoceti, Ziphiidae	MED, CAA	vagrant		
12	*Mesoplodon europaeus*	Gervais' beaked whale	Odontoceti, Ziphiidae	MED, CAA	vagrant		

13	*Ziphius cavirostris*	Cuvier's beaked whale	Odontoceti, Ziphiidae	MED, CAA	regular	**slope,** oceanic	Vulnerable
14	*Delphinus d. delphis*	common dolphin	Odontoceti, Delphinidae	MED, CAA	regular	**neritic, slope, oceanic**	Endangered
15	*Delphinus d. ponticus*	Black Sea common dolphin	Odontoceti, Delphinidae	BS	regular	**neritic, slope, oceanic**	Vulnerable
16	*Globicephala macrorhynchus*	short-finned pilot whale	Odontoceti, Delphinidae	MED, CAA	vagrant		
17	*Globicephala m. melas*	North Atlantic long-finned pilot whale	Odontoceti, Delphinidae	MED, CAA	regular in the western MED and CAA, vagrant elsewhere	**oceanic,** slope, neritic	Endangered
18	*Grampus griseus*	Risso's dolphin	Odontoceti, Delphinidae	MED, CAA	regular	**slope,** oceanic	Endangered
19	*Orcinus orca*	orca	Odontoceti, Delphinidae	MED, CAA	regular in CAA, visitor in MED	**neritic, slope, oceanic**	Critically Endangered
20	*Pseudorca crassidens*	false killer whale	Odontoceti, Delphinidae	MED, CAA	Visitor, but possibly regular in the Levantine Sea as of recent		
21	*Sousa plumbea*	Indian Ocean humpback dolphin	Odontoceti, Delphinidae	MED	vagrant		
22	*Stenella coeruleoalba*	striped dolphin	Odontoceti, Delphinidae	MED, CAA	regular	**oceanic,** slope	Least Concern
23	*Steno bredanensis*	rough-toothed dolphin	Odontoceti, Delphinidae	MED, CAA	regular in the Levantine Sea, visitor elsewhere	**oceanic, slope,** neritic	Near Threatened
24	*Tursiops truncatus truncatus*	common bottlenose dolphin	Odontoceti, Delphinidae	MED, CAA	regular	**neritic,** oceanic	Least Concern
25	*Tursiops t. ponticus*	Black Sea bottlenose dolphin	Odontoceti, Delphinidae	BS	regular	**neritic**	Endangered
26	*Phocoena p. phocoena*	Atlantic harbour porpoise	Odontoceti, Phocoenidae	CAA, MED	regular in CAA, vagrant in MED	**neritic**	Least Concern
27	*Phocoena p. relicta*	Black Sea harbour porpoise	Odontoceti, Phocoenidae	BS, MED	regular in BS and N. Aegean Sea	**neritic**	Endangered

Note on species of doubtful occurrence in the ACCOBAMS area

The fact that grey whales appeared twice in the Mediterranean in the past two decades, after having travelled tens of thousands of km from the North Pacific Ocean, should induce to keep an open mind about the possibility that any exotic cetacean species might, one day, be found in these waters. However, some species are mentioned in the literature as having occurred in parts of the ACCOBAMS area, in the Mediterranean in particular, that we consider either doubtful or just wrong, and that in our view should not be considered as having occurred in the region until further confirmation. These include (some sources deliberately omitted):

- Bryde's whale, *Balaenoptera edeni*.
  Although 10 individuals were reported to having been caught in the whaling operations in the Gibraltar area in summer 1948 (Anonymous 1950), the species was never reported again in the area since. The possibility exist that these might have been misidentified sei whales, *B. borealis*. More recently, Bryde's whale strandings were reported from the southern Mediterranean, but no conclusive confirmation of species ID, repeatedly requested, could be obtained.
- True's beaked whale, *Mesoplodon mirus*.
  A misidentified Cuvier's beaked whale stranded in the eastern Mediterranean.
- Narwal, *Monodon monoceros*.
  An undocumented stranding report exists from Corsica.
- Beluga, *Delphinapterus leucas*.
  Some individuals of Arctic provenance have occurred in the Black Sea, having escaped captive facilities in the former Soviet Union.
- Pygmy killer whale, *Feresa attenuata*.
  This was a misidentified Risso's dolphin calf stranded in Algeria.
- Atlantic white-sided dolphin, *Lagenorhynchus acutus*.
  It concerned a misidentified common dolphin sighted in the Adriatic, and undocumented sightings in the Strait of Gibraltar.
- White-beaked dolphin, *Lagenorhynchus albirostris*.
  Based on undocumented sightings in the Strait of Gibraltar.
- Atlantic spotted dolphin, *Stenella frontalis*.
  Based on an undocumented sighting near the Balearic Islands.

Cetacean species in the ACCOBAMS area

regular species

North Atlantic fin whale

Balaenoptera physalus physalus (Linnaeus 1758)

Conservation status in the ACCOBAMS area

Endangered - EN C2a(ii) (Panigada *et al.* in press) based on the following conditions: a) the Mediterranean subpopulation, which is genetically distinct from fin whales in the Atlantic, contains fewer than 2,500 mature individuals: b) the subpopulation experiences an inferred continuing decline in number of mature individuals; and c) all mature individuals are in one subpopulation.

Change in status since 2010

In a previous assessment Mediterranean fin whales were listed as Vulnerable VU C2a(ii) (Panigada and Notarbartolo di Sciara 2012). More robust population estimates generated during the last decade allowed a reassessment of the maximum number of mature individuals in the subpopulation, from <10,000 to <2,500. This caused the status category to be upgraded from VU to EN. In addition, a continuing decline as inferred in the same assessment (Panigada *et al.* in press) likely also contributed to this change.

Listed in

Bern Convention App. II
CMS App. I, App. II
CITES App. I
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive: Annex IV

Global status

Vulnerable (Cooke 2018a)

World distribution

Fin whales are a cosmopolitan species, occurring mostly at temperate and sup-polar latitudes. Although fin whales are highly mobile and known to migrate seasonally towards the poles in summer and to lower latitudes in winter, they are more amenable to make exceptions to this pattern than most other large whales, with their movements becoming more accurately described as nomadic than migratory. Fin whale densities become distinctly lower in tropical latitudes, to complete absence in some locations such as the North Indian Ocean.

Habitat and ecology

Fin whales, the only common baleen whale species in the Mediterranean Sea, mostly prefer the region's deep waters, but can also occur over slope and shelf areas if attracted there by the presence of their prey (Notarbartolo di Sciara *et al.* 2003), to a large extent northern krill *Meganyctiphanes norvegica*, but also *Nyctiphanes couchii* and more rarely small schooling fishes. Small-scale (10s of km), short-lived sites optimal for foraging, associated with specific chlorophyll-a fronts, are disseminated across their feeding grounds, such as in the northwestern Mediterranean, in areas with high concentrations of zooplanktonic crustaceans, their main prey (Druon *et al.* 2012). Whilst favourable feeding conditions seem to be widespread across the Mediterranean from autumn to spring, these conditions apparently shrink during the warmer months to persist in specific locations, such as the Pelagos Sanctuary area and adjacent waters to the west and south-east, causing fin whales to concentrate there during summer (Notarbartolo di Sciara *et al.* 2016), with evident persistence of site-fidelity in the area (Zanardelli *et al.* 2020).

Wide fluctuations are observed across years in fin whale distribution in their summer feeding grounds, based on the variability of optimal feeding conditions depending on oceanographic and climate variations (Azzellino *et al.* 2008, Arcangeli *et al.* 2013, Notarbartolo di Sciara *et al.* 2016).

Population

Genetic studies provide evidence that fin whales in the Mediterranean are a resident population, separate from Atlantic fin whales (Bérubé *et al.* 1998). Satellite tagging and fatty acid analyses also indicates that at least part of these resident whales spend the winter in Spanish Atlantic waters, returning to the Mediterranean Sea in the warmer months (Cotté *et al.* 2009, Panigada *et al.* 2017, Gauffier *et al.* 2020). Evidence also exists, based on recordings of song patterns made in the Alborán Sea and Gulf of Cadiz that are different from those from the Ligurian and Ionian Seas, for another fin whale population from the Northeast Atlantic entering the

Balene kokemahde • شائع هرآول (harcul chaii) • Veliki kit • Rorqual commun • πτεροφάλαινα (pterofálaina) • לויתן מצוי (livyatan matzui) • Balenottera comune • Il-balena l-kbira, il-balenottera l-kbira, il-balena mbaċċa • Baleia-comum • Rorcual común • Uzun balina

Mediterranean during winter (Castellote *et al.* 2012a, Notarbartolo di Sciara *et al.* 2016), and overlapping with the Mediterranean population. However the interactions between these two putative populations are still far from being understood.

A region-wide population estimate of fin whales in the Mediterranean was first attempted through the 2018 ACCOBAMS Survey Initiative (ASI), which resulted in a corrected estimate of 3,280 individuals, all of them sighted in the Mediterranean west of the Italian Peninsula (ACCOBAMS 2021a). Population estimates over subsets of the Western Mediterranean had been conducted in previous years many times (see Panigada *et al.* in press) cannot be used to infer the overall regional population size. The only earlier effort that is comparable in methods and area with the ASI data was the ship-based survey carried out in 1991 over a large portion of the western Mediterranean, which produced an estimate of 3,583 fin whales (Forcada *et al.* 1996). From a comparison of the two surveys 27-years apart a fin whale population decrease in the Mediterranean can be inferred.

Threats

Threats to fin whales in the ACCOBAMS area include: ship strikes, disturbance by vessels and noise, fisheries, solid and chemical contaminants, and possibly climate change. Although each factor might not have a major impact on the population if considered by itself, their cumulative effects could be significant and explain the inferred decline of fin whales in the Mediterranean.

Collisions with vessels have been a known cause of fin whale mortality for a long time (Cagnolaro and Notarbartolo di Sciara 1992), and are of concern in areas of heavy vessel traffic such as the northwestern Mediterranean (Panigada *et al.* 2006, Gauffier *et al.* 2018). Airgun noise from seismic surveys was shown to expel fin whales from wintering grounds (Castellote *et al.* 2012b). Shipping noise and disturbance from vessels, e.g., during whale watching, can also be detrimental (Airoldi *et al.* 1999).

Although there is no direct competition with fisheries in the Mediterranean, and enmeshing in driftnets has never been reported (Notarbartolo di Sciara *et al.* 2003), negative effect on fin whales can include entanglements in lines or net fragments resulting in whale mutilations. Contamination by organochlorines and trace elements, including endocrine disrupting compounds, were reported in Mediterranean fin whale biopsy samples (Fossi *et al.* 2003, 2007), which might negatively affect the whales' reproduction through estrogenic and anti-androgenic effects. The potential for contamination by persistent organic pollutants (POP) is further increased through the involuntary ingestion of microplastics suspended in the water column (Fossi *et al.* 2016, Lambert *et al.* 2020).

Finally, the potential effects of global climate change and ocean acidification cannot be discounted on the zooplanktonic prey that fin whales are dependent from in the Mediterranean (Notarbartolo di Sciara *et al.* 2003).

Conservation actions

The "Pelagos Sanctuary for Mediterranean Marine Mammals" was established in 1999 by a treaty among France, Italy and Monaco (entered into force in 2002), to extend international protection to a large area (87,000 km^2) in portions of the Provençal, Corsican, Ligurian, Tyrrhenian and northern Sardinian Seas. The area contains important habitat for several cetaceans in the Mediterranean including key fin whale feeding grounds (Notarbartolo di Sciara *et al.* 2008).

The Pelagos Sanctuary was subsequently listed as a Specially Protected Areas of Mediterranean Importance (SPAMI) within the framework of the Barcelona Convention SPA/BD Protocol. Measures adopted by the Sanctuary Agreement include whale watching regulations. Addressing the problems caused by shipping and noise revealed to be more challenging.

Another SPAMI relevant to fin whale conservation was adopted in 2019 based on the "Mediterranean Cetaceans Migratory Corridor" ("Corredor de Migración de Cetáceos del Mediterráneo") MPA declared in 2018 by Spain, including most of the waters between the Balearic Islands and the mainland (Balearic Sea). The area is 46,386 km^2 wide and includes the migration corridor for fin whales in the western Mediterranean. Seismic surveys and oil and gas exploitation are prohibited in the area.

A modification in the maritime traffic separation scheme (TSS) - declared by the Government of Spain based on an International Maritime Organisation designation - in the Strait of Gibraltar to reduce the risk of collisions between ships and sperm whales potentially benefits fin whales as well. This is a seasonal measure, thereby providing benefits to fin whales only during part of their migratory phases.

Four Important Marine Mammal Areas (IMMAs) and one candidate IMMA (cIMMA) for fin whales have also been identified in the Mediterranean Sea (IUCN Marine Mammal Protected Areas Task Force 2017), possibly leading to the proposal for the establishment of Marine Protected Areas and/or helping to identify areas of high risk for ship strikes, where appropriate and dedicated mitigation measures can be suggested (Anonymous 2019). These include (from west to east): the "Alborán Sea IMMA", the "North West Mediterranean Sea, Slope and Canyon System IMMA", the "Waters of Ischia and Ventotene IMMA", the "Lampedusa IMMA", and the "Central Tyrrhenian Sea cIMMA".

Distribution in the Mediterranean and Black Seas and adjacent areas

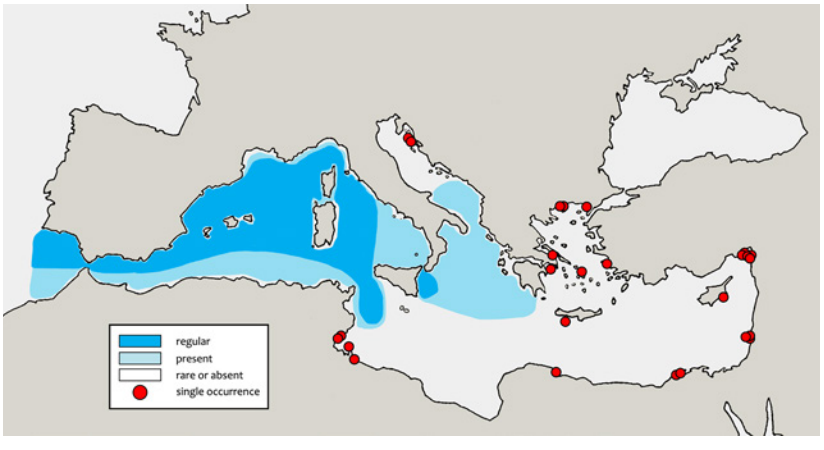
Fin whales in the Mediterranean Sea are most frequent in the deep, offshore waters of the western and central portions of the region, from the Balearic Sea to the Ionian Sea, and less frequent elsewhere, although they are rarely reported also from the eastern Mediterranean, including the Aegean Sea and the Levantine Sea (Notarbartolo di Sciara *et al.* 2003).

The highest fin whale abundance in the Mediterranean is in the Corso-Ligurian Basin/Gulf of Lyon complex (Notarbartolo di Sciara *et al.* 2003, 2016, Panigada *et al.* 2017). Laran & Gannier (2008) predicted fin whale habitats in the northwestern Mediterranean using relevant environmental parameters such as bathymetry, chlorophyll-a, and sea surface temperature (SST), revealing the extension of favourable habitats for the species well beyond the boundaries of the Pelagos Sanctuary, both to the west and to the south-east. While the seasonal summer concentrations in the species' feeding grounds in the highly productive portions of the Provencal, Corsican, Ligurian and northern Tyrrhenian seas is the best known (Notarbartolo di Sciara *et al.* 2003), other, more limited feeding grounds have also been identified in other areas, such as the Strait of Sicily in winter (Canese *et al.* 2006), in the Balearic Sea in spring (EDMAKTUB 2018). The gathering of fin whales in the northwestern Mediterranean Sea during summer can be explained by the contraction of feeding opportunities elsewhere during the warmest time of year; conversely, after summer, the observed dispersal of fin whales from the northwestern portion of the basin is concomitant with a diffused reappearance of favourable feeding conditions over a much wider Mediterranean surface (Notarbartolo di Sciara *et al.* 2016).

In the westernmost part of the Mediterranean Castellote *et al.* (2012a) detected through acoustic recordings fin whale winter movements from the Corso-Ligurian Basin to southern Spain and the North Africa. However, movements of fin whales in the Mediterranean are apparently more complex, as some of them were observed to move westward during spring reaching the Strait of Gibraltar in summer, and back from November to March (Gauffier *et al.* 2018, EDMAKTUB 2018), also confirmed acoustically (Castellote *et al.* 2012a) and through stable isotope analyses (Gauffier *et al.* 2020). Fin whales occur only sporadically in the northern Adriatic, Aegean and Levantine seas (Notarbartolo di Sciara *et al.* 2003), although these observations are mostly limited to summer, and their presence in the eastern Mediterranean during winter is unknown because of lack of observation effort (Notarbartolo di Sciara *et al.* 2016, Mannocci *et al.* 2018). Specific breeding and calving grounds in the Mediterranean have never been identified, and presumably occur anywhere throughout the basin (Notarbartolo di Sciara *et al.* 2003, 2016).

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular
- **Black Sea:** absent



Sperm whale

Physeter macrocephalus Linnaeus 1758

Conservation status in the ACCOBAMS area

Endangered - EN C2a(ii) (Pirotta *et al.* in press) based on the following conditions: a) the Mediterranean subpopulation, which is genetically distinct from sperm whales in the Atlantic, contains fewer than 2,500 mature individuals; b) the subpopulation experiences an inferred continuing decline in number of mature individuals; and c) all mature individuals are in one subpopulation.

Change in status since 2010

No change.

Listed in

CMS App. I, App. II
CITES App. I
Bern Convention App. II
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive: Annex IV

Global status

Vulnerable (Taylor *et al.* 2019)

World distribution

Sperm whales range very broadly in the world's oceans and seas, extending from the tropics to polar waters in all oceans and in many semi-enclosed seas such as the Gulf of California, the Gulf of Mexico, the Sea of Okhotsk, and of course the Mediterranean. Absent, however, from other seas such the Red Sea and the Black Sea.

Habitat and ecology

Sperm whales favour continental slope, with a preference for the deepest portions of the slope, the preferred habitat of mesopelagic cephalopods, their preferred prey (Pirotta *et al.* 2011), and deep offshore waters, likely in association with frontal systems (Gannier & Praca 2007). In the Mediterranean, sperm whales prey mostly on mesopelagic squids, with a preference for species belonging to genera *Histioteuthis* and *Octopoteuthis* (Foskolos *et al.* 2020). Segregation between adult males and female social units, commonly observed in oceanic populations, is observed also in the Mediterranean, with males often found isolated during summer in the northernmost portions of the western basin. However, notable exceptions are found in which large males are seen in long-term aggregations with social units, such as around the Balearic Islands (Pirotta *et al.* 2020) and in the Hellenic Trench (Frantzis *et al.* 2014), indicating the presence in the Mediterranean of a social structure divergent from that of oceanic populations (Pirotta *et al.* in press).

Sperm whales are known to be capable of extensive movements within the Mediterranean, both latitudinal (Drouot-Dulau & Gannier 2007, Rendell *et al.* 2014) and longitudinal (Carpinelli *et al.* 2014), including across basin (Frantzis *et al.* 2011); probably, however, not based on regular migratory patterns across the Mediterranean as hypothesised by Bolognari (1949).

Population

Sperm whales in the Mediterranean are represented by both sexes and all age classes, including lactating females and neonates, confirming that births take place in the region (Frantzis *et al.* 2014, Drouot-Dulau & Gannier 2007, Calogero *et al.* 2019). Mitochondrial and nuclear genetic analyses further suggest that sperm whales in the Mediterranean are a resident population separated from the North Atlantic (Drouot *et al.* 2004, Engelhaupt *et al.* 2009). Evidence exists of unidirectional gene flow from the Atlantic, also supported by the frequent observations of sperm whales in the Strait of Gibraltar (de Stephanis *et al.* 2008). A comparison between photo-ID catalogues from the Mediterranean and the North Atlantic revealed no matches (Carpinelli *et al.* 2014).

Determining the total population size of sperm whales in the Mediterranean is proving a challenge. An estimate of the total sperm whale abundance recently provided through the 2018 ACCOBAMS Survey Initiative (ASI) was of 1,478 individuals, however the very large coefficient of variation (0.52) indicates a high level of uncertainty (ACCOBAMS 2021a), with the real number likely ranging between 600 and 4,000 whales. Most of these are concentrated in the western portion of the basin; the best estimate for the population size of sperm whales in the eastern basin is a mere 200-300 individuals (Frantzis *et al.* 2019).

Given the uncertainty about total population numbers, and considering that a large portion of sperm whale habitat in the Mediterranean is unsurveyed, it is currently impossible to tell whether the species is declining, stable or increasing in the region. More localised evidence exists, however, of substantive decline, e.g., in the Strait of Messina where reports by Bolognari (1949, 1950, 1951, 1957) of the frequent occurrence of aggregations of up to 30 animals have never been recorded since, anywhere

Kashalot • عنبر (ambar) • Ulješurat • Cachalot •
φυσητήρας (fysitíras) • ראשתן (roshtan) • Capodoglio •
Il-Gabdoll • Cachalote • Cachalote • İspermeçet balinası, kaşalot

in the Mediterranean. Elsewhere, such as around the Balearic Islands (Pirotta *et al.* 2020), in the southern Tyrrhenian Sea (Mussi *et al.* 2014) and in the Ligurian Sea (Azzellino *et al.* 2017), numbers have been increasing in recent years, which however suggests redistribution more than population increase. In view overall current encounter rates compared with historical records, and considering the absence of management measures to mitigate ongoing threats (Notarbartolo di Sciara 2014, Rendell & Frantzis 2016), on the basis of precaution it is correct to assume that sperm whales in the Mediterranean are declining (Pirotta *et al.* in press).

Threats

Sperm whale survival in the Mediterranean is threatened by several human activities. Entanglement in illegal pelagic driftnets continue to be an important source of mortality despite a region-wide ban which came into force in 2002 (Cornax & Pardo 2009). In addition, collisions with ships (Frantzis *et al.* 2019), anthropogenic noise, ingestion of debris (mostly plastic: Alexiadou *et al.* 2019), chemical pollution, disturbance from marine traffic and whale watching vessels, and possibly climate change, all add to the pressure which Mediterranean sperm whales receive from human activities and contribute to the species' assumed decline in the region (Notarbartolo di Sciara 2014, Rendell & Frantzis 2016, Pirotta *et al.* in press).

Of particular concern are human activities occurring in the Hellenic Trench, the major habitat for the remaining eastern Mediterranean sperm whales. These include the existence of major shipping routes running along the 1000-m depth contour in prime sperm whale habitat, resulting in the observed ship strikes; and the conduction of seismic explorations in the corresponding IMMA.

Conservation actions

The "Pelagos Sanctuary for Mediterranean Marine Mammals", established in 1999 by a treaty among France, Italy and Monaco (entered into force in 2002), extended international protection to a large area (87,000 km^2) in portions of the Provençal, Corsican, Ligurian, Tyrrhenian and northern Sardinian Seas. The area contains important habitat for several cetaceans in the Mediterranean including sperm whales (Notarbartolo di Sciara *et al.* 2008). The Pelagos Sanctuary was subsequently listed as a Specially Protected Areas of Mediterranean Importance (SPAMI) within the framework of the Barcelona Convention SPA/BD Protocol. Measures adopted by the Sanctuary Agreement include whale watching regulations. In Italy the MPA called "Ischia – Regno di Nettuno" was established to protect several cetacean species frequenting a submarine canyon within the area's boundaries, including sperm whales.

A measure by the Spanish Defence Ministry to reduce ship speed to mitigate the risk of collisions between sperm whales and ships in the Strait of Gibraltar was issued in 2007; however the measure is voluntary-based and seasonally limited, despite whales being present in the area year-round, which calls into question its effectiveness (Gauffier *et al.* 2012).

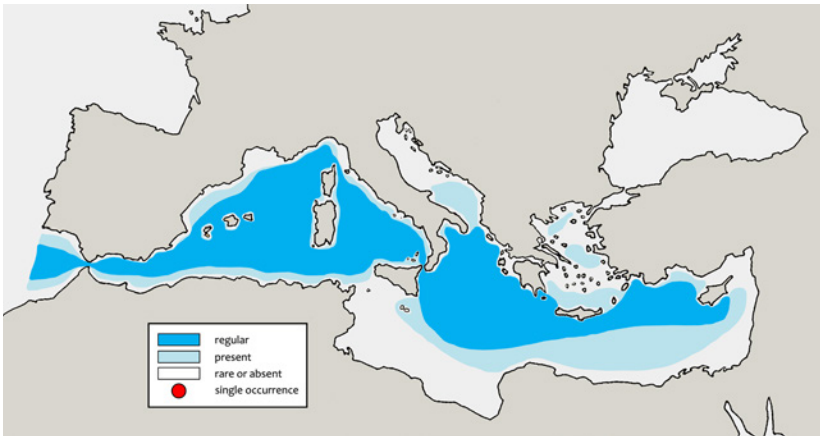
Six Important Marine Mammal Areas (IMMAs) identified in the Mediterranean region by the IUCN Marine Mammal Protected Areas Task Force in 2017 included sperm whales as qualifying species (the Alborán Corridor and Alborán Deep, the Campanian and Pontino Archipelago, the Hellenic Trench, the Balearic Islands Shelf and Slope, and the North West Mediterranean Sea, Slope and Canyon System).

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular
- **Black Sea:** absent

Distribution in the Mediterranean and Black Seas and adjacent areas

Sperm whales occur throughout the Mediterranean from Gibraltar (and beyond) to the Levantine Sea, in deep and slope waters. Areas where the species is particularly frequent include the Strait of Gibraltar, the Balearic Islands, the Liguro-Provençal Basin, parts of the Tyrrhenian Sea, the Hellenic Trench, and south of Turkey from Rhodes to Cyprus. By contrast, sperm whales are rare in (if not absent from) the shallower parts of the Mediterranean such as the northern and central Adriatic, the Strait of Sicily and portions of the Aegean Sea. Sperm whales do not occur in the Black Sea and in the Turkish Straits System.



Cuvier's beaked whale

Ziphius cavirostris G. Cuvier 1823

Conservation status in the ACCOBAMS area

Vulnerable - VU C2a(ii) (Cañadas & Notarbartolo di Sciara) based on the following conditions: a) the Mediterranean subpopulation, which is genetically distinct from Atlantic Cuvier's beaked whales, contains fewer than 10,000 mature individuals; b) the subpopulation experiences an inferred continuing decline in number of mature individuals; and c) all mature individuals are in one subpopulation.

Change in status since 2010

In the previous assessment Cuvier's beaked whales from the Mediterranean were listed as Data Deficient (Cañadas 2012a). Population data collected since that account was published allowed an assessment of maximum subpopulation size and of the inferred status.

Listed in

CMS App. I (Mediterranean population)
CITES App. II
Bern Convention App. II
Barcelona Convention SPA/BD Protocol, Annex II
EU Habitats Directive: Annex IV

Global status

Least Concern (Taylor *et al.* 2008a)

World distribution

Cuvier's beaked whales have the widest geographic range of any other beaked whale species, being distributed in all of the world's oceans, from the polar regions in both hemispheres to the tropics. They are also found in many semienclosed seas such as the Caribbean, Gulf of Mexico, Gulf of California, Sea of Japan and Sea of Okhotsk, and of course the Mediterranean Sea where it is the only Ziphiid species regularly found (Taylor *et al.* 2008a).

Habitat and ecology

Z. cavirostris is an oceanic species with a clear preference for steep slope habitat, particularly if indented by submarine canyons and complex topographic features (Azzellino *et al.* 2008, 2012, Cañadas *et al.* 2017). Its preferred depth range is normally comprised between approximately 500 and 1,500m, although it can also be occasionally found in offshore, deep waters covering abyssal plains (Frantzis *et al.* 2003). Cuvier's beaked whales in the Mediterranean are largely found in "hotspots" (see Distribution) with very restricted ranges indicating the species' strong preference for specific habitats (Cañadas *et al.* 2005). There is no information available about movements of whales between hotspots, although the absence of population structure within the Mediterranean points to gene flow across the region (Cañadas & Notarbartolo di Sciara in press).

Cuvier's beaked whales feed mostly on meso- and bathypelagic cephalopods, commonly from the family Histioteuthidae (largely *Histioteuthys bonnellii* and *H. reversa*) (Moulins *et al.* 2007). The species can also be in part ichthyophagous, although this characteristic was never observed in the Mediterranean (Cañadas & Notarbartolo di Sciara in press). Mean group size across the whole of the Mediterranean ranges between 1.6 and 2.5, but was seen to be 4 in the Ligurian Sea (Cañadas & Notarbartolo di Sciara in press).

Population

Cuvier's beaked whales in the Mediterranean are considered to be genetically isolated from the Atlantic, with low mitochondrial haplotypic diversity, and haplotypes found on Mediterranean whales which have not been found elsewhere (Dalebout *et al.* 2005, Tonay *et al.* 2019). Furthermore, extensive vessel surveys conducted in the Gibraltar Strait area never detected the species' presence there (de Stephanis *et al.* 2007), supporting the idea that Cuvier's beaked whales form an isolated population in the Mediterranean. Cañadas *et al.* (2017) estimated a total abundance of Cuvier's beaked whales in the Mediterranean at 5,799 individuals (coefficient of variation = 24%). There is no information on overall population trend in the Mediterranean. Even local trend data (e.g., from the hotspot in the Ligurian Sea), seen as decreasing, proved to be not significant (Cañadas & Notarbartolo di Sciara in press). However, it is suspected that a combination of human pressures affecting the species, in particular anthropogenic noise (see "Threats"), has caused a decline over the last half-century leading to the inference that, in the absence of effective management to mitigate the ongoing threats, the population decline is continuing.

Balene me sqep • زيفيوس (zifyus) • Cuvierov kit • Baleine de Cuvier, ziphius • ζιφιός (zifiós) • זיפיוס חלול חרטום (zifyus chalul chartom) • Zifio • Il-baliena ta'Kuvjer • Zífio • Zifio de Cuvier • Gagalı balina

Threats

Cuvier's beaked whales in the Mediterranean are subject to multiple pressures deriving from human activities, which are responsible for the species' threatened status. Main mortality factors include naval sonar, entanglement in illegal pelagic driftnets, and ingestion of plastic debris. Disturbance generated by other high energy sources of anthropogenic noise such as seismic surveys, as well as disturbance from maritime traffic, should be also included as a pressure factor.

Noise generated by naval sonar was proven to be responsible of "atypical" mass strandings - i.e., concerning a minimum of two or usually more individuals and refers to an unusual spread of stranded cetaceans in space and time (Frantzis 1998) – recorded in the region at least 17 times and causing the death of a minimum of 108 individuals (Podestà *et al.* 2016). This is very likely a gross underestimate of the impact of naval sonar on the species in the Mediterranean, where major naval exercises using noxious sonar levels regularly occur; and although the implication of this mortality source at the population level has not been quantified yet, evidence from other parts of the world suggest that it is significant, at a minimum at a local scale (Cañadas & Notarbartolo di Sciara in press).

Pelagic driftnets, illegal in the Mediterranean since 2002, continue to cause cetacean mortality in many countries, with enforcement clearly inadequate. Cuvier's beaked whales are among the species that are bycaught in this fishery (Notarbartolo di Sciara 1990, Cañadas & Notarbartolo di Sciara in press). Cuvier's beaked whales are also known to be prone to the ingestion of macroplastic debris, which can lead to their death (Holčer *et al.* 2007, Frantzis 2009).

Conservation actions

The Pelagos Sanctuary for Mediterranean marine mammals encompasses the Ligurian Sea Cuvier's beaked whale hotspot and the northern portion of the Caprera Canyon hotspot; this condition affords some level of protection to the species considering that illegal driftnet fishing in the Sanctuary is minimal compared to other Mediterranean areas, and that the use of naval sonar is presumably avoided in the Sanctuary. Elsewhere in the region Cuvier's beaked whales are devoid of effective protection.

However, the Parties to ACCOBAMS, during their 5th Meeting (Tangiers, 2013) resolved that, during naval exercises using sonar or underwater explosions, there should be absolute avoidance within a 50 nautical mile buffer zone around all areas that have been designated as 'Areas of Special Concern for Beaked Whales' in the Mediterranean Sea (ACCOBAMS 2013).

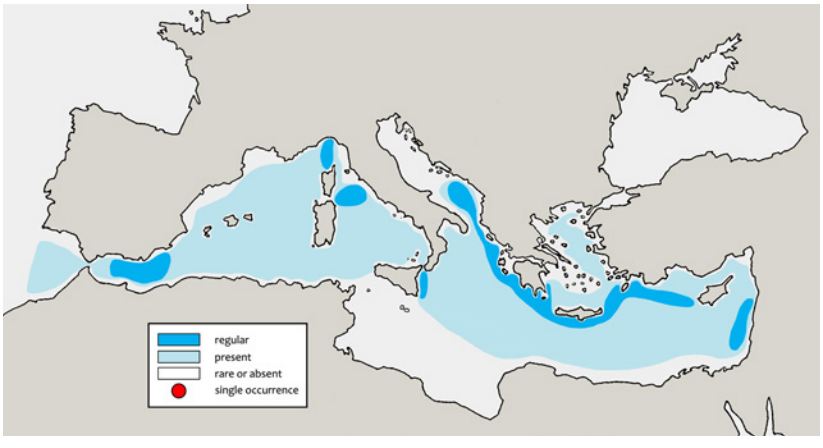
Three Important Marine Mammal Areas (IMMAs) where identified in the Mediterranean which included *Z. cavirostris* as qualifying species: The "Alborán Deep" IMMA[5], the "Western Ligurian Sea and Genoa Canyon" IMMA[6], and the "Hellenic Trench" IMMA[7]. These include three of the major Cuvier's beaked whale hotspots in the region. It is expected that other IMMAs will be identified in the near future around other Mediterranean Cuvier's beaked whale hotspots.

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular
- **Black Sea:** absent

Distribution in the Mediterranean and Black Seas and adjacent areas

Cuvier's beaked whales are present throughout the Mediterranean region, in areas where the species' habitat requirements are favourable. These conditions apparently are satisfied in specific locations where the animals are regularly seen, that can be considered as beaked whale "hot spots" because they are so well delimited. These include (from west to east): the Alborán Sea; the northern Ligurian Sea; the northern Tyrrhenian Sea (including the Caprera Canyon); the Ionian Sea east of Sicily; a long, narrow belt connecting the southern Adriatic Sea running along the Hellenic Trench to the west of Cyprus, especially around Anaximander Seamount; and Levantine Sea waters off Lebanon and Israel. Areas where *Z. cavirostris* is absent from include the north and central Adriatic Sea, the Black Sea and the Turkish Strait System. A large portion of the southern Mediterranean along the coasts of Tunisia, Libya and Egypt is also considered an area where beaked whales are absent from, however this could change once greater investigation effort can be dedicated there.



[5] https://www.marinemammalhabitat.org/portfolio-item/Alborán-deep/
[6] https://www.marinemammalhabitat.org/portfolio-item/western-ligurian-sea-genoa-canyon/
[7] https://www.marinemammalhabitat.org/portfolio-item/hellenic-trench/

Orca, also commonly known as "killer whale"

Orcinus orca (Linnaeus 1758)

Conservation status in the ACCOBAMS area

Critically Endangered - CR C2a (I, ii); D (Esteban & Foote 2019). This assessment is based on the consideration that orcas from the Strait of Gibraltar: a) are genetically distinct from other known Northeast Atlantic subpopulations; b) subsist in a very reduced number (<50); c) heavily depend on a single prey species, the Atlantic bluefin tuna *Thunnus thynnus*, which is itself listed as Endangered (Collette *et al.* 2011); and d) experience observed poor recruitment, suggesting inferred future decline

Change in status since 2010

Provisionally proposed as Critically Endangered in 2006 (Reeves & Notarbartolo di Sciara 2006), however not formally assessed until 2019.

Listed in

CMS App. II
CITES App. II
Bern Convention App. II
Barcelona Convention,
SPA/BD Protocol, Annex II
EU Habitats Directive: Annex IV

Global status

Data Deficient (Reeves *et al.* 2017). Although regional populations exist that have declined significantly and could qualify for a threatened status, at the global level orcas do not meet any of the Red List criteria for such status (Reeves *et al.* 2017). Considered to likely include more than one subspecies, and possibly multiple species, *O. orca* current listing as Data Deficient is justified by taxonomic uncertainty, until proper taxonomic units are described and status assessments of them can be carried out.

World distribution

Orcas are considered the cetacean species with the world's widest distribution; Rice (1998) suggested that they are the second-most widely ranging mammal species on the planet after *Homo sapiens*. Although they are most frequently found in areas characterized by cold waters and high productivity, orcas can be found from tropical to polar latitudes and from shallow coastal waters to the open seas. They are also regularly found in semi-enclosed seas such as the Sea of Okhotsk, the Gulf of California and parts of the Caribbean and Gulf of Mexico, and occasionally venture inside other bodies such as the Red Sea, the Persian Gulf and the Mediterranean Sea.

Habitat and ecology

Orcas found regularly in the Mediterranean region are limited to the area of the Strait of Gibraltar and waters immediately to the west of the Strait, where they congregate seasonally to intercept the inward spawning migration of their preferred prey, the Atlantic bluefin tuna (Esteban *et al.* 2013). The whereabouts of this population during the seasons when it is not present in the Gibraltar area are not known. There is some evidence of the continued presence of orcas in the Strait surroundings during the rest of the year (Esteban *et al.* 2016a), as well as sporadic sightings along the west and north coasts of the Iberian Peninsula (Esteban & Foote 2019). Orcas from other populations that venture into the Mediterranean on occasional, short-lived visits are not necessarily tied to any specific marine habitat in the region. Some of these have been shown to be inclined to predation on other marine mammal species, such as Cuvier's beaked whales *Ziphius cavirostris* (Notarbartolo di Sciara 1987).

The Gibraltar population's foraging need limits the presence of orcas to the shallow waters of the Strait, and of the northern Gulf of Cadiz immediately to the west of the Strait. Part of this population (pods A1 and A2), having learned to interact with the local artisanal drop longline fishery by wrestling the tuna out of the fishing lines, are gaining an energetic advantage from this behaviour with respect to other orcas in the population (pods B, C and D) who limit themselves to active hunting (Esteban *et al.* 2016b).

Population

This account only considers orcas from the small population regularly observed in the Strait of Gibraltar area during spring and summer; threats affecting them and conservation considerations discussed below only pertain to this small nucleus of individuals. Orcas from farther, mostly unknown Atlantic populations who episodically venture into the Mediterranean are treated separately, as occasional visitors, and are unconcerned by threat and conservation agents related to the Strait of Gibraltar orcas.

أُركة (arqa) • Orka, kit ubojica • Orque • όρκα (orka) • קטלן (katlan) • Orca • L-orka • Orca • Orca • Katil balina

Strait of Gibraltar orcas are distinct from other Atlantic populations based on genetic analyses and photo-ID studies (Foote *et al.* 2011, Esteban *et al.* 2016a). This population currently consists of 39 individuals subdivided into five pods, showing a high level of seasonal site-fidelity to the Strait area (Esteban *et al.* 2016a). Although survival rates estimated for the population indicate stability, recently observed poor recruitment, particularly in the actively hunting pods, suggest that the population is bound to decline unless conditions will improve (Esteban *et al.* 2016b).

Threats

Depletion of the orca's main species, the Endangered East Atlantic bluefin tuna, *Thunnus thynnus*, is the main threat to the Strait of Gibraltar orcas, as any further decrease in the tuna's abundance would pose a high risk to the population's survival (Esteban & Foote 2019). Conversely, no direct injury or retaliation by drop-line fishermen has ever been observed or reported (Esteban *et al.* 2016a), although some animals have been reported with injuries of unknown origin (Otero-Sabio *et al.* 2018).

Other threats include bycatch in fishing gear, disturbance from maritime traffic, and chemical pollution. However, evidence that bycatch might be a significant pressure factor is weak (Esteban & Foote 2019). Levels of vessel traffic are already very high in the Strait and whale watching companies specifically targeting orcas in the Strait area in July and August, as the animals are intent on interacting with the tuna fishery, are likely to affect the orca's foraging efficiency, already marginal (Esteban & Foote 2019). During spring major naval exercises in the area constitute an added burden of interference (Esteban & Foote 2019). With mean concentrations exceeding 200mg/kg lipid in their tissues, Strait of Gibraltar orcas were found to have the highest PCB levels found in cetaceans, clearly exceeding known PCB toxicity thresholds for marine mammals (Jepson *et al.* 2016).

Conservation actions

Considering the high level of risk to Gibraltar Strait orcas posed by the perspective of prey depletion, Esteban *et al.* (2016b) suggested that a specific extra quota be assigned to the Strait's local artisanal drop long-line fishery by the International Commission for the Conservation of Atlantic Tuna (ICCAT) to account for the orcas' food requirement. Mitigation of disturbance by whale watching and military exercises to orcas in two of their main spring and summer habitats in the Strait of Gibraltar was achieved by the Spanish Ministry of Environment in 2017 with a specific regulation, B.O.E.-A-2017-5474 (Esteban & Foote 2019). The same regulation provides for the exclusion of seismic surveys from "critical areas for killer whales", the regulation of the recreational activity of observation of cetaceans, and the maintenance of a non-transmissible fishing quota of bluefin tuna for the drop long-line fishery of the Strait. The IUCN Task Force on Marine Mammal Protected Areas identified in 2017 an Important Marine Mammal Area (IMMA) in the area, the "Strait of Gibraltar and Gulf of Cadiz IMMA", in relation of the importance of the area for this orca population.

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular (Gibraltar area); visitor eslewhere
- **Black Sea:** absent

Distribution in the Mediterranean and Black Seas and adjacent areas

In the region, orcas are regular only in a small area centred around the western portion of the Strait of Gibraltar and the waters of the Gulf of Cadiz immediately to the west. Other occurrences within the Mediterranean Sea, marked by coloured circles, indicate the locations of episodic sightings or strandings events by orcas, dating from the late XIX century to the present time, unlikely to belong, or certainly not belonging, to the Strait of Gibraltar population. Yellow circles connected by arrows indicate the successive positions of a pod of orcas originating from the west of Iceland (M.T. Mrusczok, Orca Guardians, pers. comm.), who appeared in December 2019 off Spain, then Sardinia, Genoa, Messina, and finally last seen off Lebanon in January 2020 (the arrows connect the successive locations and are not meant to describe the accurate path followed by the pod). The initial composition of the pod was of five animals (an adult male, an adult female with her calf, and two younger individuals). Whilst the calf died when the animals were in front of Genoa, when they arrived in Sicily only three of them were seen. On his appearance off Beirut in January, only the adult male was seen.

Long-finned pilot whale

Globicephala melas (Traill 1809)

Conservation status in the ACCOBAMS area

Endangered - EN C2a(ii) (Gauffier & Verborgh in press) based on the following conditions: a) a "subpopulation" genetically isolated from the North Atlantic, containing less than ~2,500 mature individuals; b) a continuing decline based on impact from various pressure factors (a morbillivirus epizootic outbreak in 2006 that started in the Strait of Gibraltar and extended throughout the western basin, high contaminant levels, disturbance by maritime traffic and whale-watching, and fisheries interactions) and on PVA predicting a population decline of 35% over three generations; and c) 100% of mature individuals are in one "subpopulation". In addition, a distinct pilot whale subpopulation of long-finned pilot whales was identified, limited to the Strait of Gibraltar area, and listed as Critically Endangered - CR C2a(ii) (Verborgh & Gauffier in press).

Change in status since 2010

The long-finned pilot whale Mediterranean "subpopulation" was first assessed (Cañadas 2012b) in 2010 as Data Deficient because of the absence of data on the species' biology, distribution and abundance across much of the Mediterranean region.

Listed in

CMS App. II (only North and Baltic Seas populations)
CITES App. II
Bern Convention App. II
Barcelona Convention SPA/BD Protocol, Annex II

Global status

Least Concern (Minton *et al.* 2018a)

World distribution

G. melas is anti-tropically distributed in temperate and subpolar regions of the both hemispheres, but in the Northern Hemisphere it is confined to the North Atlantic, inclusive of the North Sea and the Mediterranean Sea (Minton *et al.* 2018a).

Habitat and ecology

Long-finned pilot whales are a typically offshore species, mostly found in deep waters beyond the continental shelf and slope (Cañadas *et al.* 2005, Azzellino *et al.* 2008). They are amongst the deepest-diving delphinids, recorded as having exceeded depths of 800 m whilst foraging in the Mediterranean (Baird *et al.* 2002). Deep dives allow these whales to hunt a variety of mesopelagic squid species such as *Ancistroteuthis lichtensteinii*, *Heteroteuthis dispar*, *Histioteuthis bonnellii*, *H. elongata*, *H. reversa*, *Todarodes sagittatus*, as well as other species belonging to the Chiroteuthid, Octopoteuthid, and Ommastrephid families (Astruc 2005, Praca *et al.* 2011). Long-finned pilot whales also occasionally feed on pelagic fish, mostly Gadids such as *Micromesistius poutassou* (Praca *et al.* 2011). As evident from the large variety of squid species they prey upon, long-finned pilot whales are amongst the most generalists of teuthophagous cetaceans; they are also feeding at a lower trophic level than other sympatric teuthophagous species such as sperm whales (*Physeter macrocephalus*), Cuvier's beaked dolphins (*Ziphius cavirostris*) and Risso's dolphins (*Grampus griseus*), thus likely minimising interspecies competition (Azzellino *et al.* 2008).

Long-finned pilot whale societies are organised in matrilineal units stable in time, not unlike those of orcas (*Orcinus orca*); this is corroborated by the observation that individuals sampled within units in the Strait of Gibraltar shared the same haplotype (Verborgh *et al.* 2016). De Stephanis *et al.* (2008) suggested that the population consists of "clans", each of them consisting of several pods. In the Mediterranean Sea long-finned pilot whale pods are generally composed by few tens of individuals, although groups of several hundred are occasionally seen aggregating in the Alborán Sea (Cañadas & Sagarminaga 2000).

Population

Genetic evidence based on both mitochondrial and nuclear analyses revealed that Mediterranean long-finned pilot whales are distinct from their North Atlantic conspecifics (Kraft *et al.* 2020). Genetic structure was also detected within the Mediterranean, between a smaller unit centred around the Strait of Gibraltar and the rest of the Mediterranean population (Verborgh *et al.* 2016), although the two units should be considered part of the same "subpopulation" according to IUCN guidelines (Gauffier & Verborgh in press). Population size data deriving from the ACCOBAMS Survey Initiative yielded a total estimate of 5,540 (CV = 42%) (ACCOBAMS 2021a). Although this information should be treated with caution as it was based on only 14 sightings, it is not inconsistent with the sum of previous estimates made in different portions of the species' range in the Mediterranean, as reported in Gauffier and Verborgh (in press). Long-finned pilot whales apparently underwent a population decrease by >10% caused by a morbillivirus epizootic which affected them, starting in winter 2006-2007 in the Strait of Gibraltar, and subsequently extending northeast along the Spanish coasts, all the way to France (Fernández *et al.* 2008, Raga *et al.* 2008, Keck *et al.* 2010). A Population Viability Analysis (PVA) performed on the Strait of Gibraltar pilot whales in 2007 predicted 100% probability of extinction in the next 100 years based on the most pessimistic estimates, while mean estimates still showed a 50% decrease in the population over 100 years (Verborgh *et al.* 2020). During the past 50 years, the presence of long-finned pilot whales also drastically declined in the easternmost reaches of their Mediterranean range, such as in the Ligurian and Tyrrhenian seas, from frequent yearly encounters of

الرأس الشائع (kouraoui arras achaii) • Bjelogrli dupin • Globicéphale noir • μαυροδέλφινο (mavrodélfino) • נתב שחור (natav shachor) • Globicéfalo • Il-balena s-sewda • Baleia-piloto-de-peitorais-longas • Calderón común • Siyah yunus

very large pods in the 1970s (Vallon *et al.* 1977) to very few each summer (Podestà & Magnaghi 1988, Laran *et al.* 2012).

Threats

Long-finned pilot whales in the Mediterranean Sea are only marginally affected by human pressures occurring in coastal waters because of their open sea habitat preference (Gauffier & Verborgh in press). The main threats affecting the Mediterranean population include fisheries interactions, collisions with vessels, disturbance from whale watching operations, chemical contamination, and disease. Bycatch in pelagic driftnets was significant when this fishing gear was legal (Podestà & Magnaghi 1989, Notarbartolo di Sciara 1990), but likely of minor impact after the 2002 ban considering that the illegal use of driftnets in the Mediterranean mostly appears to be occurring today at the boundaries of the species' range in the region, if not beyond. Based on frequent observations of injury scars caused by hooks, particularly in the Strait of Gibraltar, entanglement in longlines should also be considered a threat to pilot whales (Vasquez *et al.* 2014, Herr *et al.* 2020). Ship strikes of long-finned pilot whales have been recorded in the Mediterranean, and the high levels of maritime traffic in the Strait of Gibraltar is presumably a significant threat to the species in that area (Gauffier & Verborgh in press). Long-finned pilot whales have also been recorded reacting vocally to military sonar in the Ligurian Sea (Rendell & Gordon 1999). Possible signs of disturbance to these animals by whale watching operations, e.g., in the Strait of Gibraltar, was detected through changes in breathing patterns in presence of the boats (Senigaglia *et al.* 2012), but is not considered to be a major threat for the species (Gauffier & Verborgh in press). Mediterranean long-finned pilot whales have been shown to have very high levels of organochlorine (PCBs and DDTs) and flame retardant (PBDEs) in their tissues, with extreme concentrations detected in individuals sampled in the Strait of Gibraltar (Praca *et al.* 2011, Lauriano *et al.* 2014, Pinzone *et al.* 2015); such concentrations can be related to the animals' susceptibility to morbillivirus infections, like the one which caused high mortality levels in long-finned pilot whales in 2006-07 in the Strait of Gibraltar and the wider Alborán Sea (Fernández *et al.* 2008).

Conservation actions

Having facilitated the discontinuation of pelagic driftnet use in the northwestern part of the Mediterranean, the Pelagos Sanctuary for Mediterranean Mammals, established by a treaty amongst France, Italy and Monaco and a SPAMI, has contributed to reducing long-finned pilot whale fishing-related mortality in the easternmost portion of the species' Mediterranean range. Furthermore, Spain has declared three marine Natura 2000 sites (ESZZ16003 *Sur de Almería – Seco de los Olivos*, ES6200048 *Valles submarinos del escarpe de Mazarrón* and ES6120032 *Estrecho Oriental*) containing long-finned pilot whale habitat.

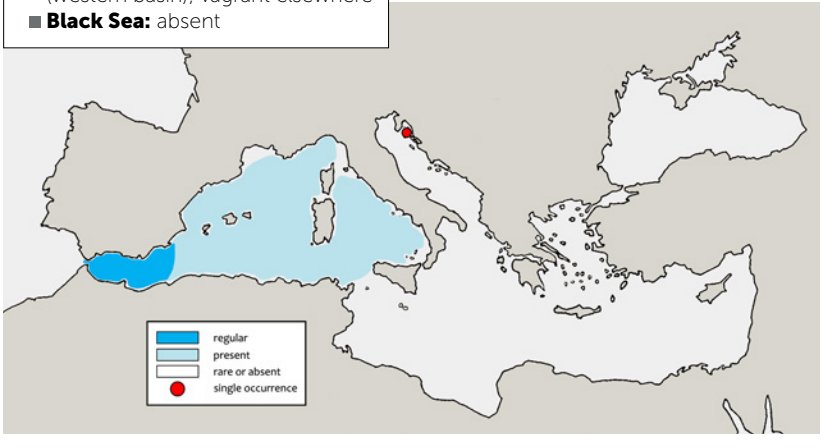
In 2017 an Important Marine Mammal Area (IMMA), the "Alborán Deep IMMA", was identified in the Mediterranean having long-finned pilot whales as qualifying species. Five more IMMAs ("Strait of Gibraltar and Gulf of Cádiz IMMA", "Alborán Corridor IMMA", "Balearic Islands Shelf and Slope IMMA", "Western Ligurian Sea and Genoa Canyon IMMA", and "North West Mediterranean Sea, Slope and Canyon System IMMA") were also identified having long-finned pilot whales as supporting species.

Distribution in the Mediterranean and Black Seas and adjacent areas

The presence of long-finned pilot whales in the Mediterranean is limited to the western portion of the basin. Their density is highest from the Strait of Gibraltar to the eastern boundary of the Alborán Sea and Gulf of Vera, where they are observed year-round. In other regions of the western Mediterranean, such as around the Balearic Islands, the Provencal Basin, the western Ligurian Sea and the Tyrrhenian Sea, the species is present but much less frequent, and its frequency there has been significantly decreasing in recent decades. Records in Maltese waters are very few and sporadic. The only confirmed occurrence of the species east of the Italian peninsula involved the capture of a vagrant adult male in a tuna trap off the island of Rab in former Yugoslavia (now Croatia) (Hirtz 1922).

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular (western basin); vagrant elsewhere
- **Black Sea:** absent



Risso's dolphin

Grampus griseus (G. Cuvier 1812)

Conservation status in the ACCOBAMS area

Endangered - EN A2bc (Lanfredi *et al.* in press) based on the following condition: an inferred reduction of more than 50% in the numbers of individuals, calculated in a 10-year period.

Change in status since 2010

In the previous assessment the Risso's dolphin from the Mediterranean was listed as Data Deficient (Gaspari & Natoli 2012). Population data collected since that evaluation was published allowed to infer a reduction of population size.

Listed in

CMS App. II (North Sea, Baltic Sea and Mediterranean populations)
CITES App. II
Bern Convention App. II
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive, Annex IV

Global status

Least Concern
(Kiszka & Braulik 2018)

World distribution

Widely distributed world-wide, mostly across temperate and tropical seas, occasionally extending to higher latitudes, 60°N and 60°S.

Habitat and ecology

The species is found mostly in deep pelagic waters (300-1,500m), especially over steep shelf slopes and submarine canyons (Notarbartolo di Sciara *et al.* 1993, Cañadas *et al.* 2002, 2005, Praca and Gannier 2007, Azzellino *et al.* 2008, 2012, 2016). In the northwestern Mediterranean, habitat suitability models revealed a strong preference for steep slope habitat and a narrow band of suitable habitat near the 200m contour (Praca & Gannier 2007, Azzellino *et al.* 2008). At a local scale in the northwestern Mediterranean Sea, changes in distribution and habitat were reported, with a lower encounter rate over the coastal and continental slope in recent years and a more stable presence in the pelagic area (Azzellino *et al.* 2016). Large numbers of sightings were made offshore as well as in the more predicted slope zones in the western Mediterranean during recent basin-scale aerial surveys (ACCOBAMS 2021a). Risso's dolphins in the Mediterranean feed mostly on deep-water cephalopods; species include various ommastrephid, histioteuthid, onychoteuthid and cranchiid squids, but also the epipelagic octopod *Argonauta argo* (Blanco *et al.* 2006, Öztürk *et al.* 2007, Pedà *et al.* 2015). Group size is variable, ranging 3 to 55, but more often in small groups, typically four to eight individuals, often with strong relationships observed between individuals over months and even years (Notarbartolo di Sciara *et al.* 1993, Azzellino *et al.* 2016). Risso's dolphins have been observed in mixed-species groups with striped dolphins and short-beaked common dolphins in the deep waters of the semi-closed Gulf of Corinth (a single individual: Bearzi *et al.* 2016), in the northern Aegean Sea (Tonay *et al.* 2015) and in the open waters off Finike, Levantine Sea (Dede *et al.* 2012); with rough-toothed dolphins south of Cyprus (Ryan *et al.* 2014); and with long-finned pilot whales in the Ligurian sea (Beaubrun *et al.* 1998).

Population

According to estimates based on the result of ASI basin-wide aerial survey (ACCOBAMS 2021a), Risso's dolphins in the Mediterranean are found in excess of 23,000 individuals: 16,651 in the western Mediterranean Sea (CV = 0.34;

غرامبوس (ghrambous) • Glavati dupin • Dauphin de Risso • Σταχτοδέλφινο (stachtodèlfino) • גרמפוס אפור (Grampus afor) • Grampo • Delfin griú • Grampo • Id-denfil il-griż, id-denfil ta' Risso, il-monka tal-punent • Calderón Gris, Delfín de Risso • Grampus

95% CI: 8,545-32,448), 5,116 in the eastern Mediterranean (CV: 0.51; 95% CI: 1,989 -13,163) and 1,467 in the Adriatic Sea (CV: 0.70; 95% CI: 419 -5,130). Risso's dolphins in the Mediterranean Sea are genetically differentiated from those in the eastern Atlantic and other ocean's populations, suggesting that the gene flow across Gibraltar is limited or negligible; there is also evidence of possible subpopulation structure in the Mediterranean Sea (Gaspari *et al.* 2007, Chen *et al.* 2018).

Threats

The main known threat to Risso's dolphins in the Mediterranean Sea is entanglement in pelagic driftnets (Notarbartolo di Sciara 1990, Öztürk *et al.* 2001, Bearzi *et al.* 2011) and longlines (Valeiras & Caminas 2001, Macias Lopez *et al.* 2012). Other potential problems include disturbance by vessels (e.g., Miragliuolo *et al.* 2004) and ingestion of plastic debris (Alexiadou *et al.* 2019). Furthermore, like other odontocetes, Risso's dolphins in the Mediterranean may carry substantial contaminant burdens (Marsili & Focardi 1997, Storelli *et al.* 1999, Storelli & Marcotrigiano 2000, Shoham-Frider *et al.* 2014). Although there have been no reports of Risso's dolphin strandings in the Mediterranean Sea directly linked to noise, evidence from the UK supports the eventuality of this species being affected by a syndrome linked to high-intensity sonar exposure (Jepson *et al.* 2005).

Conservation actions

Two large Marine Protected Areas, the Pelagos Sanctuary and the Spanish Marine Protected Area Corredor de Migración de Cetáceos del Mediterráneo, declared in 2018 and proposed as SPAMI, encompass some of the species' natural range. Among Mediterranean IMMAs, two areas have been designated for their recognised importance to Risso's dolphins: the "Alborán Deep IMMA" and the "Northwest Mediterranean Sea, Slope and Canyon System IMMA".

Distribution in the Mediterranean and Black Seas and adjacent areas

Risso's dolphins can be found throughout the Mediterranean Sea, from Gibraltar to the Levantine Sea, as well as in the southern Adriatic and Aegean Seas. However, higher frequencies are observed in the western part of the basin, mostly in the north-eastern Alborán Sea, the western Ligurian Sea, the offshore waters of Gulf of Lion, the Sardinian-Balearic seas, and the coast of Algeria. Evidence of the species' presence in North African waters east of Algeria mainly derives from occasional strandings events.

Risso's dolphins are not regularly observed in the Strait of Gibraltar and adjacent waters. Only one stranding record is reported from the Marmara Sea, part of the Turkish Straits System (Dede *et al.* 2013), where the species is considered vagrant; it is absent from the Black Sea.

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** rare
- **Mediterranean Sea:** regular
- **Black Sea:** absent

Rough-toothed dolphin

Steno bredanensis (Lesson 1828)

Conservation status in the ACCOBAMS area

Near Threatened - NT (Kerem *et al.* in press).

Listed in

CITES App. II
Bern Convention App. II
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive: Annex IV

Global status

Least Concern (Kiszka *et al.* 2019)

World distribution

Circumglobal in tropical and warm-temperate waters in all oceans and adjacent sea such as the Gulf of California, Gulf of Mexico, Caribbean, and of course the Mediterranean. Rare in the Red Sea.

Habitat and ecology

Rough-toothed dolphins are normally found in deep, oceanic waters, although their frequentation of continental shelf waters is not unheard of, e.g., in specific locations off Brazil. In some localities these dolphins also show remarkable site fidelity, such as in Hawaii and Polynesia (Kiszka *et al.* 2019), and the Canary Islands (Ritter 2002).

Rough-toothed dolphins are known to prey on a variety of fishes and cephalopods (West *et al.* 2011), in some cases including large-sized species such as common dolphinfishes, *Coryphaena hippurus*. This dolphin is normally found in small- to medium-sized groups, up to 15 individuals, although larger aggregations are known; one of such aggregations, of about 160, was observed in the Mediterranean Sea (Watkins *et al.* 1987).

الخشنة الاسنان ذو الدلفين • Dauphin à bec étroit • στενόρυγχο δελφίνι (stenóryncho delfíni) • דולפין תלום-שן (dolphin tlum-shen) • Steno • Id-denfil tat-tikki • Caldeirão • Delfin de dientes rugosos • Kaba dişli yunus

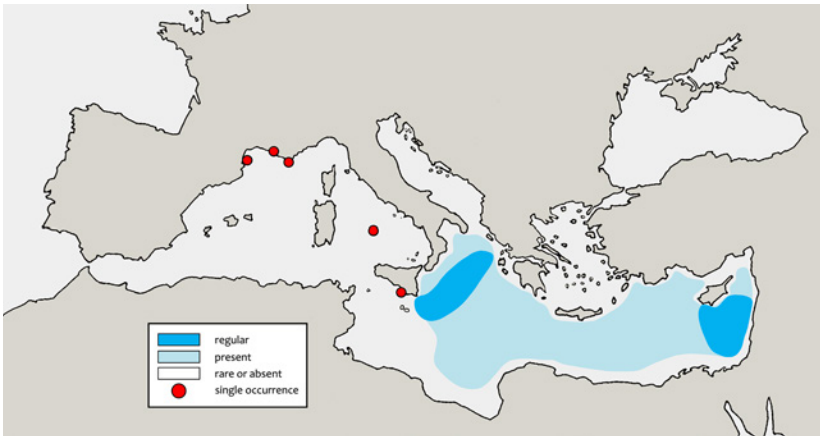
Population
No estimate is available for the Mediterranean subpopulation. Rough-toothed dolphins are repeatedly sighted in the Levantine and Ionian Seas, are known to reproduce there (e.g., Gonzalvo 2009, showing a bycaught female in Lebanon with a near-term embryo), and occur in the region's bycatch and stranding records (Kerem *et al.* in press). They likely occur throughout the offshore waters of the Ionian/Levantine complex. It has been suggested that their presence in this area might be connected to the species' preference for warm waters, particularly in the south-eastern corner of the Levantine Sea where the SST in winter rarely descends below 22°C (Kerem *et al.* in press). Based on mitochondrial DNA studies, Mediterranean *S. bredanensis* are most likely of Atlantic origin, and, by contrast, unlikely to have originated from the Red Sea (Kerem *et al.* 2016).

Threats
Rough-toothed dolphins are accidentally captured in gillnets in Israel (Kerem *et al.* 2016) and Lebanon (Gonzalvo 2009), and have been involved in mass-stranding twice, possibly in relation to the extremely intense seismic activities which have occurred in the eastern Levantine Sea lately (Kerem *et al.* in press).

Conservation actions
No conservation action has ever been envisaged to protect this likely isolated, relic subpopulation of rough-toothed dolphins. In fact, *Steno bredanensis* might be one of the most highly threatened cetaceans amongst the species regular in the ACCOBAMS area.

Distribution in the Mediterranean and Black Seas and adjacent areas
Rough-toothed dolphins in the Mediterranean Sea are confined to the eastern portion of the basin, likely ranging across the offshore waters of the Ionian and Levantine seas; the areas where they are marked as regular in the map is where clusters of sightings exist, although the situation is likely to change once more information is secured. Occurrences in this portion of the region are summarised in Kerem *et al.* (in press).
Other historical findings outside of the "presence" area, summarised in Notarbartolo di Sciara & Birkun (2010), include: the cranium of a specimen from the Tyrrhenian Sea and conserved in the collections of the museum of natural history "La Specola" of Florence (Giglioli 1880); the cranium of a specimen from the Gulf of Marseille conserved in the collections of the museum of Marseille (Robineau 1975); an individual bycaught near the Embiez Islands, Toulon, in 1926 (Robineau 1975, citing Neuville 1927); another individual, a female 2.35m long, captured in a tuna net in the gulf of Aigues-Mortes, France in September 1970 (Granier 1970-1972); and the live stranding of a pod of six, four males and two females, lengths comprised between 1.99 and 2.42 m, near Donnalucata, Ragusa, on 5 April 2002 (Centro Studi Cetacei 2004; three died in the process, and three were released at sea). By contrast, the following uncertain events and reports were not included in this list, due to lack of minimal documentation: (a) an unsubstantiated personal communication by R.G. Busnel to Collet (1984) of "about 10" rough-toothed dolphins taken in the Mediterranean Sea in the 1950s, on behalf of the Laboratoire de Physiologie Acoustique in France; (b) non-documented sightings reported by non-specialists in the Gulf of Taranto (Ionian Sea) and Strait of Sicily (Di Natale 1983); and (c) non-documented sightings in the Strait of Gibraltar (Hashmi & Adloff 1991).
Finally, the stranding of a rough-toothed dolphin along the Egyptian coast reported by Farrag *et al.* (2019) is, in fact, a common bottlenose dolphin, as evident from the published photograph.

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** rare
- **Mediterranean Sea:** regular (eastern basin); vagrant elsewhere.
- **Black Sea:** absent



Striped dolphin

Stenella coeruleoalba (Meyen 1833)

Conservation status in the ACCOBAMS area

Least Concern - LC (Lauriano in press). The Gulf of Corinth (Greece) subpopulation was proposed as Vulnerable - VU D1 (Bearzi *et al.* submitted).

Change in status since 2010

Was assessed as Vulnerable - VU A2bcde in 2012 (Aguilar & Gaspari 2012).

Listed in

CMS App. II (Mediterranean and Eastern Tropical Pacific populations)
CITES App. II
Bern Convention App. II
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive: Annex IV

Global status

Least Concern (Braulik 2019)

World distribution

Widely distributed across temperate and subtropical waters of all oceans and many adjacent seas, from warm temperate to tropical waters between 50°N and 40°S.

Habitat and ecology

In the Mediterranean Sea, striped dolphins are found predominantly in the oceanic zone (Azzellino *et al.* 2008), very rarely venturing in waters shallower than 100 m (Notarbartolo di Sciara *et al.* 1993). Their diet, varied and often opportunistic, includes several species of small epipelagic, mesopelagic and bathypelagic fishes, cephalopods and crustaceans (Würtz & Marrale 1993, Meissner *et al.* 2012, Dede *et al.* 2016a). Aznar *et al.* (2017) detected through stable isotope analyses a significant shift in the diet of striped dolphins in the western Mediterranean, from oceanic prey to more neritic prey, which they attributed to trophic cascading effects caused by overfishing. Striped dolphins are found in groups normally composed of few dozens, but at times aggregating in much larger assemblages. Evidence of fluidity in striped dolphin group composition, caused by a tendency of female philopatry and male dispersion, was detected by Gaspari *et al.* (2007) based on genetic studies. Gaspari *et al.* (2007) also detected genetic differences between groups in the Ligurian Sea found far from shore, and others sampled closer to the coast. Evidence of seasonal movements of striped dolphins is provided by aerial censuses conducted in the Pelagos Sanctuary, where striped dolphin numbers in winter were about half of those in summer (Panigada *et al.* 2011). Conversely, striped dolphin density was seen to increase during winter in Spanish waters (Gomez de Segura

دلفين أزرق وأبيض (Delfin azraq wa abyad) • Prugasti dupin • Dauphin bleu et blanc • ζωνοδέλφινο (zonodélfino) • סטנלה פסוסה (Stenella psusa) • Stenella striata • I-istenella • Golfinho-riscado • Delfín listado • Çizgili yunus

et al. 2006), indicating the possibility of seasonal movements across that portion of the north western Mediterranean.

Population

Mediterranean striped dolphins are a different population from that their Northeast Atlantic conspecifics. Very limited gene flow across the Strait of Gibraltar exists, based on morphological (Calzada & Aguilar 1995), and genetic (mitochondrial: Garcia-Martinez *et al.* 1999, and nuclear: Valsecchi *et al.* 2004, Bourret *et al.* 2007, Gkafas *et al.* 2017) evidence. Genetic analyses (both nuclear and mitochondrial) carried out on *S. coeruleoalba* specimens from Gibraltar to Israel revealed that the population of striped dolphins in the Mediterranean is structured, with low levels of gene flow across the region (Aguilar & Gaspari 2012, Gaspari *et al.* 2019). An extreme case of isolation is represented by a population of about 1,300 striped dolphins confined within the semi-enclosed Gulf of Corinth (Greece), clearly differentiated genetically even from nearby Ionian individuals (Bearzi *et al.* 2016, Gkafas *et al.* 2017). Genetic differences have also been detected in striped dolphins found in the Gulf of Taranto (Ciccarese *et al.* 2019). *S. coeruleoalba* often occurs in mixed groups with common dolphins *Delphinus delphis* and occasionally with Risso's dolphins *Grampus griseus* as well, in the northern Aegean Sea (Tonay *et al.* 2015), in the Gulf of Corinth (Frantzis & Herzing 2002) and open waters of Finike, Levantine Sea (Dede *et al.* 2012). Striped dolphins in the Gulf of Corinth are interbreeding with common dolphins *Delphinus delphis* (Frantzis & Herzing 2002, Bearzi *et al.* 2016), with the production of fertile hybrids (Antoniou *et al.* 2018, Santostasi *et al.* 2020). Striped dolphins are, both numerically and in terms of biomass, the most abundant cetacean in the Mediterranean Sea. A basin-wide population census, also including a small portion of the contiguous Atlantic, was recently generated through a synoptic survey conducted in summer 2018 under the purview

of ACCOBAMS; the survey produced an estimate comprised between 426,656 (design-based method, CV=0.1348) and 472,343 individuals (model-based method, CV=0.1454) (ACCOBAMS 2021a). Surveys conducted before the 2018 ACCOBAMS effort only generated estimates over portions of the region, and all concentrated in the western Mediterranean; a summary of these is included in Notarbartolo di Sciara & Zanardelli (in press).

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular
- **Black Sea:** absent

Threats

The main factors impacting on striped dolphin status in the Mediterranean are fisheries, chemical pollution, and disease. Bycatch in pelagic driftnets for swordfish and tuna has caused significant mortality in striped dolphins in the past, until that fishing gear was declared illegal in 2002 (Öztürk *et al.* 2001, David *et al.* 2010, Akyol *et al.* 2012, Macias Lopez *et al.* 2012). Unfortunately illegal driftnet fishing still occurring in parts of the Mediterranean by various fisheries, including by Moroccan, Algerian, and Italian vessels, still cause striped dolphin bycatch (Tudela *et al.* 2005, Cornax & Pardo 2009, Öztürk 2015, Braulik 2019). Also, overfishing in some Mediterranean areas has been indicated as possibly causing a dietary shift in striped dolphins (Aznar *et al.* 2017).

Striped dolphins are affected by high levels of persistent organic pollutants (most notably DDT and PCBs) in their tissues, accumulated by feeding (Aguilar 2000, Fossi *et al.* 2004, Jepson *et al.* 2016); there is evidence of a slow decline in their concentration in the dolphins' blubber (Aguilar & Borrell 2005, Castrillon *et al.* 2010). These pollutants are likely to disrupt the dolphins' endocrine and reproduction systems (Fossi *et al.* 2002), and their immunosuppressive action likely contributed to aggravate their susceptibility to disease (Aguilar & Borrell 1994). Also microplastics, possibly a threat, were found in >90% of striped dolphin intestinal contents observed in the western Mediterranean during the past three decades (Novillo *et al.* 2020). Morbillivirus epizootics struck Mediterranean striped dolphins in recent decades with devastating consequences (Domingo *et al.* 1990, Keck *et al.* 2010). The first outbreak occurred in 1990-1992, spreading eastward from Spain to the Aegean Sea, and causing the death of thousands of dolphins (Aguilar & Raga 1993, Di Guardo *et al.* 2005, Kennedy 1998). The second epizootic occurred from the end of 2006 to 2007, affecting striped dolphins in the western Mediterranean only (Raga *et al.* 2008). More limited and localised episodes also occurred in later years (Rubio-Guerri *et al.* 2013). Finally, maritime traffic and associated noise can be a source of disturbance for striped dolphins with potentially negative consequences, such as in intense traffic hotspots identified within the Pelagos Sanctuary (Pennino *et al.* 2017), as well as in portions of the Gulf of Taranto (Carlucci *et al.* 2017), coinciding with areas where striped dolphins are present in high densities.

Conservation actions

Striped dolphins are the frequent-most cetacean in the Pelagos Sanctuary for Mediterranean marine mammals, where they have benefited from the early suspension of driftnet fishing induced by the Sanctuary declaration (Notarbartolo di Sciara *et al.* 2008). An IMMA was identified in the Gulf of Corinth, Greece, the "Gulf of Corinth IMMA" specifically in consideration of the striped dolphin population living isolated in that body of water.

Distribution in the Mediterranean and Black Seas and adjacent areas

Striped dolphins are the most common offshore cetaceans in the Mediterranean Sea, found wherever deep waters occur, from Gibraltar to the Levantine Sea. Particularly abundant in the Alborán Sea, in the waters between the Balearic Islands and the Iberian mainland, in the Gulf of Lions and in the Ligurian Sea, but also frequent in the Tyrrhenian and Ionian Seas, including in the Gulf of Taranto, and in the open waters of the southern Adriatic Sea. Their presence is also well known in the Strait of Sicily, and throughout the Aegean and Levantine seas, all the way to Cyprus and Israel. A population of about 1,300 striped dolphins lives in isolation in the semi-enclosed eastern portion of the Gulf of Corinth, Greece.

S. coeruleoalba is vagrant in the Marmara Sea (three strandings and two sightings) (Bayar 2014, Dede *et al.* 2016b) and is absent from the Black Sea.

* (https://www.marinemammalhabitat.org/portfolio-item/gulf-of-corinth/)

Common bottlenose dolphin

Tursiops truncatus truncatus (Montagu 1821)

Conservation status in the ACCOBAMS area

Least Concern (Natoli *et al.* in press). The subpopulation of common bottlenose dolphin found in the Ambracian Gulf, Greece, is assessed as Critically Endangered - CR C2a(ii) (Gonzalvo & Notarbartolo di Sciara in press).

Change in status since 2010

The Mediterranean subpopulation was listed as Vulnerable - VU A2cde (Bearzi *et al.* 2012). The suggestion for down-listing is explained by the large amount of new information that has become available in the intervening period, which no longer supports the notion of a population decline (Natoli *et al.* in press).

Listed in

CMS App. II (North Sea, Baltic Sea, Mediterranean and Black Sea populations)
CITES App. II
Bern Convention App. II
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive: Annex II, Annex IV

Global status

Least Concern (Wells *et al.* 2019)

World distribution

Common bottlenose dolphins are amongst the most widespread cetacean species, occurring in all oceans within a broad latitudinal range, and in many adjacent seas including the Gulf of Mexico, Caribbean region, Gulf of California, Red Sea, Persian Gulf and of course the Mediterranean.

Habitat and ecology

T. truncatus is a typically neritic dolphin; however, the species displays a high level of ecological plasticity, with the existence in many places across its range of distinct inshore and offshore ecotypes. In the Mediterranean common bottlenose dolphins are normally limited to the continental shelf, although their presence in deeper, oceanic waters is not unusual. Common bottlenose dolphins feed on a variety of prey, including fishes, cephalopods, and occasionally crustaceans. Preferred species vary by location, but are largely demersal although epipelagic fishes are also preyed upon. Common bottlenose dolphins in the Mediterranean are also known to follow bottom trawlers to feed on fishes escaping the nets (e.g., Gonzalvo *et al.* 2008), and can be attracted by fish farms which can provide them a significant food source (Piroddi *et al.* 2011, Bearzi *et al.* 2009).

Population

A recent survey initiative spearheaded by ACCOBAMS (ACCOBAMS 2021a) provided a population estimate of over 60,000 common bottlenose dolphins (95%CI=45,000-79,000); this is likely an underestimate because it was not corrected for perception and availability bias and did not cover some coastal areas where the species might have been present (Natoli *et al.* in press). The survey data over specific areas were consistent with previous surveys, or photo-ID-based mark/recapture experiments, that had been conducted in those areas. The above being the first region-wide estimate for the species, it doesn't lend itself to the detection of population trends; however, based on long-term observations in specific sub-areas, as well as on decades-long stranding records along well-monitored coasts (e.g., Spain, Italy, Croatia, Israel), no significant declining or increasing trends were revealed (Natoli *et al.* in press). Common bottlenose

Delfin i madh • دلفين كبي (delfin kabir) • Dobri dupin • Grand dauphin • ρινοδέλφινο (rinodélfino) • דולפינן מצוי (dolphinan matzuy) • Tursìope • Id-denfil ta' geddumu qasir • Roaz-corvineiro • Velika pliskavka • Delfin mulár • Afalina

dolphins in the Mediterranean are genetically distinct from their North East Atlantic conspecifics, and can be considered a distinct subpopulation (Natoli *et al.* 2004, Natoli *et al.* 2005). However, clear population structure was detected across the basin, with a mosaic of different genetic, social and cultural differences (Tezanos-Pinto *et al.* 2008, Viaud-Martinez *et al.* 2008, Moura *et al.* 2013a, 2020, Gaspari *et al.* 2015, Nykänen *et al.* 2019).

Threats

Due to their coastal habits, common bottlenose dolphins in the Mediterranean are exposed to pressures in a marine ecosystem where impacts from human activities are highest; however, at the same time and possibly by consequence, the species appears to be more adaptable and resilient to such impacts than other cetaceans (Bearzi *et al.* 2009). A major factor affecting the species' survival in the region has been, in the past, mortality derived by widespread state-supported culling campaigns, which were discontinued between the 1960s (e.g., Adriatic Sea: Bearzi *et al.* 2004a) and the 1970s (Aegean Sea: Berkes 1977, Tonay & Öztürk 2012, Tonay *et al.* 2015). Non-systematic and yet intentional killings still occur occasionally, mostly involving acts of retaliation by fishermen in connection to episodes of net and catch "depredation" by the dolphins (e.g., Gonzalvo *et al.* 2008, Lauriano *et al.* 2004, 2009, Díaz López 2006, Buscaino *et al.* 2009, Benmessaoud *et al.* 2013, Pardalou and Tsikliras 2020). Other negative effects deriving from fisheries interactions include bycatch in a variety of gear types, including: bottom trawlers, driftnets, gillnets, long-lines, purse seines, and hooks and lines (ACCOBAMS 2019). Marine pollution by chemical contaminants, particularly Persistent Organic Pollutants (POP) and heavy metals, also affect common bottlenose dolphin health (Genov *et al.* 2019, also see Natoli *et al.*, in press, for a list of references). Morbillivirus epizootics, which devastated striped dolphins, *Stenella coeruleoalba*, have not affected common bottlenose dolphins as severely (Van Bressem *et al.* 2014),

although outbreaks in the Mediterranean have also affected this species in the recent past (Raga *et al.* 2008, Di Guardo *et al.* 2013, Casalone *et al.* 2014). Boat traffic has also been shown to alter common bottlenose dolphin behaviour (Papale *et al.* 2011, Clarkson *et al.* 2020), and causing area avoidance in some cases (e.g., La Manna *et al.* 2010, Rako *et al.* 2013, Gonzalvo *et al.* 2014).

ACCOBAMS Sub-Areas

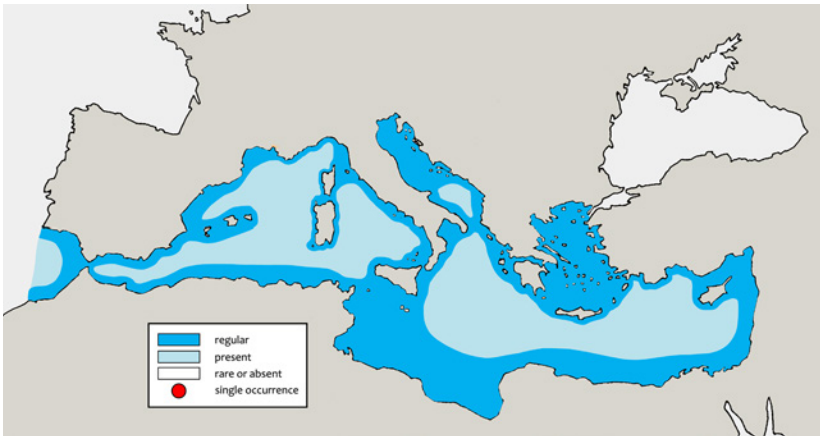
- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular
- **Black Sea:** absent

Conservation actions

With few exceptions, marine protected areas (MPAs) in the Mediterranean are coastal, and bottlenose dolphins are amongst the species most amenable to benefit from them, although their protection is often not explicitly included in MPAs' management objectives and plans.

Distribution in the Mediterranean and Black Seas and adjacent areas

Common bottlenose dolphins are widely distributed across the Mediterranean, mostly, but not limited to, the continental shelf, and occur in the territorial waters of all the region's coastal nations.



Black Sea bottlenose dolphin

Tursiops truncatus ponticus Barabash-Nikiforov 1940

Conservation status in the ACCOBAMS area

Proposed as Endangered - EN A2bcde (Gol'din *et al.* submitted) based on the following conditions: a) at least 50% population decline can be estimated between 1971 and 2019; b) habitat deterioration, decrease in prey populations due to invasion of alien species and overfishing; and c) exploitation – extensive hunting in the past, illegal live capture, bycatch.

Change in status since 2010

Category unchanged; criteria changed from A2cde to A2bcde

Listed in

CITES, Appendix II (0-quota for commercial export of wild-captured live individuals)
CMS, Appendix I and II
Bern Convention, Appendix II
Bucharest Convention. Annex II
EU Habitats Directive: Annex II, Annex IV

Global status

Not applicable.

Taxonomical note

Bottlenose dolphins in the Black Sea are recognized as a subspecies possessing morphological differences from Atlantic and Pacific populations (Barabash-Nikiforov 1960, Geptner *et al.* 1976), genetically distinct from the subspecies *T. t. truncatus* (Montagu 1821) found in the Mediterranean, despite evidence that connectivity between the two subspecies exists (Natoli *et al.* 2005, Viaud-Martinez et al. 2008, Tonay *et al.* 2018).

World distribution

The Black Sea bottlenose dolphin is only found in the Black Sea, Azov Sea and Turkish Straits System.

Habitat and ecology

Black Sea bottlenose dolphins are regularly seen in coastal and shelf waters and in offshore deep waters in the region (Birkun 2008). There are variations in the seasonal presence and density of these dolphins in portions of their range. The south-eastern part of the Black Sea is the least populated, especially in summer, when only rare sightings of small groups are reported there (Çelikkale *et al.* 1989, Sánchez-Cabanes *et al.* 2017, ACCOBAMS 2021b). Also, low density is recorded in the north-western Black Sea, and in some northernmost coastal localities dolphins occur only during the warm season (Gladilina *et al.* 2017). Records in the Azov Sea are rare (Vishnyakova & Gol'din 2008). Bottlenose dolphins are frequently observed in the Danube Delta, as well as in the estuaries of the Dniester, the Southern Buh, the Dnieper and Lake Donuzlav (Birkun 2008).

Black Sea bottlenose dolphins are primarily piscivorous, preying on both benthic and pelagic fishes of various sizes. A total of 23 fish species have been recorded, with whiting (*Merlangius merlangus*), picarel (*Spicara flexuosa*) and horse mackerel (*Trachurus* spp.) as the dominant prey species; mullets (Mugilidae) may be of significance in some coastal areas (Birkun 2002a, Gladilina & Gol'din 2014).

Population

Although earlier region-wide bottlenose dolphin population estimates, based on strip transect surveys made in the USSR and Turkey, were shown to be flawed for a number of methodological reasons, causing their use as indicators of absolute abundance to be unwarranted (IWC 1992, Buckland *et al.* 1992), bottlenose dolphins had been considered the least abundant of the three cetacean species in the Black Sea since those early times (Kleinenberg 1956, Geptner *et al.* 1976).

Partial line-transect cetacean surveys conducted in the inshore and offshore waters of the western Black Sea in July 2013, combining shipboard and aerial line transect survey, documented the distribution and abundance of cetaceans in the waters under the jurisdiction of Bulgaria, Romania and the waters of Ukraine located to the west of Crimea Peninsula. The bottlenose dolphin population size in the surveyed area was estimated to be around 26,000 (Birkun *et al.* 2014). However, more recent (summer

Afala, puchtun • Afalini • Afalin, delfin cu bot de sticlă, delfin cu bot gros • черноморская афалина (chernomorskaya afalina) • Afalina • чорноморська афаліна (chornomors'ka afalina)

2019) estimates based on aerial line-transect surveys in the Black Sea suggest a rather smaller overall population size of about 18,000 (excluding Russian waters) or 42,000 (including Russian waters), also confirming that bottlenose dolphins are indeed the least abundant cetacean in the Black Sea (ACCOBAMS 2021b). Resident groups of bottlenose dolphins are recognised in the Black Sea and Istanbul Strait (Dede *et al.* 2016b, Akkaya Baş *et al.* 2015, 2019, Gladilina *et al.* 2018). Sightings there peaked between May-June and October-November during the pelagic fish migration in the Strait (Dede *et al.* 2016b). Increased densities of purse seiners resulted in a drastic decline of dolphin sightings (Akkaya Baş *et al.* 2019) and possibly impede access to feeding grounds by the dolphins (Dede *et al.* 2014), especially in autumn. In the TSS, abundance estimates of bottlenose dolphin in 1997-1999 varied between 350 and 700, depending on the seasons (Dede *et al.* 2016b).

Threats

Black Sea bottlenose dolphins, as well as the other two cetacean species, have been subjected to extensive direct killing in the past, before hunting bans took place. Only in Turkey, despite bottlenose dolphins accounting for less than 2-3% of the overall catch, estimates of up to 26,000 bottlenose dolphins were killed between 1965-1983 (Thornton 1982, IWC 1983, 1984, Arpa 2012).

Since the mid-1960s, for military, commercial and scientific purposes, several hundreds of bottlenose dolphins (probably >1,000, not counting those that died during capture operations) have been live-captured in the former USSR, Russia, Ukraine and Romania (Birkun 2002b). Bottlenose dolphins from Russia and Ukraine were exported to a large number of countries, including Argentina, Bahrain, Belarus, Chile, Cyprus, Egypt, Georgia, Hungary, Iran, Israel, Kuwait, Lebanon, Lithuania, Morocco, Oman, Romania, Saudi Arabia, Syria, Turkey, United Arab Emirates, Vietnam, Malta, and former Yugoslavia.

Currently, one of the main threats to the bottlenose dolphin is accidental mortality in fishing gear, especially in bottom-set nets. Birkun *et al.* (2014) suggested the total yearly cetacean bycatch in the Black Sea to involve, as a crude estimate, around 14,000 dolphins (common and bottlenose dolphins together). However, a robust overall assessment of the impact of bycatch on the bottlenose dolphin population in the Black Sea, e.g., through an on-board observers programme, is still unavailable except Tonay (2016), CeNoBS (2021). In those studies very few bottlenose dolphin were recorded as bycaught in bottom turbot nets.

Large-scale pelagic trawling and small-scale coastal fisheries (overfishing) and invasion of alien species are thought to be also affecting Black Sea bottlenose dolphin by reducing their prey and degrading their habitat (Birkun 2002a, 2008). Bottlenose dolphins are at chronic risk of opportunistic bacterial infections attribu-

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** absent
- **Mediterranean Sea:** absent
- **Black Sea:** regular

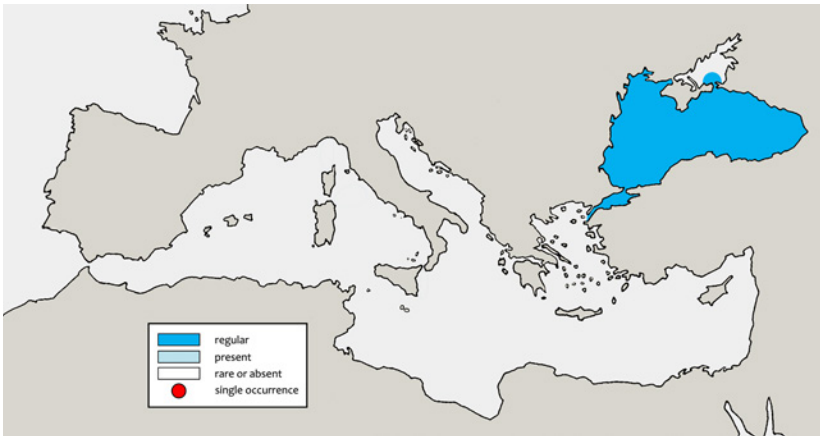


table to multi-microbial contamination from untreated waste in coastal waters, and there is also evidence that they are vulnerable to morbillivirus infection, not unlike the other Black Sea cetacean species (Birkun 2002c).

Conservation actions

Commercial hunting of Black Sea cetaceans, including bottlenose dolphins, was banned in 1966 in the former USSR (present Georgia, Russia and Ukraine), Bulgaria and Romania, and in 1983 in Turkey.

In 1996, the Ministers of Environment of Black Sea countries adopted cetacean conservation and research measures within the framework of the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea. In 2002 the Black Sea bottlenose dolphin was listed as Endangered in the Provisional List of Species of the Black Sea Importance, an annex to the Black Sea Biodiversity and Landscape Conservation Protocol of the Bucharest Convention. The regional Conservation Plan for Black Sea Cetaceans (Birkun *et al.* 2006), prepared in accordance with the ACCOBAMS International Implementation Priorities for 2002-2006 (Notarbartolo di Sciara 2002), was adopted by the 3rd Meeting of Parties to ACCOBAMS (Dubrovnik, Croatia, 22-25 October 2007), but not at a regional level in the Black Sea. Zero annual export quota for *Tursiops truncatus ponticus* taken from the wild was adopted by the CITES Parties in 2002b. At the national level, all Black Sea cetaceans, including bottlenose dolphin, are protected by environmental legislations and governmental decrees. Action plans for the conservation of Black Sea cetaceans were produced and formally adopted in Romania (2004), Georgia (2017) and Ukraine (2020).

Distribution in the Mediterranean and Black Seas and adjacent areas

The range of Black Sea bottlenose dolphins includes the entire Black Sea, the Kerch Strait along with adjoining southern part of the Azov Sea and, the Turkish Straits System. There are records of bottlenose dolphins entering the lower course of major rivers such as the Danube, Southern Buh, Dnieper and Donuzlav Lake.

Common dolphin

Delphinus delphis delphis Linnaeus 1758

Conservation status in the ACCOBAMS area

Endangered - EN A2cde, C1 (Bearzi *et al.* in press) based on the following conditions: a) the Mediterranean subpopulation contains fewer than 2,500 mature individuals; b) the subpopulation experiences an estimated continuing decline of at least 20% in two generations; and c) a subpopulation reduction of 66% is suspected in the past three generations, based on actual or potential levels of exploitation, where the causes have not ceased and may not be reversible.
Gulf of Corinth Subpopulation: Critically Endangered - CR D (Bearzi *et al.* 2020), based on the following condition: fewer than 50 mature individuals in the subpopulation.

Change in status since 2010

Status unchanged, but with a different selection of criteria and subcriteria (Bearzi 2012).

Listed in

CMS App. I (Mediterranean subpopulation), App. II (North and Baltic Seas, Mediterranean, Black Sea and eastern tropical Pacific populations)
CITES App. II
Bern Convention App. II
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive: Annex IV

Global status

Least Concern - LC (Braulik *et al.* 2021)

Taxonomical note

Previously considered as consisting of two species – the short-beaked common dolphin *D. delphis* Linnaeus, 1758 (which included common dolphins from the Mediterranean) and the long-beaked common dolphin *D. capensis* Grey, 1828 (Heyning & Perrin 1994), the genus *Delphinus* is today recognised as monotypic, consisting of single species, the common dolphin *D. delphis* (Cunha *et al.* 2015), and comprising four subspecies (*D. d. delphis* Linnaeus 1758; *D. d. bairdii* Dall, 1873; *D. d. ponticus* Barabash 1935; and *D. d. tropicalis* Van Bree 1971: Committee on Taxonomy 2020). By consequence Mediterranean common dolphins no longer warrant the name "short-beaked common dolphins".

World distribution

Broadly distributed across tropical and temperate waters in all oceans, from coast to open sea. Present also in semienclosed seas such as the Okhotsk Sea, the Sea of Japan, the Caribbean and the Gulf of Mexico, and of course the Mediterranean Sea.

Habitat and ecology

Common dolphins in the Mediterranean can be found in both deep offshore waters and shallow coastal waters (Bearzi *et al.* 2003, ACCOBAMS 2021a), including areas less than 50 m deep (Brand *et al.*, 2019, Milani *et al.* 2019). The species' feeding habits in the Mediterranean are very flexible, with a mostly ichthyophagous diet that includes epipelagic species (e.g., sardines, anchovies, but also Sphyraenids, Sparids, Congrids and Carangids) as well as mesopelagic species such as Myctophids; to a smaller extent than fishes, small cephalopods are also included in the dolphins' diet (Milani *et al.* 2019, Giannoulaki *et al.* 2016, Brand *et al.* 2019, Giménez *et al.* 2018). Despite the variety of species that compose its diet, however, in European and Mediterranean waters *D. delphis* is considered an "ecological specialist on high-energy pelagic schooling prey" (Moura *et al.* 2013b). Known world-wide to be living in large groups (50-100 and occasionally much more), common dolphin group sizes in the Mediterranean have apparently decreased drastically in recent years, with means comprised between 10 and 20 (Bearzi *et al.* in press). The species is very often observed in mixed groups with other species, largely striped dolphins *Stenella coeruleoalba*

Delfin i zakonshem • الدلفين الشائ (Al-dolpheen al-sha'eh) • Obični dupin • Dauphin commun • Κοινό δελφίνι (Kinò delfini) • דולפין מצוי (Dolphin matzuy) • Delfino comune • Id-denfil komuni • Golfinho-comum • Navadni delfin • Delfín común • Tırtak

(Cañadas & Hammond 2008, Bearzi *et al.* 2016, Mussi *et al.* 2019) and common bottlenose dolphins *Tursiops truncatus* (Frantzis 2009, Kerem *et al.* 2012, Ryan *et al.* 2014, Pace *et al.* 2015). In the Gulf of Corinth (Greece), where their number has been reduced to less than 25 individuals, common dolphins only occur in mixed groups with the more abundant striped dolphins (Bearzi *et al.* 2020); here the coexistence between the two species has created the conditions for fertile hybridisation (Antoniou *et al.* 2018, Santostasi *et al.* 2020).

Population

Mediterranean common dolphins are genetically different from their northeast Atlantic conspecifics (Natoli *et al.* 2008, Moura *et al.* 2013b). The actual boundary between these two populations was shown to be occurring not at Gibraltar but within the western Mediterranean, in correspondence of the Almería-Orán thermohaline front (Tintoré *et al.* 1988); by consequence, common dolphins found in the Alborán Sea should be considered as part of the North Atlantic population which extends its range into the westernmost reaches of the Mediterranean (Natoli *et al.* 2008, Moura *et al.* 2013b). Not much is known about the extent of movements by common dolphins in the Mediterranean; opportunistic observations on single individuals may reveal that movements of some extent might be occurring (Genov *et al.* 2012).

The exact location of a boundary between Mediterranean common dolphins *D. d. delphis* and Black Sea common dolphins *D. d. ponticus* is unclear, and even the existence of such a boundary is controversial, as is the notion that the taxonomic distinction between the two subspecies is supported by genetic evidence (Tonay *et al.* 2020). For the purposes of the current description, and pending future more robust determinations, the boundary is placed in the Aegean Sea at the entrance of the Çanakkale (Dardanelles) Strait.

A recent Mediterranean-wide cetacean survey, Alborán Sea included, was conducted in 2018 and yielded an estimate of about 64,000-66,000 common dolphins (depending on methods) (ACCOBAMS 2021a). However, the large coefficient of variation (0.40) is indicative of the challenges to estimating population size deriving from: a) assessing a species that has become rare, b) its absence or near-absence from areas of former high abundance, and c) complications induced by the frequent occurrence of the species in mixed groups with striped dolphins, *Stenella coeruleoalba* (Bearzi *et al.* submitted). Common dolphin numbers in the Mediterranean Sea are known to have been plummeting during the second half of the 20th century (Bearzi *et al.* 2003), likely due to a combination of factors. In various Mediterranean locations where abundance data have been collected in the past decades, a drastic decrease was documented, including: the Spanish Mediterranean from the Gulf of Vera to the Balearic Islands (Cañadas & Hammond 2008); the northwestern Mediterranean, including the Pelagos Sanctuary (Bearzi *et al.* 2003); the southern Tyrrhenian Sea off Ischia (Mussi *et al.* 2019); the waters surrounding Malta (Vella 2005); the Adriatic Sea, where the species was historically abundant (Bearzi *et al.* 2004a, Genov *et al.* 2021); the Inner Ionian Sea Archipelago, Greece (Bearzi *et al.* 2006, 2008); and the Gulf of Corinth, Greece (Bearzi *et al.* 2020). Rates of decline calculated in areas where the data allowed such calculations were comprised between 5%/year in the Gulf of Vera and 10%/year in the Inner Ionian Sea Archipelago (Bearzi *et al.* in press).

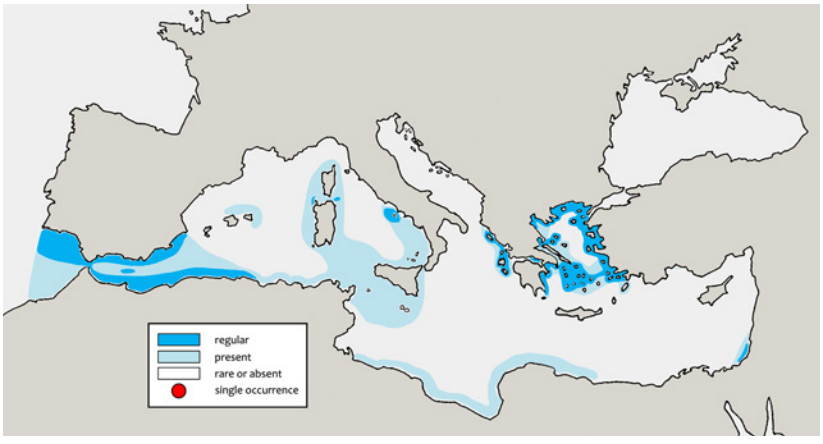
There is currently no evidence that common dolphins are increasing, or even stable, anywhere they are still present in the Mediterranean.

Threats

Past massive directed takes of common dolphins in the Mediterranean, once considered "pests" by the fishing industry (Bearzi *et al.* 2004a, 2008b), are believed to have been a significant factor in precipitating the species' decline in the region (Bearzi *et al.* in press). Despite being a threat of unlikely significance today, deliberate killing effects might have cumulated with other pressure factors currently impacting on the species,

ACCOBAMS Sub-Areas

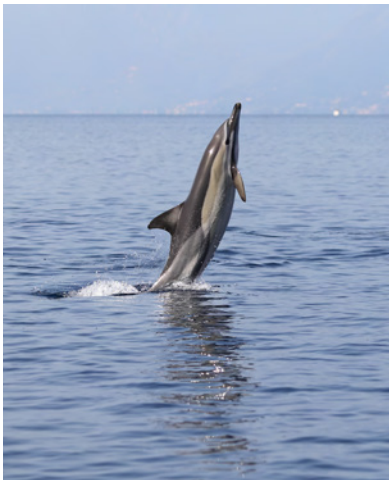
- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** regular
- **Black Sea:** absent



including fisheries interactions such as bycatch (Cagnolaro & Notarbartolo di Sciara 1992, Tudela *et al.* 2005, Frantzis 2007) and prey depletion (Cañadas & Hammond 2008, Mussi *et al.* 2019, Bearzi *et al.* 2003, 2006, Piroddi *et al.* 2011). The role of chemical contaminants in the Mediterranean common dolphin decline is still poorly understood (Murphy *et al.* 2018). The risk of habitat loss caused by increases in sea surface temperature (SST) due to climate disruption, has also been mentioned (Cañadas & Vasquez 2017).

Conservation actions

The conservation of common dolphins in the Mediterranean was the subject of Resolution 4.13 adopted in 2010 by the Parties to ACCOBAMS, largely based on a specific Conservation Plan (Bearzi *et al.* 2004b), with a clear emphasis on the mitigation of threats posed by fisheries. Because of its large size, the Pelagos Sanctuary could in theory provide the conditions for common dolphin monitoring and conservation (Notarbartolo di Sciara *et al.* 2008), however the species has now almost completely disappeared from the area. The positive impact from smaller, coastal MPAs which are the norm in the Mediterranean is less promising, but can still be significant in some cases (e.g., the "Regno di Nettuno" MPA in the Italian Tyrrhenian Sea, with its Numa Canyon including common dolphin habitat, and the National Marine Park of Alonissos and the Northern Sporades in Greece). Four Important Marine Mammal Areas (IMMAs) were identified in the Mediterranean that include common dolphins as qualifying species: "Alborán Sea", "Coastal Shelf Waters of the South East Levantine Sea", "Gulf of Corinth", Ionian Archipelago", and "Waters of Ischia and Ventotene".



Distribution in the Mediterranean and Black Seas and adjacent areas

Common dolphins used to be widely distributed across much of the Mediterranean marine region until the first half of the 20th century, based on abundant literature and museum collections. On such basis, they are shown here as still potentially present across their former range, and the mapping of single occurrences in "rare or absent" areas is here omitted because of their presumed historical abundance throughout the region. Areas where common dolphins are regularly observed today include: the Alborán Sea; parts of the Strait of Sicily and of the Sardinian, Tyrrhenian and western Ionian seas, including the Gulf of Corinth; the northern and eastern Aegean Sea; and along the coastal waters of southern Israel. The presence of common dolphins off the coast of North Africa from Algeria to Libya has been often reported, but without quantitative indications of abundance or regularity of occurrence.

Black Sea common dolphin

Delphinus delphis ponticus Barabash 1935

Conservation status in the ACCOBAMS area

Proposed as Vulnerable - VU A2cde (Tonay *et al.* submitted) based on the following conditions: a) large directed kills occurred until 1983 (approx. 40-50,000 common dolphins were killed in the last 8 years before the ban), b) combined effects of pathogens (mass mortality events of in 1990, 1994, 2009 and 2017), habitat deterioration, decrease in prey populations due to invasion of alien species and overfishing; and c) bycatch in several type of fishing nets.

Change in status since 2010

Unchanged.

Listed in

CMS, Appendix II
CITES, Appendix II
Bern Convention, Appendix II
EU Habitats Directive, Annex IV
Bucharest Convention. Annex II

Global status

Not applicable.

Taxonomical note

The Black Sea common dolphin is here considered a subspecies of *D. delphis*, as currently recognised (Committee on Taxonomy 2020). *D. delphis* in the Black Sea was proposed as a subspecies *D. d. ponticus* on the basis of morphological features (Barabash 1935), later criticized as not being diagnostic (Kleinenberg 1956). However, comparative analyses using skull morphometrics (Amaha 1994), nine microsatellite DNA loci, and mitochondrial DNA (Rosel *et al.* 1994, Natoli *et al.* 2008) suggested that differences do exist between Black Sea and Mediterranean common dolphins, even though differentiation was not significant due to small sample sizes. Such differentiation was not supported by mitochondrial DNA analyses comparing Mediterranean, Turkish Straits System and the Black Sea samples (Tonay *et al.* 2020).

World distribution

The Black Sea common dolphin is only found in the Black Sea and Turkish Straits System.

Habitat and ecology

Black Sea common dolphins are distributed mainly offshore, and visit shallow coastal waters following seasonal aggregations and regular migrations of their preferred prey, small pelagic fishes such as Black Sea anchovy (*Engraulis encrasicolus ponticus*), Black Sea sprat (*Sprattus sprattus phalericus*), sand smelt (*Atherina* sp.) and horse mackerel (*Trachurus* spp.) (Tzalkin 1940, Kleinenberg 1956, Geptner *et al.* 1976, Gol'din *et al.* 2017a, Bilgin *et al.* 2018a). Annual winter concentrations of anchovies in the southeastern Black Sea and, to a lesser degree, off south of Crimea create favourable conditions for wintering concentrations in those areas of common dolphins. Summer concentrations of sprats in the northwestern, northeastern and central Black Sea attract common dolphins to quite different summer feeding grounds. According to a model-based study, Black Sea common dolphins prefer deep waters (from a minimum of 50 m to the basin's deepest) where temperatures are between 5° and 18°C (Sanchez-Cabanes *et al.* 2017).

Population

The overall population size of Black Sea common dolphins was unknown until summer 2019, when basin-wide aerial line-transect surveys which covered 62% of the Black Sea were conducted. Results suggest that the current population size is in the order of 118,000 (ACCOBAMS 2021b). Previously (July 2013), a partial dedicated line-transect cetacean survey was made in the inshore and offshore waters of the western Black Sea, combining shipboard and aerial line transect survey, to document the distribution

Obiknoven delfin, karakash • Thethrgverda delfini, chveulebrivi delfini • Delfin comun • черноморский дельфин-белобочка, белобочка, обыкновенный дельфин (chernomorskiy del'fin-belobochka, belobochka, obyknovennyi del'fin) • Tırtak • чорноморський дельфін-білобочка, білобочка, звичайний дельфін (chornomors'kyi del'fin-bilobochka, bilobochka, zvychainyi del'fin)

and abundance of cetaceans in the waters under the jurisdiction of Bulgaria, Romania and the waters of Ukraine located to the west of Crimea peninsula. The common dolphin estimated population size in the surveyed area was around 60,000 (Birkun *et al.* 2014). Abundance estimates of common dolphin In the TSS in 1997-1999 varied between 300 and 1200, depending on seasons (Dede *et al.* 2016b).

Previous region-wide estimates based on strip transect surveys made in the USSR and Turkey were shown to be fundamentally flawed for a number of methodological reasons, causing their use as indicators of absolute abundance to be unwarranted (IWC 1992, Buckland *et al.* 1992). Nevertheless, it is generally recognized that until the 1970s the abundance of common dolphins in the Black Sea was far higher than that of bottlenose dolphins, *Tursiops truncatus ponticus*, and harbour porpoises, *Phocoena phocoena relicta* (Tzalkin 1940, Kleinenberg 1956, Geptner *et al.* 1976).

Threats

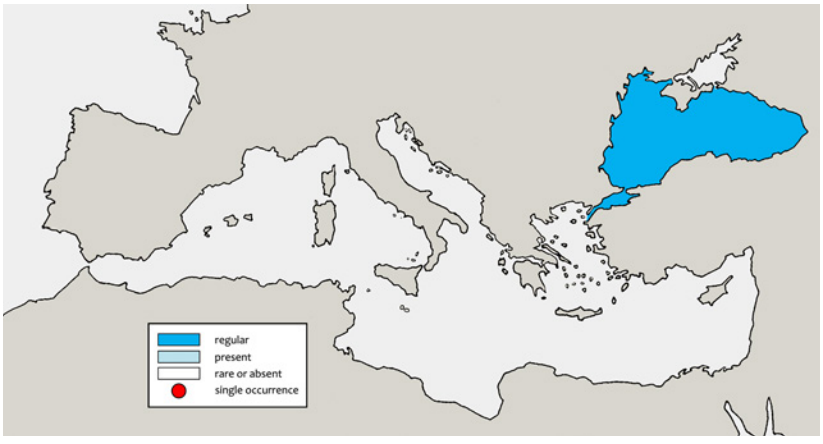
During the 20th century the Black Sea common dolphin population was massively depleted by directed takes. The total number of animals killed is unknown, but it was estimated that before the mid-1950s common dolphins comprised 94.8% of the total number of Black Sea cetaceans killed and processed in the USSR (Tzalkin 1940, Kleinenberg 1956). Based on this value, it was calculated that between 1931-1961 the USSR and Bulgaria landed 1.570.699 common dolphins (Zemsky 1996). Tonay and Öztürk (2012) estimated that a total 44,178 tonnes of cetaceans were caught in the Turkish Black Sea between 1967 and 1983, and 13,327 tonnes of cetacean between 1974-1983. Assuming that the mean weight of a processed dolphin is around 50 kg (Arpa 2012), it can crudely be inferred that total 265,000 cetaceans were killed between 1975-1982. The species composition of the Turkish fishery in the early 1980s was reported to consist of common dolphins by 15-16% (Thornton 1982, IWC 1983). The total catch estimate for all three cetacean species between 1976 and 1981 was around 248,000 (IWC 1984). Based on some estimates, in Turkish waters alone 37,200-39,700 common dolphins were killed in a 6-year span; Arpa (2012) estimate a kill of 39,800-42,500 common dolphins during eight years. Based on the above it is possible to conclude that approximately 40-50,000 common dolphins were removed from the population during the last eight years before the hunting ban by Turkey alone.

Since the late 1980s, reduced prey availability has been considered an ongoing major threat to *D. d. ponticus* (Bushuyev 2000). Of four mass mortality events that killed unknown but certainly large numbers of common dolphins in winter–spring 1990, summer–autumn 1994, summer 2009 and spring-summer 2017 (Krivokhizhin & Birkun 1999, Tonay *et al.* 2012, Gol'din *et al.* 2017a, Vishnyakova *et al.* 2017), the second was recognised as being the result of a morbillivirus epizootic (Birkun *et al.* 1999). However, the first two die-offs coincided with a drastic decline in the abundance of the two main prey species, anchovy and sprat. The stocks of the small pelagic fishes in the Black Sea showed drastic fluctuations especially within the last 3 decades. For example, the total annual landings of anchovies have fluctuated considerably between 85kt to 500kt in the last 50 years (Gücü *et al.* 2017). These changes are believed to be driven by four major factors: the changes in the climatic regime; changes in the trophic structure in ecosystem due to eutrophication, and malfunctioning of food web; deterioration of prey-predator relations due to overfishing; and introduction of invasive alien species (e.g. alien ctenophore *Mnemiopsis leidyi*) (Zaitsev & Mamaev 1997, Gücü, 2012). A correlation between large die-offs of Black Sea common dolphins and prey scarcity could signify that reduced prey availability compromised the health of the dolphins and increased their susceptibility to viral infection, similar to a condition observed in Mediterranean striped dolphins, *Stenella coeruleoalba*, during the 1990-1992 morbillivirus epizootic outbreak (Aguilar & Raga 1993).

Common dolphin bycatch in bottom gillnets, trammel nets, mid-trawls, pound nets and purse seine has been reported

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** absent
- **Mediterranean Sea:** absent
- **Black Sea:** regular



via a combination between questionnaire studies with fishermen and on-board observation (Vasiliu & Dima, 1990, Ozdemir & Erdem 2011, Birkun *et al.* 2014, Bilgin *et al.* 2018a, ACCOBAMS-MoP7, 2019). Birkun *et al.* (2014) suggested the total yearly dolphin bycatch in the Black Sea to involve, as a crude estimate, around 14,000 dolphins (bottlenose and common dolphins together). An unambiguous overall assessment of the possible impact of bycatch on the common dolphin population in the Black Sea, e.g., through an on-board observers programme covering all fishing methods, is still unavailable.

Conservation actions

Concerns regarding the Black Sea population were expressed in the IUCN/SSC 2002-2010 Conservation Action Plan (Reeves *et al.* 2003).

Commercial killing of Black Sea common dolphins, as well as other Black Sea cetaceans, was banned in 1966 in the former USSR, Bulgaria and Romania, and in 1983 in Turkey. The Black Sea States, although not all of them, have international obligations to protect cetaceans as contracting parties to the Convention on Biological Diversity (CBD), Convention on the Conservation of Migratory Species of Wild Animals (CMS), Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention), Convention on the Protection of the Black Sea Against Pollution (Bucharest Convention), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS). *Delphinus delphis* is listed in Annex IV of EC Directive No.92/43/EEC on the conservation of natural habitats of wild fauna and flora. In 2003 the IWC Scientific Committee's Sub-Committee on Small Cetaceans recommended that the Black Sea population should be managed for conservation as a distinct entity (IWC 2004).

The Strategic Action Plan for the Rehabilitation and Protection of the Black Sea (1996) envisages specific cetacean-oriented conservation and research actions. The common dolphin was included as Data Deficient in the Black Sea Red Data Book (1999). Nevertheless, it is listed as Endangered in the Provisional List of Species of Black Sea Importance, an annex to the Black Sea Biodiversity and Landscape Conservation Protocol (2002) of the Bucharest Convention. The regional Conservation Plan for Black Sea Cetaceans prepared in accordance with the ACCOBAMS International Implementation Priorities for 2002-2006 (Notarbartolo di Sciara 2002b) was adopted by the 3rd MoP to ACCOBAMS (Dubrovnik, Croatia, 22-25 October 2007), but not at a regional level.

At the national level all Black Sea cetaceans, including common dolphins, are protected by environmental legislation and governmental decrees. Action plans for the conservation of Black Sea cetaceans were produced and formally adopted in Romania (2004), Georgia (2017) and Ukraine (2020).

Distribution in the Mediterranean and Black Seas and adjacent areas

Black Sea common dolphins range throughout the entire Black Sea, including territorial waters and exclusive economic zones of Bulgaria, Georgia, Romania, Russian Federation, Turkey and Ukraine, and including the Turkish Straits System. Common dolphins do not occur in the Azov Sea but they can be seen in the Kerch Strait. No information is available about their possible expansion through the Turkish Straits System into the Aegean Sea.

Atlantic harbour porpoise

Phocoena phocoena phocoena (Linnaeus 1758)

Conservation status in the ACCOBAMS area

Atlantic harbour porpoises are not listed separately from *P. phocoena* at the global level. However, the Afro-Iberian population – likely to be eventually defined as a subspecies – is of conservation concern and may warrant separate subpopulation assessment (Braulik *et al.* 2020).

Listed in

CMS App. II (North and Baltic Sea, western North Atlantic, Black Sea and North West African populations)
CITES App. II
Bern Convention App. II
Barcelona Convention, SPA/BD Protocol, Annex II
EU Habitats Directive: Annex II, Annex IV

Global status

Least Concern - LC
(Braulik *et al.* 2020)

Taxonomical note

Atlantic harbour porpoises are recognised as one of three valid subspecies of *P. phocoena*, the other two being the Pacific harbour porpoise *P. phocoena vomerina* (Gill 1965), and the Black Sea harbour porpoise *P. phocoena relicta* Abel 1905. Based on morphological, genetic and zoogeographic considerations, a distinct population of Atlantic harbour porpoises found along the Iberian Peninsula and North African coast, including within the ACCOBAMS' contiguous Atlantic area, was proposed as a separate subspecies, *P. phocoena meridionalis* (Fontaine *et al.* 2014). A decision on this proposal will hopefully be forthcoming from the Committee on Taxonomy of the Society for Marine Mammalogy.

World distribution

The distribution of *P. phocoena* is limited to cold-temperate to sub-polar waters of the Northern Hemisphere.

Habitat and ecology

Harbour porpoises are a typical neritic cetacean, limited to the continental shelf, although they may occasionally venture offshore, at greater depths. They feed on a variety of fish species, characteristically demersal, but occasionally also on epipelagic schooling species such as herring.
Six fish families (Gadidae, Clupeidae, Osmeridae, Ammodytidae, Gobiidae, Carangidae) are harbour porpoises' most frequent prey in the North Eastern Atlantic, although they may also feed on cephalopods.

خنزير البحر الشائع (khinzir albahr achaii) • Bôto • Marsopa común

Population
Harbour porpoises in the European Atlantic are the most abundant cetaceans, with an estimated population size in 2016 of 466,569 (CV=0.154), based on a combination of aerial and ship surveys (Hammond *et al.* 2017). The estimate around the Iberian Peninsula and Portugal was 2,898 (CV=0.32).

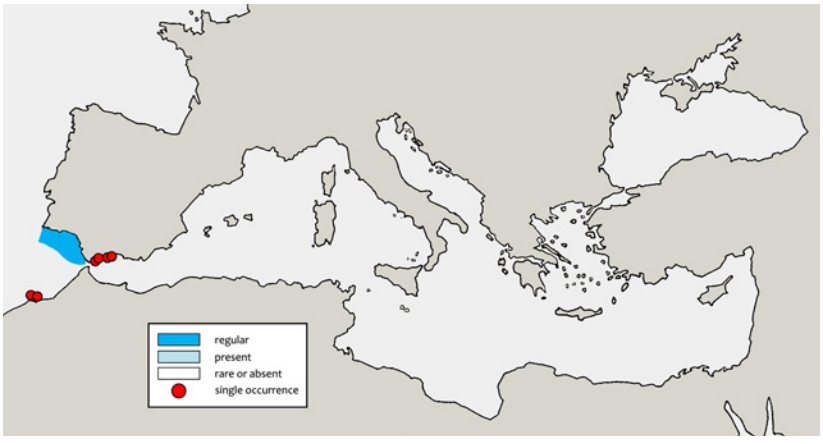
Threats
Bycatch, largely in gillnets, is the most significant threat to harbour porpoise survival throughout these cetaceans' range. Along the western Iberian Peninsula 305 porpoises were found stranded between 1990 and 2010, around 60% of which bore evidence of fisheries interactions on their bodies; such mortality level was calculated to be unsustainable (Braulik *et al.* 2020). Other threats to the species include chemical pollution, maritime traffic, noise (e.g., from piling, offshore wind farm construction, and acoustic harassment devices), and prey depletion caused by fisheries.

Conservation actions
Bycatch reduction regulations using, amongst others, the use of acoustic deterrent devices (pingers) was adopted by the European Union in the North and Baltic Seas.

Distribution in the Mediterranean and Black Seas and adjacent areas
To the south-eastern limit of their range, Atlantic harbour porpoises are represented by a small population along the Atlantic coast of the Iberian Peninsula, from Galicia to Cadiz, and by another population off the coast of Northwest Africa, separated from the former by a gap of about 1000 km (Fontaine 2016). The Iberian population regularly occurs along the northern (Spanish) shelf of the Gulf of Cadiz (Sociedad Española de Cetaceos 2006) within the contiguous Atlantic area; two strandings near Casablanca were reported by Masski & de Stephanis (2018). By contrast, Atlantic harbour porpoises don't extend into the Mediterranean except as strays. Here,

only four certain occurrences were noted. The first was a female stranded at Playa de Malagueta in October 1981 (Rey & Cendrero 1982 in Frantzis *et al.* 2001). The second was a 1.65m long male sighted at sea near Malaga in July 2006, and later stranded (Bellido *et al.* 2006). The other two were the finding of mummified and skeletal remains of *P. phocoena* in Estepona, Malaga on 24 November 2009, and a male stranded on Playa de la Sobrevela (close to Gibraltar) on 14 February 2010, both recorded in the Mediterranean Database of Cetacean Strandings, MEDACES (http://medaces.uv.es). The species' regular – and yet undocumented – presence along the coast of Algeria, particularly in the Gulf of Béjaia where it was reported as "very commonly observed" (Ahmim 2019) is considered doubtful and is not included here.

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** regular
- **Mediterranean Sea:** very rare in the Alborán Sea
- **Black Sea:** absent



Black Sea harbour porpoise

Phocoena phocoena relicta Abel 1905

Conservation status in the ACCOBAMS area

Proposed as Endangered - EN A4cde (Öztürk *et al.* submitted) based on the following conditions: a) ongoing incidental mortality mostly in bottom net fishery (the rough approximation of 20,000 individuals annually bycaught); b) several mass mortality events possibly due to the effect of pathogens; and c) habitat deterioration, decrease in prey populations due to invasion of alien species and overfishing.

Change in status since 2010

Category unchanged; criteria changed from A1d + 4cde to A4cde

Listed in

CMS, Appendix II
CITES, Appendix II
Bern Convention, Appendix II
Bucharest Convention, Annex II
EU Habitats Directive:
Annex II, Annex IV

Global status

Not applicable.

World distribution

The Black Sea harbour porpoise is only found in the Black Sea, Turkish Straits System and the northern Aegean Sea.

Habitat and ecology

Harbour porpoises inhabit mainly shallow waters over the continental shelf around the entire perimeter of the Black Sea. However, sometimes they also occur far offshore in deep waters (Birkun 2008). According to a model-based study, Black Sea harbour porpoises are distributed mostly over the continental shelf (at depths <200 m) and have a preference for lower sea surface temperatures (<18°C) in the Black Sea (Sanchez-Cabanes *et al.* 2017). The species undertakes a seasonal migration from the Black Sea into the Azov Sea through the Kerch Strait during the warm season (Kleinenberg 1956), and leaving the Azov Sea (Tzalkin 1938) and the northwestern Black Sea before winter. The primary wintering areas are situated in the southeastern Black Sea, including the southern Georgian territorial waters and the eastern Turkish territorial waters (Birkun 2008). These are also the well-known wintering grounds of anchovy (*Engraulis encrasicolus ponticus*), an important prey species for harbour porpoises during the cold season (Kleinenberg 1956). At least 20 fish species were recorded in Black Sea harbour porpoises' stomachs, three of which are considered as the most important prey: anchovy, sprat (*Sprattus sprattus phalericus*) and whiting (*Merlangius merlangus*) (Birkun 2002a, Tonay et al 2007, Krivokhizhin & Birkun 2009, Bilgin *et al.* 2018a). Black Sea harbour porpoises also occur in waters with low salinity and high turbidity; during the warm season they may visit brackish bays, lagoons, estuaries and rivers, such as in the Danube, Dnieper, Don and Kuban (Birkun 2008).

Population

The Black Sea harbour porpoise, confirmed as a valid subspecies by genetic and morphometric studies (Rosel *et al.* 1995, 2003, Fontaine *et al.* 2007, 2010, 2014, Viaud-Martinez *et al.* 2007, Galatius & Gol'din 2011, Lah *et al.* 2016, Tonay *et al.*

Morska svinya, mutkur • Zghvis ghori, mutkhuri • φώκαινα (fókaina) • Marsuin, focenă, porc de mare • черноморская обыкновенная морская свинья, азовка (chernomorskaya obyknovennaya morskaya svinya, azovka) • Mutur • чорноморська звичайна морська свиня, азовка, пихтун (chornomors'ka zvychaina mors'ka svynya, azovka, pykhtun)

2017, Chehida *et al.* 2020), is endemic to the Black Sea and neighbouring waters. It was separated from the nearest conspecifics (*P.p. phocoena*) living in Iberian and NW African coasts of the Atlantic Ocean around 5,500 years ago (Fontaine *et al.* 2010, 2016). The possibility of the existence of an isolated subpopulation of the subspecies in the TSS was also proposed (Tonay *et al.* 2017). The overall population size of Black Sea harbour porpoises was unknown until summer 2019, when basin-wide aerial line-transect surveys covering 62% of the whole Black Sea were conducted. The results suggest that the current population size is around 94,000 (ACCOBAMS 2021b). Previously (July 2013), a partial dedicated line-transect cetacean survey was conducted in the inshore and offshore waters of the western Black Sea, combining shipboard and aerial line transect survey, to document the distribution and abundance of cetaceans in the waters under the jurisdiction of Bulgaria, Romania and the waters of Ukraine located to the west of Crimea peninsula. The harbour porpoise estimated population size in the surveyed area was around 29,000 (Birkun *et al.* 2014). Previous region-wide harbour porpoise population estimates, based on strip transect surveys made in the USSR and Turkey, were shown to be fundamentally flawed for a number of methodological reasons, causing their use as indicators of absolute abundance to be unwarranted (IWC 1992, Buckland *et al.* 1992). Nevertheless, it is generally recognized that until the 1970s the abundance of harbour porpoises in the Black Sea was far higher than that of bottlenose dolphins, *Tursiops truncatus ponticus*, and less than that of common dolphins, *Delphinus delphis ponticus*. Besides, before the mid-1990s the harbour porpoise was considered the predominant cetacean in coastal waters of the northern and eastern Black Sea (Tzalkin 1940, Kleinenberg 1956, Geptner *et al.* 1976).

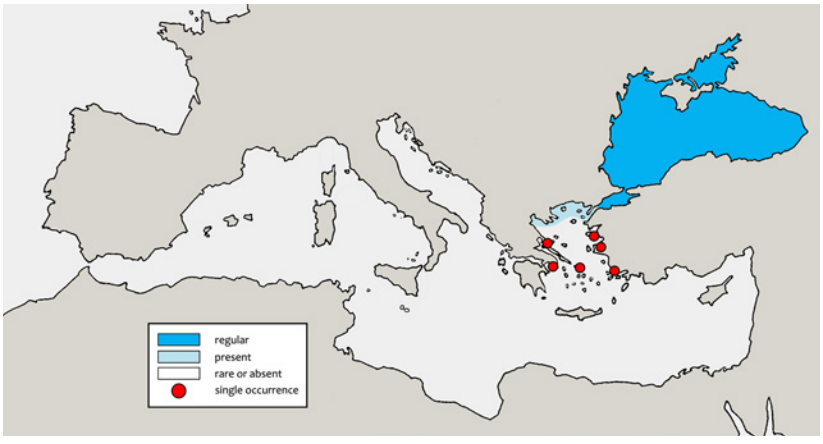
Threats

Until 1983, unregulated hunting was the primary threat (IWC 1992, 2004). Very large numbers of harbour porpoises, as well as the other two Black Sea cetacean species, were taken until well into the 20th century by all Black Sea countries for a variety of industrial uses (Kleinenberg 1956, Tomilin 1967). The predominant species in the catch changed from common dolphins to harbour porpoises at the beginning of 1960s (Danilevsky & Tyutyunnikov 1968, Smith 1982). Tonay & Öztürk (2012) estimated that a total 44,178 tonnes of cetaceans were caught in the Turkish Black Sea between 1967 and 1983, and 13,327 tonnes of cetaceans between 1974 and 1983. Assuming that the mean weight of a processed dolphin is around 50 kg (Arpa 2012), it can crudely be inferred that 265.000 cetaceans were killed between 1974 and 1982. The species composition of the Turkish fishery in the early 1980s was reported to consist of harbour porpoises by 80% (Thornton 1982, IWC 1983). The total catch estimate for all three cetacean species between 1976 and 1981 was around 248,000 (IWC 1984). Based on such estimate, in Turkish waters alone, 198,400 harbour porpoises were killed in a six-year span, and Arpa (2012) estimated a kill of 212,600 harbour porpoises in nine years. Based on the above-mentioned data, it is possible to conclude that approximately 200,000 harbour porpoises were removed from the population during the last decade before the hunting ban came into force in 1983. A strong reduction in the population size of this subspecies (approximately 90%) in the past 50 years due to massive dolphin fisheries and bycatch, was suggested on genetic bases (Fontaine *et al.* 2012).

At present, incidental mortality in fishing nets is the most serious threat (Birkun 2008). Although all three Black Sea cetacean species are 'bycaught', the majority (95%) of recorded cetacean entanglements are of harbour porpoises (Birkun 2008). Almost all (99%) of the porpoises are caught in bottom-set gillnets and trammel nets especially used to catch turbot species (*Scophthalmus* spp.) and spiny dogfish, the peak of which occurs in April–June in the Black Sea (Birkun 2008, Tonay 2016), and in July in the Azov Sea (Vishnyakova & Gol'din 2015). Half of bycaught harbour porpoises were found to be within the ages of 4 - 5 years old, and 78% of all bycaught individuals were physically immature; according the estimates harbour porpoises bycatch may

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** absent
- **Mediterranean Sea:** presence limited to the North Aegean Sea
- **Black Sea:** regular



exceed 2,000 individuals in the Turkish western Black Sea only in 2008 fishing season (Tonay 2016). Birkun *et al.* (2014) suggested that the total yearly harbour porpoise bycatch in the Black Sea involved, as a crude estimate, around 20,000 individuals. Another robustness estimate suggests the total annual bycatch of harbour porpoises in the Black Sea is at least between 12.000 and 20,000 individuals (CeNoBS 2021). The situation is made even more critical by the fact that the turbot fishing season coincides with the harbour porpoise's late gestation and nursing period (Birkun 2002a), causing the lethal by-catch of lactating females to result in neonates to starve and die (Öztürk *et al.* 2012).

An explosion at a gas-drilling platform in the Azov Sea in August 1982 resulted in the death of over 2,000 harbour porpoises (Birkun 2002d).

Large-scale pelagic, trawling and small-scale coastal fisheries are thought to be affecting Black Sea harbour porpoises indirectly by reducing their prey and degrading their habitat. The total annual landings of anchovies have fluctuated wildly between 85kt to 500kt in the last 50 years (Gücü *et al.* 2017). The stocks of the small pelagic fishes in the Black Sea showed drastic fluctuations especially within the last 3 decades, possibly driven by climate change and changes in the trophic structure of the ecosystem due to eutrophication, and malfunctioning of food web, deterioration of prey-predator relations due to overfishing; and introduction of invasive alien species (e.g., alien ctenophore *Mnemiopsis leidyi*) (Zaitsev & Mamaev 1997, Gücü 2012). These factors likely reduced prey availability, which also coincided with two mass mortality events (in 1989 and 1990). Although these two events involved all three cetacean species, harbour porpoises were primarily affected (Birkun 2002c). Severe pulmonary nematodosis, caused by *Halocercus* spp. and complicated by bacterial super-infection, was recognized as the primary cause of these deaths, which were mainly of young animals. In the summers of 2003, 2009, 2012 and 2016 unusual mass harbour porpoise stranding events occurred, but the causes could not be identified. The last mortality affected mostly neonates on the Bulgarian and western Turkish Black Sea coasts (Tonay *et al.* 2012, Gol'din *et al.* 2014, Öztürk *et al.* 2017). High concentrations of organochlorines and relatively low concentrations of toxic trace elements were detected in Black Sea harbour porpoises (Madhusree *et al.* 1997, Tanabe *et al.* 1997a, b, Joiris *et al.* 2001, Das *et al.* 2004, Weijs *et al.* 2010). In the 1990s the contamination by DDTs and HCHs was shown to be higher than that reported for this species elsewhere in the world (Tanabe *et al.* 1997a), and DDXs higher than the North Sea (Weijs *et al.* 2010), possibly contributing to the onset of epizootics.

Black Sea harbour porpoises were also occasionally affected by ice entrapment in the Azov Sea (Birkun 2002c). In the Istanbul Strait all cetacean species, including harbour porpoises, have been observed feeding and possibly socialising during spring based on passive acoustic monitoring, but were mostly traveling in the other seasons (Dede *et al.* 2014). Intense marine traffic in the Strait was shown to be significantly affecting the behaviour of harbour porpoises (Akkaya Baş *et al.* 2017a).

Conservation actions

Commercial hunting of Black Sea cetaceans, including harbour porpoises, was banned in 1966 in the former USSR (present Georgia, Russia and Ukraine), Bulgaria and Romania, and in 1983 in Turkey.

In 1996, the Ministers of Environment of Black Sea countries adopted cetacean conservation and research measures within the framework of the Strategic Action Plan for the Rehabilitation and Protection of the Black Sea. In 2002 the Black Sea harbour porpoise was listed as Endangered in the Provisional List of Species of the Black Sea Importance, an annex to the Black Sea Biodiversity and Landscape Conservation Protocol of the Bucharest Convention. The regional Conservation Plan for Black Sea Cetaceans (Birkun *et al.* 2006), prepared in accordance with the ACCOBAMS International Implementation Priorities for 2002-2006 (Notarbartolo di Sciara 2002b), was adopted by the 3rd Meeting of Parties to ACCOBAMS (Dubrovnik, Croatia, 22-25 October 2007), but not at regional level as yet. At the national level, all Black Sea cetaceans, including harbour porpoise, are protected by environmental legislations and governmental decrees. Action plans for the conservation of Black Sea cetaceans were produced and formally adopted in Romania (2004), Georgia (2017) and Ukraine (2020).

To reduce accidental mortality of harbour porpoises caused by fisheries, several bycatch mitigation studies through pingers were conducted in Romania (Anton *et al.* 2013), Bulgaria (Zaharieva *et al.* 2019, Popov *et al.* 2020, Popov 2020) and Turkey (Gönener & Bilgin 2009, Bilgin *et al.* 2018b, Özsandikçi & Gönener 2020); furthermore, modified nets with acrylic glass spheres were tested (Kratzer *et al.* 2019, 2021). Several pinger models and acrylic glass spheres trials were found to be promising for reducing bycatch.

Distribution in the Mediterranean and Black Seas and adjacent areas

The Black Sea harbour porpoise's range encompasses the Black Sea proper and adjacent water bodies such as the Azov Sea, Kerch Strait, the Turkish Straits System (TSS), and the northern Aegean Sea. The subspecies was described as "sometimes" present in the Marmara Sea and "very rarely'' in the Aegean Sea by Deveciyan (1926). More recently, sightings and strandings were reported from the TSS, as well as from the Turkish and Greek coasts of the Aegean Sea (Frantzis 2009, Tonay & Dede 2013, Cucknell *et al.* 2016, Dede *et al.* 2016b). Based on genetic analyses, harbour porpoises from the Black Sea appear to have dispersed into the Aegean Sea through the TSS.

Occasionally, harbour porpoises are also sighted in the lower tracts of the Danube, Dnieper, Don and Kuban rivers, their estuaries, deltas and tributaries and coastal freshwater, brackish and saline lakes and lagoons.

Cetacean species in the ACCOBAMS area

non regular species

North Atlantic minke whale

Balaenoptera acutorostrata acutorostrata Lacépède 1804

Global status
Least Concern (Cooke 2018b)

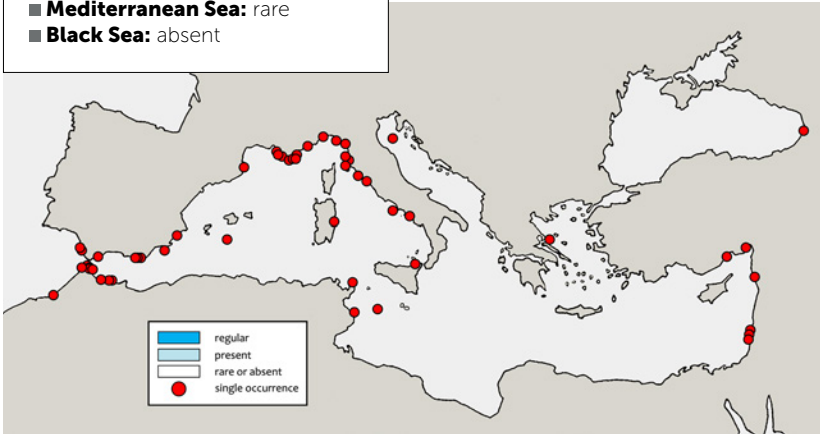
World distribution
A cosmopolitan species, present at all latitudes in both hemispheres. Most frequent in cold temperate, sub-polar and polar waters.

Habitat and ecology
Found both in neritic and oceanic habitats, most frequently over the continental shelf. The species' prey is varied, including fish, krill, and squid.

Likely origin
North Atlantic individuals occasionally enter the Mediterranean through the Strait of Gibraltar from the contiguous Atlantic Area.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
The common minke whale is a visitor to the Mediterranean and the contiguous Atlantic Area of ACCOBAMS, with less than one reported presence/year during the past 35 years. On such basis, the suggestion that the Mediterranean is possibly a common minke whale calving or nursery ground (Maio *et al.* 2016) needs corroboration. At least 54 records have been reported in the ACCOBAMS area during the last 140 years. There is one ancient (1880) record of a minke whale stranding on the coast of Georgia, in the Black Sea (Tomilin 1967), a clear vagrant. The species' occurrence in the Mediterranean up to 2010 was summarised by Notarbartolo di Sciara & Birkun (2010). In the last decade, some unpublished, older records from the mid-1980s to the mid-2000s were made available, including from Morocco, Spain, France and Turkey (Dhermain *et al.* 2009, Öztürk *et al.* 2011, Rojo–Nieto *et al.* 2011, Masski & Stephanis 2018, Fraija-Fernández *et al.* 2015). Additionally, new records were reported from various Mediterranean locations, including stranding and sighting events in Spain (Fraija-Fernández *et al.* 2015), three strandings in Italy (Maio *et al.* 2012, Insacco *et al.* 2016, Grano *et al.* 2020), one stranding in south-eastern Turkey (Öztürk *et al.* 2015) and one stranding event in Syria (Ibrahim *et al.* 2020).

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** rare
- **Mediterranean Sea:** rare
- **Black Sea:** absent



Northern sei whale

Balaenoptera borealis borealis Lesson 1828

Global status
Endangered (Cooke 2018c)

World distribution
The sei whale is a species having a very wide distribution in the North Atlantic and North Pacific Oceans, and in the Southern Hemisphere. It is likely absent from the northern Indian Ocean (Cooke 2018c).

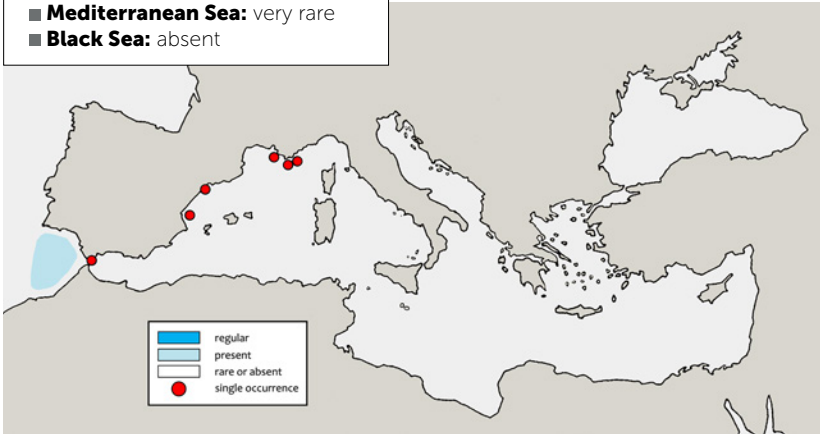
Habitat and ecology
Sei whales, a mostly offshore species, undertake extensive migrations between warm, low-latitude waters in winter and temperate to subpolar latitudes in summer. They mostly feed on planktonic crustaceans such as euphausiids, copepods and amphipods, but are also known to occasionally feed on small pelagic fishes such as anchovies, sardines, and capelin (Cooke 2018c).

Likely origin
North East Atlantic Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
Rare sightings and strandings have been reported from the western Mediterranean, in particular from Spain and France. In June 1921 a 15.2m long individual stranded near Valréas, Hérault (Beaubrun 1995). In June 1952 a whale identified as a sei whale was filmed by Alain Bombard off Valencia (Bompar 2000). In September 1973 a young female, 7.3m long, was found stranded near the Ebro Delta (Casinos & Vericad 1976). Bompar (2000) reported the sightings of two individuals in summer 1987, off Port Cros in August, and 25 nm. offshore of Var in September, which he thought were definitely sei whales. On 7 May 2013 the presence of a sei whale was documented at the entrance of the Bay of Algeciras, Spain (Scuderi *et al.* 2017). Other reports of sei whales from the Mediterranean should be considered uncertain or even unlikely, because they were undocumented and unsubstantiated; these include the sighting of 10 sei whales in the Gulf of Genoa mentioned by Horwood (1987); a young rorqual captured near Tunis on 21 Oct. 1949, identified as *B. borealis* by Heldt (1949) but considered doubtful by Ktari-Chakroun (1980); occurrences in the Adriatic in 1880 and in the Gulf of Taranto (Ionian Sea) in the late 1940s (Bompar 2000).

Horwood (1987) provides a summary of historical occurrences and catches of whales in the contiguous Atlantic Area by whale catchers based in the Strait of Gibraltar, however their species identification (either sei or Bryde's whales, *B. edeni*) was uncertain; they are not marked in the map. No records exist for the Marmara and Black Seas.

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** rare but present
- **Mediterranean Sea:** very rare
- **Black Sea:** absent



North Atlantic humpback whale

Megaptera novaeangliae novaeangliae (Borowski 1781)

Global status
Least Concern (Cooke 2018d)

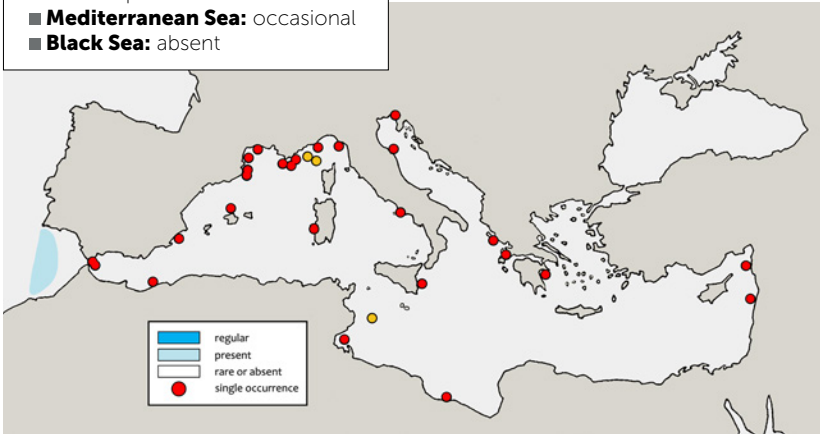
World distribution
Humpback whales are widely distributed across all oceans, subdivided in discrete populations.

Habitat and ecology
Humpback whales are known for their extensive migratory habits; in fact, the species holds the record of the maximum migratory distance (8,300 km) for any mammal (Rasmussen *et al.* 2007).
A notable exception to this migratory behaviour is presented by the Arabian Sea population which is non-migratory in the North Western Indian Ocean. Migrations occur between tropical coastal waters in winter, where breeding and calving takes place, and summer feeding grounds in cold temperate, sub-polar and polar waters. Humpback whale prey varies depending on location and availability, and includes euphausiid (= krill) and amphipod crustaceans, as well as small schooling fishes such as capelin, sardines, sand lance, and mackerel.

Likely origin
North East Atlantic Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
Humpback whales are sighted with increasing frequency in the Mediterranean Sea, where they were once considered very rare. Since the late 1980s, humpback whales have been reported almost every year in the region, in some years up to three times. One of these individuals, about 8-9 m long, was observed three times (shown in the map with yellow dots): in June 2012 in the Ligurian Sea, in March 2013 in the Strait of Sicily, and in August 2013 again in the Ligurian Sea (Panigada *et al.* 2014).
Most of the sightings, largely involving juvenile whales, have occurred in the North West Mediterranean, however humpback whales have been also reported from the African coasts and Adriatic, Ionian, Aegean and Levantine seas. In part, this increase of observations can be attributed to the greater attention by the public to the presence of these whales, which often display their presence with highly visible behaviours such as breachings; in part, however, these increased occurrences could also be attributed to the recovery of the species in the North East Atlantic, which could cause individuals to enter the Mediterranean through Gibraltar with higher frequency. However, conditions still don't seem to be favourable for *M. novaeangliae* to become a regular cetacean in the Mediterranean anytime soon. Humpback whales are present but infrequent in the contiguous Atlantic Area. Conversely, they have not been observed in the Black and Marmara seas.

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** rare but present
- **Mediterranean Sea:** occasional
- **Black Sea:** absent



Grey whale

Eschrichtius robustus (Lilljeborg 1861)

Global status
Least Concern (Cooke 2018e)

World distribution

Today the species is only found in the North Pacific and adjacent waters, but was once present also in the North Atlantic (on the eastern seaboard of North America from Florida to New Jersey and on the coasts of the English Channel and the North and Baltic Seas) until the late XVII cent. The species survives in a sizeable (27,000) population in the eastern North Pacific, summering and feeding in the Chukchi, Beaufort, and northwestern Bering seas, and breeding in Mexico. Another smaller population, breeding in the western North Pacific (Okhotsk Sea) is possibly extinct (Cooke 2018e).

Habitat and ecology

Grey whales are a markedly migratory and coastal species, moving from the summer feeding grounds in the Arctic and North Pacific to the winter breeding sites in Mexico, largely within coastal lagoons along the western coast of the peninsula of Baja California.
Unlike most Mysticete species, grey whales are primarily bottom feeders, preying mostly on swarming mysids, tube-dwelling amphipods, and polychaete tube worms which they find on the shallow continental shelf of the Chukchi and Bering seas.

Likely origin

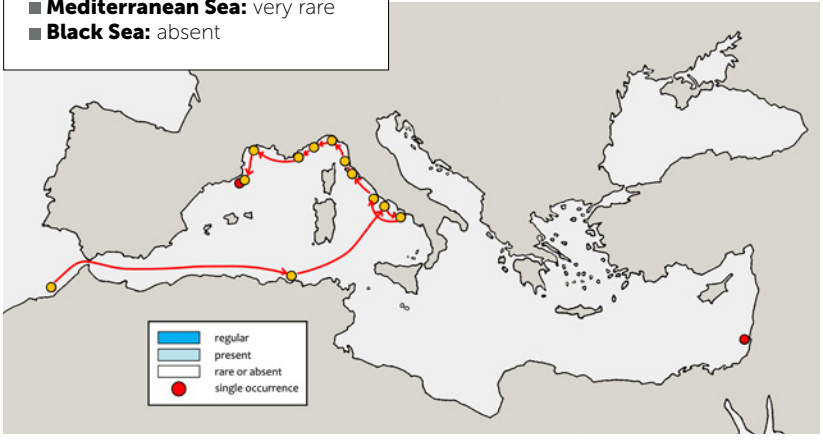
Eastern North Pacific Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas

The occurrences of grey whales in the Mediterranean are extraordinary events. The first known episode involved the sighting of a single grey whale about 13m long off Jaffa, Israel on 8 May 2010; the same individual, recognised through distinctive body markings, was sighted again on 6 June of the same year off Barcelona, Spain (red dots in the map; Scheinin *et al.* 2011). A second event involved a young specimen, likely a one-year old calf approximately 8m long, appeared off Rabat (Atlantic Morocco) in early March 2021, and subsequently off Algeria, central and then northern Italy, southern France and finally Barcelona, as shown in the above map by yellow circles connected by arrows (the arrows connect the successive locations and are not meant to accurately describe the path followed by the whale) (Simone Panigada, pers. comm.). Why did grey whales venture into the Mediterranean Sea from their North Pacific haunts is still a matter of speculation. Three years after the 2010 episode a different grey whale individual was repeatedly sighted of Namibia, a location even farther than the Mediterranean from the whale's original population (Elwen & Gridley 2013).

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** very rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent



North Atlantic right whale

Eubalaena glacialis (Müller 1776)

Global status
Critically Endangered (Cooke 2020)

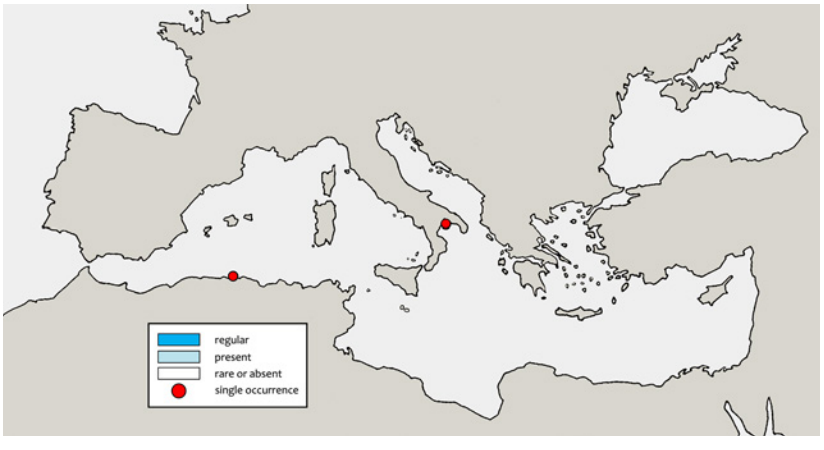
ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** very rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent

World distribution
Once widely distributed across the North Atlantic, North Atlantic right whales never recovered from whaling and are now reduced to a small, Critically Endangered population estimated to be slightly greater than 400 individuals, confined to waters off the east coast of the North American continent. The species has now been extirpated from the Northeast Atlantic, where isolated individuals are observed with extreme rarity.

Habitat and ecology
Like many Mysticetes, North Atlantic right whales are a migratory species, moving seasonally between sub-polar and cold-temperate feeding grounds (summer) and warm-temperate and sub-tropical waters (winter) to breed. The species feeds largely on calanoid copepods, occasionally integrated with euphausiids, pteropods and various invertebrate larvae.

Likely origin
Of the three extant right whale species – the North Atlantic right whale, the North Pacific right whale *E. japonica* (Lacépède 1818), and the Southern right whale *E. australis* (Desmoulins 1822) – the individuals that have occurred in the Mediterranean in the past were most likely (but not conclusively) belonging to the former.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
Two certain occurrences of this species were recorded in the Mediterranean Sea in historical times. The first was a 12m long female that ventured near shore near Taranto (Italy) on 9 February 1877 and was captured; her skeleton is now displayed in the zoological museum of the University of Naples (Capellini 1877, Gasco 1878). The second occurrence was the sighting of two in the Bay of Castiglione near Algiers, one of which, 11m long, was captured and its skeleton is conserved in the national museum of Paris (Pouchet & Beauregard 1888, Bompar 2000).



Dwarf sperm whale

Kogia sima (Owen 1866)

Global status
Least Concern (Kiszka & Braulik 2020)

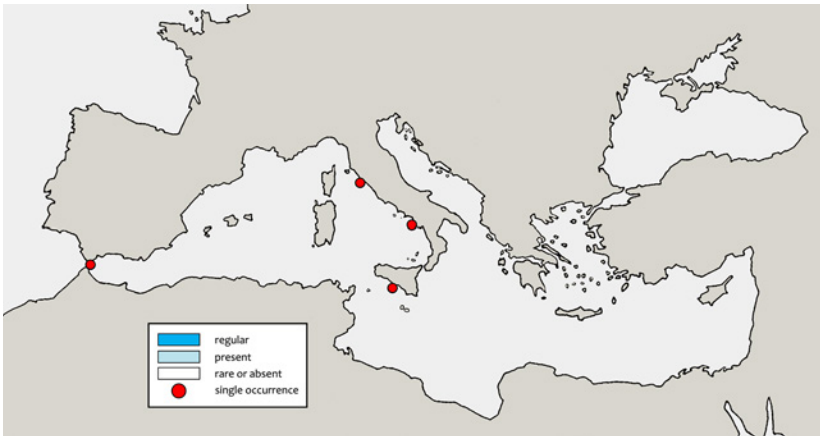
World distribution
Ecological information about dwarf sperm whales, a cryptic species, is still insufficient to accurately describe their world distribution, other than they occur in offshore waters of all the major oceans between approximately 45°N and 45°S.

Habitat and ecology
Dwarf sperm whales are a deep-water species, occurring in warm-temperate to tropical waters, preferably over steep continental slopes and deep offshore areas. Their diet is predominantly based on cephalopods belonging to many different species.

Likely origin
North Atlantic Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
Only four occurrences of dwarf sperm whales have been recorded in the Mediterranean Sea. The first involved an individual 2.2m long (sex unknown) found stranded near Foce del Chiarone, Grosseto on 24 May 1988, its skeleton now preserved in the collections of the Accademia dei Fisiocritici of Siena (Baccetti *et al.* 1991); the second was a male 2.1m long, stranded alive and later died near Eraclea Minoa, Agrigento on 8 Sept. 2002, its skeleton preserved in the collections of the marine museum of Comiso, Ragusa (Centro Studi Cetacei 2004); the third was a male 2.2m long found stranded at Mnar, Tanger, on 30 April 2015 (Benchoucha *et al.* 2018); finally, a female 1.95m long, found stranded near Trentova, Agropoli on 4 February 2017, her skeleton exposed in Vallo di Diano and Alburni National Park Museum Centre in Salerno (Maio *et al.* 2017).

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** very rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent



Northern bottlenose whale

Hyperoodon ampullatus (Forster 1770)

Global status
Data Deficient (Taylor *et al.* 2008b)

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** very rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent

World distribution
The northern bottlenose whale range is confined to subarctic to cold-temperate latitudes in the North Atlantic, with occasional forays in warmer waters, as far south to North Carolina in the US, the Azores, and even the Cape Verde islands.

Habitat and ecology
Northern bottlenose whales are a cold-water species with a preference for deep waters, marine canyons and steep slopes. They are deep divers and have a rather specialised diet (mostly squids belonging to the genus *Gonatus*), occasionally supplemented with fishes and benthic invertebrates.

Likely origin
North Atlantic Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
Two records of northern bottlenose whales exist in the Mediterranean. The first involves the live stranding of a mother and calf on 26 September 1880 in the Gulf of Aigues-Mortes, Languedoc-Roussillon; the mother was 9m long, the calf (unsexed) 5m (Clément 1881, Bompar 2000). A northern bottlenose whale was sighted in the Alborán Sea off Spain (Cañadas & Sagarminaga 2000), with no date but unambiguous identification details provided (A. Cañadas, personal communication). Several other reports of *Hyperoodon ampullatus* from the Mediterranean either turned out to be misidentified *Ziphius cavirostris*, or remain doubtful, and cannot be considered reliable. These include: (a) the capture of a Cuvier's beaked whale in Liguria reported by Mezzana (1900); (b) doubtful occurrences off Tuscany in 1835; off Languedoc, near Fontignan in 1850; and off Corsica, all mentioned by Bompar (2000); (c) an undocumented sighting reported by casual observers to McBrearty *et al.* (1986); (d) two Cuvier's beaked whales misidentified as *H. ampullatus* off Croatia: one specimen captured near Cavtat in 1939, reported by Hirtz (1940), and a second individual that remained for a while in Župski Bay, near Cavtat, in March 2001, before dying (Holčer *et al.* 2003).

Blainville's beaked whale

Mesoplodon densirostris (Blainville 1817)

Global status
Least Concern (Pitman & Brownell 2020a)

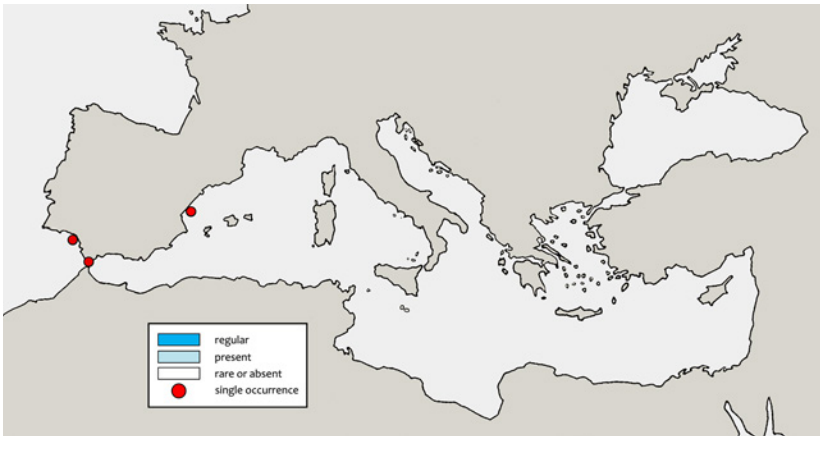
World distribution
Blainville's beaked whales, the widest-ranging of all species in the genus *Mesoplodon*, occur at tropical and warm-temperate latitudes in all oceans, and are also present in adjacent seas such as the Caribbean Sea, Gulf of Mexico, Gulf of California, Gulf of Thailand and Sea of Japan.

Habitat and ecology
Like all Ziphiids, *M. densirostris* is a deep-diving whale (down to 1,599m). Accordingly, the species' preferred habitat is over deep waters and steep slopes, that can also occur close to shore in the case of oceanic, volcanic islands. Its main preys include meso- and bathypelagic cephalopods.

Likely origin
North Atlantic Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
The only confirmed occurrence of this species inside the Mediterranean refers to the stranding of a female 4.21 m long on the Beach of Alcossebre, Castellò de la Plana (Catalonia) on 17 Feb. 1980 (Casinos & Filella 1981). Two more records in the Strait of Gibraltar and contiguous Atlantic Area coast of Spain include a decomposed individual found stranded in Matalascañas (Huelva) on 20 May 1996, its skeleton preserved in Vertebrate Collection of the Estación Biológica de Doñana; and a 4.1 m long female, found stranded in Tarifa (Cádiz) on 17 December 2003 (Bellido *et al.* 2009).

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** very rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent



Gervais' beaked whale

Mesoplodon europaeus (Gervais 1855)

Global status
Least Concern (Pitman & Brownell 2020b)

World distribution
Gervais' beaked whales are endemic to the tropical and temperate waters of the Atlantic Ocean, reaching higher latitudes in the northern than in the southern hemisphere.

Habitat and ecology
There is very little ecological knowledge about this species, except that, like al Ziphiids, it is found in deep waters and over continental slopes. Its diet includes a variety of meso-pelagic cephalopods and fishes.

Likely origin
North Atlantic Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
Known in the Mediterranean from only one specimen, a female 4.5 m long stranded near Castiglioncello, Italy, on 9 Aug. 2001. The skull is conserved at the Civic Museum of Natural History of Milano (Podestà *et al.* 2005). Records from the contiguous Atlantic Area, all from strandings along the cost of Spain, include: an individual found in the Huelva Province in 1990 (Bellido *et al.* 2009); a second specimen, possibly a female, stranded near Almonte (Valverde & Galan 1997); and two males stranded on 17 and 19 September 1997 near the mouth of the river Odiel, their skeletons conserved in the Vertebrate Collection of the Estación Biológica de Doñana (Bellido *et al.* 2009). Finally, a ziphiid that live stranded near Fethiye, Mediterranean coast of Turkey (marked in the map with a yellow dot), was tentatively identified as *Mesoplodon* cf. *M. europaeus* (Notarbartolo di Sciara & Birkun 2010); however, other colleagues considered that individual to be a Cuvier's beaked whale, *Z. cavirostris*, with a particularly slender rostrum. Another beaked whale stranded along the Egyptian coast, and identified as *M. europaeus* (Farrag *et al.* 2019) is, in fact, *Z. cavirostris* as evident from published photographs.

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** very rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent

Sowerby's beaked whale

Mesoplodon bidens (Sowerby 1804)

Global status
Least Concern (Pitman & Brownell 2020c)

Taxonomical note

In 1975 P.J.H. van Bree commented on a proposition by E.L. Trouessart (1910), based on Van Beneden (1888), that the fanciful *Epiodon urganantus* described from the coasts of Sicily by C.S. Rafinesque in 1814 was in fact a *Mesoplodon bidens*. This caused subsequent authors (Toschi 1965, Ellerman & Morrison Scott 1951, Van den Brink 1967) to uncritically list the species as present in the Mediterranean. Van Bree correctly recognises that "the possibility is not excluded that a specimen of *Mesoplodon bidens* may enter the Mediterranean accidentally and may be found on the coast or may be caught but as long as no well documented record has been published, the species cannot be regarded as belonging to the Mediterranean fauna". In fact, science had to wait more than 40 years before adequately documented sightings (Bittau *et al.* 2018) could confirm van Bree's prediction.

World distribution

The Sowerby's Beaked Whale is endemic to the North Atlantic, from temperate to polar waters. It is the *Mesoplodon* species that extends northernmost its range in the Atlantic.

Habitat and ecology

Like all ziphiids, *M. bidens* is a deep-diving species that is found over slope and deep oceanic waters. Unlike most of its congeners, however, its diet is based more on small meso- and bathypelagic fishes and less on cephalopods.

Likely origin

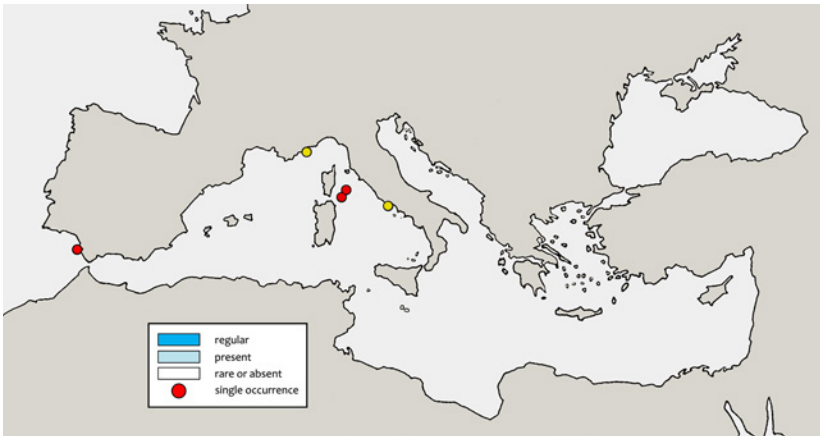
North Atlantic Ocean.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas

Certain identifications of Sowerby's beaked whales in the Mediterranean were made during research sighting cruises in the Tyrrhenian Sea, marked on the map with red dots (Bittau *et al.* 2017). Other occurrences of Mesoplodon in the Mediterranean, in which however the species could not be identified but which could have been *M. bidens* (marked with yellow dots in the map), include: a) a specimen found on the beach at Foce Verde, Latina, on 9 November 1927 (Brunelli & Fasella 1928); and b) two individuals that live-stranded on the Iles des Lérins, Alpes Maritimes on 15 August 1996, and were unfortunately released without documentation sufficient to confirm the species (Bompar 2000). In the Contiguous Atlantic Area the stranding of two male *M. bidens*, respectively 480 and 435cm long, was reported from the coast of Rota, Andalusia; their skeletons are conserved in the Vertebrate Collection of the Estacion Biologica de Doñana (Bellido *et al.* 2009).

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** very rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent



False killer whale

Pseudorca crassidens (Owen 1846)

Global status
Near Threatened (Baird 2018)

World distribution

False killer whales are widely distributed worldwide in tropical and warm temperate waters, most frequently in deeper oceanic waters. In addition, sometimes they venture into higher latitudes and move into shallow waters (Baird 2018).

Habitat and ecology

False killer whales are typical oceanic inhabitants, often found over steep slopes and capable of encroaching into continental shelf waters. *P. crassidens* can occur in pods of several tens of individuals. The species feeds mainly on large fish (e.g., several tunas, billfish and dolphin fishes) and cephalopods; it is also known to occasionally attack other delphinid species.

Likely origin

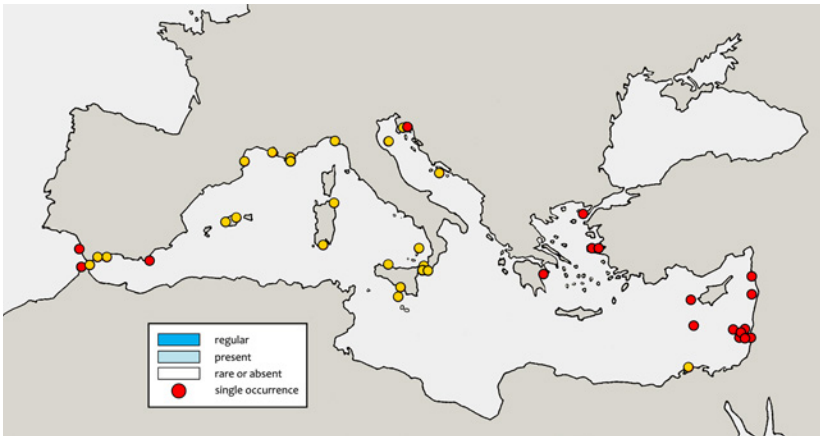
False killer whales can visit the Mediterranean Sea entering through the Strait of Gibraltar from the subtropical East Atlantic Ocean, but their access to the Mediterranean through the Suez Canal is also far from being unlikely, considering the many sightings in the Levantine Sea, and that the species occurs regularly in the Red Sea (Notarbartolo di Sciara *et al.* 2017).

Observed occurrence in the Mediterranean and Black Seas and adjacent areas

False killer whales have been reported a minimum of 40 times in the Mediterranean Sea during the last 200 years, and the question arises of whether the species should now be considered regular in the region. We provisionally propose to still consider it as non-regular, pending more robust evidence to the contrary. In the map to the right, occurrences before the early 1990s are marked in yellow. The more recent ones (from 1991 to present), marked in red, suggest that in recent decades, aside from a few instances of whales of clear Atlantic provenance, likely Lessepsian immigrant false killer whales might have colonised the eastern Mediterranean where they have also been seen with young; in July 2012 a neonate was found stranded near Tel-Aviv (A. Scheinin, pers. comm.). The species' occurrence in the Mediterranean up to 2010 is summarised in Notarbartolo di Sciara & Birkun (2010). Successive records, all sightings at sea in the eastern Mediterranean, include: a pod of 3-4 individuals seen south of Cyprus in August 2013 (Ryan *et al.* 2014); a pod of eight seen off Gökçeada Island in the northern Aegean Sea in January 2020 (Dede *et al.* 2020); a pod of five, including a calf, reported from the Kvarner Bay in the northern Adriatic Sea in spring 2021 (Holcer *et al.* 2021); sightings of a large pod of about fifteen individuals including calves in May 2020, seen in few different occasions along the Israeli coast from Ashdod to Haifa (Morris Kahn Marine Research Station 2020) and another sighting off Lebanon nine days later (Mediterranean Marine Life 2020), which could have been the same group hugging the coast northwards.

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** rare
- **Mediterranean Sea:** rare
- **Black Sea:** absent



Short-finned pilot whale

Globicephala macrorhynchus Gray 1846

Global status
Least Concern (Minton *et al.* 2018b)

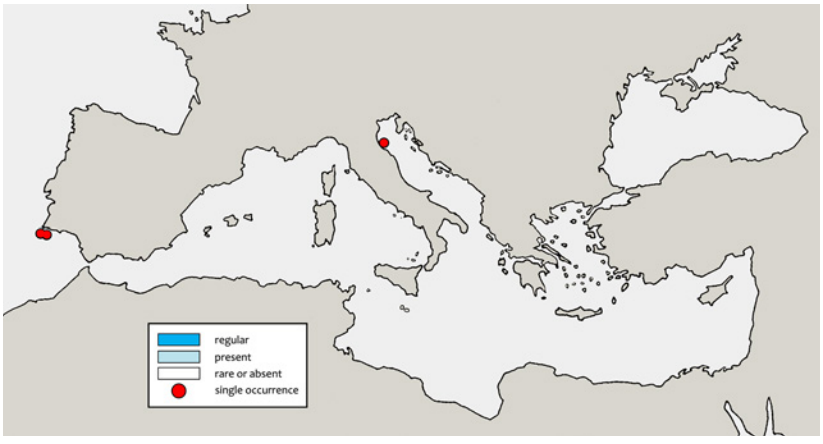
World distribution
Short-finned pilot whales have a circumglobal distribution, mostly limited to tropical and warm-temperate latitudes between 50° N and 40° S. They also occur in semi-enclosed seas such as the Gulf of California, the Red Sea and the Sea of Japan. In the Atlantic Ocean, where they can overlap with their colder-water congenerics, long-finned pilot whales *G. melas*, they are common in many areas including the Gulf of Mexico, the Caribbean Sea and the waters surrounding the Macaronesian archipelagos.

Habitat and ecology
Short-finned pilot whales are oceanic, deep-diving odontocetes. Their habits are considered nomadic rather than migratory, and are known to be resident over broad areas. Their diet is mostly based on meso-pelagic cephalopods, although in some areas they also feed on epi-pelagic squid species.

Likely origin
North Atlantic Ocean. Although short-finned pilot whales are present in the Red Sea (Notarbartolo di Sciara *et al.* 2017), they are rare there and their entrance into the Mediterranean through the Suez Canal is quite unlikely.

Observed occurrence in the Mediterranean and Black Seas and adjacent areas
Short-finned pilot whales are a vagrant species in the Mediterranean, where they have been reported only once, when a group of three was documented off Cattolica, in the Adriatic Sea, in May 2010 (Notarbartolo di Sciara 2016, Verborgh *et al.* 2016). Interestingly, these whales occurred well outside of the regular Mediterranean range of long-finned pilot whales. Short-finned pilot whales can occur in the Contiguous Atlantic (Alves *et al.* 2018) but are rare also there.

ACCOBAMS Sub-Areas
- **Contiguous Atlantic:** rare
- **Mediterranean Sea:** very rare
- **Black Sea:** absent



Indian Ocean humpback dolphin

Sousa plumbea (G. Cuvier 1829)

Global status
Endangered (Braulik *et al.* 2017)

Taxonomical note

Until 2014, dolphins in the genus *Sousa* found in the Indian, Indo-Pacific and West Pacific regions were considered to be part of a single species, the Indo-Pacific humpback dolphin *S. chinensis* (Osbeck 1765). A subsequent revisionary work by Jefferson & Rosenbaum (2014) pointed to substantive species-level structure within *S. chinensis*, proposing that the *Sousa* form found across the Western Indian Ocean, including the Red Sea, the Arabian Sea and the Persian Gulf, be considered a distinct species, *S. plumbea* (G. Cuvier 1929). Their proposal is now accepted by current cetacean nomenclatural practice.

World distribution

Indian Ocean humpback dolphins are broadly distributed across the coastal waters of Africa, from the Gulf of Suez in the Red Sea, Egypt, to False Bay, South Africa, and along the shores of the Arabian Peninsula and of the Arabian Sea to the southern tip of India, extending further east into the Bay of Bengal. They are also present in the coastal waters of offshore islands such as the Dahlak and the Farasan archipelagos in the southern Red Sea, Zanzibar, Mayotte, and western Madagascar (Braulik *et al.* 2017).

Habitat and ecology

Indian Ocean humpback dolphins are a strictly coastal species normally remaining within a narrow alongshore strip where depth doesn't exceed 30 m. Their habitat includes shallow bays, coastal channels across mangroves, and estuarine environments (Braulik *et al.* 2017).

Likely origin

The Indian Ocean humpback dolphin is a Lessepsian immigrant into the Mediterranean (i.e., from the Red Sea through the Suez Canal). This justifies

considering it an alien species in the Mediterranean, which would not have reached the region were it not for human intervention (i.e., the cutting of the Suez Canal). Indian Ocean humpback dolphins are regular in the Gulf of Suez; an Important Marine Mammal Area, the "Northern Red Sea Islands IMMA" located at the mouth of the Gulf of Suez, in the Red Sea, was identified in 2019 having *S. plumbea* as a qualifying species.

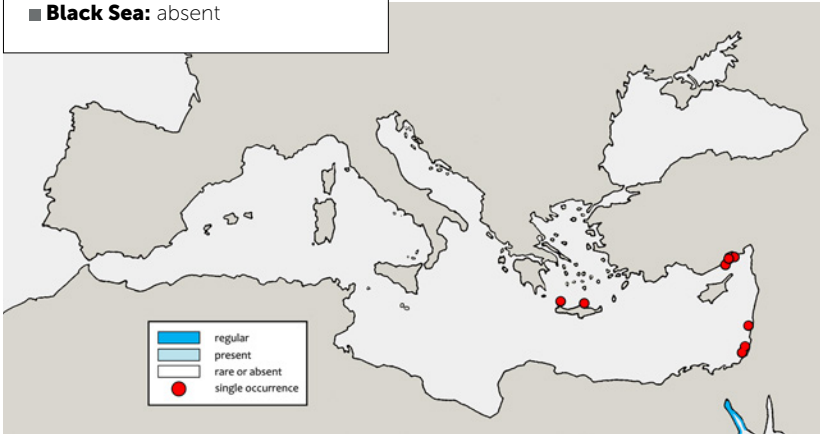
Observed occurrence in the Mediterranean and Black Seas and adjacent areas

Individual Indian Ocean humpback dolphins have been occasionally reported to venture into the Mediterranean. Reports include:

1. Sightings at the entrance of Port Said harbour, Egypt (Marchessaux 1980, quoting Mörzer-Bruyns, pers. comm).
2. Successive documented sightings of the same individual in Israel: Bay of Atlit, 10 Jan 2000; inside Jaffa harbour, 18 Jan 2000; inside Ashdod harbour, 20 Jan 2000 (Kerem *et al.* 2001).
3. Filming of several individuals (two in Feb. 2016, and two in April 2016; possibly the same individuals) feeding on fish escaping during two experimental demersal trawl operations conducted in shallow waters in Mersin Bay, southern Turkey (Ozbilgin *et al.* 2018).
4. Repeated sightings of lone dolphins (possibly the same individual) along the shore of northern Crete, Greece, first on 7 November 2017 and later between 14 and 17 November, in localities separated by approximately 100 km (Frantzis 2018).
5. Sighting of a minimum of two, about 700-800 m offshore from the Institute of Marine Science in Erdemli, Turkey, on 15 November 2017 (A. Tonay pers. comm., Akkaya Baş 2017b). The simultaneous appearances of these dolphins in both northern Crete (item 4 above) and southern Turkey might not be coincidental, although the sighting sites are separated by >1,000 km if calculated along the shallowest coastal itinerary.

ACCOBAMS Sub-Areas

- **Contiguous Atlantic:** absent
- **Mediterranean Sea:** very rare
- **Black Sea:** absent



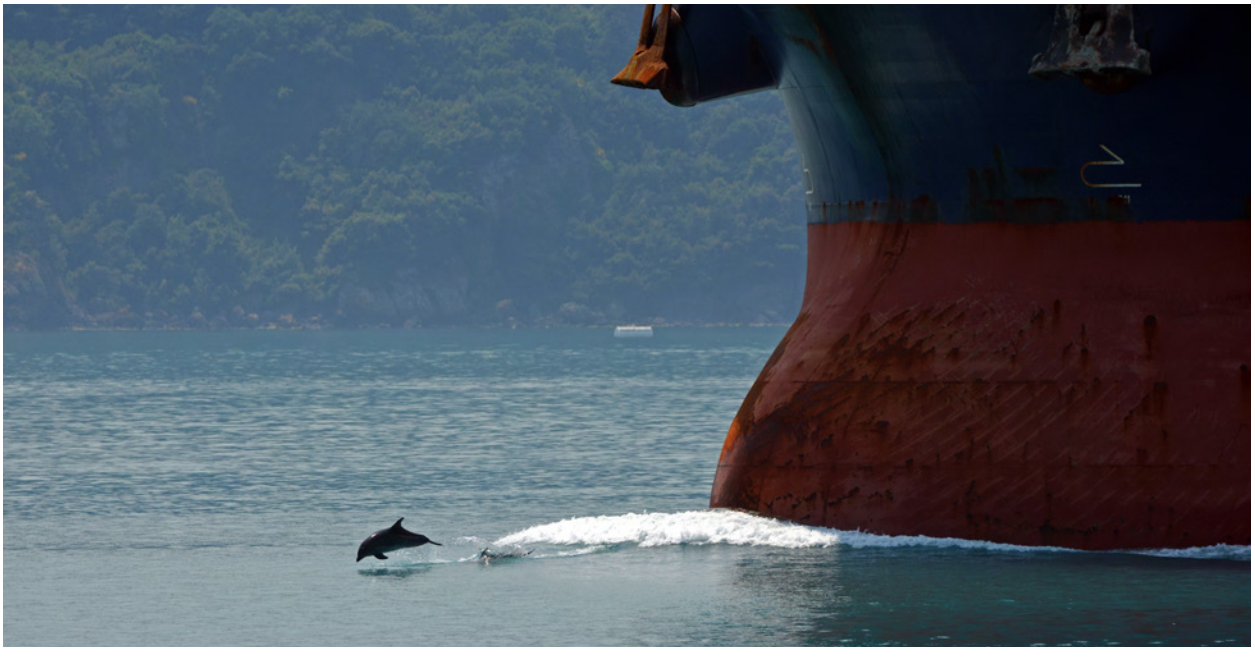
Threats

impacting on cetaceans in the ACCOBAMS Area

The main threats affecting cetacean survival in the ACCOBAMS area are listed in Table 2, where the root cause of each threat is also specified. An effort was also made to: a) distinguish different types of impacts, b) whether the pressure exerted on the animals is likely to cause direct mortality, thereby ultimately affecting population size, or c) whether the pressure exerted on the animals is instead likely to dislodge them from their preferred habitat for variable lengths of time (the latter also ultimately likely to end up decreasing the animals' fitness, and in turn population size in the longer term).

In the "type of impact" column, "long-term habitat degradation" is meant to be measured in years or longer; "medium-term" in months to days; "short-term" in days to hours. "Large-scale" redistribution may involve hundreds of km or more; "medium-scale" tens of km; "small-scale" in the order of single digit km. The above quantities, however, can only be approximate and are only intended to convey the involved order of magnitude only.

For each type of threat, the species most affected are listed. In the single species accounts in the preceding pages, specific threats are listed and briefly discussed separately in greater detail. Table 2 is conceived to place such separate discussions into broader perspective.



THREAT	*ROOT CAUSE*	TYPE OF IMPACT	METRIC TO QUANTIFY TRENDS	SPECIES MOST AFFECTED	SELECTED REFERENCES
FISHERIES	*unsustainable and illegal fishing practice*	direct mortality through bycatch	population size	striped dolphin, sperm whale, long-finned pilot whale, Cuvier's beaked whale, common bottlenose dolphin, common dolphin, rough-toothed dolphin, Black Sea harbour porpoise, Black Sea bottlenose dolphin, Black Sea common dolphin	Birkun 2008, Kerem *et al.* 2016, Notarbartolo di Sciara 1990, Öztürk 2015, Podestà *et al.* 2016, Rendell & Frantzis 2016.
	overfishing, cetacean/ fishery interactions	direct mortality caused by retaliation	population size	common bottlenose dolphin, Black Sea bottlenose dolphin, orca, common dolphin	Bearzi *et al.* 2004a, Esteban *et al.* 2016a, Notarbartolo di Sciara & Birkun 2010, Pardalou & Tsikliras 2018, 2020, Tonay *et al.* 2015, TUDAV 2015, 2017.
	overfishing, possibly combined with climate change	long-term habitat degradation (depletion of prey) causing medium-scale redistribution	population size, distribution	orca, Risso's dolphin, common bottlenose dolphin, common dolphin, Black Sea harbour porpoise, Black Sea bottlenose dolphin, Black Sea common dolphin	Azzellino *et al.* 2016, Bearzi *et al.* 2003, Birkun 2008, Esteban *et al.* 2016b, Meza *et al.* 2020, Piroddi *et al.* 2011, Tsagarakis *et al.* 2020, Tudela 2004.
POLLUTION	*Chemical pollution (urban and agricultural runoff, industrial effluent, shipping accidents)*	mortality/health impairment deriving from contact/ ingestion of oil and chemical spills, ingestion of noxious substances through food	population size	all species, but odontocetes in particular	Birkun 2008, Esteban *et al.* 2016, Fossi *et al.* 2002, 2012, 2014, Genov *et al.* 2019, Gonzalvo *et al.* 2016, Jepson & Law 2016, Jepson *et al.* 2016, Kerem *et al.* 2016, Pinzone *et al.* 2015, Rendell & Frantzis 2016, Squadrone *et al.* 2015.
	Marine litter (poor solid waste management, illegal dumping of fishing gear)	direct mortality by entanglement in/ingestion of solid debris	population size	sperm whale, Cuvier's beaked whale	de Stephanis *et al.* 2013, Fossi *et al.* 2020, Podestà *et al.* 2016, Rendell & Frantzis 2016.
	poor solid waste management	health impairment by ingestion of microplastics	population size	all species	Fossi *et al.* 2012, 2016, 2017, 2020, Germanov *et al.* 2018.

THREAT	ROOT CAUSE	TYPE OF IMPACT	METRIC TO QUANTIFY TRENDS	SPECIES MOST AFFECTED	SELECTED REFERENCES
NOISE FROM NAVAL SONAR	*military activities*	direct mortality	population size	Cuvier's beaked whale	Frantzis 1998, Jepson *et al.* 2003, Fernández *et al.* 2004, Notarbartolo di Sciara *et al.* 2014, Podestà *et al.* 2016.
	military activities	short-term habitat degradation causing medium-scale redistribution	distribution	Cuvier's beaked whale, long-finned pilot whale	Aguilar Soto *et al.* 2006, DeRuiter *et al.* 2013, Dolman *et al.* 2011, Podestà *et al.* 2016, Rendell & Gordon 1999, Tyack *et al.* 2011, Verborgh *et al.* 2016.
NOISE FROM SEISMIC EXPLORATION	*offshore oil & gas industry*	short-term habitat degradation causing medium-scale redistribution	distribution	fin whale, Cuvier's beaked whale	Castellote *et al.* 2012b, Kavanagh *et al.* 2019, Kerem *et al.* 2016, Maglio *et al.* 2016, Podestà *et al.* 2016.
CONSTRUCTION NOISE	*coastal infrastructure, pile driving*	medium-term habitat degradation causing medium-scale redistribution	distribution	all species, but coastal odontocetes in particular	Brandt *et al.* 2011, Gedamke & Sholik-Schlomer 2011, Weaver 2021.
DISTURBANCE FROM WHALE WATCHING, MOTORIZED VESSELS	*unregulated whale watching, unsustainable tourism*	short-term habitat degradation causing small-scale redistribution	distribution	all species	Esteban *et al.* 2016, Jahoda *et al.* 2003, Rendell & Frantzis 2016, Verborgh *et al.* 2016, IUCN-ACCOBAMS 2016.
VESSEL NOISE, VESSEL TRAFFIC	*powered vessel traffic*	short-term habitat degradation causing small-scale redistribution	distribution	all species	Akkaya Baş *et al.* 2017a,c Campana *et al.* 2015, Esteban *et al.* 2016a, La Manna *et al.* 2010, 2013, Rako *et al.* 2013, Rendell & Frantzis 2016, Verborgh *et al.* 2016, Williams *et al.* 2015.

THREAT	ROOT CAUSE	TYPE OF IMPACT	METRIC TO QUANTIFY TRENDS	SPECIES MOST AFFECTED	SELECTED REFERENCES
SHIP STRIKES	*powered vessel traffic*	direct mortality	population size	fin wale, sperm whale, long-finned pilot whale	Di-Meglio *et al.* 2018, Frantzis *et al.* 2019, Jensen *et al.* 2004, Notarbartolo di Sciara *et al.* 2016, Panigada *et al.* 2006, Peltier *et al.* 2019, Rendell & Frantzis 2016, Verborgh *et al.* 2016, Weinrich *et al.* 2006.
EPIZOOTICS	*contagious disease (mostly morbillivirus), likely enhanced by contaminants*	direct mortality	population size	fin whale, long-finned pilot whale, common bottlenose dolphin, striped dolphin, Black Sea harbour porpoise (known to have been affected in the Black Sea only), Black Sea bottlenose dolphin, Black Sea common dolphin	Aguilar & Raga 1993, Birkun 2008, Beffagna *et al.* 2017, Centelleghe *et al.* 2017, Di Guardo *et al.* 2011, Mazzariol *et al.* 2016, 2018, Müller *et al.* 2000, Rubio-Guerri *et al.* 2013, Soto *et al.* 2011, Van Bressem et al 2014, Verborgh *et al.* 2016, Wierucka *et al.* 2014.
LIVE CAPTURES	*Illegal deliberate captures for the captivity industry*	Population subtraction, disturbance, mortality	population size	Black Sea bottlenose dolphin	Birkun 2002, Marine Connection 2017.
COASTAL DEGRADATION	*unregulated or inadequately regulated coastal planning*	long-term habitat degradation causing medium-scale redistribution	distribution	common bottlenose dolphin	Bearzi *et al.* 2012, Coll *et al.* 2012, Halpern *et al.* 2008.
CLIMATE DISRUPTION	*atmospheric carbon loading*	long-term habitat degradation causing large-scale redistribution	population size distribution	all species	ACCOBAMS 2014, Albouy *et al.* 2020, Canadas & Vasquez 2017, Evans & Bjørge 2013, Grose *et al.* 2020, Lejeusne *et al.* 2010, Simmonds *et al.* 2012.

Table 2. A summary of threats, impacts and species affected in the ACCOBAMS area.

A comparison with the discussion of threats contained in Notarbartolo di Sciara & Birkun (2010) can support an assessment of how the complement of anthropogenic threats affecting cetaceans in the ACCOBAMS region, in addition to our knowledge about them, is evolving.

Concerning interactions with fisheries activities, things do not seem to have improved much as far as bycatch is concerned due to lack of systematic monitoring and reporting. Things are even more serious concerning illegal driftnets, with some countries unable or unwilling to ensure compliance with the law. Robust data are unavailable because of the illegal nature of the phenomenon; however episodes of entangled sperm whales are not infrequent in the popular and social media during summer. In the Black Sea, incidental mortality in fishing nets is still the most serious threat for cetaceans, especially for Black Sea harbour porpoises (Birkun *et al.* 2014, CeNoBS 2021). Fishing gear is still reportedly "depredated" in the contiguous Atlantic (Marçalo *et al.* 2015) and in the Mediterranean and Black seas, largely involving common bottlenose dolphins (Benmessaoud *et al.* 2018, Miliou *et al.* 2018, Pardalou & Tsikliras 2018, 2020, Pires *et al.* 2019, Popov 2014) but also orcas (Esteban *et al.* 2016a). Depletion of prey for cetaceans caused by overfishing, in addition to the well-known situation involving common dolphins in western Greece (e.g., Piroddi *et al.* 2011), have also been reported for striped, common and bottlenose dolphins in the northern Aegean (Tsagarakis *et al.* 2020), common dolphins (Gannier 2018), and possibly Risso's dolphins (Azzellino *et al.* 2016) in the north-western Mediterranean. In the Istanbul Strait, the presence of purse seine vessels causes bottlenose and common dolphins to change their behaviour, and is related with a decrease of energy intake in harbour porpoises (Meza *et al.* 2020).

Although zero annual export quota for Black Sea bottlenose dolphin taken from the wild was adopted by the CITES Parties in 2002, Turkey, Ukraine and Georgia captured at least 44 individuals from Marmara Sea and Black Sea between 2006-2009 (Notarbartolo di Sciara & Birkun 2010). Three bottlenose dolphins were found illegally captured in Russia in 2017 (Marine Connection 2017).

Impact on cetaceans from chemical contaminants, most notably organochlorine compounds, continues to be of high concern (Weijs *et al.* 2010, Jepson *et al.* 2016, Genov *et al.* 2019, Fossi & Panti

2018). Cetacean health is also affected by the growing activities connected with the extraction and transportation of oil across the Mediterranean (Piante & Ody 2015). In addition, the Mediterranean continues to be a repository of marine litter, including discarded fishing gear and plastic (Pham *et al.* 2014), some of which finds its way into cetaceans, causing their death (de Stephanis *et al.* 2013). A consequence of the release of plastic at sea is its fragmentation, ultimately producing microplastics that can be easily ingested by living organisms with food; such microplastics could be responsible for the ingestion of toxic compounds contained in them (e.g., phthalates), as recently found in Mediterranean fin whales through the sieving of large amounts of water during feeding within the Pelagos Sanctuary (Fossi *et al.* 2012, 2016, 2017, 2020). The Ligurian Sea in particular has very high microplastic contamination which is comparable to that recorded in the North Pacific Gyre (Fossi *et al.* 2017, 2018). Also Cuvier's beaked whales and sperm whales are especially badly affected by marine litter ingestion in the Mediterranean (Alexiadou *et al.* 2019, de Stephanis *et al.* 2013, Fossi *et al.* 2020) in comparison to other oceanic areas, likely because of the relatively high level of marine litter contamination in this region.

Underwater noise continues to be a source of high concern for the wellbeing of several cetaceans species in the ACCOBAMS area. The main sources of noise that have a potential effect on cetaceans include: a) low-frequency noise produced by shipping; and b) impulsive (acute) noise produced by seismic surveys for oil & gas exploration in the sea bottom, naval sonar, and coastal construction involving pile driving (ACCOBAMS 2016); impulse noise from the above sources has demonstrably the potential of excluding cetaceans from their habitat at a minimum (Castellote *et al.* 2012b, Kavanagh *et al.* 2019), or even being a source of direct mortality (Frantzis 1998, Jepson *et al.* 2003, Fernández *et al.* 2004, Notarbartolo di Sciara *et al.* 2014, Podestà *et al.* 2016). Seismic surveys for oil and gas have been widely carried out in the Black Sea, which concerns their effect on the cetaceans.

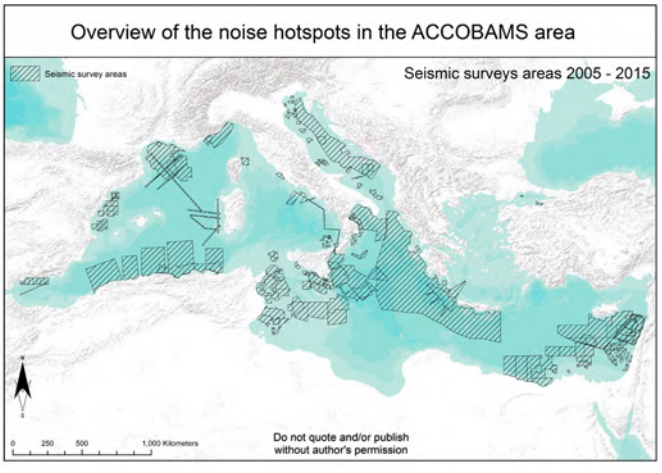


Fig 1. *Overall view of areas licensed for oil & gas exploration in a 10-year period (2005 to 2015). From ACCOBAMS (2016).*

Concerning maritime transport, all indicators point to a continued growth, with consequent increase in the levels of shipping-caused noise in the region. The rise in transit capacity recorded from the mid-1990s to the mid-2000s (58%), and the simultaneous increased size of vessels

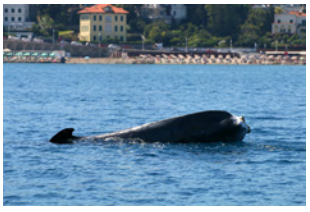
(30%) is expected to continue to increase, judging from the clear growing trend in container port traffic development and the doubling of the Suez Canal (UNEP Mediterranean Action Plan 2017), as well as projections based on international developments stimulated by, e.g., China's "Belt & Road Initiative".

As far as impulsive noise is concerned, the last decade has seen a significant increase in licensing of offshore "blocks" for seismic surveys by many Mediterranean coastal nations, from 3.8% to 27% of the Mediterranean surface between 2005 and 2013 (Maglio *et al.* 2016), which involve some of the loudest, most pervasive sources of man-made noise in the marine environment (Figure 1).

It is worth noting that country-approved licencing of blocks does not necessarily means that surveys have actually happened in such blocks. Information on the actual operational follow-up to licencing is very difficult to obtain from industry sources as a centralised repository of past, present and future activities is still missing. Welcome developments include the ban of future seismic surveys by France and Spain in waters under their jurisdiction.

It is difficult to provide a clear picture of the situation concerning the use of naval sonar in the ACCOBAMS area due to the confidential nature of military operations, except than exercises involving sonar and anti-submarine warfare training continue to occur in deep-diving cetaceans habitat hotspots, occasionally with lethal consequences (Notarbartolo di Sciara *et al.* 2014).

Disturbance to cetaceans from marine traffic of all sorts is also unlikely to abate in a scenario of continuous and diffused increase of traffic intensity in the region. Campana *et al.* (2015) reported on a multispecies avoidance response to marine traffic in the north-west Mediterranean. In consideration of their coastal habits, common bottlenose dolphins seem to be among the most affected species by traffic disturbance, as reported from various locations such as the Strait of Sicily (La Manna *et al.* 2010, 2013), the northern Adriatic (Rako *et al.* 2013), and the Bosporus (Akkaya Baş *et al.* 2017c). In the aforementioned situation of generalised increase of traffic, the incidence of ship strikes has certainly not decreased, as evidenced from the examination of stranded fin and sperm whales along the French coasts across the past half-century (Peltier *et al.* 2019). Similar concern was raised for traffic occurring in sperm whale habitat in the Hellenic Trench, Greece (Frantzis *et al.* 2019), and in the Pelagos Sanctuary (Di-Meglio *et al.* 2018).



The case of a female fin whale nicknamed "Codamozza" ("dock-tail") exemplifies well the dangerous existence of large whales in the Mediterranean. Codamozza was first sighted in the Pelagos Sanctuary in summer 1996, with one of her tail flukes cut off, possibly due to a collision with a vessel. Observed again several times in the Sanctuary in the early 2000s, in May 2020 she was sighted again off Syria, this time with both flukes missing – either as a result of a net entanglement or, again, of a vessel collision. With remarkable stamina having been deprived of her main swimming device and, by consequence, the means of properly feeding, the poor whale was observed in her long journey first in the Aegean Sea (June 2020), one week later in the southern Tyrrhenian Sea, and finally again two weeks thereafter in the Pelagos Sanctuary, where she was last seen at the beginning of July, emaciated and clearly debilitated (M. Zanardelli, pers. comm.).

Another serious concern regards the spread amongst Mediterranean cetacean populations of epizootic outbreaks such as the morbillivirus events that severely affected striped dolphins first from 1990 to 1992 and later from 2006 to 2008 (Di Guardo *et al.* 2013, Van Bressem *et al.* 2014). Massive mortality episodes like those luckily have not occurred again in the Mediterranean, however the pathologies have revealed to be able to extend to other species represented in the region by smaller populations, and thus potentially more vulnerable. These include long-finned pilot whales (Wierucka *et al.* 2014, Verborgh *et al.* 2019), fin whales (Mazzariol *et al.* 2016, Beffagna *et al.* 2017), Cuvier's beaked whales (Centelleghe *et al.* 2017), sperm whales (Mazzariol *et al.* 2018); but also, again, striped dolphins (Soto *et al.* 2011, Rubio-Guerri *et al.* 2013).

Finally, the human-caused disruption of climate with consequent ocean warming and acidification, which is known to be already exerting effects on the Mediterranean biota (Lejeusne *et al.* 2010), as well as on various marine mammal species globally (Evans & Bjørge 2013, Albouy *et al.* 2020, Grose *et al.* 2020), is very likely to eventually impact on the region's cetaceans (ACCOBAMS 2014). For instance, recent research on Indo-Pacific bottlenose dolphins *Tursiops aduncus*, a non-Mediterranean species, has revealed significant increases in calf mortality following severe marine heathwaves (Mann *et al.* 2021), and we have no reason to believe that this would not happen also in the ACCOBAMS area.

Conser-
vation

In the toolbox of marine conservation, a useful way of describing approaches to the conservation of cetaceans consists in subdividing them into two separate categories: a) the "pressure-based" approach consisting in regulations devised to manage the various pressures at the root, i.e., targeting the sectors responsible for the exertion of such pressures, regardless of where they operate; and b) the "place-based" approach involving the identification of specific areas which contain habitat of cetaceans essential for their survival, which can then be subjected to a special legal regime where human behaviour is regulated to mitigate threats.

Pressure-based conservation approach

In the ACCOBAMS region a wealth of regulations is available concerning pressure-based measures, addressing many of the human activities that impact on the conservation of cetacean populations. These include most notably regulations of fisheries, maritime transportation, and of a number of activities susceptible of introducing into the marine environment pollution of various types, e.g., chemical, nutrient, noise, etc., thereby causing this environment to degrade and to become less hospitable to native cetaceans.

Notably, management measures that will benefit indirectly cetaceans in the ACCOBAMS area are already embedded in existing legislation and treaties that were put in place not specifically to protect cetaceans, but with the intent of making human activities at sea sustainable. By consequence, if all such measures, invoked by existing international, regional and national legal instruments for the management of the ACCOBAMS area, were to be fully implemented and enforced, the conservation status of cetaceans in the concerned regions would be significantly enhanced. Given that so many of the factors that are responsible for the decline of cetaceans in the ACCOBAMS area derive from human activities that are unsustainable and/or illegal, it can be concluded that honouring existing obligations with regard to the management of fisheries, pollution and other forms of habitat degradation represents the single most important action to stop the decline of ACCOBAMS cetaceans and facilitate their recovery. Such obligations include, in addition of course to the specific ACCOBAMS provisions: binding recommendations adopted by the General Fisheries Commission for the Mediterranean (GFCM) and by the International Commission for the Conservation

of Atlantic Tuna (ICCAT); the various decisions and protocols to the Barcelona and Bucharest Conventions on pollution and conservation of biodiversity; and, as far as the European Member States are concerned, the relevant environmental and nature protection directives and fishery regulations by the European Union.

Concerning specifically the conservation of cetaceans, in addition to all the relevant ACCOBAMS Resolutions, non-exhausting examples of pressure-based measures are presented in the Table 3 below.

PRESSURE	MEASURE	STATUS
Disturbance and risk of ship-strikes caused by maritime traffic	International Maritime Organisation (IMO) measures (PSSAs, TSSs, ATAs, traffic separation schemes); IWC; EU Habitats Directive	Strait of Gibraltar (seasonal, voluntary speed restriction); Cabo de Gata (Spain) TSS; 'takes' and disturbance prohibited
Disturbance and risk of ship-strikes caused by offshore boat races	Limitations included in Pelagos Sanctuary Agreement; EU Habitats Directive	Limited to within Pelagos Sanctuary boundaries; 'takes' and disturbance prohibited
Disturbance and habitat-exclusion caused by seismic surveys	EU Directives (Habitats Directive, Environmental Impact Assessment and Strategic Environmental Assessment, Marine Strategy Framework Directive), National-level legal initiatives	Ban currently limited to waters of France and Spain
Disturbance from whale watching operations	National-level regulations, including based on ACCOBAMS guidelines and Pelagos Sanctuary, EU Habitats Directive	Currently formal legislation/regulation only limited to France, Portugal, Spain
Bycatch in drift gillnet	EU Regulations, GFCM Resolutions and recommendations, ICCAT Recommendations	Pelagic gillnets banned from Mediterranean, but widespread illegal use continues.
Contamination by chemical contaminants and solid devris (including plastic)	Barcelona Convention Protocols and Decisions, Bucharest Convention, EU Marine Strategy Framework Directive and Water Framework Directive	

Table 3

However, pressure types exist for which only voluntary guidelines may exist but no strict measures are available, such as those deriving to cetaceans from military activities, the conduction of seismic surveys in most of the region, the practice of pile driving in coastal construction or in the construction of offshore wind farms, etc. In very general terms, we can consider that we are in a transitional state where awareness of the destructive potential of some of these human activities at sea is growing, and a genuine intent of "doing something about it" exists, but the drive to continue such noxious activities still remains stronger than the concern for cetacean survival, because these activities are considered necessary if not inevitable. In many cases (but not all: e.g., the military) governments may require the submission of Environmental Impact Assessments and operational mitigation measures before allowing certain activities to proceed, however often serious concerns exist about the reliability, completeness and authoritativeness of such assessments (e.g., Morrison-Saunders and Fischer 2006).

ACCOBAMS engages in addressing human-derived pressures in many ways, including the following:

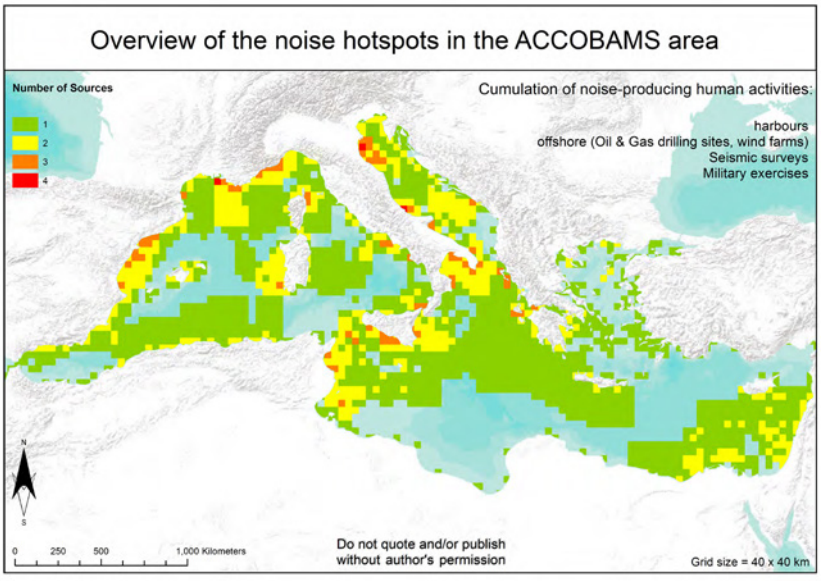


Fig 2. *Cumulative view of noise producing human activities in the Mediterranean Sea. From ACCOBAMS (2016).*

Anthropogenic noise:

a) Policy-oriented initiatives: Resolutions 2.16 (2004); 3.10 (2007): 4.17 (2010); 5.15 (2013); 6.17 & 6.18 (2016); 7.13 (2019), supporting the implementation of measures for balancing human activities at sea and cetacean conservation.

b) Partnering with several organisations in the implementation of QUIETMED, QUIETMED 2, QUIETSEAS, CeNoBS, a series of projects funded by the European Commission to "get better coordination among [EU] member states that share marine regions and sub-regions to increase the protection level and the conservation status of the marine spaces of the Mediterranean Sea against the damages caused by underwater noise resulted from anthropogenic activities".

c) The "Mediterranean Strategy on Underwater Noise Monitoring" aiming at laying down the methodological basis for a future implementation of a basin-wide monitoring programme on underwater noise in collaboration with the Barcelona Convention.

d) The "Guidance on underwater noise mitigation measures" developed in 2013 and updated in 2016 and 2019 to support the implementation of noise mitigation measures by industry as a result of a cooperation between representatives of the industry, scientists and NGOs.

e) The "Overview of the noise hotspots in the ACCOBAMS area", a project launched in 2015 with the aim of producing the first overview at the Mediterranean scale of the extent of noise-producing human activities. Results of this project will support decision making on conservation measures for cetaceans, most notably within the objectives of the Barcelona Convention within the framework of the EcAp (Ecosystems Approach) initiative.

f) The ACCOBAMS register for impulsive noise.

Fishery interactions:

a) Policy-oriented initiatives: Resolution 2.12 on Guidelines for the use of acoustic deterrent devices; Resolution 2.13 on pelagic gillnets; Resolution 2.21 on assessment and mitigation of the adverse impacts of interactions between cetaceans and fishing activities in the ACCOBAMS area; Resolution 2.25 on Prey depletion; Resolution A/3.1, amending Annex 2 to ACCOBAMS, as regards the use of drift nets; Resolution 3.8 strengthening collaboration with the General Fisheries Commission for the Mediterranean; Resolution 4.9 on fisheries interactions with cetaceans; Resolution 7.11 on interactions between fisheries and cetaceans.

b) Joint ACCOBAMS/ASCOBANS Working Group on bycatch.

c) Specific projects on pressure monitoring and mitigation, such as the ACCOBAMS/GFCM project on monitoring and mitigating interactions between endangered species and fishing activities (completed), the "MedBycatch" project (ongoing), the "Depredation project" (ongoing), and the CeNoBS project (completed).

Ship strikes:

a) Policy-oriented initiatives: Resolution 5.11 on ship strikes on cetaceans in the Mediterranean area; Resolution 6.19 on ship strikes on cetaceans in the Mediterranean area; Resolution 7.12 on ship strikes.

b) Workshops: Joint IWC-ACCOBAMS Workshop on Reducing Risk of Collisions between Vessels and Cetaceans (Beaulieu-sur-Mer, France from 21-24 September 2010); Joint IWC-IUCN-ACCOBAMS workshop to evaluate how the data and process used to identify Important Marine Mammal Areas (IMMAs) can assist the IWC to identify areas of high risk for ship strike (6-7 April 2019: ICMMPA 5, Messinia, Greece).

Climate change:

a) Policy-oriented initiatives: Resolution 4.14 (November 2010, Monaco) stating that necessary actions to reduce anthropogenic contributions to climate change and marine acidification have to be taken.

b) Workshop on the impact of climate change on cetaceans in the Mediterranean and Black Sea, Monaco 11 June 2014.

Although the various actions listed above are meant to be applied throughout the ACCOBAMS area, the activities started in the Mediterranean Sea before than in the Black Sea. The main difference in the Black Sea involved the recent cessation of massive, country-supported killing of cetaceans as the starting point. Commercial killing of Black Sea cetaceans was banned in 1966 in the former USSR, Bulgaria and Romania, and in 1983 in Turkey. Most Black Sea states now have international obligations to protect cetaceans. The Convention on the Protection of the Black Sea against Pollution, also known as the Bucharest Convention, came into force in 1994 and is implemented by the Black Sea Commission.

The Strategic Action Plan for the Rehabilitation and Protection of the Black Sea (1996), promoted within the framework of the Black Sea Commission, envisages specific cetacean-oriented conservation and research actions. Furthermore, the 3rd Meeting of Parties of ACCOBAMS adopted in 2007 a Regional Conservation Plan for Black Sea Cetaceans at a regional level. However, an updated version has not been adopted yet. Overfishing and bycatch,

in particular, are common regional issues that result in extensive and unsustainable mortality of cetaceans caught in fishing gear, as well as the depletion of cetacean prey.

National action plans for the conservation of Black Sea cetaceans were produced and formally adopted in Romania (2004), Georgia (2017) and Ukraine (2020). Bulgaria and Romania, as EU Member States, are expected to implement policies under the Habitats Directive and the Marine Strategy Framework Directive, the latter setting a strict benchmark for the conservation of marine biodiversity through an ecosystem-based approach to human activity management and protecting marine biodiversity in order to achieve «Good Environmental Status.»

Place-based conservation approach

This approach can be separated into an initial phase in which areas containing essential habitat of cetaceans are identified, and a second phase in which legal regulations or measures are adopted to achieve elimination or mitigation of human-caused threats in such areas. The first phase is essentially a scientific process; the second is based on policy, decision-making, governmental administration and management.

Cetacean Critical Habitat and Important Marine Mammal Areas

In the ACCOBAMS area the process of the identification of cetacean habitat to be protected has proceeded, for historical reasons, along two separate tracks: a) "Cetacean Critical Habitat" (CCH), promoted internally at the regional level; and b) "Important Marine Mammal Areas" (IMMA), promoted globally by IUCN.

Cetacean Critical Habitat (CCH). The first attempt at defining CCH within the ACCOBAMS framework is contained in SC4/Doc 21, "The ACCOBAMS Programme of Work on Marine Protected Areas (MPAs)", submitted to the Fourth Meeting of the Scientific Committee in 2006 and subsequently annexed to the Meeting's report as Annex 5. In that document, CCH was defined as:

"Cetacean critical habitat has been defined as 'a place or area regularly used by a cetacean group, population or species to perform tasks essential for survival and maintaining a healthy population growth rate' (Hoyt 2005). This is a helpful starting point but it may

be useful for the Scientific Committee to discuss and refine its understanding in order to come up with its own working definition. Various countries have definitions of critical habitat (US, Australia) and Harwood (2001) discussed critical habitat. We suggest that the following criteria be used to identify sites with critical habitats for cetaceans and which could be considered strong candidates for protection status:

- Areas used by cetaceans for feeding, breeding, calving, nursing and social behaviour
- Migration routes and corridors and related resting areas
- Areas where there are seasonal concentrations of cetacean species
- Areas of importance to cetacean prey
- Natural processes that support continued productivity of cetacean foraging species (upwellings, fronts, etc.)
- Topographic structures favourable for enhancing foraging opportunities for cetacean species (canyons, seamounts)"

In addition to the biocentric criteria listed above, the document added a second category of factors for consideration, this time of anthropogenic nature:

"The following criteria are suggested for the identification of sites in need of protection due to the occurrence of significant interactions between cetaceans and human activities:

- areas containing cetacean critical habitats, where - conflicts between cetaceans and fishing activities have been reported, or
- significant or frequent bycatch of cetaceans is reported, or
- intensive whale watching or other marine tourism activities occur, or
- navigation presents a potential threat to cetaceans, or
- pollution runoff, outflow or other marine dumping occur, or
- military exercises are known to routinely occur.

The document also included in its Appendix III a preliminary list of 79 Mediterranean sites identified as "important areas for cetaceans", prepared with the help of various experts working in the Agreement area, based on knowledge currently available. This list however, comprising but not limited to sites from other lists that had been included in several relevant ACCOBAMS resolutions, was accrued on the basis of expert opinion, without the application of specific criteria and without peer review. CCH work is planned to be updated regularly.

Important Marine Mammal Areas (IMMAs). IMMAs, "discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation", are an initiative of the Joint IUCN SSC/WCPA Task Force on Marine Mammal Protected Areas (the "Task Force"). Following the successful example of Important Bird and Biodiversity Areas (IBAs), the IMMA concept is designed to respond to the need to implement a standardized approach for the global identification of areas that are relevant to marine mammal conservation, and to support the consideration of marine mammals in the designation of Convention on Biological Diversity (CBD) Ecologically or Biologically Significant Areas (EBSAs) and the IUCN standard for the identification of Key Biodiversity Areas (KBAs). This is achieved through the application of IMMA criteria covering key biological and ecological considerations for marine mammal species (Notarbartolo di Sciara *et al.* 2016). These criteria were created through an expert process with additional public consultation with the wider marine mammal science and conservation community. In October 2017 the Convention on Migratory Species, with Resolution 12.13 adopted at COP12 in Manila, acknowledged the IMMA process, and inter alia requested Parties and invited Range States to identify specific areas where the identification of IMMAs could be beneficial.

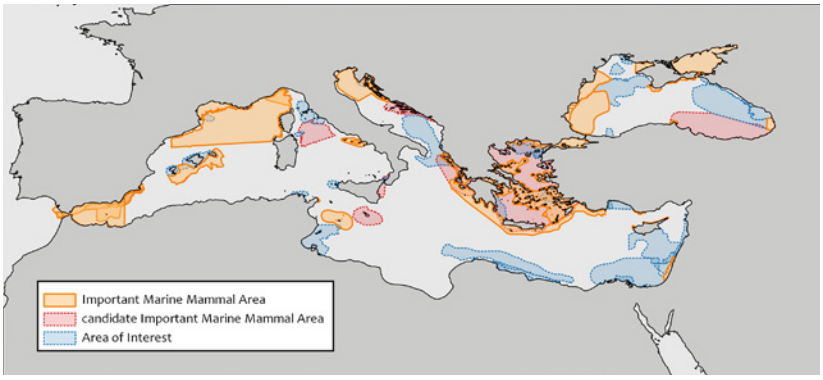


Fig 3. *Important Marine Mammal Areas in the Mediterranean and Black Seas. IMMAs are marked in orange, candidate IMMAs in pink, and Areas of Interest in blue (form the IUCN Marine Mammal Protected Areas Task Force, https://www.marinemammalhabitat.org/imma-eatlas/). Please note that these denominations concern the wider taxonomic assemblage of marine mammals, including in this case the Mediterranean monk seal,* Monachus monachus*, in addition to cetaceans.*

In October 2016, the Task Force joined efforts with ACCOBAMS to identify IMMAs in the Mediterranean Sea, with support from the MAVA Foundation. Following the review process, 26 IMMAs, 5 candidate IMMAs (cIMMAs) and 39 Areas of Interest (AoI) were accepted. In February 2021 a similar process was applied to the Black Sea and Turkish Straits System, leading to the identification of 11 IMMAs, one cIMMA and nine AoI. These IMMAs have now joined IMMAs from other regions of the world's oceans, being accrued within the framework of a global process and available to users and public scrutiny on the Task Force's website (www.marinemammalhabitat.org/imma-eatlas/).

Although IMMAs are defined solely on the basis of biocentric criteria, their raison d'être in terms of management and conservation is evident. In successive phases, spatially-explicit representations of

anthropogenic pressures known to affect cetaceans (e.g., fisheries, shipping, seismic surveys) can be made to overlay on IMMAs for use in marine spatial planning (MSP) exercises and to flag out the existence or the possibility of a problematic interaction. In other words, IMMAs are intended as biocentric precursors to management, being the first step (through the spatial definition of the animals' most important habitats) in the management process; to be followed by a second step in which the spatial distribution of threats is identified, and the overlap of the two previous layers of information may help in defining the new CCHs. In a final step, management is implemented.

Having been started independently and at different geographical scales, the two processes have subsequently been made to converge and complement each other by the ACCOBAMS Parties with Resolution 6.24 (2016).

Marine Protected Areas and Marine Spatial Planning

Based on recommendations from its Scientific Committee, ACCOBAMS has expressed its resolve to formally protect cetacean habitat with three Resolutions:

- 3.22 - "Marine Protected Areas for Cetaceans" (2007);
- 4.15 - "Marine Protected Areas of Importance for Cetacean Conservation" (2010); and
- 6.24 - "New Areas of Conservation of Cetacean Habitats" (2016).

However, whereas Resolutions 3.22 and 6.24 were mostly addressing questions of policy and method, Resolution 4.15 listed in its Annex 22 "areas of special importance for cetaceans in the ACCOBAMS area", including:

- 10 "areas of special importance for the common dolphin and other cetaceans": Kalamos (Greece); the Alborán Sea (Morocco and Spain); waters surrounding the island of Ischia (south-eastern Tyrrhenian Sea, Italy); waters surrounding the island of Malta and south-eastern Sicily, Italy; the eastern Ionian Sea and the Gulf of Corinth (Greece); the Sazani Island – Karaburuni Peninsula (Adriatic and Ionian Sea, Albania); the Saronikos Gulf and adjacent waters (Argo-Saronikos and southern Evvoikos Gulf, Greece); waters surrounding the northern Sporades (Greece); the northern Aegean Sea (Greece); and waters surrounding the Dodecanese (Greece);
- three "areas of special importance for Black Sea cetaceans": the Kerch Strait for the bottlenose dolphin and the harbour porpoise (Russian Federation, Ukraine); Cape Sarych to Cape Khersones for bottlenose and common dolphins and the harbour porpoise

(Ukraine); and Cape Anaklia to Sarp for the common dolphin and the harbour porpoise (Georgia);

• five "areas of special importance for bottlenose dolphins": the Amvrakikos Gulf (northwestern Greece); waters along east coast of the Cres-Lošinj archipelago (designated as part of Croatian ecological network, proposed for protection as regional park, and recognized as a potential NATURA 2000 site); the Turkish Straits System (also used by all Black Sea cetacean species); North western area of Sardinia (Italy); and the Tuscany archipelago (Italy);

• one "area of special importance for the sperm whale": Southwest Crete and the Hellenic Trench (Greece); and

• three "areas of special importance and diversity for various cetacean species": the Alborán Sea and the Strait of Gibraltar, critical habitat and migration corridor for large numbers of ten of the region's cetacean species, being the most diverse cetacean habitat in the ACCOBAMS region; the Strait of Sicily for fin whales and common, bottlenose and striped dolphins; and the Sallum marine protected area (Egypt), sensitive marine ecosystems, including seagrass meadows, shallow and intermediate depth marine habitats.

More than a decade has now passed since the adoption of Resolution 4.15, and while some of the areas listed in the Resolution's annex have been subjected to various levels of protection, many others still haven't. Nevertheless, also the designation of areas as IMMAs and CCH can be fulfilling a protective role by bringing such designations to the attention of managers and decision-makers in other ways, e.g., in the drafting of Marine (or Maritime) Spatial Plans and in the evaluation of specific Environmental Impact Assessments.

Conservation Management Plans

Conservation Management Plans (CMPs) are a species-based conservation initiative by the International Whaling Commission, aimed at protecting and rebuilding vulnerable cetacean populations within a framework of international collaboration. CMPs are voluntary, led by the concerned range states, and provide a coordinated and collaborative framework for addressing transboundary gaps in existing conservation measures.

The CMP methodology has also been adopted by ACCOBAMS. Currently, CMPs are being developed for fin whales, Risso's dolphins, bottlenose dolphins and common dolphin in the Mediterranean Sea. CMPs for sperm whales will also likely to be drafted in the near future.

Key components of CMPs include: a) focusing on actions that are practical and achievable; b) CMP documents must be "living", i.e., reviewed periodically against measurable milestones based on monitoring, assessment, and compliance with agreed measures; and c) CMPs to be designed to complement existing measures rather than replacing them. Criteria for population/species selection for being the object of a CMP include:

- population status (i.e. knowledge of where the population is now in relation to its unexploited abundance, with an estimate of future trend) has been assessed and is of concern, and actual or likely human activities that can negatively impact the population have been identified; or
- population status has not been assessed but human impacts are believed to be substantial and thus of concern; or
- present abundance is known and actual or likely human activities that can negatively impact the population have been identified; or
- present abundance and trend are not well known but abundance is believed to be small such that any adverse impacts as a result of human activity may be critical.

Conclusi

The need to conserve marine biodiversity is today a globally accepted principle, enshrined in several international agreements and conventions, most notably the Convention on Biological Diversity (CBD), which is in force since 1993 and has today 196 Parties. With even greater significance, the Convention on the Conservation of Migratory Species of Wild Animals (CMS) capitalizes on mechanisms for international cooperation for protecting species that move, regularly and predictably, across national borders and between areas beyond and within national jurisdictions. Quite fittingly, ACCOBAMS is a "daughter agreement" of CMS. Furthermore, the relevant regional seas organisations for the Mediterranean and the Black Sea, respectively the Barcelona Convention and the Bucharest Convention, support the ACCOBAMS mandate by ensuring that the UNEP MAP Regional Activities Centre for Specially Protected Areas (RAC/SPA) and the Black Sea Commission act as the Agreement's Sub-Regional Coordinating Units.

Marine mammals, and cetaceans in particular, in their quality of apex predators represent an important element of marine biodiversity, which is, however, seriously threatened in most of the world's marine ecosystems. In particular, cetaceans living in the Mediterranean and Black Seas must face the manifold pressures which are exerted on the marine environment by a variety of human activities in these semi-enclosed seas. Cetaceans are very mobile species, and many are highly migratory. With few exceptions, these mammals are not confined to waters within the jurisdiction of any single nation, and this is particularly true in the ACCOBAMS area, where many countries have not declared their Exclusive Economic Zones (EEZs). By contrast, critical habitats of most cetacean populations living in the Mediterranean and Black Seas extend across waters under the jurisdiction of different nations, as well as across the remaining areas beyond national jurisdiction (ABNJ) in the region. By consequence, cetaceans offer an exemplary case in which conservation needs cooperation amongst the different countries, and this is the very raison-d'être of an organisation such as ACCOBAMS.

Despite clear indications that most cetacean populations living in ACCOBAMS waters are reduced in comparison to the recent past, even only a century ago, the region still hosts a considerable diversity of species, and

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specific areas exist where cetaceans are found in remarkable densities. Quite importantly, cetacean taxa from the region, and under the remit of ACCOBAMS, are genetically distinct from their oceanic counterparts, and some are even endemic subspecies. Their extirpation would be a terrible loss for global biodiversity, and a dramatic reduction of the range of the more cosmopolitan species in the best of cases.

Research and monitoring efforts stimulated by ACCOBAMS during the past two decades demonstrate that, whilst no cetacean species has been extirpated yet from the region as the influence of the effects of human activities at sea continues to increase, there can be no room for complacency. Whereas it is true that some species are now considered to be faring better than we thought a decade ago, many other species are still teetering at the edge of the cliff and need constant dedication until their status will improve and they return to a safe zone. The renewed challenge for ACCOBAMS and all the institutions and people concerned with the future of Mediterranean cetaceans should consist not only in their conservation, but in the active restoration of their numbers and their habitats, so that populations are allowed to reconquer their historical ranges (Bearzi & Reeves 2021). Furthermore, conservation efforts should not simply target the restoration of population sizes. Conservation cannot be reduced to mere survival: cetaceans should be allowed to feel comfortable in their habitats, and to be freed from the constant struggle of drowning in a net, being sliced by the propeller of a ship, being deafened by some human contraption, or sickened for having ingested man-made poison or plastics.

Results will be achieved only if all the concerned powers will more heartfeltly support the good work of ACCOBAMS, of its Secretariat and its Scientific Committee. Decision-makers should rest assured that the scientific community shall continue to do its part not only by continuing to fill the knowledge gaps and conduct monitoring, but also as a stakeholder in its own right (Notarbartolo di Sciara & Hoyt 2020). Convinced support for cetacean conservation is needed on the tables where policies are discussed and financial resources are allocated, and in the reality of the natural environment where measures are applied. This is what a growing portion of civil society is asking for.

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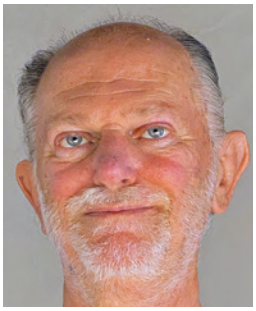
90. ©Cascadia Research/R.W. Baird - Breaching False killer whale *Pseudorca crassidens*
91. ©F. Innocenti, Short-finned pilot whales *Globicephala macrorhynchus*, 23 May 2010, 4 n.m. off Cattolica, provided as by Marco Affronte, Fondazione Cetacea.
©Shutterstock/J.J. Everitt - Short-finned pilot whale *Globicephala macrorhynchus*
92. ©Pelagos Cetacean Research Institute/S. Rapanis - On 7 November 2017 a solitary Indian Ocean humpback dolphin *Sousa plumbea* was sighted in Karavolas Bay, near the port of Heraklion, Crete, Greece. This was the first record away from the SE Mediterranean coasts, where the species was first observed as a lessepsian marine mammal (Frantzis 2018)
93. ©Shutterstock/M. Trinkuniene
96. ©TUDAV/A. Tonay - A Black Sea harbour porpoise *Phocoena phocoena relicta* bycaught in a turbot bottom gill net, August 2015.
©TUDAV/A. Tonay - A Black Sea bottlenose dolphin *Tursiops truncatus ponticus*, Istanbul Strait, June 2017
100. ©TUDAV /A. Öztürk - Stranded Black Sea bottlenose dolphin killed by a shotgun in the Istanbul Strait
©TUDAV/A. Dede - A sperm whale rescued from bycatch in Turkey.
©Green Balkans NGO/D. Popov - Black Sea harbour porpoises *Phocoena phocoena relicta* bycaught in a turbot bottom gill net
101. ©Pelagos Cetacean Research Institute/A. Frantzis - An emaciated, young male sperm whale was found dead in Mykonos Island (Aegean Sea, Greece) in 2006. His stomach contained nearly 120 plastic bags, ropes and fishing nets.
This aerial photograph (Alexiadou *et al.* 2019) shows all the plastic debris found (ca. 33 m^2) in the stomach laid on a tennis court. As a scale, the people in the frame are 1.71 m tall each. The scientists of the Pelagos Cetacean Research Institute traced the origin for some of the ingested plastics and found that one plastic bag came from a souvlaki restaurant in Northern Greece (Thessaloniki); plastic garbage bags of both Greek and Turkish origin were found as well as packaging from Turkish biscuits and from an Iced Tea six can pack, among other items.
102. ©TUDAV/A. Dede - Stranded Black Sea common dolphin in the Turkish western Black Sea coast.
©Pelagos Cetacean Research Institute/L. Aggelopoulos - An atypical mass stranding of up to ten Cuvier's beaked whales (*Ziphius cavirostris*) occurred on the 1st April 2014 along the coasts of S and SW Crete, Greece, Mediterranean Sea, while the trilateral naval exercise "Noble Dina 2014" was taking place off the south Cretan coasts. War-ships from Greece, Israel and USA participated in the military manoeuvres, which included anti-submarine warfare (ASW) and use of military sonar. A minimum of six and a maximum of ten whales – almost all stranded alive – were involved in this mass stranding, which was the last of a series of mass strandings that occurred in Greece during military sonar use.
Most of them stranded alive and died later agonizing on the shore.
©Tethys Research Institute/L. Gordigiani - Fluker, the fluke-less female fin whale *Balaenoptera physalus physalus*
103. ©TUDAV/A. Dede - A black Sea bottlenose dolphin with missing dorsal fin
104. ©Shutterstock/J. Ozkaritz - Long-finned Pilot whale *Globicephala melas,* Gran Canaria, Spain
119. ©Shutterstock/A. Armyagov
122. ©Shutterstock/wildestanimal - Fin Whale *Balaenoptera physalus*, at the surface, Atlantic Ocean, Pico Island, The Azores.
126. ©Shutterstock/A. Izzotti - Cuvier's Beaked whale *Ziphius cavirostris*
141. ©Shutterstock/T. Fairbank - Long-finned Pilot whale *Globicephala melas*
156. ©Shutterstock/J. Mika - Two common Dolphins *Delphinus delphis* in the Strait of Gibraltar.

Authors' biographies



Giuseppe Notarbartolo di Sciara is a marine conservation ecologist who has been concerned for over 40 years with the advancement of knowledge of the natural history, ecology, behaviour, and taxonomy of marine mammals and cartilaginous fishes, has described a new species of manta ray, and published more than 230 scientific papers. During the past 30 years he has concentrated efforts on conservation, in particular through the development of marine protected areas and the identification of Important Marine Mammal Areas. In the early '90s he has spearheaded the creation of the first high-seas marine protected area, the Pelagos Sanctuary for Mediterranean Marine Mammals, established in 2002 by a treaty among France, Italy and Monaco. He has been responsible for the leading and management of governmental and private, national and international science and conservation organisations, including the Tethys Research Institute, the Italian Central Institute for Applied Marine Research (ICRAM), and the European Cetacean Society. Dr. Notarbartolo di Sciara is the Co-chair of the IUCN Marine Mammal Protected Areas Task Force. He has chaired the Scientific Committee of ACCOBAMS from the beginning of the agreement until 2010, and currently serves as the COP-appointed Councillor for aquatic mammals at the Convention on Migratory Species. In 2009 he received the Knighthood in the Order of St. Charles from H.S.H. the Prince Albert II of Monaco (for more details: www.disciara.org).

Arda M. Tonay was born in 1976 in Istanbul. He graduated from the Faculty of Fisheries before completing his MSc and PhD in Marine Biology at the Institute of Science, Istanbul University (I.U.) in 2010. He has been working at the Marine Biology Department, Faculty of Aquatic Sciences in I.U. since 2001, as Assoc. Prof. since 2018. Arda's research and work focuses mainly on cetacean strandings, bycatch, life history and conservation. He is the vice president of Turkish Marine Research Foundation (TUDAV), and currently the Black Sea regional representative of ACCOBAMS Scientific Committee.

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