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ACTION PLAN FOR THE CONSERVATION OF CETACEANS IN THE MEDITERRANEAN SEA

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UN environment programme | Mediterranean Action Plan Barcelona Convention | SPA / RAC

ACTION PLAN FOR THE CONSERVATION OF CETACEANS IN THE MEDITERRANEAN SEA

Table of contents

1. INTRODUCTION

The Contracting Parties to the Barcelona Convention, within the framework of the Mediterranean Action Plan, give priority to the conservation of the marine environment and to the components of its biological diversity. This was confirmed by the adoption of the 1995 Barcelona Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) and of its annexes, among them a list of endangered or threatened species.

Elaborating and implementing action plans to conserve one species or group of species is an effective way of guiding, coordinating and strengthening the efforts the Mediterranean countries are making to safeguard the natural heritage of the region. Although they do not have a binding legal character, these action plans were adopted by the Contracting Parties as regional strategies setting priorities and activities to be undertaken. In particular, they call for greater solidarity between the States of the region, and for coordination of efforts to protect the species in question. This approach has proved to be necessary for ensuring conservation and sustainable management of the concerned species in every Mediterranean area of their distribution.

These Action Plans constitute mid-term regional strategies that should be updated every five years, based on an evaluation of their implementation at regional and national levels. For the biennium 2020-2021, the Contracting Parties to Barcelona Convention requested SPA/RAC during the CoP 21 (Naples, Italy, 2-5 December 2019) to update the Action Plan for the conservation of cetaceans.

This update process was done in close collaboration with ACCOBAMS, given that the common obligations relating to cetaceans under the Protocol on Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol) are fulfilled through the implementation of ACCOBAMS (COP 14, Slovenia 2005) and the new Memorandum of Collaboration between ACCOBAMS and SPA/RAC, signed in Monaco on October 15, 2020, defining the joint ACCOBAMS - SPA/RAC work program for the period 2020-2022.

The Mediterranean Sea, Mare Mediterraneum (Latin for a “sea in the middle of the land”), is the largest (2,969,000 km^2) and deepest (average 1,460 m, maximum 5,267 m) enclosed sea on Earth. It is a marine biodiversity hotspot, with approximately 17,000 marine species occurring within its basin (Coll *et al,* 2010). Its cetacean diversity is also remarkable: twenty-five species of cetaceans occur or have occurred at various degrees of abundance in the Mediterranean Sea. Eleven species occur regularly, with resident populations in the basin (Table 1). In addition, the North Atlantic minke whale *Balaenoptera a. acutorostrata*, the North Atlantic humpback whale *Megaptera n. novaeangliae* and the false killer whale are considered visitors, while the remaining 11 species are very rare (Table 2).

Table 1

Cetacean species with regular occurrence and resident populations in the Mediterranean Sea and their common names in English, French and Arabic.

(Cetacean names in Arabic are usually direct translation from the English version but some Arabic countries translate the French names instead. When two options are given, the upper name refers to English and the lower to French).

Cetacean species represented by populations regularly present in the Mediterranean
(Drawings of Massimo Demma)

Species	English	French	Arabic
 *Balaenoptera physalus*	Fin whale	Rorqual commun	الحوت الزعنفي روكال شائع
 *Physeter macrocephalus*	Sperm whale	Cachalot	حوت العنبر
 *Ziphius cavirostris*	Cuvier's beaked whale	Ziphius	حوت كوفيير المنقاري زيفيوس
 *Orcinus orca*	Orca	Orque	الحوت القاتل اوركا
 *Globicephala melas*	Long-finned pilot whales	Globicéphale noir	الحوت القائد جلوبيسيفالوس
 *Grampus griseus*	Risso's dolphin	Dauphin de Risso	دلفين ريسو جرامبوس
 *Steno bredanensis*	Rough-toothed dolphin	Sténo	الدلفين ذو الاسنان الخشنة ستينو
 *Tursiops truncatus*	Common bottlenose dolphin	Grand dauphin	الدلفين زجاجي الانف الدلفين الكبير
 *Stenella coeruleoalba*	Striped dolphin	Dauphin bleu et blanc	الدلفين المخطط الدلفين الأبيض والازرق
 *Delphinus delphis*	Common dolphin	Dauphin commun	الدلفين الشائع
 *Phocoena phocoena relicta*	Harbour porpoise	Marsouin commun	خنزير البحر

Table 2

Cetacean species occurring, or having occurred, in the Mediterranean Sea. Regular species outlined in grey. Habitat (preferred in bold) and status are indicated only for species recognized as regular.

(Adapted from ACCOBAMS, 2021. Conserving Whales, Dolphins and Porpoises in the Mediterranean Sea, Black Sea and adjacent areas: an ACCOBAMS status report. By Giuseppe Notarbartolo di Sciara and Arda Tonay. In preparation.)

	Species/ subspecies	English name	Classification	Presence	Habitat	Current status (IUCN)
1	*Eubalaena glacialis*	North Atlantic right whale	Mysticeti, Balaenidae	Very rare		
2	*Balaenoptera a. acutorostrata*	North Atlantic minke whale	Mysticeti, Balaenopteridae	Visitor		
3	*Balaenoptera b. borealis*	Northern Sei whale	Mysticeti, Balaenopteridae	Very rare		
4	*Balaenoptera p. physalus*	North Atlantic fin whale	Mysticeti, Balaenopteridae	**Regular**	**Oceanic**, slope, neritic	Vulnerable
5	*Megaptera n. novaeangliae*	North Atlantic humpback whale	Mysticeti, Balaenopteridae	Visitor		
6	*Eschrichtius robustus*	Grey whale	Mysticeti, Eschrichtiidae	Very rare		
7	*Physeter macrocephalus*	Sperm whale	Odontoceti, Physeteridae	**Regular**	**Slope**, oceanic	Endangered
8	*Kogia sima*	Dwarf sperm whale	Odontoceti, Kogiidae	Very rare		
9	*Hyperoodon ampullatus*	Northern bottlenose whale	Odontoceti, Ziphiidae	Very rare		
10	*Mesoplodon bidens*	Sowerby's beaked whale	Odontoceti, Ziphiidae	Very rare		
11	*Mesoplodon densirostris*	Blainville's beaked whale	Odontoceti, Ziphiidae	Very rare		
12	*Mesoplodon europaeus*	Gervais' beaked whale	Odontoceti, Ziphiidae	Very rare		
13	*Ziphius cavirostris*	Cuvier's beaked whale	Odontoceti, Ziphiidae	**Regular**	**Slope**, oceanic	Vulnerable
14	*Delphinus d. delphis*	Common dolphin'	Odontoceti, Delphinidae	**Regular**	**Neritic, slope, oceanic**	Endangered
15	*Globicephala macrorhynchus*	Short-finned pilot whale	Odontoceti, Delphinidae	Very rare		
16	*Globicephala m. melas*	North Atlantic long-finned pilot whale	Odontoceti, Delphinidae	**Regular**	**Oceanic**, slope, neritic	Endangered (proposed)
17	*Grampus griseus*	Risso's dolphin	Odontoceti, Delphinidae	**Regular**	**Slope**, oceanic	Vulnerable (proposed)
18	*Orcinus orca*	Orca	Odontoceti, Delphinidae	**Regular**	**Neritic, slope, oceanic**	Critically Endangered
19	*Pseudorca crassidens*	False killer whale	Odontoceti, Delphinidae	Visitor		
20	*Sousa plumbea*	Indian Ocean humpback dolphin	Odontoceti, Delphinidae	Very rare		
21	*Stenella coeruleoalba*	Striped dolphin	Odontoceti, Delphinidae	**Regular**	**Oceanic**, slope	Least Concern (proposed)
22	*Steno bredanensis*	Rough-toothed dolphin	Odontoceti, Delphinidae	**Regular** in the Levantine Sea, visitor	**Oceanic, slope,** neritic	Data Deficient (proposed)

23	*Tursiops t. truncatus*	North Atlantic bottlenose dolphin	Odontoceti, Delphinidae	**Regular**	**neritic,** oceanic	Least Concern (proposed)
24	*Phocoena p. phocoena*	North Atlantic harbour porpoise	Odontoceti, Phocoenidae	very rare		
25	*Phocoena p. relicta*	Black Sea harbour porpoise	Odontoceti, Phocoenidae	**regular** in N. Aegean Sea	**Neritic**	Endangered

The Mediterranean region has been inhabited by humans for millennia. Among the planet's marine environments, the Mediterranean Sea is one of the most affected by anthropogenic activities. Concentration of human populations and activities around the basin cause substantial impacts to the marine and coastal environments, threatening the structure and function of natural ecosystems and the quality and abundance of natural resources to varying degrees. The State of the Mediterranean Marine and Coastal Environment Report 2012 (UNEP/MAP, 2012) highlighted the following as the major issues requiring coordinated policy and management responses to stop the degradation of the Mediterranean ecosystems: coastal development and sprawl, chemical pollution, eutrophication, marine litter, marine noise, invasive non-indigenous species, over-exploitation, sea-floor integrity, changed hydrographic conditions, marine food webs, and biodiversity.

This complex scenario of multiple pressures acting simultaneously puts certain habitats and species at high risk. As very mobile, long-lived vertebrates situated at the highest levels of the marine trophic webs and with very low reproductive rates, cetaceans are among those species at risk. Accordingly, nations bordering the Mediterranean and Black Seas created a legal instrument to ensure the survival of whales and dolphins in the area: The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), which came into force in 2001. Besides this, and in addition to national legislation, other European and international regulations are also of relevance, either directly or indirectly, to cetacean conservation (Table 3).

Table 3

European legislations, international environmental agreements and Intergovernmental organisations relevant to cetacean protection in the Mediterranean Sea.

European 	Habitats Directive (1992)	• The directive's overarching goal strives to ensure the "preservation, protection and improvement of the quality of the environment, including the conservation of natural habitats and wild fauna and flora". Cetacean species are listed in annexes II and IV. • Establishes a Community-wide network of nature protection areas known as Natura 2000 with the aim of assuring the long-term survival of Europe's most valuable and threatened species and habitats. The responsibility for proposing sites for Natura 2000 lies with the Member States.
	Pelagos Sanctuary (1999)	• France, Italy and the Principality of Monaco to create jointly coordinated initiatives to protect cetaceans and their habitats from all sources of disturbance: pollution, noise, accidental capture and injury, disruption etc.
	The Mediterranean Regulation (2006)	• Adaptation of the EU Common Fisheries Policy in the Mediterranean Sea context, by laying out the necessary measures for the sustainable exploitation of fishery resources. • Regulation of the European Parliament and of the Council for fisheries technical measures. Newest version Regulation (EU) 1241/2019.
	Marine Strategy Framework Directive (2008)	• Establishment of a framework within which Member States shall take the necessary measures to achieve or maintain good environmental status2 in the marine environment by the year 2020 at the latest. • Designated to create a synergy with the Habitats Directive for marine protection.
International 	Barcelona Convention (1976 and 1995)	• "Convention for the protection of the marine environment and the coastal region of the Mediterranean". The Mediterranean Action Plan of the United Nations Environment Programme (UNEP/MAP) acts as its Secretariat. • Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean. • Action Plan for the conservation of Mediterranean cetaceans" (1991).
	Bonn Convention (1979)	• The Convention on the Conservation of Migratory Species of Wild Animals (CMS).
	ACCOBAMS (1996)	• The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area.
	CITES (1973)	• The Convention on International Trade in Endangered Species of Wild Fauna and Flora, also known Washington Convention. • Forbids trade in endangered species (e.g., cetaceans)
	Bern Convention (1979)	• The Convention on the Conservation of European Wildlife and Natural Habitats, also known as Bern Convention. • Places all cetaceans regularly found in the Mediterranean in Appendix I (strictly protected fauna species).
	Convention on Biological Diversity (1992)	• Also known as CBD, although not explicitly referring to cetaceans, urges Contracting Parties to develop national programmes that will safeguard their natural heritage and biological diversity.
	UNCLOS (1982)	• United Nations Convention on the Law of the Sea. • It has special provisions for marine mammals (Art. 65: "States shall cooperate with a view to the conservation of marine mammals...")
	GFCM (1949)	• The General Fisheries Commission for the Mediterranean was established under the provisions of Article XIV of the Constitution of the Food and Agriculture Organization of the United Nations (FAO). • Its main objective is to ensure the conservation and the sustainable use of living marine resources as well as the sustainable development of aquaculture in the Mediterranean and in the Black Sea.
	IWC (1946)	• The International Whaling Commission is the global body charged with the conservation of whales and the management of whaling. • Currently 88 member governments from countries all over the world. Today IWC works to address a wide range of conservation issues.

2. MAIN THREATS

Main threats faced by cetacean species in the Mediterranean Sea are reviewed below:

2.1 Fisheries interactions

Bycatch in fishing gear (legal/illegal, ghost nets)

Interactions between cetaceans and fisheries in the Mediterranean Sea are probably as old as the first human attempts to catch fish with a net (Bearzi, 2002). Direct fisheries interactions pose a serious threat to the survival of many populations and some species of marine mammals, with bycatch (incidental mortality and injury caused by fisheries from accidental entanglement) being the most acute problem (Read, 2008; Brownell *et al*. 2019). Various types of fishing gear can lead to cetacean bycatch, including passive and active nets, longlines, traps and discarded or lost nets and lines. More than observed bycatch rates themselves, the evidence of entanglement observed in stranded cetaceans in the past few years shows the strong impact of fisheries on Mediterranean (and Black Sea) cetacean populations (ACCOBAMS, 2019). Additionally, larynx entanglement or laryngeal strangulation has also been shown as a cause of death in dolphins depredating fishing gear. During these depredation events dolphins may swallow the net, which may get wrapped around the larynx, get lodged in the stomach or cut into laryngeal tissue (Đuras Gomerčić *et al*. 2009).

Recently, the incidental catch of cetaceans in Mediterranean fisheries has decreased with respect to earlier periods, when marine mammal bycatch, caused mainly by pelagic driftnets, was relevant (also for other groups of large marine vertebrate species). The use of these nets was banned in 2005, and since then, only a few studies have reported on the bycatch of marine mammals from other fisheries in the Mediterranean Sea.

Currently, the types of vessel groups with the greatest rates of interactions with marine mammals seem to be those using set gillnets and trammel nets in coastal areas.

In terms of species bycatch composition, the recorded species of cetaceans decreased considerably once large driftnets were banned and subsequently dismissed. Currently, medium-small cetacean species, such as the striped dolphin (Stenella coeruleoalba), the bottlenose dolphin (Tursiops truncatus) and the common dolphin (Delphinus delphis) are sporadically found in bycatch reports (GFCM SOMFI 2020).

In recent decades, the use of static nets extending to the continental slopes in all coastal fisheries has led to an increased risk of fishing gear loss and thus to unaccounted catches Fishing gear can be lost accidentally during storms, but it can also be abandoned deliberately. In the Mediterranean, despite the scarcity and inconsistency of data on derelict fishing gear, this has been recognized as an issue of major concern. The main impacts of abandoned or lost fishing gear are not only the continued catches of fish, but also of other animals such as whales and dolphins. Additional impacts include alterations of the sea-floor environment (FAO, 2019).

Overfishing and prey depletion.

The Mediterranean Sea is one of the most intensely fished regions in the world and hosts a substantial fishing fleet comprising an estimated 76,280 fishing vessels, of which small-scale fishing vessels represent approximately 82% (FAO, 2020). The intense fishing effort is depleting fish populations and impacting many vulnerable species, including cetaceans but also sharks, Mediterranean monk seals Monachus monachus and sea turtles. Unsustainable fishing has contributed to dramatic ecological changes in the Mediterranean Sea (Sala, 2004), where overfishing is well documented and has had negative effects on prey availability for marine mammals, especially for small cetaceans (Piroddi *et al*. 2010).

Depredation by cetaceans

Fish depredation by dolphins appears to be recurrently perceived by Mediterranean fishers to be causing economic hardship, particularly as far as small-scale fisheries are concerned, by causing damage to fishing gear and disturbing fishing activities (Bearzi, 2002). However, dolphin depredation is not limited exclusively to small-scale fisheries and has been also reported, for instance, in purse seiners in Tunisia and Morocco (Benmessaoud *et al.* 2018). Ecosystem damage resulting from overfishing and habitat degradation in the Mediterranean Sea has probably exacerbated the perception that dolphins reduce fishery yields (Reeves *et al.* 2001). Therefore, the economic damage caused by dolphins generates conflict with fishers and, although rarely, may lead to intentional kills in retaliation, as well as to occasional demands for organized culls in some places.

2.2 Intentional Killings

In some Mediterranean areas, direct killings and bounties for dolphins represented the first human attempts to solve the problem of depredation and competition, a strategy that was supported by several governments and went on until the late 1960s. Nowadays, approaches to marine mammal control such as culling, or harassment are illegal in most Mediterranean countries and are no longer viewed as appropriate by most fishing organizations. Although direct killings are still occasionally enacted by individual fishers or other people, intentional killings likely do not pose a conservation problem to Mediterranean cetacean populations anymore.

2.3 Ship strikes

The Mediterranean Sea is subject to some of the heaviest vessel traffic in the world, with about 30 % of the world's total merchant shipping concentrated within only 0.8 % of the global ocean surface.

Collisions with large vessels present a major conservation issue for both fin whales (*Balaenoptera physalus*) (David *et al.* 2011; Panigada *et al.* 2006) and sperm whales (*Physeter macrocephalus*) (Di Méglio *et al.* 2018; Frantzis *et al.* 2019). Fin whales and sperm whales are listed as Vulnerable (VU) and Endangered (EN) under the IUCN Red List Criteria respectively, underlying the urgent need to reduce and mitigate any anthropogenic pressure. An analysis of stranding and collision records showed that the fin whale is the most vulnerable species to ship strikes in the North-Western Mediterranean Sea. Unusually high rates of ship collisions have been reported for this species in the region, where the minimum mean annual fatal collision rate increased from 1 to 1.7 whales/year from the 1970s to the 1990s. It should also be noted that reported strikes greatly underestimate the true number of strikes. The highest number of collisions with fin whales occur in summer, during their feeding season when they are more often encountered, and when the traffic in ferries and passenger ships increases in the area. Collisions with fin whales tend to occur predominantly on the main passenger ship routes that cross the basin.

Sperm whales also are vulnerable to ship strikes, particularly on the main cargo routes that travel parallel to the Italian and French coastlines and along the Hellenic Trench, where sperm whale occurrence and naval traffic overlap substantially (Frantzis ***et al***. 2019).

2.4 Underwater noise

Underwater noise from various maritime activities is recognised as a chronic, habitat-level stressor (Williams *et al.* 2020) and can adversely affect cetaceans in a number of ways. In the most severe cases, such as extremely high levels of acute noise (e.g., from seismic vessels or drilling projects of the offshore industry), this can result in permanent threshold shift or even tissue damage leading to stranding and death. Both acute and chronic noise - at various spatial and temporal scales - can affect cetaceans through a range of mechanisms, including temporary threshold shifts, spatial displacement and habitat exclusion, masking of sounds relevant to communication and foraging, disturbance and elevated stress levels, and modifications of short-term and possibly long-term behaviour (Southall *et al.* 2007; Weilgart 2007; Clark *et al.* 2009; Williams *et al*. 2020). These may lead to impacts on feeding and energetic balance, as well as on reproduction, potentially leading to population-level consequences. In addition to vessel traffic of all types and purposes (cargo, transport, fishing, tourism, whale watching, research), noisy activities can arise from geophysical exploration, military activities (sonar and explosions), dredging and coastal and offshore development (e.g., offshore windfarms). Potentially, the noise emitted by vessels may also affect the ability of cetaceans to avoid collisions with vessels.

2.5 Disturbance from boat traffic

There has been a great expansion of recreational boat traffic and shipping in the Mediterranean Sea in recent decades. The relatively closed nature of the Mediterranean Sea, its densely populated coastlines and prominent presence of tourism likely make cetaceans in this basin particularly susceptible to the impacts of recreational boat traffic and the associated acoustic disturbance. A number of studies demonstrated behavioural changes (including acoustic behaviour) in response to recreational boat traffic in some species (Papale *et al.* 2011), as well as temporary avoidance of areas with high vessel density of recreational boat traffic (La Manna *et al.* 2010; Gonzalvo *et al.* 2014), although a certain degree of tolerance has been also reported (La Manna *et al.* 2013). In addition to its potential to disrupt foraging, socializing or resting behaviour, as well as increase stress levels (see also 4-Underwater noise), boat traffic may also lead to serious injuries or death from boat strikes, as described above.

2.6 Cetacean-watching (including swimming-with)

Invasive approaches of boats (e.g., from cetacean-watching activities or even non-careful research activities) can disturb cetaceans through direct physical presence and/or via emitted noise and may interrupt important behaviours, such as feeding and reproduction (Jahoda *et al.* 2003). Long-term vessel presence can also exclude animals from preferred habitat (see also 4-Underwater noise).

Unregulated cetacean-watching activities, which may grow very fast in some areas, may have detrimental population-level effects, which need to be mitigated and prevented.

Close and invasive approaches, such as those related to swim-with operations, should be prohibited in accordance with guidance from ACCOBAMS, the Pelagos Sanctuary Agreement and the IWC, as they may lead to severe disturbance to the animals.

It is noteworthy to consider also that Unmanned Aerial Vehicles (UAVs), or drones, have recently emerged as a relatively affordable and accessible method for studying, photographing and filming cetaceans. For many cetacean watching operators this relatively new, rapidly evolving and increasingly affordable technology is seen as a good opportunity to obtain spectacular images and footage for promoting their business.

2.7 Chemical pollutants

Effects of chemical pollutants on cetaceans are varied and can be both direct and indirect. They include immunosuppression (Tanabe *et al.* 1994), endocrine disruption (Tanabe *et al.* 1994 ; Vos *et al.* 2003 ; Schwacke *et al.* 2012), reproductive impairment (Schwacke *et al.* 2002) and developmental abnormalities (Tanabe *et al.* 1994 ; Vos *et al.* 2003). Pollutants may directly impact abundance through reduced reproduction or survival (Hall *et al.* 2006; Hall *et al.* 2017), while indirect effects include impacts on the abundance or quality of cetacean prey. Although organochlorine contamination has generally decreased in several areas, levels in several Mediterranean cetaceans remain alarmingly high (Jepson *et al.* 2016; Marsili *et al.* 2018; Genov *et al.* 2019). Currently, Polychlorinated Biphenyls (PCBs) are likely the greatest contaminant threat to cetaceans (Jepson *et al.* 2016). Within the Mediterranean Sea, PCB concentrations in bottlenose dolphins, a species widespread across the basin, generally decline from north to south, and from west to east (Genov *et al.* 2019), in line with a general gradient of human activities in this basin. The Mediterranean Sea may also be particularly vulnerable to contamination by mercury, due to its semi-enclosed nature, as well as the relatively high presence of this heavy metal from both natural and anthropogenic sources (Andre *et al.* 1991).

2.8 Marine debris (macro/micro)

Plastic pollution has become one of the biggest environmental concerns of the Anthropocene, as it represents a major threat to both wildlife and human health. The Mediterranean Sea is one of the most plastic polluted environments. This acute marine pollution might threaten entire ecosystems through its impact on marine fauna (entanglement, ingestion, contamination), eventually impacting the tourism industry and the well-being of Mediterranean populations (Lambert *at el.*, 2020).

Different cetacean species may be threatened by marine debris to varying degrees (Baulch & Perry 2014), with deep-diving odontocetes apparently particularly vulnerable to ingestion of plastic macro debris (Simmonds 2012; de Stephanis *et al.* 2013). Baleen whales such as the Mediterranean fin whale may be especially vulnerable to the ingestion of microplastics due to their feeding mechanisms. The interaction between free-ranging fin whales and microplastics in the Mediterranean Sea and elsewhere has only recently started to be investigated. Fossi *et al.* (2012) found considerable quantities of microplastics and plastic additives in surface water samples of and adjacent to the Pelagos Sanctuary. More recent studies suggest that debris, including micro-plastics and chemical additives (e.g. phthalates), tend to accumulate in pelagic areas in the Mediterranean (Fossi *et al.* 2016, 2017),indicating a potential overlap between debris accumulation areas and fin whale feeding grounds. Exposure to microplastics (direct ingestion and consumption of contaminated prey) poses a major threat to the health

of fin whales in the Mediterranean Sea. Microplastics have also been found in a number of odontocete species, but the scale of impacts is still poorly understood (Nelms *et al.* 2019).

2.9 Habitat loss and degradation

Habitat degradation can be defined as 'those processes of anthropogenic origin that make habitats less suitable or less available to marine mammals' (IWC, 2006). It is often difficult to separate physical degradation of certain activities (i.e., physical damage to the habitat such as coastal development or bottom trawling) from other factors associated with those activities (e.g., high levels of noise resulting from coastal development or trophic web effects). Either way, directly or indirectly human development activities (both coastal and pelagic) in key cetacean habitats can have serious adverse impacts.

Reduced habitat quality and loss of critical habitat can be caused by coastal and offshore development, marine engineering, port and dam construction, opening and closing of waterways, and exploitation of marine resources (e.g., resulting in sea floor modifications, changes in water quality, eutrophication and harmful algal blooms). The resulting disruption of cetacean behaviour might compromise an individual's energy balance and, consequently, population vital rates (e.g., survival and reproduction). Moreover, when this disruption affects most individuals in a population, it can translate into changes in population dynamics. It has been reported, for instance, that higher intensities of dredging related to a harbour expansion project caused bottlenose dolphins to spend less time in the harbour, despite high baseline levels of disturbance and the importance of the area as a foraging patch (Pirotta *et al.* 2013).

2.10 Climate change

Climate change is now widely recognized as a global issue (IPCC, 2007), which has also been documented in the Mediterranean Sea. Boero and colleagues (2008) reviewed water temperature and salinity levels over the last decades, reporting higher levels throughout the entire Mediterranean Sea, attributable to climate change. The effects of climate change over the Mediterranean Sea have been the subject of several studies (Gambaiani *et al.* 2009; Lejeusne *et al.* 2009), with predicted changes in prey availability and distribution over the water column and increases in the presence of alien (exotic) species, due to the 'tropicalization' of the entire area (Bianchi, 2007).

As an example, the potential effects of global climate change or ocean acidification on Mediterranean fin whales, largely dependent for feeding on euphausiids such as Meganyctyphanes norvegica (Notarbartolo di Sciara *et al.* 2003), as well as possibly susceptible to an increase in water temperature and salinity (Gambaiani *et al.* 2009), may strongly influence the entire population, leaving no space to move to northern latitudes.

The effects of climate change on Mediterranean cetaceans are currently unknown but cannot be neglected and need further investigation. Impacts may occur because of changes in prey availability, increased intra- and inter-specific competition, potentially increased incidence of pathogens, oceanographic changes or interaction of climate change and fishery pressure (Gambaiani *et al.* 2009).

2.11 Cumulative effects

The above sections discuss threats individually. However, it is clear that some or all of them may interact temporally and/or spatially.

Cumulative effects can be considered as changes in reproduction and/or survivorship that negatively affect population dynamics and status, because of repeated exposure to the same stressor(s) over time, or the combined effects of multiple stressors. Developing robust ways to evaluate this is a complex problem (Stelzenmüller *et al.* 2018). Perhaps the best-developed framework to date is the Population Consequences of Disturbance (PCoD) model (Booth *et al.* 2020), which has been extended to consider the Population Consequences of Multiple Stressors (PCoMS) (National Academies of Sciences, Engineering, and Medicine 2017). This approach moves through the effects of stressors on individuals behaviour and physiology, which is converted to effects on vital rates and then on to population trends and sustainability. However, the approach is extremely data demanding and requires quantitative temporal and spatial information on the target species (distribution, demographics and physiology), their prey and environment, human activities and models linking these - this complexity also contains inherent large levels of predictive uncertainty

Table 4

Threats faced by cetaceans with a regular occurrence and resident populations in the Mediterranean Sea. (The attempt to rank threats affecting these 11 cetacean species should be considered as a purely indicative exercise. For instance, some of these threats may be locally high in a given area but considered medium or low at regional level. Moreover, the sparce use of "?" indicating lack of knowledge does not imply that the rest of "ranked" cells have to be considered as definitive, but as stated above, purelyindicative basedon available evidence)

Balaenoptera physalus									?				
Physeter macrocephalus									?			?	
Ziphius cavirostris		?							?			?	
Orcinus orca												?	
Globicephala melas									?			?	
Grampus griseus									?			?	
Steno bredanensis			?				?	?	?	?	?		
Tursiops truncatus												?	
Stenella coeruleoalba												?	
Delphinus delphis									?			?	
Phocoena phocoena relicta		?	?						?			?	

? High Medium Low None

Bycatch in fishing gear (legal/illegal, ghost nets)

Overfishing and prey deplation

Depredation by cetaceans

Intentional killings

Ship strikes

Underwater noise

Disturbance from boat traffic

Cetacean-watching (including swimming-with)

Chemical polluants

Marine debris (macro/micro)

Habitat loss and degradation

Climate change

Cumulative effects

3. OBJECTIVE OF THIS ACTION PLAN

The main Objective of this Action Plan is to provide a conservation framework and guidance, in line with decisions adopted by international bodies such as ACCOBAMS, the Pelagos Sanctuary Agreement and the International Whaling Commission (IWC), to be used to improve the conservation status of cetacean populations within the Mediterranean Sea.

4. METHODOLOGY

According to the IUCN Red List, several cetacean populations in the Mediterranean Sea are Endangered or Threatened. Consequently, measures to enhance their protection and conservation should be considered as priority actions within this Action Plan by all Parties to the Barcelona Convention when defining the best strategies to implement it with the assistance of ACCOBAMS and SPA/RAC.

Ongoing efforts at the Mediterranean scale, such as the ACCOBAMS Survey Initiative (ASI), have allowed the collection of robust baseline data on presence, distribution, abundance and density of several cetacean species. On the other hand, many important aspects of cetacean biology, behaviour, range and habitats in the Mediterranean are still poorly known.

In drafting this action plan, references to the ongoing programme of work by ACCOBAMS and by the IWC have been taken into careful consideration. As an example, Conservation and Management Plans should be drafted and implemented for most cetacean species in the Mediterranean Sea, in order to properly manage human activities that may have detrimental effects on cetacean populations.

The Action Plan considers the UNEP/MAP Decision IG22/7 on the Integrated Monitoring and Assessment Programme and related Assessment Criteria (IMAP), that aimed at enabling a quantitative, integrated analysis of the state of the marine and coastal environment. IMAP covers three clusters i) pollution and marine litter, ii) biodiversity and non-indigenous species and iii) hydrography. These backbones of the IMAP are the 11 Ecological Objectives and their agreed common indicators, targets and Good Environmental Status (GES) definition. At their 19th Ordinary Meeting (COP 19, Athens, Greece, 9-12 February 2016), the Contracting Parties to Barcelona Convention, when adopting IMAP, stated that species of cetaceans regularly present in the Mediterranean Sea should all be considered when developing the national monitoring and assessment activities. Accordingly, the Contracting Parties should make every effort to identify a minimum of two species (if present) to be included in their national monitoring programme, based on the specificity of their marine environment and

biodiversity, and taking account that these species should belong to at least two different functional groups, where possible (Baleen whales/Deep-diving toothed whales/Shallow-diving toothed whales). Moreover, as far as possible, the choice of monitored species should be coordinated at subregional scale to ensure coherence with cetacean population distribution in the Mediterranean Sea.

Cetaceans are included in two Ecological Objectives of IMAP (EO1 and EO11). EO1 focus on common Indicators 3, 4 and 5 for distribution, abundance, and demography respectively. Most of the actions proposed are expected to provide robust data and inputs relevant for the establishment of a primary, region-wide Standardized Integrated Monitoring and Assessment Programme. Monitoring and assessment of cetacean distribution, abundance and demography at national, sub-regional and regional levels will be used to improve knowledge on the Mediterranean marine environment through the development every cycle of six year a regional assessment product (2023 Mediterranean Quality Status Report (2023 MEDQSR),).

While the different actions have not necessarily been specifically designed according to the EcAp/IMAP process, they are aligned with EcAp/IMAP goals and requirements. The data arising from the implementation of each single action will provide key inputs to address the different indicators targeting cetaceans.

5. REGIONAL COORDINATING STRUCTURE AND IMPLEMENTATION

The coordinating body is composed by SPA/RAC in collaboration with ACCOBAMS with occasional support/advice from its Scientific Committee, which will be helping by:

- providing support to in the implementation of the AP, its review and update every five years;
- providing recommendations and advice on issues related to cetacean conservation;
- providing support on the creation and maintenance of a forum for cetacean conservation experts, where relevant information and experience is shared, exchanges are facilitated,challenges are discussed, cooperative initiatives are enhanced, transparency and openness of procedures are safeguarded (e.g. NETCCOBAMS);
- Regularly reporting to the National Focal Points for SPAs about the implementation of the present Action Plan;
- ensuring that the Mediterranean region is involved in the pertinent international and/or regional initiatives in relation with cetacean monitoring and conservation.

Implementing the present Action Plan is the responsibility of the national authorities of the Contracting Parties. At each of their meetings, the National Focal Points for SPAs shall assess how far the Action Plan is being implemented on the basis of national reports on the subject and a report made by SPA/RAC on implementation at regional level.

In the light of this assessment, the Meeting of National Focal Points for SPAs will suggest recommendations to be submitted to the Contracting Parties. If necessary, the Meeting of Focal Points will also suggest adjustments to the schedule that appears in the Appendix to the Action Plan.

6. PARTICIPATION IN THE IMPLEMENTATION

Implementing the present Action Plan is the province of the national authorities of the Contracting Parties. The concerned international organisations and/or NGOs, laboratories and any organisation or body are invited to join in the work necessary for implementing the Action Plan. At their ordinary meetings, the Contracting Parties may, at the suggestion of the meeting of National Focal Points for SPAs, grant the status of «Action Plan Associate» to any organization or laboratory which so requests, and which carries out, or supports (financially or otherwise) the carrying out of concrete actions (conservation, research, etc.) likely to facilitate the implementation of the present Action Plan, taking into account the priorities contained therein.

7. NATIONAL ACTION PLAN

To ensure more efficiency in the measures envisaged in the implementation of this Action Plan, Contracting Parties are invited to establish National Action Plans for the conservation of cetaceans.

Each National Action Plan, taking into account the concerned country's specific features, should address the current factors causing loss or decline of cetacean population and their habitats, suggest appropriate subjects for legislation, give priority to the protection and management of marine areas, the regulation of fishing practices and ensure continued research and monitoring of populations and habitats as well as the training and refresher courses for specialists and the awareness-raising and education for the general public, actors and decision-makers.

8 PRIORITY ACTIONS

The actions outlined in this Plan are grouped into four categories: Education and Awareness, Capacity Building, Research and Monitoring, and Management.

In all the actions presented below, there is a section referred to as Actors and one as Evaluation. In the former, various bodies that may be responsible for the execution and implementation of each action are proposed; this is not meant to be an exclusive or comprehensive list and other actors can be included in a case-by-case basis, depending on the country/region of implementation of the action and its needs (e.g Pelagos Secretariat). Ultimate evaluation of all the actions proposed within this AP is to be carried out by SPA/RAC and ACCOBAMS, as stated above, with support and advice from the ACCOBAMS SC.

There are several actions in this Action Plan, and we acknowledge it would be difficult to implement all of them and evaluate their objectives within the next five years. A priority ranking is provided for each action and it is suggested that during the next meeting of the Contracting Parties, these actions are carefully evaluated, their feasibility is considered, and agreement is reached on identifying the actions to be urgently implemented, according to national and international conservation and management priorities.

8.1 Education and awareness

8.1.1.INCREASE PUBLIC AWARENESS	
Objective	**Priority** (Low, Medium, High)
To develop a strategy for the timely production of a series of resources to inform citizens of the status and the importance of conservation of Mediterranean cetaceans.	Medium
Description	
Aim of this action is to develop a strategy and a series of actions to produce a variety of targeted, accurate, public awareness resources that will inform the general public on the status of Mediterranean cetaceans and on how citizens can assist in conservation efforts, including what they should do if they encounter living or dead individuals. This action refers to a variety of categories of stakeholders for each range state: coast guard, mariners (and their trade associations where applicable), fishers (and their trade associations where applicable), cetacean watching operators, NGOs, research institutes, schools, etc. Outreach should include the use of mass media such as newspapers, radio and television; the internet and social media; public lectures and symposiums; education programmes for teachers and students of all ages; and dissemination of information in written and spoken form in cetacean-watching and other tourism operations. Dedicated smartphone applications could also be developed, or those already existing may be adapted, as necessary.	
Actors	**Evaluation**
Parties to the Barcelona Convention, Ministry of Environment (or equivalent for each country), Ministry of Fisheries, Ministry of Education (or equivalent for each country), NGOs.	SPA/RAC and ACCOBAMS

8.2 Capacity building

8.2.1. INCREASE AND STRENGTHEN CAPACITY AT THE MEDITERRANEAN LEVEL	
Objective	**Priority** (Low, Medium, High)
To ensure that individuals and relevant management bodies have the motivation, skills and resources needed to implement this plan.	High
Description	
The degree of knowledge and expertise throughout the region is unevenly distributed. The transfer of necessary skills is a key step in the process of successfully implementing this AP. Training effort should be diverse and target different aspects of the conservation process, by providing the knowledge needed to conduct adequate research, monitoring and assessment activities on cetacean species and their ecosystems, but also by giving tools to effectively translate the newly acquired information on cetacean distribution and conservation needs into legislative, regulatory and management actions, that will lead to direct conservation benefits. This strategy is to be tailored for each Contracting Party and target groups may vary between countries - while some may be in need of very specific capacity building actions (i.e., training), other may be in a position to play an active role in exchanging of best practices by providing sub-regional training opportunities. Training packages for different approaches to cetacean research (e.g., line-transect surveys, photo-identification, stranding management and sampling protocols, data analysis, etc.) and conservation tools, with the aim of unifying teaching methods, will be designed in synergywith the ongoing activities developed within the EcAp/IMAP process.	
Actors	**Evaluation**
Parties to the Barcelona Convention, the Pelagos Sanctuary Agreement, research institutes, Universities, MedPAN and NGOs	SPA/RAC and ACCOBAMS

8.2.2. INCREASE THE CAPACITY OF AND DEVELOP STRANDING NETWORKS THROUGHOUT THE REGION	
Objective	**Priority** (Low, Medium, High)
Set up a pilot project on remote training and advice for stranding networks	Medium
Description	
The Covid19- pandemic crisis has demonstrated the great potential of remote training and advisory services. This innovative approach can be applied to cetacean stranding capacity building, by setting up an online programme based on video tutorials and presentations. While some aspects of training may be carried out remotely, other aspects may be implemented through in-person teaching. These courses can be followed by dedicated personnel going through a final test, which should give access to a formal accreditation (open badge) issued by teaching entities (i.e., universities) and recognized by ACCOBAMS. The course should be tailored depending on resources and skills present in each country. Practical training should be provided for veterinarians and/or biologists by preparing a train-the-trainer program. Training subjects covered by the program will include information on stranding response and management, carcass disposal, data collection and basic post-mortem evaluation, as well as specific instructions on the collection and preservation of samples, related to both life history and histopathology. After compilation of the training, follow-up advice will be provided to support first interventions in stranding events and in more complex cases by using remote support platforms such as WhatsApp, Zoom, etc.	
Actors	**Evaluation**
Universities, Research institutes, veterinary professionals, NGOs, already existing and well-established Stranding Networks, SPA/RAC and ACCOBAMS	SPA/RAC and ACCOBAMS

8.2.3. INCREASE CAPACITY ON AND DISSEMINATE CETACEAN MONITORING TECHNIQUES	
Objective	**Priority** (Low, Medium, High)
Capacity building on cetacean monitoring techniques, to be complemented with a pilot initiative to facilitate remote training and advice for less experienced researchers.	Medium
Description	
Effective national and regional monitoring programmes in line with the EcAp/IMAP process and in synergy with the Marine Strategy Framework Directive (MSFD) are fundamental in setting conservation targets and ensure they are being met. Increasing national and regional capacity for implementing such programmes is therefore of utmost importance. Because institutional and individual capacity in the region is highly uneven and variable, training activities are vital in ensuring wider implementation capabilities and therefore data representativeness. Depending on the specific needs, the methods in question (e.g., boat- based visual surveys, aerial surveys, photo-identification, passive acoustic monitoring) and the level of experience by the trainees, training may be organised in-person, remotely, or as a combination of the two. **Increasing capacity is needed at the level of data collection, data analysis and data publishing.**	
Actors	**Evaluation**
MPA management unit(s), IMAP national committee(s), Universities, research institutes running long-term cetacean monitoring programmes and projects, NGOs	SPA/RAC and ACCOBAMS

8.2.4. INCREASE CAPACITY ON AND IMPROVE MONITORING OF THREATS AFFECTING CETACEANS	
Objective	**Priority** (Low, Medium, High)
Capacity building on monitoring threats, to facilitate training and advice for less experienced researchers.	Medium
Description	
Alongside monitoring of cetacean populations, it is imperative to monitor the threats affecting them. This action is consistent with Action 2.3 and may build into it. As already postulated in Action 2.3, the monitoring capacity is highly uneven across the Mediterranean region and there are clear benefits to carry out capacity building activities to ensure a better data representativeness and region-wide ability to monitor the status of cetacean populations. As with Action 2.3, training activities may be organised through both in-person and remote learning, depending on the specific methodology, threats (e.g., fisheries bycatch, underwater noise, chemical pollutants, etc.) and individual needs in different countries or regions.	
Actors	**Evaluation**
Universities, research institutes running long-term cetacean monitoring projects, National IMAP Committee(s) 1, NGOs	SPA/RAC and ACCOBAMS

8.3 Research and Monitoring

8.3.1. CETACEAN BYCATCH IMPLEMENTATION OF LESSONS LEARNT BY MEDBYCATCH PROJECT THROUGHOUT THE MEDITERRANEAN

Objective	**Priority** (Low, Medium, High)
Implementing lessons learnt from the MedBycatch project throughout the Mediterranean..	High

Description

The scope of the on-going MAVA funded MedBycatch Project is to monitor and mitigate incidental catches of vulnerable species (Marine Mammals, Sharks, rays, seabirds, marine turtles, corals and sponges) and reduce fishing impacts and pressures on marine habitats and species. Phase 1 (Sept. 2017 - Jun. 2020), involving Morocco, Tunisia and Turkey generated several outputs, among them a protocol on Monitoring the incidental catch of vulnerable species in Mediterranean and Black Sea Fisheries: Methodology of data collection, an Identification guide of vulnerable species incidentally caught in Mediterranean fisheries, creation of a Pan-Mediterranean multi-taxa database containing data on bycatch of vulnerable species in the region, and a Review on Incidental Catches of Vulnerable Species in the Mediterranean and the Black Seas as well as national bycatch reports. Phase 2 (Jun. 2020 - Oct. 2022) has expanded the geographical scope of the project, including Croatia and Italy. Phase 2 is primarily focusing on testing mitigation measures and on informing and influencing policy developments related to the bycatch of vulnerable species at national and regional levels. It is of key importance to capitalize the efforts done so far (and on-going) in the context of the MedBycatch project and promoting its approach, deliverables and results to encourage replication across the Mediterranean, establishing a baseline for bycatch in the region and identifying existing gaps.

Actors	**Evaluation**
Parties to the Barcelona Convention, National IMAP Committee(s), Ministries of Fisheries and Environment (or equivalent for each country), GFCM, partners of the MedBycatch project directly (or indirectly) involved in cetacean conservation	SPA/RAC and ACCOBAMS

8.3.2. INVOLVING FISHERS ACROSS THE MEDITERRANEAN SEA ON CETACEAN CONSERVATION

Objective	**Priority** (Low, Medium, High)
Gather fishers' local ecological knowledge in order to improve information on cetacean conservation status and threats, and increase their marine conservation awareness	Medium

Description

Fishers' local ecological knowledge (LEK), accumulated over the course of their fishing careers, can be invaluable in helping marine researchers and resource managers obtain critical information to improve management of fish stocks and rebuild and conserve marine ecosystems. Well-designed and carefully conducted interviews with fishers will allow insights into past abundance of fish and changes in ecosystem status and quality, dolphin–fisheries interactions, as well as whale and dolphin population trends and status, and to identify the main conservation management actions needed. In addition, this initiative will contribute to increasing the marine conservation awareness of fishers by inviting them to reflect on issues that, in many cases, have been largely ignored by their community, and to directly contribute to effective ecosystem-based management measures. The LEK protocol used in the context of the MedBycatch project (see above), as well as the experience gained in this field through similar initiatives within the Mediterranean are to be taken into consideration when designing future questionnaires addressed to fishers. Fishers of different ages and from different generations should be ideally included in this exercise, to account for the phenomenon of shifting environmental baselines[1]. Before conducting private interviews, informative talks will be given at the local fishers' cooperatives to call for the collaboration of their members. This action should not be focused exclusively on small-scale fishers, but also on those working in industrial fishing fleets.

[1] The phenomenon of shifting environmental baselines was described by Daniel Pauly (1995) noting that each generation subconsciously views as 'natural' the way the environment appeared in their youth. As one generation replaces another, perceptions of what is natural can change dramatically among local communities and lead to the loss of memory on past ecosystem status:

Actors	**Evaluation**
Parties to the Barcelona Convention, GFCM, Ministries of Fisheries (or equivalent for each country), Ministry of Environment (or equivalent for each country), NGOs	SPA/RAC and ACCOBAMSS

8.3.3. STANDARIZATION OF CETACEAN STRANDING PROTOCOLS ACROSS MEDITERRANEAN COUNTRIES

Objective	**Priority** (Low, Medium, High)
Promote and implement standardized cetacean stranding protocols throughout the Mediterranean	High

Description

At the Joint ACCOBAMS/ASCOBANS Workshop on standardization of best practices on cetacean post-mortem investigation and tissue sampling, a common approach was adopted. This was followed by the resolution 7.14 on best practices in monitoring and management of cetacean stranding being released at the 7 th Meeting of the Parties to ACCOBAMS, held in Istanbul, Turkey, in November 2019[2] . This should now be shared across the entire Region, including focusing on the collection of data on marine litter ingestion. Three sub-actions are envisaged:

IV Promotion and distribution of the documents to the different stranding networks in the region. Common data sets will be collected annually to have an updated overall view of cetacean interaction with fishing activities and marine litter.

V To stress the relevance of a common basic sampling. A common set of tissue samples should be collected and stored for further analyses. These data sets will be dependent on stranding networks skills and resources (see 2.2). Part of these samples will be stored in centralized common tissue banks identified by ACCOBAMS that will store and share samples with all the Mediterranean countries where required. A dialogue with CITES will be established as necessary to facilitate sharing tissue samples, including with IWC.

VI Set-up of veterinary laboratories for those stranding networks not having one national laboratory for ancillary analyses (necropsy, histopathology, microbiology). Through the cooperation with the World Animal Health Organization Marine Mammal Health (OIE) reference centre, based in Torino, laboratories will be identified, training will be provided and contacts with already existing and well-established stranding networks will be facilitated.

VII All resulting data is to be shared with the Mediterranean database on cetacean strandings (MEDACES)

This action is complementary to 2.2 (Capacity building). A centralized tissue bank system should be identified according to the ISO standards foreseen by the OIE and the Environmental Tissue Bank standards.

Actors	**Evaluation**
Parties to the Barcelona Convention, Ministry of Environment (or equivalent for each country), Coastguards, NGOs, National Stranding Networks	SPA/RAC and ACCOBAMS

8.3.4. WEB-BASED EXCHANGE OF SCIENTIFIC INFORMATION

Objective	**Priority** (Low, Medium, High)
Contribute to a harmonized web-based platform such as NETCCOBAMS by which scientific information (e.g., photo-ID catalogues, tissue sample database, sighting record registry) can be maintained in a centralized location and freely exchanged among interested parties	High

[2] ACCOBAMS-MOP7/2019/Doc38/Annex15/Res.7.14
https://accobams.org/wp-content/uploads/2019/12/Res.7.14_-Best-Practices-Strandings.pdf
ACCOBAMS-MOP7/2019/Doc 33 - Best Practice on Cetacean Postmortem Investigation and Tissue Sampling
https://accobams.org/wp-content/uploads/2019/04/MOP7.Doc33_Best-practices-on-cetacean-post-mortem-investigation.pdf..

Description
Integration of information on Mediterranean cetaceans from all areas where they are observed is of substantial value in understanding patterns of habitat use and the links between geographic areas, as well as in determining migration routes and wintering location(s) for some species, such as fin and sperm whales. Having a centralized data repository where all interested parties (including the public) would be able to share and exchange information on Mediterranean cetaceans - in accordance with an agreed data availability protocol - would benefit conservation measures at a broader (i.e., range-wide) geo-spatial scale.

Actors	Evaluation
Parties to the Barcelona Convention, Ministry of Education (or equivalent for each country), Ministry of Environment (or equivalent for each country), Research Institutes, NGOs	SPA/RAC and ACCOBAMS

8.3.5. DEVELOP AND CARRY OUT EFFECTIVE LONG-TERM MONITORING AT THE ENTIRE MEDITERRANEAN BASIN SCALE TO ESTIMATE ABUNDANCE AND TRENDS

Objective	**Priority** (Low, Medium, High)
To obtain robust and unbiased population estimates and distributional information on Mediterranean cetaceans throughout the Basin at regular intervals (suggested 6 years following the IMAP requirements)	High

Description
Promote suitable monitoring programme for the entire Mediterranean region to enable abundance trends, potential distributional changes to be identified and demography of population, in order to inform timely mitigation actions. Robust baseline information on parameters following the agreed EcAp/IMAP agreed common indicators (i.e distribution, abundance and demography) are necessary to inform conservation actions and to implement and evaluate the efficacy of any measures currently in place. The European Habitat Directive, the Marine Strategy Framework Directive, and the IMAP/Ecosystem Approach not only require the monitoring of the Good Environmental Status (GES) of species and habitats of community interest, but also require reporting on this status every 6 years. A synoptic survey, applying line transect distance sampling methodologies, to be carried out in a short period of time across the whole Mediterranean Sea, combining visual survey methods (boat- and aerial-based surveys) and passive acoustic monitoring (PAM). The main aim in both aerial and vessel-based surveys is to estimate density and abundance and assess potential trends over time. Standardized and agreed protocols should be used for the monitoring actions, following the guidelines endorsed by the Contracting Parties during the EcAp Coordination Group Meeting and benefits from the ACCOBAMS Survey Initiative (ASI, 2018) experience. Use existing ongoing programs to integrate abundance estimates and trend estimates. Consider the possibility to perform photo-ID and biopsy and eDNA sampling during large scale surveys to: (1) sample data poor areas, (2) monitor changes in hormones levels, stable isotopes, contaminants in areas of interest as identified by previous surveys. Power analysis should be used to design the specific monitoring framework to detect a trend of a given magnitude and to detect specific rates of population change.

Actors	Evaluation
Parties to the Barcelona Convention, National IMAP committee(s), MPA management unit(s), Ministry of Environment (or equivalent for each country), Universities, Research Institutes, NGOs	SPA/RAC and ACCOBAMS

8.3.6. DEVELOP AND CARRY OUT EFFECTIVE ANNUAL LONG-TERM MONITORING OF CETACEAN DISTRIBUTION, ABUNDANCE AND TRENDS NATIONALLY AND SUB-REGIONALLY

Objective	**Priority** (Low, Medium, High)
Ensure that annual/seasonal monitoring of distribution, abundance and density is regularly conducted nationally and at relevant sub-regional units, corresponding to the main distribution areas of Mediterranean cetaceans	High

Description
Continued monitoring of the Mediterranean cetacean populations and regular updates on population status are essential for meeting conservation objectives; among these, the Barcelona Convention, through the EcAp/IMAP, requests Parties to implement common indicators on a variety of species topics (e.g., distribution, abundance and demography) and prepare periodic regional assessment report (Quality Status Reports), to be presented at regular intervals of six years. In addition, the European Commission, through the implementation of the MSFD, asks its members to systematically report on their monitoring programs, developed at national level. Photo-identification is a widely used technique in cetacean research that can provide information on population demography, estimates of abundance and population parameters such as survival and reproductive rates. Long time series of photo-identified cetaceans of several species are available in different areas, providing opportunities for detecting changes in abundance over time. Similarly, biopsy sampling can be used to obtain information on population genetic structure, contaminant levels, and abundance through genetic mark- recapture analysis. Monitoring at the regional level may require data collection throughout the year, to better understand seasonal patterns in distribution, whereas monitoring at the basin level would mainly address inter-annual changes (3.5.). Mark-recapture models should be applied to photo- identification data (and genetic data where practicable) to estimate abundance for specific areas that populations or part of populations occupy during one or more seasons of the year. Collating information collected by different research groups in these areas is also recommended. Line-transect surveys based on distance-sampling methodology may be appropriate for some species, countries or regions. The use of platforms of opportunity, such as fisheries surveys and/or passenger ferries should also be considered in some cases, while acknowledging their limitations.

Actors	Evaluation
Parties to the Barcelona Convention, national IMAP committee(s), MPA management unit(s), Ministry of Environment (or equivalent for each country), Universities, Research Institutes, NGOs	SPA/RAC and ACCOBAMS

8.3.7. MONITOR THREATS AT THE NATIONAL AND BASIN LEVEL

Objective	**Priority** (Low, Medium, High)
To periodically assess the status and trends of threats, and the emergence of potential new threats	High

Description
Status and trends of threats to cetaceans, including ship strikes, bycatch in fishing gear and other negative interaction with fisheries, underwater noise, micro- and macro litter ingestion, chemical contaminant exposure, physical disturbance and climate change, as well as their cumulative effects in the entire Mediterranean Sea, is key information needed to assess the efficiency of existing and future mitigation measures, and the needs for adaptation of any mitigation strategies. Existing national fishing fleet monitoring programs should be leveraged to obtain information on and monitor cetacean bycatch. Trend maps will inform on the evolution of known threats in previously identified risk areas compared to previous assessments, the identification of new risk areas and the emergence of new threats. The needed know-how to conduct this monitoring is not uniformly distributed among the region; therefore, this action is to be conducted in coordination with 2.4., which aims at providing capacity on monitoring threats to cetaceans where necessary.

Actors	Evaluation
Parties to the Barcelona Convention, national IMAP committee(s), MPA management unit(s), Ministry of Environment (or equivalent for each country) in collaboration with neighbouring countries (whenever possible), Universities, Research Institutes, NGOs	SPA/RAC and ACCOBAMS

8.4 Management

8.4.1 WIDER ADOPTION AND IMPLEMENTATION OF STANDARDIZED MEASURES TO MITIGATE ADVERSE IMPACT OF CETACEAN WATCHING ACTIVITIES

Objective	**Priority** (Low, Medium, High)
Efficient management of cetacean watching activities and the implementation of relevant standardized codes of conduct (IWC, ACCOBAMS, CMS)	Medium

Description
Harassment risk begins when a vessel is deliberately closer than the minimum distance identified in common rules (Code of Conduct) for commercial cetacean watching or when the vessel stays for a period longer than prescribed. This is especially true for swim-with cetacean activities. Moreover, direct interactions between swimmers and animals may introduce risks of animal violent behaviour and transmission of diseases. Additionally, individuals that are regularly approached (even in respect of the code of conduct) can experience substantial stress, which may lead to medium or long-term population-level impacts. It is therefore necessary to minimize the risk of cetacean-watching activities having negative impacts on cetaceans, by the implementation of effective management strategies including the adoption and implementation of standardized codes of conduct (IWC, ACCOBAMS, CMS). The ACCOBAMS "High Quality Whale-Watching®" Certificate aims at encouraging the implementation of good practices and sustainable know-how by whale-watching operators involved in initiatives fostering quality and environmental responsibility; its implementation throughout the basin must be promoted and implemented, ideally, by all Parties. There have been several attempts to evaluate the potential impact of UAVs on cetaceans. At present, there is very little evidence that UAVs disrupt the behaviour of baleen whales. To date, the behavioural responses of dolphins when approached by a UAV remain poorly investigated and most studies have focused on bottlenose dolphins. The available evidence suggests that when small UAVs are flown at an altitude of 30–10 m above bottlenose dolphins, short-term behavioural responses occur. These responses may vary depending on group size and behaviour. Guidelines and well-defined protocols should be developed, promoted among the industry and properly implemented to minimize any potential adverse effects (See Raoult *et al*. 2020 for a review on using drones on marine animal research).

Actors	Evaluation
Parties to the Barcelona Convention, Ministry of Environment (or equivalent for each country), Ministry of Tourism (or equivalent for each country), Research Institutes, NGOs, MAP managers	SPA/RAC and ACCOBAMS

8.4.2. MITIGATE SHIP STRIKES WITH LARGE WHALES

Objective	Priority (Low, Medium, High)
Reduce ship strike risk for fin and sperm whales throughout the Mediterranean Basin	High

Description
Measures that separate whales from vessels (or at least minimise co-occurrence) in space and time to the extent possible (e.g., routing schemes, Traffic Separation Schemes TSS) are the most effective in reducing this threat. In the absence of routing options, reducing speed has been identified as the most effective way of reducing ship strike risk. Emphasis should be placed on the collection and reporting of data to the IWC Global Ship Strikes Database which will both: (1) facilitate a proper evaluation, prioritisation and monitoring of ship strikes as a threat to various populations and areas (e.g., the Mediterranean Sea); and (2) assist in the development of specific mitigation measures. One of the key actions is to identify high-risk areas for ship strikes (a high-risk area is defined as the convergence of either areas of high-volume shipping and whales, or high numbers of whales and shipping, reflected in the ACCOBAMS work on Cetacean Critical Habitat, CCH). Important Marine Mammal Areas (IMMAs) represent a systematic and biocentric approach to identifying important habitats and can be helpful in identifying potential high-risk areas for ship strikes. In particular, if an IMMA contains a species or population vulnerable to ship strikes, and is transited by significant shipping, the area can be "flagged" for further investigation and potential mitigation. The following steps should be undertaken as part of a process to identify High Risk Areas for Ship Strikes based on IMMAs and in relation to CCH: (1) Traffic information (e.g., vessel type, size, speed, flag, etc.): plotting major ship routes to determine overlap with IMMAs that host significant populations of species threatened by or vulnerable to ship strikes; (2) Species information (e.g., relative or absolute abundance, status, behaviour/seasonality/key lifecycle use in and within IMMAs); and (3) Management and Mitigation. Further develop the process for the designation of International Maritime Organization (IMO) measures, such as a TSS in the Hellenic Trench and a Particularly Sensitive Sea Areas (PSSA) at a scale that includes the North West Mediterranean Sea, Slope and Canyon IMMA, as well as the Spanish corridor, to take into account whale population movement and distribution. Zoning within the area with ship strike mitigation tools such as speed reduction and routing measures could be proposed as part of Associated Protective Measures within the PSSA. Co-operation with IMO, other IGOs, national authorities, the shipping industry, port authorities and the whale watching industry is essential if effective mitigation is to occur.

Actors	Evaluation
IMO, IWC, REMPEC, European Community Shipowners' Associations (ECSA), relevant Ministries per country, research institutes, NGOs	SPA/RAC and ACCOBAMS

8.4.3. DEVELOP CONSERVATION MANAGEMENT PLANS (CMPs) FOR MEDITERRANEAN CETACEANS

Objective	Priority (Low, Medium, High)
Develop a series of CMPs to manage human activities that affect cetaceans in the Mediterranean Sea in order to maintain a favourable conservation status throughout their historical range, based on the best available scientific knowledge	High

Description
It is not possible to 'manage' cetaceans in the Mediterranean Sea themselves, but it is possible to manage human activities that adversely affect the cetaceans and/or their habitat. Thus, by their nature, the management actions associated with CMPs require a degree of control and limitation on human activities. In pursuing this goal, the needs and interests of stakeholders need to be considered to the extent possible, whilst recognising that favourable conservation status is the highest priority. Moreover, scientific uncertainty must be considered while setting priorities and determining appropriate actions, but uncertainty alone should not preclude conservation action. Ideally, all management actions are based on adequate scientific data. However, there are occasions when the potential conservation consequences of waiting for confirmatory scientific evidence are sufficiently serious that it is justified to take action immediately whilst continuing to study the problem. This means following the 'precautionary principle'.

Actors	Evaluation
Parties to the Barcelona Convention, IWC, research institutes, NGOs	SPA/RAC and ACCOBAMS

8.4.4. ENHANCE EFFORT ON SPECIALLY PROTECTED AREAS OF MEDITERRANEAN IMPORTANCE (SPAMIs) WITH IMPORTANT MARINE MAMMAL AREAS (IMMAs) AND CETACEAN CRITICAL HABITATS (CCH)

Objective	Priority (Low, Medium, High)
Continue with the ongoing effort to monitor existing SPAMIs and designate new ones, assess potential new candidate IMMAs and Areas of Interest and move forward with the overlap with anthropogenic stressors, to identify CCH in the Mediterranean Sea	Medium

Description

There are 2 SPAMIs specifically designated for the protection of marine mammals in the Mediterranean Sea: the Pelagos Sanctuary and the Spanish Migration Corridor. Efforts to continue monitoring these areas, by implementing their management plan, as well as proposing new potential SPAMIs in the Basin should be considered as a priority. The Mediterranean Sea also features 19 IMMAs designated as important habitats for cetaceans. In addition to these, 5 candidate IMMAs relevant to cetacean conservation have been identified, along with 23 AoIs. The re-evaluation period for IMMAs is envisaged every 10 years. The next evaluation for the Mediterranean, following a first workshop organised in 2016, is scheduled for 2026, coinciding with the last phase of this -5year AP. Furthermore, where possible, efforts should be made to designate some of the existing IMMAs as Marine Protected Areas. SPAMIs and IMMAs provide the initial biocentric process (through the spatial definition of the animals' most important habitats) to be followed by use of the CCH, in which the spatial distribution of threats is identified. Management advice is then based upon an integration of the two approaches and the prioritization of mitigation approaches on a case-specific basis In addition, other highly relevant initiatives include the post2020- Regional Strategy for Marine Protected Areas (MPAs) and Other Effective Area-based Conservation Measures (OECMs) in the Mediterranean Sea, coordinated by SPA/RAC. This multidisciplinary effort will assist in providing Countries with advice on targeted and effective conservation measures (where appropriate on a seasonal basis) including:

- designation of new (or the extension of existing) MPAs with appropriate focusedmanagement actions,
- zoning within existing MPAs,
- corridors between MPAs,
- threat-specific mitigation measures for application throughout the region (shipping ornoise directives, e.g., through IMO) during marine spatial planning processes.

Actors	Evaluation
IUCN Marine Mammal Protected Areas Task Force, Parties to the Barcelona Convention.	SPA/RAC and ACCOBAMS

8.4.5. REDUCE THE INTRODUCTION OF ANTHROPOGENIC SOUND INTO THE MARINE ENVIRONMENT AND MITIGATE ACTIVITIES LIKELY TO PRODUCE UNDERWATER NOISE

Objective	**Priority** (Low, Medium, High)
Reduce the input of man-made sound into the marine environment, especially from sources and at levels likely to negatively impact cetaceans, as well as provide mitigation measures for noise-producing activities	High

Description

Cetaceans rely on sound to communicate, navigate and locate prey. Man-made underwater noise is a significant threat to these animals. Efforts should be made to reduce the underwater noise pollution, in order to prevent adverse effects on cetaceans. For activities and development likely to produce high intensity impulse sounds (e.g., seismic surveys for oil and gas exploration, pile driving and the use of sonar) and long-term chronic noise (e.g., planning of ports and shipping routes or other sound-producing activities), appropriate Environmental Impact Assessments should be carried out before such activities are allowed to take place. Appropriate mitigation measures should be put in place to prevent detrimental effects of underwater noise on cetaceans. Within the EcAp/IMAP process, Contracting Parties to the Barcelona Convention are required to monitor and assess the candidate common indicators related to energy including underwater noise (i.e. common indicator 26: Proportion of days and geographical distribution where loud, low, and midfrequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals, and common indicator 27: Levels of continuous low frequency sounds with the use of models as appropriate). It is also important to monitor underwater noise levels nationally and regionally and build on initiatives such as the “Overview of the Noise Hotspots in the ACCOBAMS area”, the EU funded QuietMed I & II projects, the Quit Sea Project and the Mediterranean Strategy on Underwater Noise Monitoring for establishing the methodological basis for a future implementation of a basin-wide monitoring programme on underwater noise.

Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee, MPA management unit(s), Relevant Ministries for each Government, IWC, CMS	SPA/RAC and ACCOBAMS

8.4.6. REDUCE THE INPUT OF CHEMICAL CONTAMINANTS

Objective	**Priority** (Low, Medium, High)
Reduce the input of chemical contaminants into the marine environment and limit the mobilization of contaminants in marine sediments	High

Description

Chemical pollutants impact cetacean species in a number of ways. While some pollutants in the Mediterranean Sea have declined or are declining, organochlorine levels, particularly PCBs, are found at high concentrations in several Mediterranean cetacean species. Pollutants and their impact in marine organisms are included in the EcAp/IMAP Ecological Objective 9 and its Common Indicator 19 and the Descriptor 8 of the Marine Strategy Framework Directive (MSFD) At the Mediterranean policy level, PCB concentration in relation to established toxicity thresholds should be used to assess “Favourable Conservation Status” of cetaceans. Chemical pollutants need to be included in impact assessments of other activities likely to affect cetaceans, due to cumulative and synergistic effects. Greater compliance with the Stockholm Convention is needed in order to significantly reduce PCB contamination of the marine and terrestrial environment by 2028. Measures include the safe disposal or destruction of large stocks of PCBs and PCB-containing equipment, limiting the dredging of PCB-laden rivers and estuaries, reducing PCB leakage from old landfills, limiting PCB mobilization in marine sediments, and regulating the demolition of PCB-containing precast buildings.

Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee, Relevant Ministries for each Government, MED POL, IWC, REMPEC	SPA/RAC and ACCOBAMS

8.4.7. REDUCE THE AMOUNT OF MARINE DEBRIS AND MICROPLASTICS ACROSS THE MEDITERRANEAN BASIN

Objective	**Priority** (Low, Medium, High)
Reduce the input of marine debris and micro/nano plastics into the marine environment and ensure appropriate removal where possible	High

Description

Different cetacean species are threatened by marine debris to varying degrees, with deep-diving odontocetes likely most vulnerable to ingestion of macro debris and fin whales especially vulnerable to the ingestion of micro/nano plastics. Macro- and microplastics enter the marine environment either directly from improper waste disposal, improperly managed landfills, improperly treated water waste management or result from the degradation of larger items breaking down into smaller particles. Marine litter monitoring of IMAP is based on the Regional Plan on Marine Litter management (Decision IG.10/20) and on the following agreed candidate indicator 24 “Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds, and marine turtles (EO10)”. Mitigation measures in relation to marine plastic pollution should focus on 1) preventing the leakage of new micro- and macro-plastic material into the environment and 2) instigating the removal of macro-plastics from the marine environment. The Directive (EU) 904/2019 of the European Parliament and of the Council of 5 June 2019 was established to reduce the impact of plastic on the environment (including marine ecosystems) by promoting the establishment of a circular economy. Considering that single-use plastics and fishing-related items represent the vast majority of marine litter, these products should be the main target of mitigation measures. The transition to a circular economy framework will involve the phasing out of single-use plastics, extended producer responsibilities, and recycling schemes. The Regional Plan on Marine Litter Management in the Mediterranean in the Framework of Article 15 of the Land Based Sources Protocol should be implemented.

Actors	**Evaluation**
Parties to the Barcelona Convention, national IMAP committee, Relevant Ministries for each Government, MedPOL, IWC, REMPEC	SPA/RAC and ACCOBAMS

8.4.8. MANAGEMENT OF FISHERIES TO MITIGATE CETACEAN BYCATCH

Objective	**Priority** (Low, Medium, High)
Recognising mitigating cetacean bycatch as intrinsic to successful fisheries management	High

Description

Despite being considered as the greatest threat to cetaceans globally, bycatch is frequently perceived as a separate fisheries management issue. Nevertheless, to achieve effective reduction of cetacean bycatch rates, technical mitigation measures specially designed, promoted and imposed for cetaceans, must be coupled with other intrinsic improvements in fisheries management globally. For instance, the most generally effective mitigation measure of cetacean bycatch is reduction in fishing effort; such strategy is to be seriously considered, starting to incorporate it in future fisheries management initiatives, starting by fisheries with the largest documented impact, which may vary considerably among or even within countries. According to the ACCOBAMS/ASCOBANS bycatch mitigation measures, the following are proposed:

- Encourage Parties, Research Institutes, and Private Sector bodies supported by funding bodies, in collaboration with fishers throughout the process, to develop or improve mitigation measures with new technology and/or materials, alternative gears, the shifting of fishing effort etc.
- The success of particular mitigation measures depends upon a variety of elements including the particular cetacean population, specifics of the gear and its deployment, as well as local conditions. The Working Group should keep a watching brief of case studies relevant to the Agreement Areas that describe which measures have or have not worked. This should be undertaken in liaison with other bodies (e. g. ICES, WGBYC, FAO, IWC, HELCOM, OSPAR) so that actions complement one another rather than duplicate effort.
- There is a need to improve the involvement of fishers from the start, including transfer of knowledge, in adopting good practices and to contribute prevention and monitoring of bycatches and careful release of entangled animals. Better outreach would help to inform and reduce bycatch and entanglement. Parties should consider the provision of incentives where appropriate.
- The Working Group should develop guidelines to policymakers, authorities, and the scientific community on how to best incentivise and engage fishers in prevention, mitigation and monitoring programmes.

- Where the current mitigation measures (e. g. pingers) don't solve the problem, spatio-temporal closures may be the only immediately available solution, although care is needed that this does not simply move the problem elsewhere. Consideration should be given to moving away from métiers of concern, in which case national authorities should consider some means of compensation to help cover fishers' income loss, where appropriate. The precautionary principle should be adopted. Insufficient technology development should not be considered as a reason to postpone decision-making.
- The need to move towards an internationally standardised approach for dealing with potential interventions (or lack thereof) of free-swimming, chronically entangled cetaceans should be considered. Expansion of the IWC Global Whale Entanglement Response Network across the regions should be encouraged, including dedicated training of entanglement responders.
- The humane release of live bycaught and entangled animals according to best practices should be encouraged to help ensure their survival (e.g. Guidelines for the Safe and Humane Handling and Release of Bycaught Small Cetaceans from Fishing Gear - CMS Technical Series No.43, FAO/ACCOBAMS Good Practice Guide for the Handling of Cetaceans caught incidentally in Mediterranean Fisheries, IWC Guidelines for entanglement responders) and fishers should be encouraged to report releases of bycaught individuals.
- Countries should be encouraged to establish Marine Protected Areas (MPAs) and Other Effective area-based Conservation Measures (OECMs) where appropriate, and to develop and implement management plans to reduce cetacean bycatch.
- Methods to monitor the performance of mitigation measures (such as pingers) as well as compliance in their usage by fisheries in real world conditions should be improved and become standard.

Actors	Evaluation
Parties to the Barcelona Convention, national IMAP committee, GFCM, Ministries of Fisheries (or equivalent for each country), Ministry of Environment (or equivalent for each country), IWC	SPA/RAC and ACCOBAMS

8.5 Implementation schedule

	Actions	Time	Who
	VIII.1.1. Increase public awareness	Continuously	Contracting Parties ;SPA/RAC; ACCOBAMS
VIII.2. CAPACITY BUILDING	VIII.2.1. Increase and strengthen capacit y at the Mediterranean level	Continuously and as needed	SPA/RAC; ACCOBAMS; CPs
	VIII.2.2. Increase the capacity of and develop stranding networks throughout the region		SPA/RAC; ACCOBAMS; CPs
	VIII.2.3. Increase capacity on and disseminate cetacean monitoring techniques		SPA/RAC; ACCOBAMS; CPs
	VIII.2.4. Increase capacity on and improve monitoring of threats affecting cetaceans		SPA/RAC; ACCOBAMS; CPs
VIII.3. RESEARCH AND MONITORING	VIII.3.1. Cetacean bycatch implementation of lessons learnt by med bycatch project throughout the Mediterranean	As soon as possible and continuously	SPA/RAC; ACCOBAMS; GFCM
	VIII.3.2. Involving fishers across the Mediterranean Sea on cetacean conservation		Contracting Parties
	VIII.3.3. Standarization of cetacean stranding protocols across Mediterranean countries		SPA/RAC; ACCOBAMS;
	VIII.3.4. Web-based exchange of scientific information		Contracting Parties; ACCOBAMS
	VIII.3.5. Develop and carry out effective long-term monitoring at the entire Mediterranean basin scale to estimate abundance and trends		SPA/RAC; ACCOBAMS; CPs
	VIII.3.6. Develop and carry out effective annual long-term monitoring of cetacean distribution, abundance and trends nationally and sub-regionally		SPA/RAC; ACCOBAMS; CPs
	VIII.3.7. Monitor threats at the national and basin level		CPs; SPA/RAC; ACCOBAMS;
VIII.4. MANAGEMENT	VIII.4.1. Wider adoption and implementation of standardized measures to mitigate adverse impact of cetacean watching activities	As soon as possible and continu ously	CPs; ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.2 mitigate ship strikes with large whales		CPs; ACCOBAMS;SPA/ RAC;Pelagos secretariat
	VIII.4.3. Develop conservation management plans (CMPs) for Mediterranean cetaceans		ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.4. Enhance effort on specially protected areas of Mediterranean importance (SPAMIs) with important marine mammal areas (IMMAs) and cetacean critical habitats (CCH)		ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.5. Reduce the introduction of anthropogenic sound into the marine environment and mitigate activities likely to produce underwater noise		CPs, ACCOBAMS; SPA/RAC; Pelagos secretariat
	VIII.4.6. Reduce the input of chemical contaminants		CPs, ACCOBAMS; SPA/RAC; Pelagos secretariat, MEDPOL
	VIII.4.7. Reduce the amount of marine debris and microplastics across the Mediterranean basin		CPs, ACCOBAMS; SPA/RAC; Pelagos secretariat, MEDPOL
	VIII.4.8. Management of fisheries to mitigate cetacean bycatch.		CPs, ACCOBAMS; SPA/RAC; GFCM, Pelagos secretariat

REFERENCES

ACCOBAMS, 2019. Review of Bycatch Rates of Cetaceans in the Mediterranean and the Black Sea. ACCOBAMS-MOP7/2019/Doc 29.

Andre J., Boudou A., Ribeyre F. and Bernhard, M. 1991. Comparative study of mercury accumulation in dolphins (*Stenella coeruleoalba*) from French Atlantic and Mediterranean coasts. Science of the Total Environment. 104(3): 191-209.

Baulch S. and Perry C. 2014. Evaluating the impacts of marine debris on cetaceans. Marine pollution bulletin 80:210-221.

Bearzi G. 2002. Interactions between cetacean and fisheries in the Mediterranean Sea. In Cetaceans of the Mediterranean and Black Seas: State of Knowledge and Conservation Strategies,Notarbartolo di Sciara G. (ed.). A Report to the ACCOBAMS Secretariat, Section 9, Monaco,February 2002, 20.

Benmessaoud R., Cherif M., Jaziri S., Koched W. and Zaara K. 2018. Atténuation des interactions entre les especes menacées (delphinidés et oiseaux marins) et les activités de pêche des petits pélagiques dans la région de Kélibia (Tunisie). Rapport d'avancement. MoU ACCOBAMS N°05/2016/LB6410, 57pp.

Bianchi C.N. (2007) Biodiversity issues for the forthcoming tropical Mediterranean Sea. Hydrobiologia 580:7–21.

Boero F., Féral J.P., Azzurro E., Cardin V., Rieldel B., Despalatovi M., Munda I., Moschella P., Zaouali J., Fonda Umani S., Theocharis A., Wiltshire K. and Briand F. 2008. Executive summary of CIESM Workshop 35. In Briand F. (ed.) 'Climate warming and related changes in Mediterranean marine biota'. CIESM Workshop Monographs 35, 5–21.

Booth C.G., Sinclair R.R., and Harwood J. 2020. Methods for Monitoring for the Population Consequences of Disturbance in Marine Mammals: A Review. Frontiers in Marine Science. 7 :115. 10.3389/fmars.2020.00115

Brownell R.L.J., Reeves R. R., Read A. J., Smith B. D., Thomas P. O., Ralls K., Amano M., Berggren P., Chit A.M., Collins T., Currey R., Dolar M.L.L., Genov T., Hobbs R.C., Kreb D., Marsh H., Zhigang M., Perrin W.F., Phay S., Rojas-Bracho L., Ryan G.E., Shelden K.E.W., Slooten E., Taylor B.L., Vidal O., Ding W., Whitty T.S. and Wang J.Y. 2019. Bycatch in gillnet fisheries threatens Critically
Endangered small cetaceans and another aquatic megafauna. Endangered Species Research 40 :285-296.

Clark C.W., Ellison W.T., Southall B.L., Hatch L., Van Parijs S.M., Frankel A. and Ponirakis D. 2009. Acoustic masking in marine ecosystems: intuitions, analysis, and implication. Marine Ecology Progress Series 395:201 - 222.

Coll M., Piroddi C., Steenbeek J., Kaschner K., Lasram F.B.R., Aguzzi J., Ballesteros E., Bianchi C.N., Corbera J., Dailianis T. Danovaro R., Estrada M., Froglia C., Galil B.S., Gasol J.M., Gertwagen R., Gil J.O., Guilhaumon F.O., Kesner-Reyes K., Kitsos M.-S., Koukouras A., Lampadariou N., Laxamana E., Cuadra C.M.L.P.F. de L., Lotze H.K., Martin D., Mouillot D., Oro D., Raicevich S.A., Rius-Barile J., Saiz-Salinas J.I., Vicente C.S., Somot S., Templado J., Turon X., Vafidis D. and Villanueva R., Voultsiadou E. 2010. The biodiversity of the Mediterranean Sea: estimates, patterns, and threats. PLoS ONE 5: e11842

David L., Alleaume S. and Guinet C. 2011. Evaluation of the potential of collision between

fin whales and maritime traffic in the north-western Mediterranean Sea in summer, and mitigation solutions. Journal of Marine Animals and Their Ecology, 4,1: 17-28.

De Stephanis R., Giménez J., Carpinelli E., Gutierrez-Exposito C. and Cañadas A. 2013. As main meal for sperm whales: Plastics debris. Marine pollution bulletin 69:206-214.

Di Méglio N., David L. and Monestiez P. 2018. Sperm whale ship strikes in the Pelagos Sanctuary and adjacent waters: assessing and mapping collision risks in summer. Journal of Cetacean Research and Management 18:135–147

Đuras Gomerčić M., Galov A., Gomerčić T., Škrtić D., Ćurković S., Lucić H., Vucović S., Arbanasić H., Gomerčić H. 2009. Bottlenose dolphin (*Tursiops truncatus*) depredation resulting in larynx strangulation with gill-net parts. Marine Mammal Science 25: 392–401.

FAO. 2019. Monitoring the incidental catch of vulnerable species in Mediterranean and Black Sea fisheries: Methodology for data collection. FAO Fisheries and Aquaculture Technical Paper No.640. Rome, FAO.

FAO. 2020. The State of Mediterranean and Black Sea Fisheries 2020. General Fisheries Commission for the Mediterranean. Rome. https://doi.org/10.4060/cb2429en

Frantzis A., Leaper R., Alexiadou P., Prospathopoulos A. and Lekkas D. 2019. Shipping routes through core habitat of endangered sperm whales along the Hellenic Trench, Greece: Can we reduce collision risks? PLoS ONE 14(2): e0212016. https://doi.org/10.1371/journal.pone.0212016

Fossi M.C., Panti C., Romeo T., Guerranti C., Coppola D., Giannetti, Marsili L. and Minutoli, R. 2012. Are baleen whales exposed to the threat of microplastics? A case study of the Mediterranean fin whale (*Balaenoptera physalus*). Marine Pollution Bulletin, 64(11):2374-2379. https://doi.org/10.1016/j.marpolbul.2012.08.013

Fossi M.C., Marsili L., Baini M., Giannetti M., Guerranti C., Caliani I., Minutoli R., Lauriano G., Finoia M.G., Rubegni F., Panigada S., Bérubé M., Urban J. and Panti C. 2016. Fin whales and microplastics: The Mediterranean Sea and the Sea of Cortez scenarios. Environmental Pollution 209:68-78. doi: 10.1016/j.envpol.2015.11.022

Fossi M.C., Romeo T., Baini M., Panti C., Marsili L., Campani T., Canese S., Galgani F., Druon J.N., Airoldi S., Taddei S., Fattorini M., Brandini C. and Lapucci C. 2017. Plastic debris occurrence, convergence areas and fin whales feeding ground in the Mediterranean Marine Protected Area Pelagos Sanctuary: a modelling approach, Frontiers in Marine Science 4:167 | DOI: 10.3389/fmars.2017.00167

Gambaiani D.D., Mayol P., Isaac S.J. and Simmonds M.P. 2009. Potential impacts of climate change and greenhouse gas emissions on Mediterranean marine ecosystems and cetaceans. Journal of the Marine Biological Association of the United Kingdom 89:179–201.

Genov T., Jepson P.D., Barber J.L, Hace A., Gaspari S., Centrih T., Lesjak J. and Kotnjek P. 2019.Linking organochlorine contaminants with demographic parameters in free-ranging common bottlenose dolphins from the northern Adriatic Sea. Science of the Total Environment 657:200-212.

Gonzalvo J., Forcada J., Grau E. and Aguilar A. 2014. Strong site-fidelity increases vulnerability of common bottlenose dolphins Tursiops truncatus in a mass tourism destination in the western Mediterranean Sea. Marine Biology 94:1227-1235.

Hall A.J., McConnell B.J., Rowles T.K., Aguilar A., Borrell A., Schwacke L., Reijnders P.J.H. and Wells R.S. 2006. Individual-based model framework to assess population consequences of polychlorinated biphenyl exposure in bottlenose dolphins. Environmental Health Perspectives 114(1): 60-64.

Hall A.J., McConnell B.J., Schwacke L.H., Ylitalo G.M., Williams R. and Rowles T. K. 2017. Predicting the effects of polychlorinated biphenyls on cetacean populations through impacts on immunity and calf survival. Environmental Pollution 233:407-418.

IPCC. 2007. Climate Change 2007, Intergovernmental Panel on Climate Change (IPCC). Fourth Assessment Report. Cambridge, UK and New York: Cambridge University Press (http,//www.ipcc.ch/).

IWC. 2006. Report of the IWC Scientific Committee Workshop on Habitat Degradation. Journal of Cetacean Research and Management 8 (Suppl.): 313-335.

Jahoda M., Lafortuna C.L., Biassoni N., Almirante C., Azzellino A., Panigada S., Zanardelli M. and Notarbartolo di Sciara, G. 2003. Mediterranean fin whale's (Balaenoptera physalus) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration. Marine Mammal Science 19(1):96-110.

Jepson P.D., Deaville R., Barber J.L., Aguilar À., Borrell A., Murphy S., Barry J., Brownlow A., Barnett J., Berrow S., Cunningham A.A., Davison N.J., ten Doeschate M., Esteban R., Ferreira M., Foote A.D., Genov T., Giménez J., Loveridge J., Llavona Á., Martin V., Maxwell D.L., Papachlimitzou A.,Penrose R., Perkins M.W., Smith B., de Stephanis R., Tregenza N., Verborgh P., Fernandez A. and Law R.J. 2016. PCB pollution continues to impact populations of orcas and other dolphins in European waters. Scientific Reports. 6:18573.

La Manna G., Clò S., Papale E. and Sara G. 2010. Boat traffic in Lampedusa waters (Strait of Sicily, Mediterranean Sea) and its relation to the coastal distribution of common bottlenose dolphin (*Tursiops truncatus*). Ciencias Marinas 36:71–81.

La Manna G., Manghi M., Pavan G., Lo Mascolo F. and Sarà G. 2013. Behavioural strategy of common bottlenose dolphins (*Tursiops truncatus*) in response to different kinds of boats in the waters of Lampedusa Island (Italy). Aquatic Conservation: Marine and Freshwater Ecosystems 23(5):745-757.

Lambert C., Authier M., Dorémus G., Laran S., Panigada S., Spitz J., Van Canneyt O. and Ridoux V. 2020. Setting the scene for Mediterranean litterscape management: The first basin-scale quantification and mapping of floating marine debris. Environmental Pollution 263, 114430. https://doi.org/10.1016/j.envpol.2020.114430

Lejeusne C., Chevaldonne´ P., Pergent-Martini C., Boudouresque C.F. and Perez T. 2009. Climate change effects on a miniature ocean: the highly diverse, highly impacted Mediterranean Sea.Trends in Ecology and Evolution 1204: 11 pp. doi:10.1016/j.tree.2009.10.009

Marsili L., Jiménez B. and Borrell A. 2018. Persistent organic pollutants in cetaceans living in a hotspot area: the Mediterranean Sea. In Marine Mammal Ecotoxicology: Impacts of Multiple Stressors on Population Health. (M.C. Fossi and C. Panti, eds.). Academic Press. pp.185-212.

Nelms S. E., Barnett J., Brownlow A., Davison N., Deaville R., Galloway T.S., Lindeque P.K.,

Santillo D. and Godley B. J. 2019. Microplastics in marine mammals stranded around the British coast: ubiquitous but transitory? Scientific Reports 9:1-8.

Notarbartolo di Sciara G., Zanardelli M., Jahoda M., Panigada S. and Airoldi S. 2003. The fin whale *Balaenoptera physalus* (L. 1758) in the Mediterranean Sea. Mammal Review 33: 105–150.

Notarbartolo di Sciara G. 1990. A note on the cetacean incidental catch in the Italian driftnet swordfish fishery, 1986–1988. Report of the International Whaling Commission 40:459–460.

Panigada S., Pesante G., Zanardelli M., Capoulade F., Gannier A. and Weinrich M.T., 2006. Mediterranean fin whales at risk from fatal ship strikes. Marine Pollution Bulletin 52:1287–1298. http://dx.doi.org/10.1016/j.marpolbul.2006.03.014.

Papale E., Azzolin M. and Giacoma C. 2011. Vessel traffic affects bottlenose dolphin (*Tursiops truncatus*) behaviour in waters surrounding Lampedusa Island, south Italy. Journal of the Marine Biological Association of the United Kingdom 92(8):1877-1885. doi:10.1017/S002531541100083X.

Pauly D. 1995. Anecdotes and the shifting baseline syndrome of fisheries. Trends in Ecology and Evolution 10:430.

Piroddi C., Bearzi G. and Christensen V. 2010. Effects of local fisheries and ocean productivity on the northeastern Ionian Sea ecosystem. Ecological Modelling 221:1526–1544.

Pirotta E., Laesser B.E., Hardaker A., Riddoch N., Marcoux M., Lusseau D. 2013. Dredging displaces bottlenose dolphins from an urbanised foraging patch. Marine Pollution Bulletin 74:396–402.doi:10.1016/j.marpolbul.2013.06.020

Raoult, V., Colefax, A.P., Allan, B.M., Cagnazzi, D., Castelblanco-Martínez, N., Ierodiaconou, D., Johnston, D.W., Landeo-Yauri, S., Lyons, M., Pirotta, V., Schofield, G., Butcher, P.A., 2020. Operational Protocols for the Use of Drones in Marine Animal Research. Drones 4, 64. doi:10.1016/j.pecs.2019.03.002

Read A.J. 2008. The looming crisis: Interactions between marine mammals and fisheries. Journal of Mammalogy 89:541–548.

Reeves R.R., Read A.J. and Notarbartolo di Sciara G. 2001. Report of the Workshop on Interactions between Dolphins and Fisheries in the Mediterranean: Evaluation of Mitigation Alternatives.ICRAM: Rome.

Sala E. 2004. The past and present topology and structure of Mediterranean subtidal rocky-shore food webs. Ecosystems 7:333–340.

Schwacke L.H., Voit E.O., Hansen L.J., Wells R.S., Mitchum G.B., Hohn A.A. and Fair P.A. 2002. Probabilistic risk assessment of reproductive effects of polychlorinated biphenyls on bottlenose dolphins (*Tursiops truncatus*) from the Southeast United States coast. Environmental Toxicology and Chemistry. 21(12):2752-2764.

Schwacke L.H., Zolman E.S., Balmer B.C., De Guise S., George R.C., Hoguet J., Hohn A.A., Kucklick J.R., Lamb S., Levin M., Litz J.A., McFee W.E., Place N.J., Townsend F.I., Wells R.S and Rowles, T.K.2012. Anaemia, hypothyroidism and immune suppression associated with polychlorinated biphenyl exposure in bottlenose dolphins (Tursiops truncatus). Proceedings of the Royal Society B: Biological Sciences. 279(1726):48-57.

Simmonds M. P. 2012. Cetaceans and marine debris: the great unknown. Journal of Marine Biology 2012. doi:10.1155/2012/684279

Southall B. L., Bowles A.E., Ellison W.T., Finneran J.J., Gentry R.L., Greene C.R., Kastak D., Ketten D.R., Miller J.H., Nachtigall P.E., Richardson W.J., Thomas J.A., and Tyack P.L. 2007. Marine mammal noise exposure criteria - Initial scientific recommendations. Aquatic Mammals 33:411–521.

Stelzenmüller V., Coll M., Mazaris A.D., Giakoumi S., Katsanevakis S., Portman M.E., Degen R.,Mackelworth P., Gimpel A., Albano P.G., Almpanidou V., Claudet J., Evagelopoulos F. Essl, T., Heymans J.J., Genov T., Kark S., Micheli F., Pennino M.G., Rilov G., Rumes B., Steenbeek J. and Ojaveer H. 2018. A risk-based approach to cumulative effect assessments for marine management. Science of the Total Environment 612:1132-1140.

Tanabe S., Iwata H. and Tatsukawa R. 1994. Global contamination by persistent organochlorines and their ecotoxicological impact on marine mammals. Science of the Total Environment. 154(2-3):163-177.

Vos J.G., Bossart G.D.,Fournier M. and O'Shea T.J. 2003. Toxicology of Marine Mammals. Taylor & Francis, London and New York.

Weilgart L. 2007. A brief review of known effects of noise on marine mammals. International Journal of Comparative Psychology 20:159 - 168.

Williams R., Cholewiak D., Clark C.W., Erbe C., George C., Lacy R., Leaper R., Moore S., New L., Parsons C., Rosenbaum H., Rowles T., Simmonds M., Stimmelmayr R., Suydam R.S. and Wright A. 2020.Chronic ocean noise and cetacean population models. Journal of Cetacean Research and Management 21:85-94.

SPA/RAC WORKING AREAS

*SPA/ RAC, the UNEP/ MAP **Specially Protected Areas Regional Activity Centre**, was created in 1985 to assist the Contracting Parties to the Barcelona Convention (21 Mediterranean contries and the European Union) in implementing the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean (SPA/BD Protocol).*

POST-2020 SAPBIO

Strategic Action Programme for the **Conservation** of **Biodiversity** and **Sustainable Management** of **Natural Resources** in the **Mediterranean Region**

SPAMI

Specially Protected Areas of **Mediterranean Importance**

Marine turtles

Cetaceans

Mediterranean Monk Seal

Cartilaginous fishes
(Chondrichtyans)

Marine and coastal bird species
Listed in Annex II of the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean

Specially Protected Areas

Monitoring

Coralligenous and other calcareous bio-concretions

Marine vegetation

Dark Habitats
Habitats and species associated with seamounts, underwater caves and canyons, aphotic hard beds and chemo-synthetic phenomena

Species introduction and invasive species

UN environment programme
Mediterranean Action Plan
Barcelona Convention
SPA/RAC
The Mediterranean Biodiversity Centre

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