ACTION PLAN
for Marine Mammals
in Israel
2017–2022

IMMRAC

dolphin biology conservation

The Creation, whether you believe it was placed on this planet by a single act of God or accept the scientific evidence that it evolved autonomously during billions of years, is the greatest heritage, other than the reasoning mind itself, ever provided to humanity.

— E.O. Wilson, The Creation: an Appeal to Save Life on Earth (2006)

Credits

This Action Plan was prepared by Giovanni Bearzi (Dolphin Biology and Conservation) in consultation with Dan Kerem and Mia Roditi-Elasar (IMMRAC).

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About the author

Giovanni Bearzi, Pew Marine Conservation Fellow, Ph.D., has been conducting research on Mediterranean cetaceans since 1986. He founded and directed for a decade a dolphin research and conservation programme in Croatia, which was awarded the “Henry Ford European Conservation Award” as best European project. Former Board Member (1990–2010) and President (2000–2010) of the Tethys Research Institute. Contract Professor of Cetacean Conservation (2002–2006) at the Faculty of Sciences, University of Venice, Italy. President, Dolphin Biology and Conservation (since 2011). He has authored or co-authored about 150 scientific contributions, several Action Plans for cetaceans, and other work intended to support marine conservation action.

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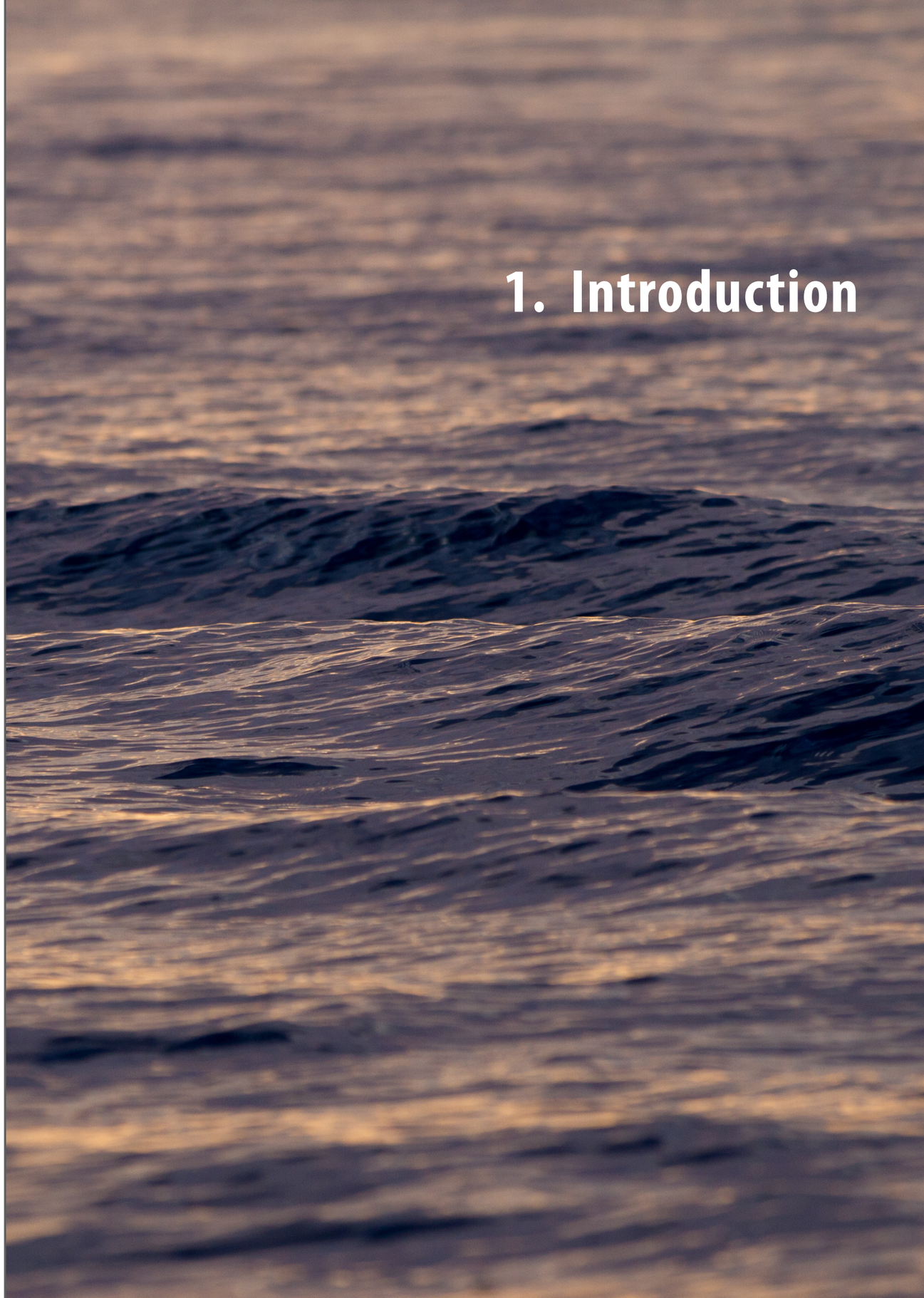


1. Introduction

Preamble

By Dan Kerem

Research on wild cetacean populations in Israel started some 20 years ago, building on a succession of Master and Doctorate theses at the Department of Maritime Civilizations of the University of Haifa. Students, as well as non-academic volunteers who helped kick off marine mammal research in Israel, were members of IMMRAC (Israel Marine Mammal Research & Assistance Center).

After a decade of intensive work, which was solely in the hands of a dedicated few, awareness grew in ever increasing circles. IMMRAC became a partner to ACCOBAMS (the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and Contiguous Atlantic Area) and an important constituent of the international conservation arena.

In recent years, due in part to the country's flourishing gas industry and the realization that underwater noise poses significant risks to marine mammals, regulators began seeking advice on ways to mitigate threats. Noting that several Mediterranean nations, including Israel's neighbors, adopted marine mammal conservation action plans, the time seemed ripe for Israel to have a plan of its own.

This document, written by a master of the trade with IMMRAC's guidance, is the final result. It conveys an illuminated and all-encompassing conservation vision and while its goals may seem ambitious, it definitely is something we must strive for.

I trust that this Action Plan for Marine Mammals in Israel will be adopted and implemented without delay.

Dan Kerem received his Ph.D. in Marine Biology in 1971 from Scripps Institution of Oceanography, La Jolla, California. Retired Head of Research and senior researcher at the Israel Naval Medical Institute, he is a research associate at the Leon Recanati Institute for Maritime Studies, Haifa, and the president of IMMRAC.

1.1 Executive summary

Israel's marine space

Israel has a wide "window" open to the Mediterranean Sea, encompassing about 180 km of coast and covering a sea surface of approximately 26,000 km^2. On the Mediterranean coast, Israel has five ports, seven marinas, and a turnover of 11,000 cargo ships and 22,500 small vessels per year (IMP 2015). The coastal area has a high urban development and various industries (including five seawater desalination plants among the world's largest) having potentially significant cumulative impacts on the marine environment.

The Red Sea coast of Israel covers a 14 km long strip at the northwestern tip of the Gulf of Aqaba/Eilat, with a sea surface of roughly 25 km^2. Most of the western shore's northern section is occupied by port facilities, including a commercial port, three marinas, a navy base, and an oil port. The Gulf of Aqaba/Eilat (bordered by Israel, Egypt, Jordan and Saudi Arabia) is approximately 180 km long, with an average width of 15 km (max 24 km) and a maximum depth of 1850 m.

The marine mammal fauna of Israel

The waters of Israel host a considerable variety of marine mammals (Section 2.1). Remarkably, most of the cetacean species known to be present in the Mediterranean Sea also occur in the oligotrophic waters of Israel. On the southern coast, the deep Gulf of Aqaba/Eilat hosts several of the cetacean species occurring in the entire Red Sea. Israel's marine mammal fauna also includes one member of the Family Phocidae (the rare Mediterranean monk seal); one sirenian—the dugong—may still occur in the Gulf of Aqaba/Eilat.

In contrast with such a variety of species, marine mammals do not appear to be consistently perceived as truly "belonging" to Israel's fauna. For instance, the Red Book of Vertebrates in Israel (Dolev and Perevolotsky 2004) includes the Mediterranean monk seal, but no cetacean species—though cetaceans are indeed Vertebrates. In addition, the Red Book reports the Mediterranean monk seal as being "regionally extinct", although the species seems to have made a comeback and is now known to occur in low numbers. A part of the general public may be still unaware of the presence of marine mammals.

Time has come to acknowledge and communicate that a rich marine mammal fauna does occur in the waters of Israel, where several cetacean species are regularly encountered and some may have local populations. Field research by Israeli and other scientists has produced important information on marine mammal occurrence, ecology and behaviour (Annex 2). Such knowledge, together with a growing popular appreciation of the importance of protecting marine biodiversity, represents a solid background to start a formal process of nation-wide recognition of marine mammals—leading to more intensive research efforts, increased public and institutional awareness, and concrete conservation action.

Why should one care about protecting marine mammals?

Following decades of exponential human population growth, unsustainability has become apparent at all scales, affecting the whole of nature (Barnosky et al. 2011, WWF 2016). Human activities in the Anthropocene are having dramatic impacts on marine biodiversity and a profound institutional and public responsibility is required to prevent irreversible damage to marine ecosystems. Marine mammals are considered "emblematic species of global conservation concern" (Piante and Ody 2015) and concern is legitimate indeed, because most of the numerous anthropogenic factors threatening marine mammals can

be expected to increase in the future (Reynolds et al. 2009). In the Mediterranean Sea, several populations are in dire straits and most have been classified as threatened (Critically Endangered, Endangered, and Vulnerable) in the IUCN Red List. Failing to stop their decline would be deplorable.

High-order predators such as marine mammals help maintain ecosystem functionality and resilience. They are also considered "umbrella species", in the sense that actions that contribute to their conservation and that of their habitat can benefit marine biodiversity generally and add to the ecological, cultural and aesthetic value of the marine environment.

Besides representing a resource for nature tourism, a healthy marine mammal fauna can raise Israel's international reputation as a nation aware of the importance of protecting its natural heritage. Science-based actions inspired by the precautionary principle can set high standards of conservation management, representing a model for marine mammal protection in the region and propelling broad marine conservation efforts.

Israel's commitments to preserve marine mammals and marine biodiversity

Israel has formally committed to the preservation of biodiversity by ratifying a number of international conservation treaties and issuing strict nature and animal conservation laws. These commitments and legal mandates, reviewed in Section 2.4 of this Action Plan, encompass Israel's marine space and its entire marine mammal fauna.

However, action taken so far has not been capable of mitigating the diversity and vehemence of human pressures on the marine environment. According to the Israel Marine Plan, there is a "worrying absence of a national policy to promote marine research" and "the marine space is still severely lacking in appropriate legislative tools, effective enforcement mechanisms, and the necessary spatial planning" (IMP 2015).

Conservation action has been similarly poor. While all marine mammal species in Israel are formally protected by the law[1], protection is limited to the prohibition of intentional harm, while little action has been taken so far to prevent unintentional damage—be it measures to reduce incidental mortality of marine mammals in fishing gear, effective protection of their habitat and prey, or mitigation of high-intensity noise. As a result, some marine mammal populations may disappear before we even come to know their original numbers and distribution, let alone appreciate the role they play in the ecosystem.

Because of the fast rate of exploitation of marine resources and the known human potential for causing irreversible damage, formal commitments to marine conservation such as those outlined in Section 2.4 are not sufficient to protect marine mammals. Timely and well-conceived management action is needed to prevent further loss of biodiversity, ecosystem damage and population decline. Initiatives such as the Israel Maritime Policy Project (Section 2.4), currently in the making, may contribute to management improvements and hopefully result in effective protection.

1 Wildlife Protection Law 5715-1955 and National Parks, Nature Reserves, National Sites and Memorial Sites Proclamation (Protected Natural Assets) 5765-2005 (Section 2.4).

Vision and goals of this Action Plan

This Action Plan contributes background information, a rationale and a set of actions intended to make the charismatic and magnificent marine mammals of Israel better known, respected and protected. The Plan's main goal is to ensure that marine mammals populations in the waters of Israel enjoy a "favourable conservation status" (Scovazzi 2016, Trouwborst et al. 2017) arising from a combination of legislative, management, research, education and awareness initiatives.

Actions in this Plan aim to:

- Improve the management of human activities known or likely to have negative impacts on marine mammals, and produce scientific information that can support and guide such process
- Prominently feature marine mammals in national legislation and management decision
- Make the general public and the institutions fully aware of the need of protecting marine mammals, as well as of the long-term benefits of preserving healthy marine ecosystems—beyond short-sighted economic interest which may undermine their future
- Ensure the protection of areas containing important marine mammal habitat and prey resources
- Support the development of expertise and establish the social and economic framework necessary to accomplish the marine mammal conservation objectives listed above.

Actions in this Plan should be harmonised with the initiatives proposed in other conservation-oriented plans and agreements, with the ultimate goal of avoiding damage to marine biodiversity, ensuring protection to Israel's natural heritage, and advancing marine mammal research and conservation in the Levantine Basin and in the Gulf of Aqaba/Eilat.

Time frame, monitoring and revision

The goals of this Plan can be met through the implementation of actions described in Section 3, that should take place between 2017 and 2022. Year 2017 is intended as a preparatory phase, whereas 2018–2022 should see the integration of all actions into Israel's management framework, and a timely enforcement.

A Steering Committee created ad-hoc (Section 3.1), should coordinate the actions outlined in this Plan, monitor the timing, and supervise the allocation of financial resources based on project priority, quality and feasibility.

A mid-term evaluation of the Action Plan's outcome and degree of enforcement should be performed by June 2020, to assess progress and identify any necessary adjustment or revision. A review of the Plan's accomplishments and challenges to implementation should be conducted by March 2023. Such review should lead to an upgrade of the Plan and the development of more specific and fine-tuned actions to be taken during subsequent phases of implementation.

General structure of the Action Plan

The general structure of this Action Plan is illustrated by the flowchart in Fig. 1. The chart shows the main relationships among the four categories of actions proposed here (Legislation and Management, Research, Capacity Building, Awareness and Education).

The ultimate and most important goal is an actual measurable improvement in the conservation status of marine mammals, which should be assessed through research.

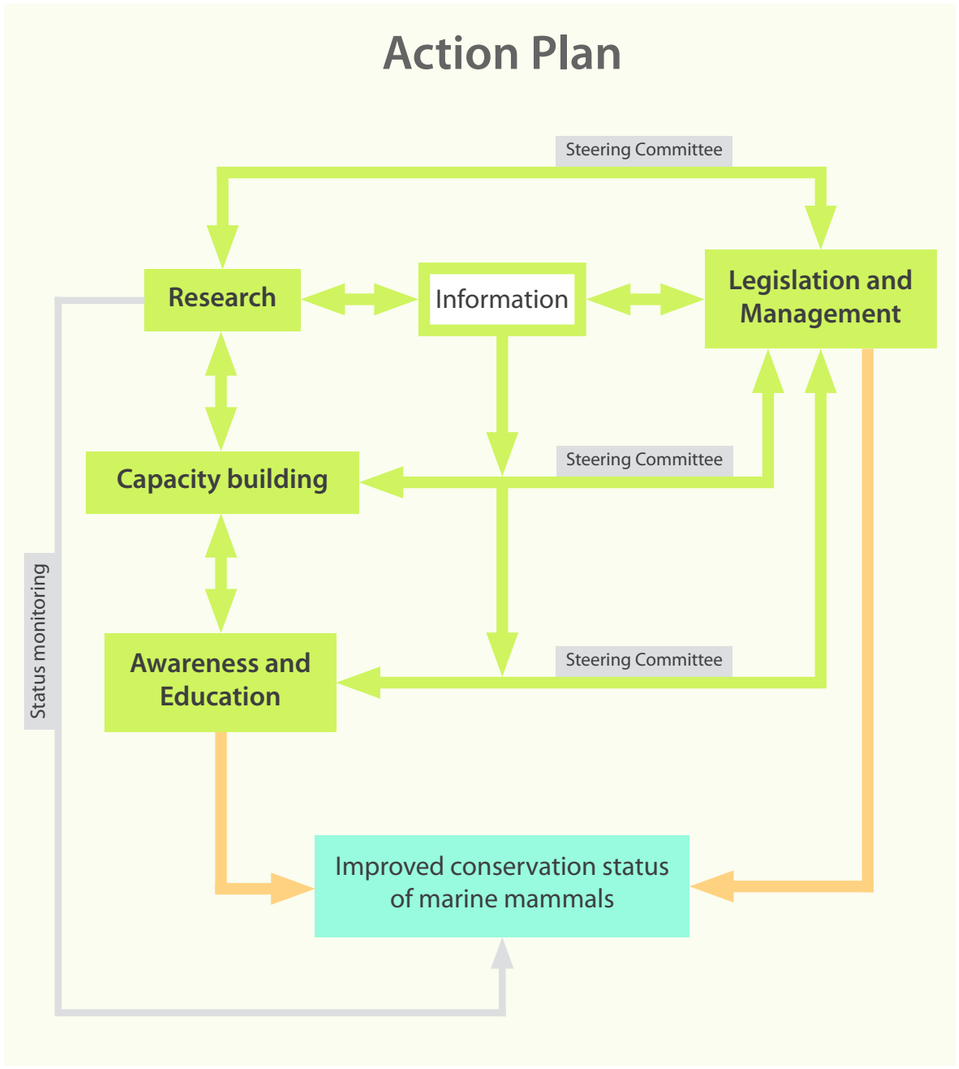


Figure 1. General structure of the Action Plan for Marine Mammals in Israel, 2017-2022.

2. Background information

2.1 Marine mammal species occurring in Israel

A note on methodology

Marine mammals include 129 extant species, worldwide (Committee on Taxonomy 2014). Tables 1 and 2 list subsets of species occurring in the entire Mediterranean Sea, in the Levantine Basin, in the Mediterranean marine space of Israel, in the entire Red Sea, in the Gulf of Suez and in the Gulf of Aqaba/Eilat.

It must be considered, however, that appropriately extensive visual surveys of marine mammal in the Mediterranean and Red Sea waters of Israel have not been conducted, and information is still scant. Consequently, the overview provided here— based on the published literature and on unpublished records provided by Dan Kerem—should be seen as provisional and indicative.

All the non-regular species listed in the tables (also including alien or Lessepsian cetacean species) are reported as "Vagrants". When scarcity of information prevented inference on actual occurrence, "Few records" was used to indicate five or less records, while "Present" indicates more than five records. "Regular" is used when records are suggestive of a regular occurrence, but the distinction between Present and Regular is sometimes blurry.

Mediterranean cetaceans

Of the cetaceans species considered regular in the Mediterranean (Notarbartolo di Sciara and Birkun 2010), only one—the long-finned pilot whale—has no records in Israel and in the whole Levantine Basin. All other regular species do occur off the coast of Israel. Overall, the cetacean fauna of Israel includes 12 species that are either regular or vagrant. Absence of records for some of the most elusive or uncommon species may be due in part to insufficient survey effort.

Kerem et al. (2012) provided a detailed review on the cetacean fauna of the Levantine Basin. This work complemented previous information based on original data collected between 1993 and 2009, which included stranding and bycatch reports as well as opportunistic and dedicated visual surveys at sea. The 2012 review was complemented by a report to the International Whaling Commission Scientific Committee (Kerem et al. 2014). These two authoritative reviews provide state-of-the-art information on cetacean occurrence in the waters of Israel and we encourage the readers to refer to these documents, as well as to the Mediterranean status report by Notarbartolo di Sciara and Birkun (2010).

An important addition to the works cited above is a recent article focusing on rough-toothed dolphins, possibly a relict population confined to the easternmost Mediterranean waters. While the species has an Atlantic origin, its Mediterranean distribution is detached from the Atlantic, most records being in the Levantine Basin (particularly off Israel; Kerem et al. 2016).

Red Sea cetaceans

Most of the cetacean species considered regular in the Red Sea have been observed in the deep Gulf of Aqaba/Eilat, and some are known to occur off the short coast of Israel. Survey effort in the region has been low and information about the cetacean fauna of the entire Red Sea is still limited. At present, it is difficult to assess the occurrence of several species with reasonable precision, thence the provisional designations

("Few records" and "Present") in Table 2. An upcoming review on Red Sea cetaceans (Notarbartolo di Sciara et al. in preparation), still unavailable at the time this Action Plan was written (April 2017), is expected to offer additional insight.

Rare and endangered marine mammals

The importance of protecting rare and endangered species

Two marine mammal species—a seal and a sirenian—have declined from their historical abundance, likely as a result of human activities. Rare and endangered marine mammals are still important components of the national and regional fauna and have the highest conservation value, being part of a natural and cultural heritage that cannot be dismissed. Marine mammals occurring in low numbers are especially vulnerable to human impact and they deserve specific and careful conservation action, designed to facilitate re-colonisation of former habitats and ensure long-term survival.

The case of the Mediterranean monk seal in Israel (Scheinin et al. 2011) shows that one should never give up on species recovery and survival, not even when a species or a population is on the verge of extinction or reported to be extinct. The timid comeback of monk seals in the Mediterranean waters of Israel—consistent with observations in other parts of the region (Notarbartolo di Sciara 2016)—represents a conservation opportunity that cannot be missed.

Mediterranean monk seal

The Mediterranean monk seal is known to have occurred in Israel in historic times. Reports, however, stopped in the 1950s (Scheinin et al. 2011) and monk seals were considered absent for five decades, and reported to be "regionally extinct" (Dolev and Perevolotsky 2004). Since 2009, however, photographic and other records have been irrefutably documenting their occurrence (Scheinin et al. 2011). Between 2009 and 2016, there have been 66 Mediterranean monk seal reports all along the coast of Israel (Scheinin et al. 2011; Mia Roditi-Elasar, personal communication). While most sightings could refer to a single individual, there is evidence that at least two seals were present (Scheinin et al. 2011, Bundone et al. 2016).

It is unknown whether monk seals were entirely absent from Israel for several decades, or a few animals have always been present (but their occurrence could not be appropriately documented). What is clear is that Mediterranean monk seal still occur in Israel in low numbers, and re-colonisation may be possible. Israel should not miss the chance of contributing to the recovery of a critically endangered marine mammal species that has risked to be lost forever.

Dolev and Perevolotsky (2004) reported the following causes of monk seal decline in Israel: 1) disturbances to pupping and lactation in coastal caves; 2) strangulation from entanglement in fishing nets; 3) deliberate killing by fishers, who fear competition for fish and damage to nets; and 4) hunting for exploiting oil, meat and skin. A recent review of Mediterranean monk seal status (Notarbartolo di Sciara 2016) ranks the causes of decline as follows: 1) deliberate killing (mostly by fishers); 2) critical habitat, particularly during the breeding season, encroached by disruptive human presence; and 3) incidental bycatch in fishing gear (mostly of young individuals). Hunting for oil, meat and skin likely was an important source of mortality in the past, but it is no longer a primary concern (Dolev and Perevolotsky 2004).

An additional threat that normally is not given a high rank but may be important is overfishing and food web competition (Trites et al. 1997) resulting in the decline of important monk seal prey. Other potentially important threats include morbillivirus outbreaks, contamination by xenobiotics, oil spills in critical habitat, and inbreeding (Karamanlidis et al. 2015, Notarbartolo di Sciara 2016).

Dugong in the Red Sea

Dugongs were once considered an inexhaustible resource, and herds could still be seen across the dugong's range as late as the 1960s. No longer so. The dugong is now listed as Vulnerable in the IUCN Red List, and is facing a high risk of extinction throughout most of its range. The species was known to extend to the northernmost parts of the Red Sea (Bertram and Ricardo Bertram 1973, Nishiwaki et al. 1979) but present numbers and distribution in the Gulf of Aqaba/Eilat remain unknown, and historical baselines of abundance are lacking. Dugongs used to occur in the Gulf of Aqaba/Eilat, where they were considered "rare, but known to local fishers" (Bertram 1943). In the Gulf of Suez the species was considered "scarce", but about 12 animals were taken in the region of Ghardaqa (Hurghada, Egypt) over a decade (Bertram and Ricardo Bertram 1973). According to Frazier et al. (1987) "one cannot believe that there are more than a few hundred dugongs in the whole of the Red Sea."

Beliefs and perceptions, however, are hardly ever an appropriate method of assessing marine mammal population numbers: hard-science investigations are needed. Useful information was provided by aerial surveys conducted in 1987 in several coastal areas of the eastern Red Sea (Preen 1989). The estimated dugong population in the survey zones of Wejh, Qunfidha and Gizan was 1818 (CV 21%). Surveys in other areas (including Tiran, just outside the Gulf of Aqaba/Eilat) did not yield sufficient sightings to obtain reliable estimates. Based on aerial surveys and other information, Preen (1989) estimated a "potential population" of 4000 dugongs in the Red Sea, in striking contrast with the low abundance reported in previous studies. Interviews with fishers also were suggestive of areas (not surveyed by Preen) having a high abundance of dugongs. Clearly, only rigorous investigations will reveal the abundance of dugongs in the Gulf of Aqaba/Eilat and its adjacent waters, and clarify whether a potential for recovery exists.

In contrast with studies conducted in other areas, only 16% of Red Sea dugongs observed by Preen (1989) were associated with vegetation. Dugongs were sighted in "deep water" (45% of observations), or on coral and at reef edges (22%). Most dugongs were observed in inshore areas with sedimentary substrate. The majority of observations included a single individual and the largest groups were composed of five or six individuals (Preen 1989).

Hunting, bycatch in fishing gear and loss of suitable habitat (Frazier et al. 1987, Preen 1989) likely concurred to the species' decline. Hunting is arguably less common today, and dugong numbers have the potential of increasing in the future if appropriate conservation management and restoration of dugong habitat were put in place. Vegetation loss due to coastal development has been reportedly compensated by afforestation projects, and Red Sea mangroves have expanded by 12% between 1972 and 2013 (Almahasheer et al. 2016). In this context, the reported increase in mangrove coverage in the Red Sea might turn out to be beneficial for dugong conservation in the region.

Table 1: Marine mammal species occurring in the Mediterranean waters of Israel

	Mediterranean	Levantine Basin[1]	Israel
Order Cetartiodactyla / Cetacea			
Family Balaenidae			
North Atlantic right whale *Eubalaena glacialis*	Vagrant	No records	No records
Family Eschrichtiidae			
Grey whale *Eschrichtius robustus*	Vagrant	Vagrant	Vagrant
Family Balaenopteridae			
Humpback whale *Megaptera novaeangliae*	Vagrant	Vagrant	No records
Fin whale *Balaenoptera physalus*	Regular	Vagrant	Vagrant
Common minke whale *Balaenoptera acutorostrata*	Vagrant	Vagrant	Vagrant
Sei whale *Balaenoptera borealis*	Vagrant	No records	No records
Family Physeteridae			
Sperm whale *Physeter macrocephalus*	Regular	Vagrant	Vagrant
Family Kogiidae			
Dwarf sperm whale *Kogia sima*	Vagrant	No records	No records
Family Ziphiidae			
Northern bottlenose whale *Hyperoodon ampullatus*	Vagrant	No records	No records
Gervais' beaked whale *Mesoplodon europaeus*	Vagrant	No records	No records
Blainville's beaked whale *Mesoplodon densirostris*	Vagrant	No records	No records
True's beaked whale *Mesoplodon mirus*	No records	Vagrant[2]	No records
Cuvier's beaked whale *Ziphius cavirostris*	Regular	Regular	Vagrant
Family Delphinidae			
Killer whale *Orcinus orca*	Regular	No records	No records[3]
False killer whale *Pseudorca crassidens*	Vagrant	Vagrant	Vagrant
Long-finned pilot whale *Globicephala melas*	Regular	No records	No records
Risso's dolphin *Grampus griseus*	Regular	Regular	Regular
Rough-toothed dolphin *Steno bredanensis*	Regular	Regular	Regular
Indo-Pacific humpback dolphin *Sousa plumbea*[4]	Vagrant	Vagrant	Vagrant
Common bottlenose dolphin *Tursiops truncatus*	Regular	Regular	Regular
Short-beaked common dolphin *Delphinus delphis*	Regular	Regular	Regular
Striped dolphin *Stenella coeruleoalba*	Regular	Regular	Regular
Family Phocoenidae			
Harbour porpoise *Phocoena phocoena relicta*[5]	Regular	No records	No records
Order Carnivora			
Family Phocidae			
Mediterranean monk seal *Monachus monachus*	Regular	Regular	Rare[6]

Table 2: Marine mammal species occurring in or near the Red Sea waters of Israel

	Red Sea	Gulf of Suez	Gulf of Aqaba/ Eilat[7]
Order Cetartiodactyla / Cetacea			
Family Balaenopteridae			
Humpback whale *Megaptera novaeangliae*	Present	No records	Few records
Bryde's whale *Balaenoptera edeni*	Regular	Few records	Doubtful
Family Delphinidae			
Killer whale *Orcinus orca*	Few records	No records	No records
False killer whale *Pseudorca crassidens*	Regular	No records	Few records
Short-finned pilot whale *Globicephala macrorhynchus*	Few records	No records	No records
Risso's dolphin *Grampus griseus*	Regular	No records	Regular
Rough-toothed dolphin *Steno bredanensis*	Few records[8]	No records	No records
Indo-Pacific humpback dolphin *Sousa plumbea*[9]	Regular	Present	No records
Indo-Pacific bottlenose dolphin *Tursiops aduncus*	Regular	Present	Present
Common bottlenose dolphin *Tursiops truncatus*	Regular	Doubtful[10]	Present
Long-beaked common dolphin *Delphinus capensis tropicalis*[11]	Regular	No records	No records
Pantropical spotted dolphin *Stenella attenuata*	Regular	No records	Regular
Spinner dolphin *Stenella longirostris*	Regular	No records	Few records
Striped dolphin *Stenella coeruleoalba*	Few records	No records	No records
Order Sirenia			
Family Dugongidae			
Dugong *Dugong dugon*	Regular[12]	Present	Few records[13]

Table footnotes

[1] Sensu Kerem et al. 2012: "the part of the Mediterranean east of an imaginary line connecting the westernmost point of Crete and the northernmost point of Cyrenaica on the Libyan coast, excluding the Aegean Sea and the eastern horn of the Hellenic Trench."
[2] Genetic identification pending (Öztürk et al. 2016).
[3] The one and only report of killer whale occurrence off Israel, which so far is also the only record in the Levantine Basin (Notarbartolo di Sciara and Birkun 2010) is most likely a misidentification (Kerem et al. 2012).
[4] Often reported as *S. chinensis*. The species is considered a Lessepsian immigrant (Kerem et al. 2001, Notarbartolo di Sciara and Birkun 2010).
[5] Black Sea subspecies.
[6] The Mediterranean monk seal was reported to be regionally extinct in Israel (Dolev and Perevolotsky 2004). The species is currently known to occur in low numbers (Scheinin et al. 2011a).
[7] All cetacean species occurring in the Gulf of Aqaba/Eilat also occur within the Red Sea waters of Israel, with the possible exception of *T. truncatus* that, so far, was only seen in the southernmost portion of the Gulf.
[8] Dan Kerem, personal communication.
[9] Often reported as *S. chinensis*.
[10] A few records of bottlenose dolphins in the Gulf of Suez exist, but it is unclear whether these refer to *T. truncatus* or to the morphologically similar *T. aduncus*. In addition, the possibility of Mediterranean *T. truncatus* migrating into the Gulf of Suez cannot be dismissed.
[11] *D. capensis tropicalis*, a regional variety of *D. capensis*, is sometimes referred to as Arabian common dolphin *D. tropicalis*. Its occurrence appears to be limited to the southern part of the Red Sea.
[12] Based on Preen 1989. More recent information would be needed to assess present occurrence.
[13] The Red Sea territorial waters of Israel do not contain dugong habitat and past records in the area (dating back to the late 1950s) were likely transient or stray individuals. There have been no reports of dugong occurrence since.

2.2. Sources of information on marine mammals

Scientific literature

The first stage of the planning process for this Action Plan entailed the collection of published materials containing relevant information about marine mammals in Israel. The search encompassed publications in the peer-reviewed literature, as well as contributions such as reports, theses, conference proceedings and abstracts.

Annex 2 lists the information available at the time this Action Plan was written (April 2017). The collection, totalling 118 contributions, suggests that interest in marine mammal research has grown rapidly after the 1990s, with a majority of scientific publications seeing the light after the year 2000. Although the number of peer-reviewed contributions in ISI journals has been rising, and publishing trends are indicative of a lively interest in marine mammals, scientific information is still limited. More focused studies—particularly on population abundance and trends, conservation status, distribution, habitat use and movement patterns—would be needed to inform management action.

Some of the actions in this Plan emphasise the importance of making the existing scientific literature easily searchable and promptly available, both in print (at specialised libraries) and in digital format online (when legally possible). Further, it would be important to expand the provisional list in Annex 2 to encompass historical literature, also including any available information in languages other than English and Hebrew.

Research-based online databases

OBIS Seamap

The Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS) is a spatially referenced online database, aggregating marine mammal, seabird, sea turtle, and elasmobranch observation data from across the globe. As of March 2017, OBIS included a total of 204 marine mammal records from Israel, all contributed by IMMRAC. Of these, 105 records refer to eight species observed in the Mediterranean waters off Israel, and 54 records to seven species observed in the Gulf of Aqaba/Eilat and adjacent waters.

For more information: http://seamap.env.duke.edu

BioGIS

BioGIS is a system to explore Israel's biodiversity. It integrates information on the composition and geographical distribution of the flora and fauna of Israel in an online open-access Geographic Information System (GIS) equipped with tools for data analysis and visualisation. The system is being developed as a long-term database and it aims to reflect the current state of knowledge on the distribution of plant and animal species in Israel, including marine mammals.

For more information: http://www.biogis.huji.ac.il

MEDACES — Mediterranean Database of Cetacean Strandings

This database was created under the Barcelona Convention extended to the ACCOBAMS area. It is supported by the Spanish Ministry of the Environment. Cetacean stranding data are shown at a rather coarse scale, but the reported intention is to have them organized into a spatially referenced database of public access. The MEDACES database includes cetacean stranding records from Israel.

For more information: http://medaces.uv.es

Information on marine mammals in captivity

Dolphin Reef

Most research on captive marine mammals in Israel has been conducted at the "Dolphin Reef" facility situated in Eilat. Studies have focused on Black Sea bottlenose dolphins *Tursiops truncatus ponticus* imported in 1990 from Taman Bay, Russia: two males and three females, and their captive-born progeny (other 18 dolphins; Perelberg et al. 2010). Three of these dolphins were relocated back to the Black Sea (Entrup and Cartlidge 1998, Perelberg et al. 2010).

Research at "Dolphin Reef" has not concerned the marine mammal fauna of Israel. However, interactions between formerly semi-captive Black Sea bottlenose dolphins and wild dolphins from the Red Sea have occurred in the past. According to Perelberg et al. (2010):

> "Between the years 1997 to 2002, one or two underwater gates were open to the sea all year round, usually 24 hr/day, enabling the dolphins almost unlimited access to the open sea. Most males (adult and adolescent) and the adolescent females frequently went into the open sea, and always returned back to the enclosure. During this period, there was only one event of a nine days long excursion of an adolescent male (Lemon), who was identified in Dahab, (Sinai, Egypt), about 125 km to the south, after which he returned back to the Dolphin Reef. All other excursions lasted less than a day. However, due to unsupervised encounters between humans and dolphins along the public beaches of Eilat, which led to harassment of the dolphins by humans and resulting in aggressive dolphin behaviors, the gates were closed and the dolphins were confined to the enclosure ever since. The species (*T. truncatus*), although of a different local subspecies, is common in the Red Sea, but rarely seen at the northern part of the Gulf of Aqaba along the beaches of Eilat (Feingold 2006). A sister species – the Indo-Pacific bottlenose dolphin (*T. aduncus*, which is actually believed to be closer to the *Stenella* and *Delphinus* genuses, see LeDuc et al. 1999), as well as four other cetacean species, occasionally visit the northern tip of the gulf (Feingold 2006), and sometimes interact with the Dolphin Reef dolphins through the circumference net (ILDBR, unpublished data)."

While reports of past interactions Black Sea bottlenose dolphins (either imported or captive born) and wild Red Sea cetaceans remain mostly anecdotal, knowing that such events potentially have occurred for about seven years within a range of up to 125 km is certainly relevant in a marine mammal conservation and management context.

Tel Aviv Dolphinarium and Tel Aviv Luna Park

Entrup and Cartlidge (1998) reviewed information about Black Sea bottlenose dolphins imported around 1994 and held captive at Tel Aviv Dolphinarium, and later at the Tel Aviv Luna Park. Both of these facilities reportedly had poor animal husbandry standards, and several dolphins died. Commercial exploitation of dolphins caused political dispute, until the business was closed.

The Tel Aviv Dolphinarium is also known to have imported non-native pinnipeds (*Pusa* sp.; Dan Kerem, personal communication). In 1980-1981, the Dolphinarium captured several dolphins in the Red Sea during a live-capture campaign mostly conducted in the southern Gulf of Suez (Beadon 1991):

> "Two types of bottlenose dolphin, *Tursiops truncatus*, were seen and caught. One was small (to no more than about 2.2 m) and relatively slender, with a gentle slope from the melon onto a relatively elongated snout. They were pale grey on the back and sides, lighter on the ventrum, and frequently had spotting, particularly on the throat (...). The second type of dolphin was large (to 4 m or more) and robust with a comparatively steeper melon, shorter, broader snout, and apparent lack of ventral spotting."

Other desk and laboratory studies

In addition to the literature and other work mentioned in previous sections, scientists from Israel have published a few theoretical studies on marine mammals, for the most part conducted on captive dolphins. Some of these studies are listed in Annex 2 for completeness, but their relevance for the purposes of this Action Plan is limited.

2.3 Key institutions, stakeholders, universities and non-profit organizations

Ministry of Environmental Protection

The Ministry of Environmental Protection is in charge of Integrated Coastal Zone Management and Maritime Spatial Planning. An overview of its activities is provided in the Legislation section.

For more information: http://www.sviva.gov.il/

Other relevant Ministries

Ministry of Interior
Ministry of Finance
Ministry of Science, Technology and Space
Ministry of Agriculture and Rural Development
Ministry of Defence
Ministry of Public Security
Ministry of Foreign Affairs
Ministry of National Infrastructures, Energy and Water Resources
Ministry of Transport and Road Safety
Ministry of Justice
Ministry of Communications
Ministry of Tourism

Committee for the Protection of the Coastal Environment

The Committee for the Protection of the Coastal Environment is responsible for decisions on marine and coastal development plans. Established in 2004 under the Protection of the Coastal Environment Law, it includes representatives of several Ministries. Activities that are *not* within its competences include: 1) management of shipping activities such as defining anchorage areas and sea ways (under the responsibility of the Ministry of Transport and Road Safety); 2) management of fishing areas (Ministry of Agriculture and Rural Development, Fishing Department); 3) drilling and extraction of oil and natural gas (Ministry of National Infrastructures, Energy and Water Resources); and 4) closing areas for military reasons (Ministry of Defence).

Israel Nature and Parks Authority

The Israel Nature and Parks Authority (INPA), funded in 1998, is a governmental organization in charge of managing nature reserves and national parks. One of its main missions is enforcing wildlife protection laws throughout the country. INPA is also responsible for issuing permits to study and handle wildlife. INPA has been collaborating with IMMRAC in the monitoring of marine mammal strandings, as well as in the conduction of half-day photo-identification surveys off Israel's northern and southern Mediterranean coasts.

Relevant agencies and other stakeholders

Israel Ports Authority
Israel Ports Development & Assets Company
Chamber of Shipping of Israel
Israel Navy (Ministry of Defence)
Israel Coast Guard (Ministry of Public Security)
Israel Natural Gas Lines
Association of Oil and Gas Exploration Industries in Israel
Fishermen Union (Jaffa, Haifa)
Mevo'ot Yam Naval School
Ort Naval Officers School
Israel's National Sailing Union
Marine Shippers Union

Universities and research institutes

Universities

Israel has nine universities and several dozen colleges. A comprehensive list is available at the link below: http://en.wikipedia.org/wiki/List_of_Israeli_universities_and_colleges

University of Haifa

The published literature (Annex 2) documents that the University of Haifa has been one of the main national "producers" of marine mammal publications and theses. The university, founded in 1963, is divided into six Faculties (humanities, social sciences, law, science and science education, social welfare and health studies, and education). Of particular importance are University of Haifa's Leon H. Charney School of Marine Sciences (which houses divisions of marine biology, marine civilizations, maritime geosciences, marine technology, maritime law, and The Morris Kahn Marine Research Center) and Leon Recanati Institute for Maritime Studies.

For more information: http://www.haifa.ac.il
Leon H. Charney School of Marine Sciences: http://marsci.haifa.ac.il/en
Leon Recanati Institute for Maritime Studies: http://maritime2.haifa.ac.il

Koret School of Veterinary Medicine

The Koret School of Veterinary Medicine, founded in 1985, is Israel's only veterinary school. The School, committed to serving as the country's major referral centre for veterinarians, has been collaborating with IMMRAC to conduct cetacean necropsies and pathology studies, resulting in peer-reviewed publications.

For more information: http://ksvm.agri.huji.ac.il/en/

Technion — Israel Institute of Technology

Technion – Israel Institute of Technology is a public research university in Haifa. Established in 1912 under the Ottoman Empire, it is the oldest university in Israel. The university offers degrees in science, engineering, architecture, medicine, industrial management and education. It has 19 academic departments, 60 research centres and 12 affiliated teaching hospitals. Technion envisaged the Israel Marine Plan (IMP 2015) and has been providing impetus and support to marine spatial planning.

For more information: http://www.technion.ac.il

Israel Oceanographic and Limnological Research

Israel Oceanographic and Limnological Research (IOLR), established in 1967, is a non-profit governmental corporation conducting research in the fields of oceanography, limnology, mariculture and marine biotechnology. It is affiliated with the Earth Sciences Research Administration of the Ministry of National Infrastructures. IOLR includes three research centres: the National Institute of Oceanography in Haifa, the Yigal Allon Kinneret Limnological Laboratory near Tiberias, and the National Center for Mariculture in Eilat. IOLR has been fruitfully collaborating with IMMRAC to conduct contaminant analyses on stranded cetaceans, resulting in several peer-reviewed publications.

For more information: http://www.ocean.org.il

Mediterranean Sea Research Center of Israel

The discovery of significant reserves of natural gas off the coast of Israel prompted the creation of a network of universities and governmental research institutes under the leadership of the University of Haifa. The Mediterranean Sea Research Center of Israel (MERCI) focuses on developing marine infrastructure, education, and use of Israel's marine resources.

For more information: http://merci.haifa.ac.il

Non-governmental organizations primarily involved in marine mammal research

Israel Marine Mammal Research & Assistance Center (IMMRAC)

IMMRAC, established in 1993, is the only non-profit organization in Israel dedicated to the study and conservation of cetacean populations that inhabit the Eastern Mediterranean and the Gulf of Aqaba/ Eilat. IMMRAC's academic sponsorship is through the Leon Recanati Institute for Maritime Studies of the University of Haifa. Activities by IMMRAC include: 1) updating the list of Mediterranean cetacean species that range into the inadequately-studied Eastern Basin, 2) conducting near-shore dolphin surveys, 3) managing a nation-wide, 24/7 hotline for stranded cetaceans, 4) post-mortem examination and collection of tissue samples from stranded and by-caught cetaceans, 5) investigating dolphin-fisheries interactions, 6) public awareness campaigns and routine alerting of the media to outstanding events, 7) nation-wide education programmes, lately embodied in the "Dolphin & Sea Centre" in Ashdod, and 8) lobbying for conservation-oriented marine mammal legislation.

For more information: http://immrac.org

Other non-governmental organizations

Society for the Protection of Nature in Israel (SPNI)

The Society for the Protection of Nature in Israel (SPNI), established in 1953, is Israel's leading environmental non-profit organization. SPNI is committed to protecting and preserving Israel's natural resources, environment, natural assets and landscape.

For more information: http://natureisrael.org

Israel Union for Environmental Defence (IUED)

The Israel Union for Environmental Defence (also known as Adam Teva V'din, "man, nature and law" in Hebrew) is a non-profit organization established in 1991. It aims to "use the power of law, science and advocacy to protect Israel's environment and public health".

For more information: http://www.iued.org.il

Zalul

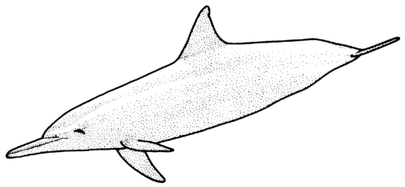
Zalul is an environmental NGO founded in 1999, dedicated to protecting the seas and rivers of Israel through conservation, activism, research, awareness-raising and education. Zalul carried out campaigns for water protection, the preservation of coral reefs in the Gulf of Aqaba/Eilat, the removal of fish cages in the Red Sea, the establishment of environmental regulations for offshore oil and gas drilling, battles against municipalities and industries polluting rivers, and plastic pollution in the marine environment.

For more information: http://www.zalul.org.il

Ecoocean

Ecoocean is a non-profit organization established in 2002 by the Weil family and a group of Israeli scientists. Its mission is to preserve the marine and coastal environment by promoting marine research, education and public awareness.

For more information: http://www.ecoocean.org



2.4 Legislative framework

This section reviews Israel's national legislation as well as the international treaties that are applicable and can be relevant for the conservation of marine mammal species occurring in the Mediterranean and Red Sea waters of Israel.

National legislation relevant for marine mammal conservation

Fisheries regulations

Fisheries Ordinance of 1937 and Amendments

This Ordinance introduced an early system of fishing licenses to regulate the taking and landing of fish in Israel. Fish was defined as "any aquatic animal, whether piscine or not". Animals that could be taken notably included marine mammals and sea turtles (*). The Ordinance refers to the sea area within six nautical miles from the low water mark. The use of explosives and poison was prohibited. The Ordinance was amended in 1939, 1944, and 1946.

*) Deliberate takes of marine mammals were promoted in the 1950s and 1960s, when dolphins in Israel were regarded as vermin and agricultural pests (Dan Kerem, personal communication).

For more information: http://www.fao.org/faolex/results/details/en/c/LEX-FAOC001688/

Fisheries Rules of 1937 and Amendments

These Rules made further provisions for the granting of fishing licences, and defined areas where fishing was not allowed. Trawling in Mediterranean waters of less than 15 m depth was prohibited. Mesh sizes, fish species and minimum sizes were defined. No person was allowed to import, introduce in Israel or transfer any live fish (arguably including marine mammals, defined as "fish" in the original Ordinance) without permission. Licence holders were demanded to report on the quantity of fish taken, size, species, composition gender, quality, and on the fishing method used. Those who purchased fish from licence holders also were demanded to report on the amount of fish, size, species, composition, gender and quality. The Rules of 1937 were amended in 1938, 1940, 1941, 1945 and 1946.

For more information: http://www.fao.org/faolex/results/details/en/c/LEX-FAOC020039/

The 2016 Amendment

Extant fisheries regulations were substantially improved by an Amendment made in 2016, "as a partial attempt to mitigate overfishing and reduce harm to fish stocks" (Rinat 2016). The 2016 Amendment introduced a number of restrictions and it represents a remarkable progress. Several of the new restrictions would be relevant for marine mammal conservation—to the extent that actual enforcement is capable of reducing marine mammal bycatch (Read et al. 2006), exploitative competition (Keddy 2001, Kaschner and Pauly 2005), food web competition (Trites et al. 1997), and ecosystem damage caused by destructive fishing methods (e.g. trawling: Jones 1992). The restrictions targeting bottom trawling are particularly important, as in Israel this fishing method has the greatest ecological footprint and potential for habitat devastation (Edelist et al. 2013, Scheinin et al. 2014). In addition, trawlers operating in the waters of Israel

are a significant source of incidental mortality for common bottlenose dolphins (Kent et al. 2005, Kerem and Edelist 2008). The new regulations include a 90-day trawling ban during the summer and the establishment of no-trawling areas. The 2016 Amendment also increases the minimum size of fish that can be landed as well as the minimum mesh size of fishing nets. So far, however, implementation has been poor and fishers reportedly ignored the new restrictions. One reason behind the lack of enforcement so far is that no funding was allocated by the Government of Israel to turn the new regulations into a management reality.

Animal Protection Law 5754-1994 and Wildlife Protection Law 5715-1955

In addition to the Animal Protection Law 5754-1994, which prohibits the cruel treatment and abuse of animals, Israel's Wildlife Protection Law 5715-1955 protects "wildlife" defined as "mammal, bird, reptile or amphibian or any part thereof, or its offspring, originated within the area of Israel or outside of it, which by its nature does not live among humans". Such definition would clearly include all marine mammal species. A 1990 amendment to the Wildlife Protection Law 5715-1955 also prohibits trade, possession and transfer of wildlife (unless a special permit is granted).

For more information:
http://www.animallaw.info/sites/default/files/stisreal_animal_protection.pdf
http://www.sviva.gov.il/English/Legislation/Documents/Wildlife%20Protection%20Laws%20and%20Regulations/WildlifeProtectionLaw1955.pdf

National Parks, Nature Reserves, National Sites and Memorial Sites Law 5758-1998

The National Parks, Nature Reserves, National Sites and Memorial Sites Law 5758-1998 aims to protect "natural assets" and "protected natural asset". Particularly relevant is the role of Israel Nature and Parks Authority: "1) to locate areas and sites for the establishment of nature reserves and national parks; 2) to promote and plan the establishment of nature reserves and national parks, or changes in them; 3) to establish, manage, maintain, operate and enhance nature reserves and national parks; 4) to preserve and restore natural assets in nature reserves and national parks and outside of them; 5) to supervise nature reserves and national parks and natural assets and heritage, including supervision with regard to offenses under the laws enumerated in the Schedule; 6) to coordinate the documentation and recording of information within the fields of nature protection and natural assets, including the preparation of a site portfolio for each nature reserve and national park, in such manner as the Minister shall prescribe, according to the recommendation of the professional-scientific subcommittee; 7) to promote, establish and encourage educational, information and guidance activities in the fields of nature protection, natural assets and heritage, and including activities to increase awareness in the aforementioned spheres among the public in general and among students and youth in particular; 8) to maintain international scientific contacts in the fields of national parks, nature protection and natural assets; 9) to conduct and promote research in the fields of nature protection and natural assets."

For more information: http://www.sviva.gov.il/English/Legislation/Documents/National%20Parks,%20Nature%20Reserves,%20National%20Sites,%20Memorial%20Sites%20Laws%20and%20Regulations/NationalParksNatureReservesNationalSitesAndMemorialSitesLaw1998.pdf

National Parks, Nature Reserves, National Sites and Memorial Sites Proclamation (Protected Natural Assets) 5765-2005

This amendment ("Proclamation") to the National Parks, Nature Reserves, National Sites and Memorial Sites Law 5758-1998, issued in 2005, specifies all the animal and plant species protected in Israel (or within portions of its territory). All the animal species within the class Mammalia are protected, with the exception of Egyptian fruit bats *Rousettus aegyptiacus* (known to host the Marburg virus), Middle East blind mole-rats *Spalax ehrenbergi* (regarded as an agriculture pest in Israel), and five other rodents.

Based on Law 5765-2005, **all marine mammal species in Israel are protected** throughout the national territory.

For more information: http://www.sviva.gov.il/English/Legislation/Documents/National%20Parks,%20Nature%20Reserves,%20National%20Sites,%20Memorial%20Sites%20Laws%20and%20Regulations/NationalParksNatureReservesNationalSitesAndMemorialSitesProclamation-2005.pdf

Protection of the Coastal Environment Law 5764-2004

The Law for the Protection of the Coastal Environment, passed in 2004, aims to protect the coastal environment and its natural and heritage assets, to reduce and prevent coastal damage, to preserve the coastal environment and the coastal sand for the benefit of present and future generations, and to establish principles for the sustainable management, development and use of the coastline. It covers the territorial waters and the land up to 300 m inland from the coastline.

For more information: http://www.sviva.gov.il/English/Legislation/Documents/Seas%20and%20Coasts%20Laws%20and%20Regulations/ProtectionOfCoastalEnvironmentLaw2004.pdf

Ministry of Environmental Protection, Marine and Coastal Division

Prevention of marine pollution

Oil pollution — To prevent and respond to oil spills, the Ministry of Environmental Protection (MoEP) has created a National Contingency Plan for Preparedness and Response to Combating Marine Oil Pollution. Additionally, MoEP has signed six international Conventions focused on preventing and managing oil pollution.

Pollution from vessels and aircraft — MoEP is responsible for ensuring that vessels operate according to international laws and regulations aimed at preventing pollution (oil, sewage, and ballast water). An inter-ministerial committee headed by MoEP is responsible for ensuring that vessels and aircraft do not dump any material or waste without a permit.

Pollution from land-based sources — A representative of MoEP's Marine and Coastal Division chairs the Committee on Discharge Permits to Sea, in charge of regulating industrial and wastewater treatment plants, ensuring that factories comply to their permit, and punishing violations.

Pollution from ports — MoEP is responsible for ensuring that port facilities personnel comply with regulations for environmental protection. Additionally, the Ministry oversees pollution contingency plans.

Clean Coast Program

This program, launched in 2005, aims to solve the litter problem on Israel's "undeclared" beaches where swimming is prohibited. While local authorities are responsible for beach cleaning, undeclared beaches are not cleaned. The program promotes routine clean-ups, enforcement against polluters, and awareness programs. MoEP also developed a Clean Coast Index to provide transparent and timely information on the state of undeclared beaches. MoEP can take action against authorities that are not complying with their beach-cleaning duty.

Marine Environment Monitoring Program

MoEP's Marine Environment Monitoring Program performs sampling and testing of various sea parameters, to support marine protection policy. Monitoring in the Mediterranean is carried out by Israel Oceanographic and Limnological Research Ltd. under MoEP's supervision. In the Gulf of Aqaba/Eilat the program aims to

determine the impact of different sources of pollution, creating a computerised database of oceanographic data on the Gulf, and developing strategies for the sound environmental management.

Water quality

In 2002, a team composed mainly of MoEP employees worked on a method to define the quality of Mediterranean water and set official standards for water quality in the marine environment.

Coastal zone management

Three National Outline Plans related to coastal zone management are potentially relevant to marine mammal conservation (Mediterranean monk seal in particular):

National Outline Plan for the Mediterranean Coast — This plan, approved in 1983, was based on two principles: preference to recreational activity on the coast and land use as a function of the carrying capacity of the coastline. The plan includes a clause prohibiting development within 100 m of the coastline, and requires environmental assessments as prerequisites for all coastal plans (specification of local conditions including coastal impacts, surveys and analysis of plan proposals, environmental impact statements, detailed coastal surveys, surveys and proposals on access routes, surveys of infrastructure systems and their impact on the proposed site).

National Master Plan for the Resource Management of the Mediterranean Coastline for Tourism and Recreation — This plan was commissioned by the National Planning and Building Board to help provide a comprehensive long-term guide to planning policy. The plan, prepared by MoEP, bases development policies on principles of suitability and sensitivity of coastal resources. Suitability for tourist and recreation development was assessed and levels of development defined for each site along the Mediterranean coastline in relation to resource sensitivity.

National Master Plan for Tourism — This plan, approved in 1983, determined coasts designated for extensive development, recreation villages, numbers of hotel rooms, and spaces in bathing beaches based on a population forecast of five million residents. An amendment to the plan recognises the importance of maintaining sufficient land reserves for tourist accommodation and services, in the face of development pressures, in order to help realise the country's tourism potential.

For more information: http://www.sviva.gov.il

Regional Cooperation in the Red Sea

Binational Red Sea Marine Peace Park

In the 1990s, both Israel and Jordan recognised that joint research, management, and cooperation are required to protect environmental resources in the Gulf of Aqaba/Eilat. In 1994, during the Trilateral Peace Negotiation Process between Jordan and Israel, the two countries agreed to develop a Binational Red Sea Marine Peace Park. In 1997, the U.S. Agency for International Development, Middle East Regional Cooperation Program, approved a joint proposal from the U.S. National Oceanic and Atmospheric Administration (NOAA), Israel, and Jordan, called "Cooperative Research, Monitoring and Management Program to Address Pressing Environment and Development Issues in the Binational Red Sea Marine Peace Park-Gulf of Aqaba/Bay of Eilat". A three-year project was launched in September 1999, which included cooperative management and outreach, and cooperative research and monitoring.

Memorandum of Understanding, Monitoring the Gulf: Israel and Jordan

An international symposium on the integration of marine science and resource management held in Aqaba, Jordan, in 2003, marked the conclusion of the Red Sea Marine Peace Park project. As a follow up, the Israel Ministry of Environmental Protection and the Aqaba Special Economic Zone Authority signed a Memorandum of Understanding on a monitoring and data management program in the Gulf of Aqaba/ Eilat. The agreement confirmed the intent of both states to "cooperate in maintaining the core elements of a recently initiated ecosystem monitoring and data management program in the northern Gulf of Aqaba". The agreement recognised the importance of transboundary coordination and cooperation to promote long-term sustainable use and conservation of shared marine resources.

Agreement on Cooperation for Preparedness for and Response to Oil Spills: Israel, Jordan, Egypt

Following the signature of the Israel-Jordan peace treaty in October 1994, Israel, Jordan, and Egypt signed an agreement on regional cooperation in the Red Sea. The Parties recognised that the Gulf of Aqaba/Eilat has nature and landscape values, as well as economic value, acknowledging that pollution does not stop at national borders. A joint action plan was issued to work together on preparedness for an oil spill, and to cooperate on a response in the event of an oil spill. Two special-purpose, oil-combat vessels were acquired (one by Israel and one by Jordan). An emergency system was established to addresses pollution events across the entire Gulf. For instance, in 1995, 30 tons of gasoline were spilled into the sea and cooperation between Israeli and Jordanian teams helped prevent an ecological disaster.

Marine Pollution Control and Response Station

Eilat's Marine Pollution Control and Response Station is the southernmost arm of MoEP's Marine and Coastal Environment Division. Located north of Eilat's coral reserve, the station is responsible for the prevention and treatment of environmental hazards (both at sea and on land) in the Eilat-Eilot region. The station serves as a logistical base for marine pollution control and prevention activities in the Gulf of Aqaba/Eilat. In case of a spill, the station aims to protect the coral nature reserve by quick deployment of mechanical containment and recovery equipment. The station also aims to treat spills in the northwestern part of the Gulf and serve as a base for large-scale operations.

Regional treaties relevant for marine mammal conservation

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

Israel is not a Party to the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS), but experts from the Israel Marine Mammal Research & Assistance Center (IMMRAC) have served on its Scientific Committee since 2008, contributing valuable information.

Because of the extraordinary regional importance of ACCOBAMS for cetacean conservation, a summary of its provisions is given in Annex 3.

For more information: http://accobams.org

Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean / Barcelona Convention for the Protection of the Mediterranean / Barcelona Convention

The Barcelona Convention is a regional convention adopted in 1976 to prevent pollution from ships, aircraft and land-based sources. Signers agreed to cooperate and assist in dealing with pollution emergencies, monitoring and scientific research. Israel is one of 22 contracting Parties to the Barcelona Convention (also including Albania, Algeria, Bosnia and Herzegovina, Croatia, Cyprus, Egypt, France, Greece, Italy, Lebanon, Libya, Malta, Monaco, Montenegro, Morocco, Slovenia, Spain, Syria, Tunisia, Turkey and the European Union). Israel ratified the original Barcelona Convention in 1978 and accepted its 2005 amendments.

The Convention is a framework treaty complemented by various protocols, which includes the following eight instruments: 1) the Barcelona Convention which, as amended in 1995, changed its name to the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, 2) the Protocol for the Prevention and Elimination of Pollution of the Mediterranean Sea by Dumping from Ships and Aircraft or Incineration at Sea, 3) the Protocol Concerning Cooperation in Preventing Pollution from Ships and, in Cases of Emergency, Combating Pollution of the Mediterranean Sea, 4) the Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities, 5) the Protocol Concerning Specially Protected Areas and Biological Diversity in the Mediterranean, 6) the Protocol Concerning Pollution Resulting from Exploration and Exploitation of the Continental Shelf, the Seabed and its Subsoil, 7) the Protocol on the Prevention of Pollution of the Mediterranean Sea by Transboundary Movements of Hazardous Wastes and their Disposal, and 8) the Protocol on Integrated Coastal Zone Management in the Mediterranean.

SPA Protocol and List of Specially Protected Areas of Mediterranean Importance

The SPA Protocol to the Barcelona Convention applies to the entire Mediterranean Sea. The Protocol provides for the establishment of a List of Specially Protected Areas of Mediterranean Importance (SPAMI List). The SPAMI List may include sites that "are of importance for conserving the components of biological diversity in the Mediterranean; contain ecosystems specific to the Mediterranean area or the habitats of endangered species; are of special interest at the scientific, aesthetic, cultural or educational levels". Protection, planning and management measures "must be adequate for the achievement of the conservation and management objectives set for the site in the short and long term, and take in particular into account the threats upon it".

Once areas are included in the SPAMI List, all the Parties should 1) recognise their importance for the Mediterranean, and 2) comply with the measures applicable to the SPAMIs and not authorise nor undertake activities that might be contrary to the objectives for which the SPAMIs were established. Additionally, the Parties should invite States that are not Parties to the Protocol and international organizations to cooperate in the implementation of the Protocol. The Parties also "undertake to adopt appropriate measures, consistent with international law, to ensure that no one engages in any activity contrary to the principles and purposes" of the Protocol.

The SPA Protocol is completed by three Annexes. Of these, particularly relevant is the List of Endangered or Threatened Species (Annex II), which includes 19 marine mammals.

For more information:
http://ec.europa.eu/environment/marine/international-cooperation/regional-sea-conventions/barcelona-convention/index_en.htm

UNEP Mediterranean Action Plan

The Barcelona Convention, together with the Mediterranean Action Plan (MAP), form part of UNEP's Regional Seas Programme. Israel is one of the contracting Parties of MAP. The original aim of MAP was to help Mediterranean countries assess and control marine pollution. Over the years, the mandate of MAP has widened to include integrated coastal zone planning and management.

For more information: http://web.unep.org/unepmap

World treaties relevant for marine mammal conservation

Convention on the Conservation of Migratory Species of Wild Animals / Convention on Migratory Species / Bonn Convention

Parties to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn 1979) recognise that wild animals are an irreplaceable part of the Earth's natural system which must be conserved for the good of mankind, and they acknowledge that each human generation has an obligation to ensure that this legacy is conserved and, where utilised, is used wisely. Israel has been a Party to this Convention since 1983. The Parties also express the need to take action to prevent any migratory species from becoming endangered. Sixteen cetacean species are listed in Appendix I (endangered migratory species), and several others in Appendix II (migratory species having an unfavourable conservation status).

For more information: http://www.cms.int

United Nations Convention on the Law of the Sea

The United Nations Convention on the Law of the Sea (UNCLOS; Montego Bay 1982) has not been ratified by Israel. UNCLOS provides that all States are under an obligation to "protect and preserve the marine environment". Measures include "those necessary to protect and preserve rare or fragile ecosystems as well as the habitat of depleted, threatened or endangered species and other forms of marine life". This obligation covers all vulnerable marine ecosystems and species, irrespective of the legal status of the relevant waters. UNCLOS requires that States cooperate to ensure the conservation and study of marine mammals in Exclusive Economic Zones and in the high seas. The exploitation of marine living resources provided for by UNCLOS, which is based on optimum utilisation and determination of the total allowable catch, does not apply to marine mammals: the exploitation of these animals can be prohibited, limited or regulated by States or a competent international organization, irrespective of their conservation status (Scovazzi 2016).

For more information: http://www.un.org/depts/los/convention_agreements/convention_overview_convention.htm

United Nations Convention on Biological Diversity / Biodiversity Convention

The UN Convention on Biological Diversity (Rio de Janeiro 1992), also known as the Biodiversity Convention, is a multilateral treaty that balances the ecological objective of nature conservation with the economic needs of development. Israel has ratified the Convention in 1995. The Convention aims to 1) conserve biological diversity, 2) make a sustainable use the components of biological diversity, and 3) fairly and equitably share the benefits arising from the use of genetic resources. Parties to the Convention are required to: 1) establish a system of protected areas or areas where special measures need to be taken to conserve biological diversity, 2) develop, where necessary, guidelines for the selection, establishment

and management of protected areas where special measures need to be taken to conserve biological diversity, 3) regulate or manage biological resources important for the conservation of biological diversity whether within or outside protected areas, with a view to ensuring their conservation and sustainable use, 4) promote the protection of ecosystems, natural habitats and the maintenance of viable populations of species in natural surroundings, 5) rehabilitate and restore degraded ecosystems and promote the recovery of threatened species, and 6) develop or maintain necessary legislation or other regulatory provisions for the protection of threatened species and populations.

In 2010 Israel joined other Parties to the Convention on Biological Diversity in adopting an updated Strategic Plan for Biodiversity for 2011-2020, which consists of 20 specific targets, called the Aichi Biodiversity Targets. To achieve these targets, Aichi's five strategic goals are to: "a) address underlying causes of biodiversity loss by mainstreaming biodiversity across government and society; b) reduce direct pressures on biodiversity and promote sustainable use; c) improve status of biodiversity by safeguarding ecosystems, species and genetic diversity; d) enhance benefits to all from biodiversity and ecoservices; e) enhance implementation through participatory planning, knowledge management and capacity building."

For more information: http://www.cbd.int
Some of the actions taken by governmental and non-governmental bodies are listed here: http://www.sviva.gov.il/English/env_topics/biodiversity/AichiTargets/Pages/default.aspx.

Convention on International Trade in Endangered Species of Wild Fauna and Flora

The purpose of Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES; Washington 1973) is to protect endangered species by regulating international trade. CITES, ratified by Israel in 1979, works based on permits and certificates that regulate trade (import and export) in a way that is not detrimental to species survival. CITES applies to animals (alive or dead) and to animal parts or derivatives. Three Appendices (I, II or III) list the species of concern to the Convention based on their status. Species listed in Appendix I benefit from the highest degree of protection. These include 23 cetacean species and two seal species. The Israel Nature and Parks Authority is officially responsible for the implementation of CITES.

For more information: https://www.cites.org/

International Convention for the Regulation of Whaling

The International Convention for the Regulation of Whaling (Washington 1946) is concerned with the conservation of whale stocks. The Convention established the International Whaling Commission (IWC), which is composed of one member from each State party. Israel joined the IWC in 2006. The IWC regulates whaling, worldwide, by defining: "1) protected and unprotected species; 2) open and closed seasons; 3) open and closed waters, including the designation of sanctuary areas; 4) size limits for each species; 5) time, methods, and intensity of whaling (including the maximum catch of whales to be taken in any one season); 6) types and specifications of gear and apparatus and appliances which may be used; 7) methods of measurement; and 8) catch returns and other statistical and biological records."

The IWC has established Sanctuaries where commercial whaling is banned: in the Indian Ocean (1979) and in the Southern Ocean (1994). The Whaling Convention can be joined by any State (i.e. not only by whaling nations). While the Convention was originally intended to optimise whale hunting, today the majority of the parties oppose commercial whaling, which is still carried out by a minority of parties (Norway, Iceland, Japan). The majority of states prefer non-lethal ways of exploiting marine mammals (such as whale watching). In 1982, the IWC adopted a moratorium of commercial whaling that is still in force today.

For more information: http://iwc.int/home

Other relevant instruments

FAO Code of Conduct for Responsible Fisheries

To promote long-term conservation and sustainable use of fisheries resources, the 1995 Food and Agriculture Organization of the United Nations (FAO) Conference adopted the FAO Code of Conduct for Responsible Fisheries. While this Code is voluntary, it is based in part on relevant rules of international law, including those reflected in the United Nations Convention on the Law of the Sea. The Code contains provisions that may be or have already been given binding effect by means of other obligatory legal instruments amongst the Parties. The Code, global in scope, provides principles and standards applicable to the conservation, management and development of all fisheries. It also covers the capture, processing and trade of fish and fishery products, fishing operations, aquaculture, fisheries research and the integration of fisheries into coastal area management.

The objectives of the Code are relevant for marine mammal conservation, as they: "1) establish principles, in accordance with the relevant rules of international law, for responsible fishing and fisheries activities, taking into account all their relevant biological, technological, economic, social, environmental and commercial aspects; 2) establish principles and criteria for the elaboration and implementation of national policies for responsible conservation of fisheries resources and fisheries management and development; 3) serve as an instrument of reference to help States to establish or to improve the legal and institutional framework required for the exercise of responsible fisheries and in the formulation and implementation of appropriate measures; 4) provide guidance which may be used where appropriate in the formulation and implementation of international agreements and other legal instruments, both binding and voluntary; 5) facilitate and promote technical, financial and other cooperation in conservation of fisheries resources and fisheries management and development; promote the contribution of fisheries to food security and food quality, giving priority to the nutritional needs of local communities; 6) promote protection of living aquatic resources and their environments and coastal areas; 7) promote the trade of fish and fishery products in conformity with relevant international rules and avoid the use of measures that constitute hidden barriers to such trade; 8) promote research on fisheries as well as on associated ecosystems and relevant environmental factors; and 9) provide standards of conduct for all persons involved in the fisheries sector."

For more information: http://www.fao.org/3/a-v9878e.pdf

Red List of Threatened Species — International Union for Conservation of Nature (IUCN)

The International Union for Conservation of Nature (IUCN) is an international NGO. It manages the authoritative Red List of Threatened Species, which includes marine mammal species occurring in the Mediterranean and Red Sea. Status assessment is based on standardised threat criteria that place the conservation status of animal and other taxa in a worldwide perspective. IUCN is active in the Mediterranean Sea under various capacities (including the Centre for Mediterranean Cooperation in Malaga, the Regional Coordination for the Mediterranean and Black Seas of the World Commission on Protected Areas – Marine, also known as WCPA), providing expert and technical support to a wide spectrum of conservation activities, including the establishment of Marine Protected Areas. Finally, the Species Survival Commission's Cetacean Specialist Group (CSG) includes several experts from the Mediterranean region, and one from Israel. The CSG can provide valuable expertise to address cetacean conservation strategies in Israel.

For more information: http://www.iucnredlist.org

Marine Mammal Protected Areas Task Force

The Marine Mammal Protected Areas Task Force was created in 2013 by the International Committee on Marine Mammal Protected Areas, the International Union for the Conservation of Nature's (IUCN) World Commission on Protected Areas (WCPA) Marine Vice Chair, and members of the IUCN Species Survival Commission. The goal of the Task Force is to encourage collaboration, share information and experience, disseminate knowledge and tools for the establishing, monitoring, and managing of protected areas for marine mammals. The Task Force is currently (April 2017) focusing on the identification of Important Marine Mammal Areas (IMMAs), including in the Mediterranean Sea.

For more information: http://www.marinemammalhabitat.org

The future

Israel Marine Plan

The Israel Marine Plan (IMP), presented in 2015, is an extensive and authoritative management proposal. The IMP is the initiative of a group of researchers and planners at the Technion (Israel Institute of Technology), joined by professional consultants from Israel and abroad, along with Ethos – Architecture, Planning and Environment, which has managed the planning process. The process was conducted with the assistance of stakeholders including government representatives, environmental organizations, local authorities and representatives of the business sector. The IMP aims to establish a long-term policy and an inclusive spatial plan for Israel's marine space in the Mediterranean Sea.

The IMP envisions a "new map of Israel", which portrays the sea as an essential and integral part of Israel's space, and emphasises that the marine space is ultimately a public good. According to the IMP, management of marine resources is in the hands of the state, that should preserve them for the general public.

The IMP vision states that:

> "The marine area will be an integral part of the Israeli space and an essential component of its future economic well-being, environmental resilience and social and cultural development for the benefit of its residents, guests and future generations. This will be achieved through the implementation of integrative governance that is ecologically balanced and participatory, the sustainable use of marine resources, the enhancement of the marine landscape and heritage, the promotion of marine research and knowledge, and through the realization of international responsibilities and cooperation."

Several of the IMP goals (listed below; emphasis added) would be relevant for marine mammal conservation as they advocate a sustainable use of marine resources which supposedly takes into consideration the need to avoid harm to marine mammals:

1. Improve governance of the marine space
2. Advance scientific knowledge and develop information about the marine space and make it accessible
3. Protect, conserve and rehabilitate the marine environment
4. Develop energy resources in the Marine Space in a *wise* and *cautious* manner
5. Develop shipping, ports and sailing in a *cautious* and *sustainable* manner
6. Develop *sustainable* interfaces of fishing and mariculture
7. Use the marine space as an alternative for land uses in a *cautious* and *sustainable* manner

8. Incorporate security considerations in the planning and balanced management of the marine space
9. Prepare for the impact of climate change on the marine and coastal space
10. Establish the status of the sea as a public entity, and develop *sustainable* uses for the public benefit
11. Discover, conserve and enhance the heritage and cultural treasures in the marine space
12. Develop the role of the sea as a bridge and an opportunity for international cooperation.

However, the precise meaning of "wise", "cautious" and "sustainable" will need to be clarified in future legislation—ideally with clear reference to activities that must be prohibited or strictly regulated because of their negative impact on marine biodiversity.

For more information: http://msp-israel.net.technion.ac.il

Israel's marine spatial planning

In May 2016 a high-profile "Israel Maritime Policy Project" was presented in Turku, Finland, by Ronit Mazar, National Planning Administrative, Israel Ministry of Finance, envisioning Israel's maritime space as "a dynamic and balanced environment which allows effective management and coordination of the different uses, exploiting the economic potential while preserving and nurturing natural, scenic and cultural assets".

The Israel Maritime Policy Project outlined the process leading to a POLICY DOCUMENT for Israel, informed by ecosystem-based management, marine spatial planning and integrated maritime policy. It identifies two types of conflicts in the marine area: 1) between different users, creating barriers that reduce efficient economic exploitation, and 2) between users and the marine ecosystem, harming the marine environment and its ecosystem services.

Phase A of the Israel Maritime Policy Project (now completed) includes a multidisciplinary analysis based on comparative survey and existing data; Phase B (currently in progress) will outline the planning of regulation and management policies based on evidence provided by Phase A. A final spatial and management POLICY DOCUMENT including a set of recommendations for future and complementary measures should be submitted to the Government of Israel by the end of 2017.

The Israel Maritime Policy Project also foresees the establishment of a "National Maritime Data Center" which aims to provide authorities, stakeholders and the general public with information relevant to marine spatial planning (including laws, regulations, policy documents, reports and publications, information on projects and monitoring, environmental surveys and geographic information).

For more information: http://iplan.gov.il

Decommissioning of trawlers and restrictions on trawling

An effort by Israel's Fisheries Department is underway to decommission trawlers operating along the Mediterranean coast. Ongoing management efforts include measures such as the complete ban of trawling north of Dor (a village located about 70 km north of Tel-Aviv). The northern trawlers will be bought out for scrapping.

At the time this Action Plan is being written (April 2017) it is impossible to predict whether these management measures—combined with a full enforcement of the 2016 Amendment—will allow for the recovery of depleted fish stocks. However, efforts so far are indicative of a political determination to endorse a more environmentally sustainable management of fisheries.

2.5 Marine protected areas

Benefits and pitfalls of marine protected areas

A Marine Protected Area (MPA) is "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values" (Dudley 2008). Regional networks of MPAs can help protect representative samples of global biodiversity, and contribute to the development of cross-national experience in resource management and conservation.

MPAs granting an appropriate level of protection and enforcement can contribute to marine mammal conservation by preserving their habitat, eliminating or reducing mortality in fishing gear, and providing areas less impacted by noise and other disturbance. Well-managed MPAs also can help preserve healthy marine food webs, ensuring that enough prey is available to marine mammals. Finally, MPAs can promote an appreciation of the beauty and complexity of natural environments, offering opportunities for nature watching and education.

While MPAs can help protect important portions of marine mammal range, most species are wide-ranging and their occurrence often varies seasonally or annually. Networks of MPAs that take into account the ecological needs of marine mammals (provided that such needs are known) can be particularly effective.

Establishing an MPA and making it work often requires substantial long-term efforts. Therefore, despite their benefits, MPAs may not be invariably the most appropriate tool to mitigate specific threats. The lengthy process leading to MPA implementation may delay the timely management action needed to prevent marine mammal decline. Whenever specific threats jeopardise the survival of marine mammal populations, specific action must be taken immediately to solve the problem.

Consequently, MPAs must be seen as one of the several marine mammal conservation options available to managers. The establishment of MPAs should proceed in parallel with mitigation of the most important human impacts, rather than represent an excuse to delay or evade the most challenging management actions.

The Mediterranean scenario

The geographical distribution of MPAs throughout the Mediterranean is greatly unbalanced. Most MPAs are in the northern and western portions of the basin, and only a few exist off eastern and southern shores. Mediterranean MPAs differ greatly in size, scope, management regimes, and levels of protection and enforcement. Most MPAs are coastal, while only a few encompass significant extensions of pelagic waters.

Excluding the large but poorly protected Pelagos Sanctuary (87,500 km^2), the total area covered by Mediterranean MPAs is about 27,000 km^2, which represents only 1% of the Mediterranean surface (Portman and Nathan 2015). In addition, the terrestrial portion of an MPA may be large, and even greater than the marine portion, implying that total MPA extension is not directly related to marine protection. For instance, only 74% of the total area of 142 MPAs reviewed by Portman and Nathan (2015) was actually marine. In other words, only an *extremely small* proportion of the Mediterranean is currently protected.

While some Governments may take pride in the "large" number of MPAs created in their national waters, such numbers do not necessarily imply significant conservation benefits. Most Mediterranean MPAs are very small (the smallest one, Grotte Marine de Temuli in France, is only 0.003 km^2) and their protection levels are

highly variable (Guidetti et al. 2008). Enforcement is often poor, and the protection balance may even be negative, e.g. because the creation of an MPA attracts tourists and investors, and the negative impacts may outbalance any conservation benefit (Portman and Nathan 2015).

Overall, present MPA coverage and management levels offer insufficient protection to Mediterranean biodiversity, and the current MPA system is neither representative nor coherent (Abdulla et al. 2008). MPAs can be highly effective tools, but their geographic extension, protection levels and enforcement must be greatly increased to grant the needed protection to a "Mediterranean under siege" (Coll et al. 2012).

ACCOBAMS Areas of Special Conservation Importance

Between 2002 and 2007, the Contracting Parties to ACCOBAMS adopted a list of areas in the Mediterranean and Black Sea that contain important cetacean habitat and should be considered for protection (Fig. 2). The fact that no such areas were proposed in the southern and eastern portions of the Mediterranean Sea likely reflects poor survey effort in those areas, insufficient information available at the time of the proposal, and possibly other biases.

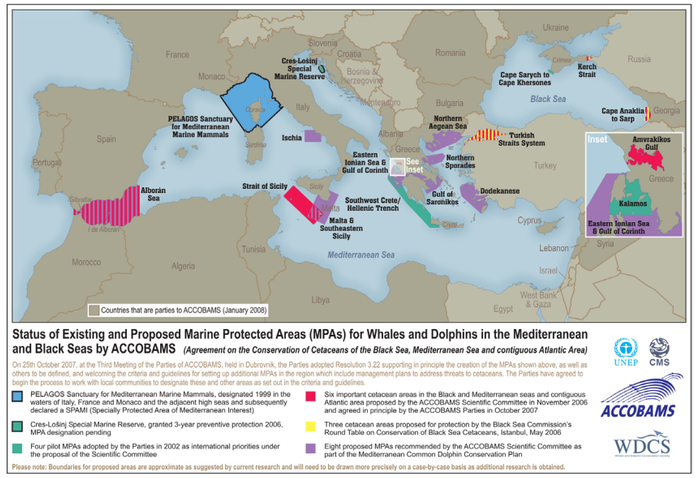


Figure 2. Status of existing and newly proposed Marine Protected Areas for whales and dolphins in the Mediterranean and Black Seas proposed by ACCOBAMS in 2007 (map by Lesley Frampton and Erich Hoyt / WDCS).
Map available from: http://www.cetaceanhabitat.org/pdf_bin/accobams_map_english.pdf

Specially Protected Areas of Mediterranean Importance

The February 2016 update of the List of Specially Protected Areas of Mediterranean Importance (SPAMI) includes 34 Mediterranean sites, none of which lies in the waters of Israel. The SPAMI List is not specific to marine mammals as it includes sites that "are of importance for conserving the components of biological diversity in the Mediterranean; contain ecosystems specific to the Mediterranean area or the habitats of endangered species; are of special interest at the scientific, aesthetic, cultural or educational levels".

The present geographic distribution of SPAMIs, shown in Fig. 3, is suggestive of a "western bias" in the attribution of importance levels.

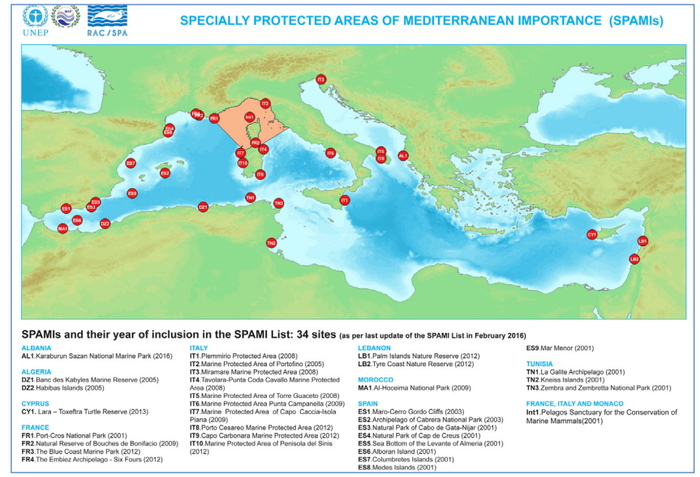


Figure 3. Specially Protected Areas of Mediterranean Importance (as per last update of the SPAMI List in February 2016).
Map available from: http://www.rac-spa.org/sites/default/files/doc_spamis/spamis2016.pdf

Important Marine Mammal Areas

Recently, the IUCN Task Force on marine mammal protected areas introduced the designation of Important Marine Mammal Areas (IMMAs). These areas, defined as "discrete portions of habitat, important to one or more marine mammal species, which have the potential to be delineated and managed for conservation" represent a science-based tool that has the potential of leading to place-based conservation (Notarbartolo di Sciara et al. 2016). The IUCN Task Force is in the process of identifying IMMAs in six marine regions, including the Mediterranean Sea.

For more information: http://www.marinemammalhabitat.org

The Red Sea scenario

The Red Sea is known for its unique marine biodiversity and high degree of endemism. Pressures on its coastal and marine ecosystems have substantially increased in the past few decades with the development of oil-based economies, the expansion of fisheries and unsustainable use of living marine resources, coastal development (resulting in part from the growth of international dive tourism), waste disposal and population growth in the coastal zone (PERSGA 1998, 2002, Gladstone et al. 2003).

A number of MPAs have been established in the Red Sea, but few are properly managed (Gladstone et al. 2003). MPAs in the northern Red Sea include Eilat's Coral Beach Nature Reserve and Conservation Area (see the following section), the Aqaba Marine Park in Jordan, and a few protected areas in the proximate waters of the Gulf of Aqaba/Eilat (Ras Mohammed National Park and Straits of Gubal in Egypt, and Straits of Tiran in Saudi Arabia).

The Aqaba Marine Park in Jordan (http://aqabamarinepark.jo) was established in 1997 with support from the Global Environment Facility (GEF). According to Jordan's Regulation No. 22 (http://www.ecolex.org/details/legislation/regulation-no-22-on-the-aqaba-marine-park-lex-faoc054863), the Park aims to preserve the environment, protect natural resources and facilitate scientific research. None of the protected areas above have specific management plans for marine mammals.

Marine protected areas in Israel

Until 2012, the surface of Israel's marine protected areas was estimated as 27 km^2, i.e. 0.55% of the surface covered by the 12 nautical mile zone (Gabrié 2012). By then, protected areas included two small nature reserves encompassing waters away from the coastal strip (Yam Dor Habonim: 5.3 km^2, Rosh Hanikra: 9.6 km^2) and a few short and narrow coastal strips (Yam Evtah: 1.4 km^2, Yam Shiqma: 1 km^2, Yam Gador: 0.7 km^2) as well as small protected spots. The combined relevance of these partly protected areas for marine mammal conservation has been low, also considering that much of the protection occurs on land. These areas also have poor connectivity with other Mediterranean protected areas, which further limits their scope. The recent expansion of the Rosh Hanikra Marine Reserve (see below) has slightly improved the marine protection scenario.

Rosh Hanikra Marine Reserve

The Rosh Hanikra Marine Reserve was substantially expanded in 2016. It is currently the largest marine reserve in Israel, stretching from the Rosh Hanikra cliff in the north to the Nahariya industrial zone to the south, and up to 15 km offshore. The reserve has a steep seabed and it includes deep Mediterranean waters and the deep canyon of Akhziv, which is Israel's only submarine canyon, known to host a rich benthic community (Yahel and Engert 2014, Roditi-Elasar 2015). Common bottlenose dolphins are known to occur within the Rosh Hanikra Marine Reserve, and the Mediterranean monk seal has been repeatedly observed in this area.

Yam Dor Habonim Marine Reserve

The Yam Dor Habonim Marine Reserve was established in 2000 with the aim of: 1) preserving the sandy and rocky habitats of the continental shelf, up to a depth of 30 m, 2) preserving biodiversity, 3) enhancing fish reproduction for the benefit of surrounding areas, 4) preserving a natural area for leisure and recreation, and 5) increasing environmental awareness through education.

For more information:
http://protectedplanet.net/yam-dor-ha-bonim-marine-nature-reserve
http://www.parks.org.il/sites/English/ParksAndReserves/dorhabonim/

Eilat's Coral Beach Nature Reserve and Conservation Area

The Coral Beach Nature Reserve and Conservation Area is Israel's only nature reserve and national park in the Red Sea. The reserve covers 1.2 km of shore and is reportedly the world's northernmost coral reef. While the reserve's small size does not make it directly relevant for marine mammal conservation, the area may play a potentially important awareness role, e.g. to inform the public about marine mammals status and conservation needs in the Red Sea.

For more information: http://www.parks.org.il/sites/English/parksandreserves/coralbeach/Pages/default.aspx

Protected areas proposed by the "Israel Marine Plan"

The Marine Plan of 2015 proposed to divide Israel's marine space into five functional marine areas (Fig. 4). The most relevant area for the purposes of this Action Plan is a "Marine Protected Area" encompassing 2660 km^2. The proposed area, subdivided into eight main sub-areas and a number of smaller areas, contains nature reserves recommended by the Israel Nature and Parks Authority, as well as habitats assessed as vulnerable or unique.

The area would benefit from a high level of protection where "one should avoid, as far as possible, human activities that do not have a significant connection with preservation operations, study and research – the latter developed at a minimal level". It is unclear, however, why the Israel Marine Plan states that research within the protected area should be conducted "at a minimal level", considering that scientific research (provided it is independent, rigorous, and it causes no harm to the animals and their habitat) is an essential component of conservation management.

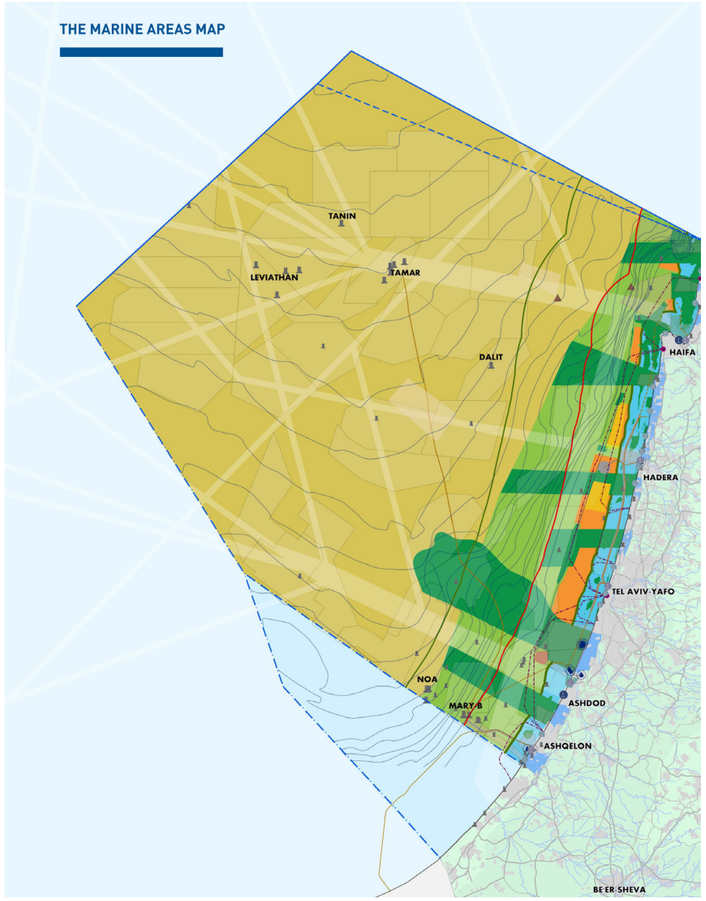


Figure 4. Functional area planning in the Israel Marine Plan.
Proposed marine protected areas in the Mediterranean Sea are shown in dark green (from IMP 2015, p. 51).

2.6 Threats known to affect marine mammals

Threats known to affect marine mammals, worldwide

Natural mortality

In a pristine marine ecosystem, **predation** would be expected to represent one of the main sources of mortality for marine mammals. The Mediterranean Sea, however, is no longer pristine and natural predators have declined to the point of representing a rather insignificant threat. Large sharks, in particular, have declined dramatically in Mediterranean waters over the past century (Ferretti et al. 2008) and this must have substantially reduced predation pressure. Marine mammal species that potentially can prey on other marine mammals, such as killer whales and false killer whales, are rare in the region and unlikely to cause significant mortality. Little is known about the present impact of predation in the Red Sea, but few scientists today would think of natural predation as a conservation concern.

Infanticide and violent inter- and intra-species interactions have involved common bottlenose dolphins in some areas around the world (e.g. Patterson et al. 1998, Robinson 2014), but do not represent a conservation concern in the region.

Some of the many **parasites** known to infect marine mammals (Dhermain et al. 2002) can have serious health effects. Infections with protozoan agents such as *Toxoplasma gondii* are common in the Mediterranean, especially in coastal areas, but only animals with compromised immune systems are at risk of becoming seriously ill (Cabezon et al. 2004).

An epizootic caused by the **dolphin morbillivirus** killed thousands of striped dolphins in the western Mediterranean Sea between 1990 and 1992 (Aguilar and Raga 1993), spreading to the eastearn basin (Van Bressem et al. 1993) and up to the Mediterranean coast of Israel (Tsur et al. 1997). Dolphin morbillivirus spread again in 2007 (Raga et al. 2008), and more recent viral epizootics in the Mediterranean Sea have affected several marine mammal species (Mazzariol et al. 2016, Notarbartolo di Sciara 2016, Centelleghe et al. 2017). The reasons behind such epizootics are still not understood, but—considering the immunotoxic and other detrimental effects of environmental pollutants (Desforges et al. 2016, Jepson et al. 2016)—anthropogenic factors cannot be ruled out. Epizootic phenomena have been related to compromised immune-system induced by exposure to xenobiotics and/or by stress from poor nutrition (Aguilar and Borrell 1994, Calzada et al. 1996, O'Shea and Aguilar 2001).

Harmful algal blooms can result in marine mammal mortality due to exposure to natural biotoxins (Van Dolah 2005). Large-scale mortality events involving bottlenose dolphins have been associated with blooms of the marine alga *Karenia brevis* and exposure to the neurotoxins (brevetoxins) produced by this dinoflagellate (Fire et al. 2007, 2011, Pierce and Henry 2008). A toxic algal bloom has been implicated in a catastrophic loss of Mediterranean monk seals at Cabo Blanco, in the Atlantic Ocean, in 1997 (Reyero et al. 2000, Martínez-Jauregui et al. 2012). Harmful algal blooms are favoured by oceanographic conditions and may be related to anthropogenically-induced eutrophication (Ignitiades and Gotsis-Skretas 2010).

Anthropogenic threats

The main anthropogenic factors that threaten marine mammal populations, worldwide, are listed below (based on Bearzi et al. 2011b, modified).

Intentional and direct takes

Killing, harming or capture to obtain products for human consumption, live capture for display facilities, acts of retaliation for actual or perceived damage to fish catches or gear, killing for amusement and other reasons.

Incidental mortality and injury caused by fisheries

Mortality or injury from accidental entanglement (bycatch) in fishing gear of various types including passive and active nets, longlines, traps and discarded or lost nets and lines and illegal fishing practices (e.g. the use of dynamite).

Prey depletion

Depletion of food resources caused directly or indirectly by fishing (e.g. through exploitative competition, food web competition, and damage caused by destructive fishing methods).

Climate change

Human-induced changes in climate resulting in ecosystem change, shifts in prey availability (abundance or distribution), altered trophic webs, marine ecology or productivity, shifts in distribution of competitors or predators, ocean acidification, exposure to novel diseases etc.

Habitat loss and degradation

Reduced habitat quality and loss of critical habitat 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, harmful algal blooms, alien species invasions).

Anthropogenic noise

Mortality, injury or chronic stressful disturbance from exposure to man-made sounds.

Chemical contamination

Accumulation in the body tissues (mostly through the food web) of chemicals known to adversely affect mammalian functions and health.

Ingestion or entanglement in debris

Mortality or injury from the ingestion of foreign objects and materials (plastic, textiles etc.) obstructing part of the digestive tract. Chemical contamination secondary to the ingestion of microplastic particles with adsorbed pollutants. Entanglement in plastic and other debris.

Oil pollution

Mortality or health problems deriving from contamination, contact or ingestion of hydrocarbons deriving from oil spills and oil derivates at sea.

Vessel strikes

Accidental mortality or injury from contact with a vessel, particularly the hull or propeller.

Disturbance

Behavioural disruption through intentional or non-intentional approaches, likely or proven to induce long-term effects on marine mammal populations.

Hidden, cumulative and long-term impacts

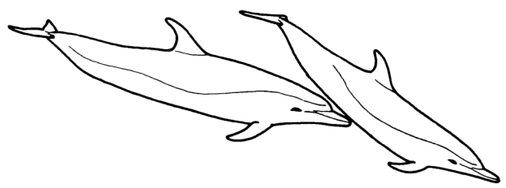
The impacts of human activities are certainly more pervasive than what can be inferred based on e.g. records of marine mammal mortality. While some threats may be easier to document (e.g. intentional killings, mortality in fishing gear or collision events), threats that are indirect and less visible (e.g. the effects of prey depletion, habitat loss, noise, or the build-up of xenobiotic contaminants) can have even greater negative impacts at the population level. In addition, the cumulative impact of threats is greater than their algebraic sum (Halpern et al. 2008).

Trends in marine ecosystems need to be interpreted in the context of the magnitude and drivers of past changes (Lotze and Worm 2009). For instance, most populations of large marine animals have greatly declined from their historical abundance as a consequence of human impacts (Myers and Worm 2003, Ferretti et al. 2008), while invertebrates such as jellyfish have skyrocketed (Mills 2001, Pauly et al. 2009). It is therefore important to assess anthropogenic threats to marine mammals and marine biodiversity in the appropriate historical and regime shift context.

The problem with small populations

Shrinking animal populations composed of a small number of animals face problems that may concur to their further decline. Smaller groups imply reduced benefits of group living (reproductive opportunities, calf protection, location of food and cooperative feeding etc.) and a higher risk of inbreeding. Small populations are also exposed to the Allee effect (a positive correlation between population density and individual fitness), potentially leading to extinction (Courchamp et al. 1999).

For instance, the Mediterranean monk seal is one of the most genetically depauperate mammals on Earth (Karamanlidis et al. 2015). Hybridisation and introgression are another cause of concern. Hybridisation may lead to local eradication through genetic swamping, where pure species are progressively replaced by hybrids, or by demographic swamping, where population growth rates are reduced due to the expression of deleterious alleles and production of maladaptive hybrids. Hybridisation has been reported to occur among Mediterranean cetaceans and it is regarded as a potential threat (Bearzi et al. 2016).



Threats known or likely to affect marine mammals in Israel

Israel has a high and growing human population, which has doubled in the last few decades. More than half of the population and most of its industries are concentrated in coastal areas. Industrial impact, overfishing, coastal development, ever-increasing ship traffic and a rush to exploit marine resources are resulting in growing pressures on the marine environment. Despite such high levels of human encroachment, little information is available on the scale, dynamics and interplay of human impacts affecting marine mammals in Israel.

For instance, climate change (Walther et al. 2002) is an increasing global threat having potentially important effects on marine mammal populations (Learmonth et al. 2006), including in the Mediterranean Sea (Cañadas and Vázquez, in press). The effects of climate change on marine mammals in Israel are entirely unknown.

Overfishing has depleted Israel's fish stocks (IMP 2015), with potentially important consequences for high-order predators such as marine mammals (Trites et al. 1997, Bearzi et al. 2008). The impact of overfishing on marine mammals in Israel has not been specifically investigated.

Incidental mortality of cetaceans is known to occur in the Mediterranean waters of Israel, and is reportedly caused by bottom trawlers and gillnetters (Kent et al. 2005, Kerem and Edelist 2008). According to Goffman (2011), 20% of all dead-stranded cetaceans show evidence of entanglement in fishing gear. Most (>70%) bycatch involves trawling gear (76% inside the net), the remaining bycatch being caused by entanglement in trawlers' lazy lines and in gillnets. All bycatch caused by trawlers involves common bottlenose dolphins, while gillnet victims also include Indo-Pacific bottlenose dolphin, striped dolphin, rough-toothed dolphin and minke whale (Kerem and Edelist 2008). Despite such clear evidence of bycatch, lack of information on past and present marine mammal status and abundance in the waters of Israel hinder understanding of impacts and trends at the population level.

Natural gas reserves discovered recently in Israel's Mediterranean waters have been estimated in the order of 1000 billion cubic metres and the upcoming exploitation of these reserves (and inherent noise-producing activities) are expected to increase pressures on vulnerable marine habitats and their denizens. Extraction of natural gas is likely to affect cetaceans during searching phases relying on the use of air guns, as well as during noisy construction phases including drilling, laying of pipelines and construction of platforms. Repeated and long-lasting high-intensity episodic noise is produced *inter alia* during the process leading to platform anchorage (Anonymous 2016). Coastal construction projects involving pile driving and sand mining (e.g. due to the expansion of the ports of Haifa and Ashdod), cause noise disturbance to coastal cetaceans in proximity to the sites. Shipping must be an additional and important source of anthropogenic noise, considering a turnover of 11,000 cargo ships and 22,500 small vessels per year on the Mediterranean coast of Israel (IMP 2015). Yet, specific investigations on the effects of anthropogenic noise on marine mammals in the waters of Israel have been limited to a single study (Zuriel et al. 2016).

Boat traffic and shipping can result in collisions and ship strikes (Panigada et al. 2006). Information from Israel is limited to a dying young fin whale found near Ashkelon in February 2008, showing clear evidence of a vessel strike.

Common bottlenose dolphins and striped dolphins stranded along the Mediterranean coast of Israel between 1994 and 2011 have shown relatively stable concentrations of heavy metals (Shoham-Frider et al. 2009, 2016). Heavy metals were also analysed in fin whale, minke whale, Cuvier's beaked whale, rough-toothed dolphin and a Risso's dolphin stranded between 2002 and 2010, concentrations of Hg and Cd in the liver and kidney of Risso's dolphin and Cuvier's beaked whale being exceptionally high (Shoham-Frider et al. 2014). High concentrations of DDE, indicative of DDT degradation, were found in common bottlenose

dolphins, suggesting high exposure to persistent organochlorine pollutants, consistent with findings in other Mediterranean areas (Shoham-Frider et al. 2009). The consequences of chemical contamination on marine mammal populations in Israel remain unknown, but are potentially important considering that toxic contamination can affect marine mammal reproduction and health at the individual and population level (O'Hara and O'Shea 2001, Tanabe 2002, Fossi and Marsili 2003, Newman and Smith 2006), and may synergise with other stressors.

Obstruction of the digestive tract by ingested plastic as well as entanglement in plastic and other debris is a known cause of marine mammal mortality (Walker and Coe 1990, Baulch and Perry 2014). Plastic debris has become widespread in the marine environment (Laist 1997, Laist et al. 1999, Derraik 2002) and the problem is acute in the Mediterranean. Several cetacean species stranded along the Mediterranean coast of Israel have shown evidence of ingestion or entanglement in debris. For instance, a short-beaked common dolphin was observed for several weeks with a hoop around its neck, a stranded Cuvier's beaked whale and a Risso's dolphin had significant amounts of plastics in their stomachs (Shoham-Frider et al. 2002), and a mature female common bottlenose dolphin died following ingestion of a piece of fishing net (Levy et al. 2009). Impacts at the population level are unknown.

The effects of habitat loss and degradation resulting from coastal development would be potentially important for marine mammals species living nearshore. For instance, five seawater reverse osmosis desalination plants on the Mediterranean coast (four within 40 km) are among the world's largest (http://www.water.gov.il/Hebrew/Pages/Water-Authority-Info.aspx). The technologies used in water desalination are accompanied by adverse environmental effects (Sadhwani et al. 2005, Lattemann and Höpner 2008, Roberts et al. 2010), but nothing can be said regarding potential direct or indirect impacts on marine mammals.

Lessepsian migrants (Red Sea species invading the Mediterranean through the man-made Suez Canal; Galil 2007) have been resulting in a progressive "tropicalisation", with potentially harmful effects on endemic marine fauna. Specific information on marine mammals off Israel is missing, but at least some dolphin species have been reported to successfully shift their diet to accommodate such changes (Brand 2013).

On the Red Sea coast, Eilat (about 50,000 residents) is one of Israel's prime vacation spots, with population number doubling at various times of the year. Military, industrial and commercial activities near Eilat expose the marine environment to various threats. Water clarity and quality has deteriorated and coral reefs are plagued by lost diversity, coral mortality, and increasingly intense macro-algal blooms. Degradation of the marine environment encompasses the whole Gulf of Aqaba/Eilat (PERSGA 2002) and is unlikely to leave marine mammals unaffected, but specific effects have not been investigated.

Of all the known anthropogenic threats, only the direct killing of marine mammals seems to have declined, both in the Mediterranean and Red Sea waters of Israel, due in part to increased awareness and appreciation of these charismatic animals, but also because marine mammal numbers must have substantially dropped compared to their historical abundance.

No information exists on the impact of disturbance on marine mammals in the waters of Israel.

Provisional ranking of anthropogenic threats

When information is poor, emphasis tends to be on threats that are comparatively easier to document (e.g. mortality in fishing gear detected through inspection of stranded animals), while the investigation of important threats that have indirect and less visible effects is typically more challenging.

Priorities and actions in this Plan (Section 3) aim to keep information and perception biases into account, while also considering local evidence (Annex 2) and knowledge from studies conducted in other areas around the world.

An attempt to rank the extant threats based on their relative importance (at the population level) for the conservation of marine mammals in Israel is made below. Because of the scarcity of information, such exercise should be seen as provisional and merely indicative.

Important threats


Incidental mortality and injury caused by fisheries


Anthropogenic noise


Prey depletion

Potentially important threats


Chemical contamination


Habitat loss and degradation


Climate change

Possibly minor threats

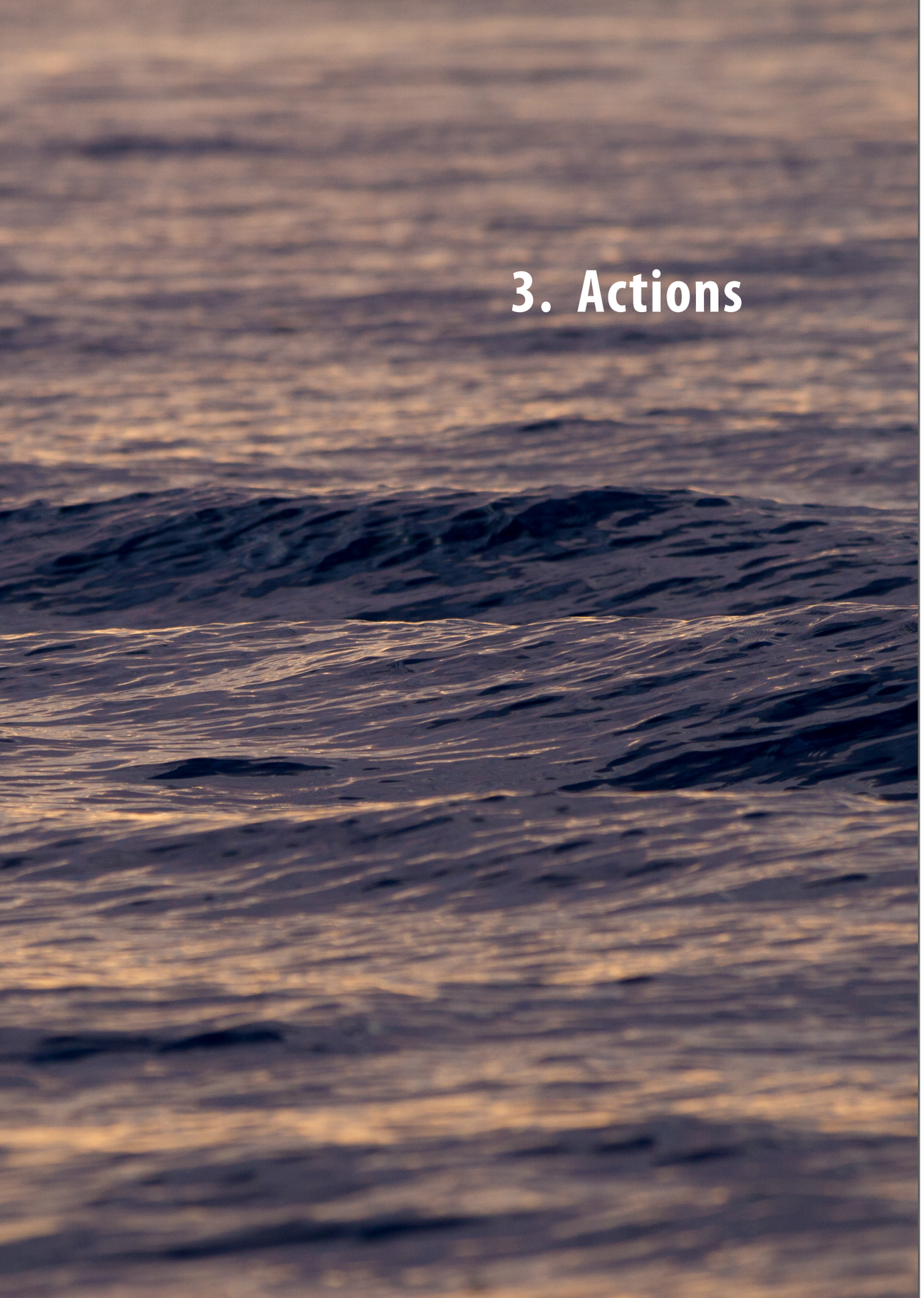

Ingestion or entanglement in debris


Vessel strikes


Oil pollution


Intentional and direct takes


Disturbance



3. Actions

3.1 Legislation and management

The role of institutions

Based on the legal provisions outlined in Section 2.4, institutions must ensure that marine mammals and their habitat are effectively protected, and adopt the necessary measures to reach this goal. The roles that can be played by institutions include:

- Effectively protect marine mammals by taking timely management action informed by scientific evidence and inspired by the principle of precaution (Tyne et al. 2016)
- Enforcing the existing legislation relevant to marine mammals, and passing new laws to ensure protection as information documenting damage caused by human activities becomes available
- Enforcing conservation-oriented spatial planning, by creating new Marine Protected Areas or other specially managed areas that can effectively protect marine mammals, their habitat and their prey
- Coordinating, fine-tuning and assessing the benefits of management action, including through the identification of key experts and advisors, the creation of committees, and the *empowerment* of such experts and committees through appropriate mandates and financial resources
- Providing the necessary funding to support marine mammal research and conservation-oriented action, both directly and by enhancing complementary or alternative funding opportunities
- Offering training, facilities, logistical support, and career opportunities to individuals and organizations committed to marine mammal conservation.

What institutions should *not* do:

- "Conservation on paper", i.e. setting up bureaucratic frameworks that have no real capacity of promoting conservation action and make recommendations that the government has no intention to follow, but make it look as if something is being done
- Perpetual calling for "more data". Waiting for ever-better information produced by research is often used as an excuse to delay the conservation process indefinitely. In many cases, conservation action can be based on the available preliminary evidence as well as lessons learned in other areas. Timely management inspired by the precautionary principle is always preferable to postponing action until the status of marine mammal populations may have deteriorated irreversibly.

Legislation and management priorities

Priority 1 *— Embrace a precautionary approach to marine mammal conservation*

Ever-increasing human pressures on marine biodiversity require a responsibility to monitor populations and manage human impacts. Management decision should be based on sound scientific evidence and rigorous monitoring. However, such requirements often conflict with insufficient knowledge and scarce funding resources allocated to research (Tyne et al. 2016). Knowing population numbers and detecting changes in abundance is especially critical for wildlife management, but cuts in research and monitoring costs result in lack of abundance estimates or poor precision of the existing ones. As a consequence, governmental agencies rarely can rely on appropriate information and statistical power to detect even catastrophic population declines (Taylor et al. 2007).

In addition, the high degree of complexity of most marine ecosystems implies that even when the best science is available there will be some level of uncertainty. In the face of uncertainty, marine conservation demands precaution. Precautionary ways to conserve marine mammals require lowering the burden

of proof that a population is in decline before a mitigation approach is taken (Taylor et al. 2000). An alternative approach would be to set annual "harm limits" to ensure that populations do not decline below a predefined threshold—provided that such thresholds can be appropriately and regularly assessed (Wade 1998, Higham et al. 2016).

Unfortunately, both of the approaches above require quantitative information (i.e. accurate estimates of population abundance, status and trends) that is currently unavailable in the waters of Israel. When information is lacking and complexity is high, management decision must be especially careful, and take into account all the potential risks based on state-of-the-art studies conducted in other areas.

The financial burden of proving that new activities and exploitation of marine resources are environmentally sustainable and cause no significant harm to marine mammals and their habitat must be on the exploiters—based on environmental impact assessments conducted by authoritative and fully independent third parties.

Indeed, the fact that environmental impact assessments in Israel are presently conducted by the exploiters themselves, and not by independent third parties, challenges the very idea of an "independent" (and therefore unbiased) assessment. As a partial mitigation of bias resulting from non-independent evaluations, it should be required that environmental reports are written by independent conservation professionals with expertise in the field of marine mammals.

Priority 2 *— Reduce overfishing of marine mammal prey and preserve healthy marine food webs*

Fishing has a tremendous impact on marine ecosystems (Dayton et al. 1995, Jackson et al. 2001, Myers and Worm 2003). Intensive fishing is known to trigger system-wide trophic cascades, which have resulted in large-scale transitions known as regime shifts (e.g. in the Black Sea, Daskalov et al. 2007). The complexity of ecosystem responses to human activities calls for management and legislative approaches that need to be more sophisticated than those provided by "traditional" environmental and fisheries management. This implies challenging the existing practices and implementing explanatory ecosystem models that can reconcile conservation and exploitation (Daskalov et al. 2007). Again, lack of data to implement such models is not a reason to delay the fisheries management process indefinitely. In the absence of hard evidence, fisheries management must be precautionary and inspired by a determination to protect fish stocks in the best interest of the nation, of future generations, and of the fishery sector itself.

Overfishing is known to have contributed to the depletion of Israel's fish stocks, with a reported 45% decline in landings (IMP 2015). According to FAO, annual marine landings in 2005 were 2756 tonnes (FAO 2007), amounting to a small percentage of national consumption. Demand for marine fish has been projected to rise steeply in the next decades. Trawling is the fishery known to cause the greatest damage, besides being subsidised by the Government. High reported discards by trawling (up to 50%, Edelist 2013) are consistent with reports from other Mediterranean areas (e.g. Machias et al. 2001), indicating that trawling is not only environmentally unsustainable and destructive, but also economically and socially irrational.

Consistently, Israel's Marine Plan (IMP 2015) recommended to "place significant restrictions on, or even cessation of, unsustainable fishing methods, e.g., the gradual decommissioning and scrapping of many of Israel's fishing trawlers, with due compensation to vessel owners; revoking the exceptional licenses that are still issued authorizing fishing with SCUBA or compressed air diving (despite their illegality); restricting fishing activity during breeding seasons; restricting fishing in sensitive areas as periodically designated, with an emphasis on underwater rocky reefs and Kurkar (eolianite) ridges; fishing restrictions of endangered species; strict catch limits on recreational fishing". Additionally, the IMP advocated to "augment relevant authorities' ability to monitor and supervise fishing and to enforce pertinent regulations, and create a flexible decision-making mechanism based on scientific knowledge and stakeholder engagement".

For the purposes of this Action Plan, priority management and legislative action must aim to reduce overfishing of marine mammal prey and enable a full recovery of depleted fish stocks. Destructive fishing methods must be banned and the composition of fishing fleets and their gear should be shifted, leading to long-term sustainability of the whole sector. Illegal fishing practices having a direct negative impact on marine mammals or their habitat (such as the use of explosives and illegal fishing gear or practices) must be prosecuted and the relevant legislation effectively enforced.

Israel's new fishing regulations ("2016 Amendment", Section 2.4) introduced restrictions that—if properly enforced—would be relevant for marine mammal conservation. Restrictions targeting bottom trawling are particularly important, and should be promptly implemented. The adopion of additional fisheries management measures should be considered, based on evidence of direct or indirect damage caused to marine mammal habitat and prey resources.

Priority 3 *— Reduce fisheries-related marine mammal mortality*

Fisheries bycatch is a known source of marine mammal mortality and it can result in population decline (Bearzi 2002, Read et al. 2006). Eliminating or reducing incidental mortality in fishing gear is a conservation priority, and solutions can be found through appropriate management of the involved fishery. Compared to the hardship of managing other and subtler threats, fisheries bycatch can often be effectively detected and eliminated.

In Israel, incidental mortality of cetaceans is reportedly caused by bottom trawling and gillnetting. While all marine mammal species are fully protected, unintentional mortality resulting from entanglement in fishing gear is not sanctioned and there are no specific regulations to reduce marine mammal bycatch (Kerem and Edelist 2008). Management action must ensure that no intentional killing or unintentional mortality of marine mammals occurs—a goal which can be achieved through monitoring, strict enforcement of the existing animal protection regulations, bans or modifications of gear known to result in marine mammal entanglement and mortality, and education initiatives.

Israel's recent restrictions on trawling and other gear ("2016 Amendment", Section 2.4) may help reduce marine mammal mortality to some extent. Potential benefits, however, will need to be assessed through dedicated research.

Priority 4 *— Reduce anthropogenic noise in marine mammal habitat*

Noise from human activities including shipping, seismic surveys, oil and gas exploration, marine construction and the use of military or other sonars is a known threat for cetaceans (Richardson et al. 1995, Hildebrand 2005, Jepson et al. 2005, Nowacek et al. 2007). The amount of noise that humans introduce into the oceans has been steadily increasing. Cetaceans are primarily acoustic animals that depend on sound to find food, communicate (including for reproduction), detect predators and navigate. Observed effects of noise on marine mammals include changes in vocalizations, respiration, swim speed, diving, and foraging behaviour, displacement, avoidance, shifts in migration path, stress, hearing damage, and strandings.

Because anthropogenic underwater noise is a novel environmental element for cetaceans, and some species have been exposed to it for only a few generations, it is unlikely that any coping mechanisms may have evolved (Wright et al. 2007).

Responses of marine mammals to noise can often be subtle and barely detectable, and there are cases of apparent tolerance or habituation. Such tolerance, however, may express a need to remain in a particular location (e.g. for feeding or reproduction) despite exposure to noise, resulting in increased impacts from masking, hearing loss, and stress. Marine mammals showing no obvious avoidance or behavioural reactions

may still suffer important consequences, as long-term population impacts may occur without observable short-term reactions (Weilgart 2007).

Strandings induced by noise, primarily with respect to beaked whales and military sonars (Fernández et al. 2005, Cox et al. 2006) have raised worldwide concern. Low frequency sounds such as naval Low Frequency Active Sonar may be heard over long distances, with levels high enough to cause hearing damage or disturbance in cetaceans. Acoustically-induced strandings may eliminate most members of a local population, e.g. of Cuvier's beaked whales. The possibility that noise can lead to strandings and mortality events exists beyond naval sonars. Seismic surveys, for instance, can raise the background noise levels by 20 dB over 300,000 km^2 continuously for days (Weilgart 2007), and seismic noise has been implicated in a stranding of beaked whales (Hildebrand 2005).

Furthermore, in the Mediterranean Sea there has been a great expansion of boat traffic and shipping (Dobler 2002). Prolonged disturbance and noise caused by vessel traffic can affect cetacean behaviour, activity and energy budgets, habitat use and reproductive success (Nowacek et al. 2007, Lusseau 2003, Bejder et al. 2006). Effects can include displacement, long-term area avoidance and reduced female reproductive success.

Because of the recent discovery of important gas fields (e.g. the Leviathan and Tamar gas fields as well as the joint exploitation of other gas fields in the so called "Energy Triangle"), underwater noise in the Mediterranean waters off Israel is expected to increase substantially in the near future (Anonymous 2016). In order to reduce acoustic and other hazards resulting from these activities and prevent an upcoming "gas rush" from causing harm to marine mammals, it is necessary to strengthen the legal provisions regarding environmental impact assessments for high-intensity noise and other intrusive human activities at sea.

Management and legislative action must be taken to ensure that naval activities, and exploration/exploitation of gas and oil resources involving the use of high-energy sounds do not result in marine mammal population displacement or decline. The assessment of environmental impacts and the development of a permit system taking into specific consideration lethal, sub-lethal and disturbance effects on cetaceans is a high priority.

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NOTE: A comprehensive review of intergovernmental decisions and academic literature (up to 2016) on the effects of anthropogenic underwater noise on marine life has been compiled by OceanCare, and is avalable at the link below:

http://www.oceancare.org/wp-content/uploads/2017/03/OceanCare-2016-Intergovernmental-Decisions-and-Academic-Bibliography-relating-to-Marine-Species-and-Anthropogenic-Underwater-Noise.pdf

***Priority 5** — Support research to assess marine mammal abundance and identify critical habitat*

Insufficient knowledge on marine mammal status, abundance, distribution, movements and trends, especially in the offshore waters of Israel (the Exclusive Economic Zone) contributes to delaying the adoption of effective management measures to reduce anthropogenic impacts. An appropriate research effort should be put in place to assess population abundance, identify areas representing critical marine mammal habitat, determine whether such habitat overlaps with extant or upcoming intrusive human activities, and propose management solutions to mitigate anthropogenic threats.

The research actions needed to address this priority are outlined in Section 3.2. However, these actions require institutional support to produce timely scientific evidence—which translates into the provision of appropriate funding, identification of the necessary expertise, and measures to ensure that scientific products remain unaffected by economic and political interest.

Legislative actions

Endorse and incorporate the provisions of ACCOBAMS into national legislation

Whether or not Israel may resolve to become a Party to the Agreement on the Conservation of Cetaceans in the Black Sea Mediterranean Sea and Contigous Atlantic Area (ACCOBAMS) transcends the horizon of this Action Plan. Becoming a Party would frame Israel's marine mammal conservation efforts into an appropriate international context. Joining ACCOBAMS, however, is not going to grant better protection *per se*, and Israel is entitled and capable of finding other and more independent ways of protecting its marine fauna, if so wishes.

What must be acknowledged is that ACCOBAMS, its Conservation Plan and its provisions represent an outstanding regional legislation framework to support marine mammal conservation (see Scovazzi 2016 for a comprehensive review). Israel has the opportunity of benefiting from the considerable work done so far by ACCOBAMS experts and Scientific Committee members. Rather than re-invent the wheel, Israel may start from there and consider the adoption of provisions equal or similar to those of ACCOBAMS. Such provisions should be incorporated into the national legislation, while carefully avoiding any legal loophole that may result in conservation impasse.

Include marine mammals in mandatory, independent and science-based environmental impact assessments

The assessments and monitoring of impacts on marine mammals should be designed to meet the following principles, outlined by Hawkins et al. (2017):

> "Avoid biologically significant negative impacts on marine mammal populations, communities, the habitats and ecosystems on which they rely
>
> Apply appropriate, systematic and rigorous assessment procedures that address the relevant scope of the project during all phases of development and operation
>
> Present accurate information regarding the likelihood and significance of potential impacts that may arise as a direct result of proposed activities with information about the statistical power and limitations
>
> Provide scientific advice as a sound basis for decision making and adaptive management responses to avoid and mitigate impacts on the environment and to ameliorate unavoidable impacts."

To ensure that activities involving the use of high-energy sounds (e.g. in military and naval activities, seismic surveys and prospections, natural gas and oil exploration, stationary industrial activities such as dredges, gas and oil drill ships or platforms, and construction pile driving) do not result in exposure to dangerous underwater noise levels, independent environmental impact assessments must be conducted and made mandatory prior to the beginning of intrusive noise-making activities. A legal permit system should be developed, based on strict guidelines that take into specific consideration the lethal, sub-lethal and disturbance effects on marine mammals.

Noise impact assessment procedures may be incorporated into Israel's extant environmental impact assessment report system. However, legislation must require that environmental impact assessments are conducted by appropriately experienced and independent parties, to guarantee unbiased evaluations (irrespective of industrial and economic convenience). Such assessments should be conducted within an

appropriately long time frame, to ensure that meaningful biological information can be produced. Finally, environmental impact assessments must be publicly available and easily retrievable.

If permits are issued, intrusive activities must include specific and mandatory procedural protocols and methods to 1) assess occurrence of marine mammals prior, during and after noise is introduced in the marine environment, 2) reduce noise levels to a minimum (whether or not marine mammals have been detected) and adopt measures to mitigate impacts on marine mammals and other species, 3) assess and report any response by the marine mammals and other sea life, 4) accurately measure and report any noise introduced into the environment based on standard governmental protocols.

Noise effects on marine mammals can be partially mitigated by e.g. equipment design and decoupling of equipment from water, changes in seasonal and hourly timing of noise production, changes in position or routing of noisy activities to place them further away from marine mammal concentrations, regulation of vessel speeds, minimising source levels to the absolute minimum to get the job done, use of lower-level warning sounds or ramping up sounds to clear the area of marine mammals, and deployment of "bubble curtains" (Richardson and Würsig 1995, Würsig et al. 2000, Lucke et al. 2011).

Once environmental impact assessments have been made mandatory, a comprehensive technical manual should be developed with the aim of offering guidance (including why assessments must be undertaken, information on procedural aspects, mandatory practice, training of observers, data collection and reporting etc.).

Ensure proper inclusion and strict protection of marine mammals in national legislation

All marine mammal species known or likely to occur in the marine space of Israel should be formally and explicitly listed in national legislation concerning the protected fauna. Consistent with the provisions of the Bonn Convention (Section 2.4), legislation should prohibit and eliminate any deliberate "taking" of marine mammals, where "taking" includes hunting, fishing, capturing, harassing, deliberate killing, or attempting to engage in any such conduct. Legal provisions must be fully enforced, including when "taking" occurs offshore or through means such as high-intensity noise, dumping and use of harmful substances, gear and materials that result in marine mammal mortality, entanglement and harming.

The degree of actual enforcement should be reviewed periodically to ensure full compliance. Legislation should be updated whenever new information becomes available, and made more stringent whenever legal loopholes become evident. Governmental agencies should be given the opportunities and the funding necessary to develop institutional capacity for enforcement and compliance, resulting in an effective marine policy relevant to marine mammal conservation.

Integrate this Action Plan for marine mammals in the national environmental strategy

Provisions in this Action Plan will need to be integrated with new governmental initiatives conducted under the Israel Planning Administration, particularly the initiative known as "Israel Maritime Policy Project" (Section 2.4). Such initiative already considers the recommendations given in the Israel Marine Plan of 2015, but it does not include management action specific to marine mammals. Therefore, planning endeavours should be expanded, integrated and complemented with the marine mammal specific actions outlined in this Action Plan (including its subsequent phases of implementation), with the ultimate goal of granting to marine mammals a high conservation management priority in future national marine policy.

Management actions

Protect marine mammal habitat and prey resources

Once areas containing critical marine mammal habitat in Israel have been identified through research (Section 3.2), they should be formally designated, legally protected and organized into a functional network of protected areas. The process of establishing Marine Protected Areas can be integrated by alternative spatial (or "place-based") designations, of which some may be particularly suitable for marine mammals. These include the Convention on Biological Diversity's "ecological or biologically significant areas", the International Maritime Organization's "particularly sensitive sea areas", IUCN's "key biodiversity areas" and "biologically important areas", and the more recent "important marine mammal areas" designation introduced by the IUCN Task Force on marine mammal protected areas (Notarbartolo di Sciara et al. 2016).

Whatever place-based designation is preferred, marine mammal conservation should become a priority for management bodies within the protected area, and relevant actions (including those outlined in this Action Plan) should become part of the area's management plan and effectively implemented. Failure to enforce concrete management actions would only result in "paper parks" that do not contribute to marine conservation.

Protected areas for marine mammals should be created and managed taking into account the animals' habitat needs, their preferred prey, and their wide-ranging movement patterns, with a view to ensuring protection across and beyond national borders. International cooperation would be possible within the framework of region-wide environmental agreements such as the Convention on Biological Diversity and the Convention on Migratory Species (Section 2.4). Cross-country communication and exchange of know-how can be achieved by joining region-wide management networks (e.g. MedPAN, the network of marine protected area managers in the Mediterranean). Collaboration would be particularly important to manage marine mammal populations across the northern and southern Mediterranean borders of Israel.

The process of creating areas that can effectively protect marine mammal habitat and prey resources should involve local marine mammal experts, as well as international experts who are familiar with the process of place-based conservation, to overcome management shortcomings and geopolitical difficulties based on lessons learned in other areas. In particular, the process may benefit from the expertise of international teams committed to place-based marine mammal conservation (e.g. the IUCN Task Force on marine mammal protected areas), ideally with experts from Israel joining and collaborating with such teams.

Enhance the national marine mammal stranding network

Current monitoring of marine mammal strandings

Stranded marine mammals represent an invaluable source of information. Strandings have been consistently monitored by the Israel Marine Mammal Research & Assistance Center (IMMRAC), that has been in charge of inspections and rescue since 1994. Work by IMMRAC has been conducted based on annual permits issued by the Israel Nature and Parks Authority (INPA), in collaboration with the Ministry of Agriculture's veterinarian services and Koret School of Veterinary Medicine (necropsies and pathology), Israel Oceanographic and Limnological Research (contaminants analysis), and INPA (rehabilitation). Marine mammal strandings are reported by Israeli authorities as well as by the general public (IMMRAC experts and stranding/rescue teams are available 24/7). INPA is routinely briefed and its rangers may be involved in the inspection. Virtually all marine mammals stranded on Israel's Mediterranean coast were attended to, with a short response time, resulting in the highest annual reporting rate to MEDACES per km of shoreline (Dan

Kerem, personal communication). In recent years, however, several stranded animals (particularly on well-attended urban beaches) were disposed of before they could be inspected by IMMRAC personnel.

IMMRAC uses a cetacean stranding protocol based on Jauniaux et al. (2005), as well as an official rehabilitation protocol for sick or injured animals developed in collaboration with INPA. Such protocol includes euthanasia that, however, was done only once (on a young striped dolphin diagnosed as dying). No intervention protocol or contingency plan for mass stranding events is available. Necropsies are normally performed on fresh individuals. Marine mammal external measurements, tissues for genetic, stable isotope, toxicological and pathological analyses, and stomach contents are routinely collected and analysed, but other tissues and samples can only be collected opportunistically because of lack of facilities for sample preservation and storage. In addition, IMMRAC manages a collection of skeletal materials (mostly cetacean skulls) that can be used e.g. for morphometric studies.

Proposed actions

It must be ensured that the excellent work done by IMMRAC over 23 years of monitoring of marine mammal strandings is carried out in the long-term, enhanced and supported. The actions listed below are particularly important:

- Appoint and provide appropriate financial support to a marine mammal expert who can be available 24/7 to reach any stranding location upon receiving a reportEnsure that the stranding network effectively encompasses the entire Mediterranean and Red Sea coasts of Israel
- Provide for the professional training of new personnel qualified to perform inspections and necropsies, to facilitate turnover
- Enhance the 24/7 hot line to report marine mammal strandings and ensure that the relevant authorities are fully involved in the monitoring and reporting of stranding events
- Produce and disseminate information to achieve a more extensive involvement of the general public and relevant stakeholders, to encourage comprehensive and timely reporting
- Establish a centralised database of marine mammals strandings including all the relevant information and make it publicly available online
- Make available the facilities and funding necessary to establish a central tissue bank for marine mammals, possibly in collaboration with the Mediterranean Marine Mammal Tissue Bank (http://www.marinemammals.eu)
- Support and provide the funding necessary to analyse tissues collected postmortem from stranded animals (genetics, toxicology, pathology etc.)
- Identify a facility where work related to marine mammal strandings can be centralised, samples stored and preserved (skeletons, embryos, organs etc.), and necropsies performed with the appropriate means.

While IMMRAC has appropriate expertise and professionalism to manage the marine mammal stranding network, a closer involvement by the State would be necessary to ensure consistent long-term effort, institutional support and funding, and to respond to information deriving from marine mammal strandings (e.g. in the case of epizootics). Because the inspection of stranded marine mammals requires combined expertise in animal biology and veterinary sciences, measures should be taken to ensure that such expertise is consistently available. In all cases, it is important to perform thorough investigations of the possible causes of marine mammal mortality, that should be assessed by experts at the stranding site and when possible validated by subsequent necropsies and laboratory investigations (Section 3.2).

Important information and samples to be collected should include, as a minimum:

- High-resolution, well-lit digital photographs to document/validate species identification and to derive other information
- Total body length (a proxy for age) and girth length (a proxy for nutritional conditions)

- Teeth (for precise age determination), or alternatively the whole pectoral fin to detect degree of bone calcification (a proxy for age)
- Tissue samples for genetic, toxicological, histological, pathology, diet and other studies
- Stomach contents for diet studies and to determine e.g. the occurrence of ingested plastics
- Whole embryos, when present.

Triage and euthanasia of marine mammals are emotionally charged choices influenced by cultural views, and intervention protocols should take public perceptions into account (e.g. see Bearzi et al. 2010). A working group should be created to establish the most appropriate protocols based on 1) investigation of public responses to live strandings, 2) assessment of public perceptions, and 3) legislative, security, health and other constraints. Identification of appropriate responses should include cases of live strandings, marine mammals in difficulty and “sociable” animals (mass strandings have been rare or absent in Israel).

Extant criteria and intervention protocols for the inspection, data collection, release, rehabilitation, post-hoc monitoring, assisted death and euthanasia should be upgraded based on authoritative work that has recently become available. Useful online resources that could be used to complement and upgrade present intervention protocols include:

Handbook for cetaceans’ strandings (Mazzariol et al. 2016)
http://www.netcet.eu/files/Handbooks/NETCET_Textbooks_on_veterinarian_operation_of_cetaceans.pdf

NOAA Marine mammal stranding response, rehabilitation, and release (Whaley and Borkovski 2009)
http://www.nmfs.noaa.gov/pr/pdfs/health/release_criteria.pdf

NOAA publications on marine mammal health and stranding response
http://www.nmfs.noaa.gov/pr/health/publications.htm

British Divers: marine life rescue
http://www.bdmlr.org.uk/index.php?page=resources

Proceedings of the ECS workshop “Best practice in rescue” (Barnett et al. 2014)
http://docmia.com/d/620796

Report of the ACCOBAMS/Pelagos workshop on cetacean live stranding (ACCOBAMS 2014)
http://www.ascobans.org/sites/default/files/document/AC22_Inf_5.3.a_ACCOBAMS_WS_CetaceanLiveStranding.pdf

Examples of online stranding databases and tissue banks include:

Mediterranean Marine Mammal Tissue Bank: http://www.marinemammals.eu

Adriatic cetaceans strandings: http://www.marinemammals.eu/database_spiaggiamenti.php

Monitoring of Cetacean Strandings on Italian Coasts: http://mammiferimarini.unipv.it/index_en.php

Recent findings of *Toxoplasma* (Cabezon et al. 2004) in three common bottlenose dolphins stranded on the Mediterranean coast of Israel (Dan Morick, personal communication), as well as the possibility of dolphin morbillivirus outbreaks and cross-species infections (Centelleghe et al. 2017), call for caution during the handling, rehabilitation and release of marine mammals. Screening for viral and other pathogens should be conducted whenever possible/appropriate to inform decision making.

Envisage action to facilitate Mediterranean monk seal and dugong recovery

Specific conservation action that can facilitate the recovery of Mediterranean monk seals and dugongs should be identified (beyond the actions proposed in this Plan) based on research *in situ* and experiences in other countries. Specific conservation measures for these species should aim to result in 1) zero killing and harming, 2) protecting and/or restoring critical habitat, 3) protecting food resources, 4) reducing disturbance and human use of feeding, resting and breeding sites, 5) contingency plans for the rescue and rehabilitation of sick, wounded or orphaned animals, and 6) research (to assess and monitor abundance, distribution, movements, reproductive success etc.).

In the case of the Mediterranean monk seal, the goal is to warrant the conditions that can facilitate the species' comeback and settlement in Israel. In the case of dugong, while the species no longer occurs within Israel's territorial waters, it is still possible to facilitate population recovery in the northern Red Sea, e.g. by contributing relevant expertise to international research, monitoring and conservation efforts in the region.

Revise and upgrade the management criteria for keeping marine mammals in captivity

This Action Plan does not address the controversial ethical and educational aspects of holding sentient animals such as dolphins and other marine mammals in captivity (see Rose et al. 2009 for a review). Still, it is clear that any developed country that consents to the confinement of marine mammals has a duty to adopt and enforce measures that guarantee the best possible treatment and management (e.g. CCAC 2014), consistent with national legislation and international agreements (Section 2.4).

Legislative measures must be taken to ensure that:

- □ The keeping and managing of captive marine mammals has no negative impact whatsoever on wild populations
- □ Optimal husbandry standards are adopted and consistently maintained over time for each and every marine mammal held in captivity, under strict periodic supervision by the relevant authorities
- □ No marine mammals are imported or exported, for whatever reason
- □ No marine mammals are taken from anywhere in the wild, unless that happens for short-term rehabilitation purposes (e.g. after a live-stranding event) having reasonable chances of success, under clear guidelines and strict supervision by reputable marine mammal experts
- □ Marine mammals are not used in controversial therapeutic programmes (Marino and Lilienfeld 2007)
- □ Accurate science-based information is given to the public visiting marine mammal facilities
- □ Claims of education, awareness-raising or research are not used to hide primarily commercial interests detrimental to the dignity and right to freedom of individual animals.

Finally, it must be noted that the use of dolphins for military exercises or the keeping of cetaceans in captivity for exhibition or amusement are violations of the obligations arising from ACCOBAMS (Scovazzi 2016, and see Section 3.1 "Endorse and incorporate the provisions of ACCOBAMS into national legislation").

Institutional framework, support and funding

Empower a Steering Committee to support the implementation of this Action Plan

Actions in this Plan should be coordinated by a small unit of marine mammal conservation experts, appointed to operate as members of a Steering Committee. The primary goal of the Steering Committee is ensuring that actions outlined in this Plan are properly set up, integrated in national frameworks in strict coordination with the relevant ministries and governmental agencies, and effectively implemented within the time frame (2017–2022).

The creation and empowerment of an authoritative Steering Committee represents one of the most important first steps towards the execution of this Action Plan. The Steering Committee should oversee and coordinate all the steps leading to implementation, operating as an independent consultancy body in partnership with the Israel Ministry of Environmental Protection and the Israel Nature and Parks Authority. Recommendations by the Steering Committee should have the power to affect decision-making by the relevant national institutions.

Additionally, the Steering Committee should promote the organization of conferences, workshops and round tables, take action to promote marine mammal legislation and management initiatives, prioritise, select and promote research projects and capacity building initiatives, and contribute to the design of public awareness campaigns.

Ideally, the Steering Committee should be composed of three members, with one operating as a Chair. Steering Committee members should have an appropriate understanding of the management and organizational constraints of marine conservation in Israel, and of the ways of addressing and involving the relevant stakeholders. They should be familiar with marine mammal research, to ensure that scientific information is properly interpreted and used in the right context. They should be aware of anthropogenic threats that may result in loss of marine mammal habitat or population decline, and capable of establishing priorities to mitigate such threats.

Finally, Steering Committee members—particularly the Chair—should have the charisma, motivation and skills necessary to liaise with stakeholders and policy makers, and the endurance to persist until conservation-oriented laws and regulations are issued and enforced. In addition to Committee members, local and international conservation experts may play the role of consultants who can contribute valuable advice whenever needed.

A shortlist of potential Steering Committee members can be suggested by IMMRAC, the longest-standing marine mammal organization in Israel. Names may be circulated for wider approval and other suggestions. The Israel Nature and Parks Authority could then formally appoint the members of the Steering Committee, who should operate based on terms of reference (including clear objectives, time table and deadlines) to be prepared by the Authority. Finally, the Steering Committee should rely on appropriate funding consistent with the importance of its mandate. Funding should include a budget for travelling, attending meetings, and covering expert consultancy related to the implementation of the Action Plan.

Centralise marine mammal research and conservation action

It would be convenient to concentrate marine mammal research and conservation efforts in a single location, and work toward the creation of a centralised authoritative network of experts. The Leon H. Charney School of Marine Sciences at the University of Haifa (http://marsci.haifa.ac.il) may be an appropriate location, under the assumption that—no matter the chosen central location—marine mammal science and conservation remains a fully independent discipline that does not pay lip service to business-oriented marine exploitation interests.

Centralisation of efforts within a qualified university will facilitate the establishment of marine mammal faculty positions and the development of comprehensive programmes of graduate studies revolving around marine mammal science. The university should offer appropriate office facilities, host a marine mammal tissue bank, provide for the storage, preparation and exhibition of national collections of marine mammal skeletons and other anatomical and histological items, host a national marine mammal and conservation library and other relevant facilities mentioned in this Action Plan.

The Israel Marine Mammal Research & Assistance Center must be integrated in the process, and its 20+ years of heritage and experience should be carefully safeguarded. The marine mammal conservation values that have been running deep into IMMRAC's blood should be preserved and passed on to a new generation of conservation biologists. National inter-university centres in the Mediterranean and Red Sea should also be involved, and their research vessels may be used to conduct marine mammal surveys and other research outlined in Section 3.2.

Enhance funding opportunities for marine mammal research and conservation

Scarce funding resources compromise the level and quality of monitoring necessary to detect trends in abundance and monitor human impacts on marine mammal species and habitats. The policy of not providing funding to marine mammal research ultimately strikes back, when managers cannot rely on appropriate knowledge for the planning of new protected areas, the assessment of industrial impacts, or for responding to environmental threats in ways that are biologically meaningful.

Therefore, marine mammal research and conservation projects need to be explicitly included in the funding mechanisms of governmental aid agencies, and measures should be taken to make good use of the available funding in ways that are impartial and based on merit.

To complement governmental funding, mechanisms should be identified to motivate (e.g. through fiscal benefits) foundations and private funding institutions to support marine mammal research and conservation proposals. Finally, support should be given toward the creation of networks of governmental and non-governmental organizations, universities and research institutes, finalised to comprehensive marine mammal assessment and monitoring programmes.

Provide institutional support to marine mammal organizations

Marine mammal organizations including small NGOs often provide the soil where new seeds can grow. Providing patronage and when possible logistical support may ease the development of new projects and ideas. Small organizations are often cost-effective and may contribute to getting the job done and help identify solutions upon the provision of minimal support.

Formal recognition should be given to organizations that are doing a good job, no matter their size and political connections. Institutional support may be offered as a part of the routine mandate of governmental institutes and agencies, with the aim of contributing whenever possible to the development of new initiatives promoted by passionate teams. For instance, national museums, protected areas management bodies etc. may be given a mandate to host selected non-profit marine mammal and marine conservation organizations, offering logistical support, office facilities, meeting space, use of equipment or free boat mooring.

International cooperation

Provide opportunities and create platforms for data sharing and science-based cross-country collaboration

It has been shown that planning for marine conservation when countries collaborate can improve efficiency compared with scenarios where countries act separately (Mazor et al. 2013). Israel has been defined as an "island state" because of its challenging relations with neighbouring countries. Enmity, political difficulties, and threats to personal security have been jeopardising scientific collaboration, hampering research efforts based on meaningful biogeographic areas (most marine mammals are wide-ranging, and best protected in the context of cross-country collaboration).

However, cooperation is essential and the advance of marine conservation and scientific knowledge must be pursued for the common good, beyond national borders and political, religious or other views. Positive examples of cross-country collaboration do exist, as shown *inter alia* by the "Gulf of Aqaba Environmental

Action Plan" (2000) endorsed and jointly implemented by Israel, Jordan and Egypt. The goal of working together to promote marine conservation should be pursued by all means, overcoming frustration and seeking new ways of promoting dialogue and sharing information. Opportunities exist in the context of international treaties (Section 2.4), and by joining or collaborating with working groups and committees under the common flag of conservation biology.

In addition, science-based collaboration can occur indirectly, by disclosing research data via the world wide web. For instance, IMMRAC has already made available significant datasets through online platforms such as OBIS Seamap and MEDACES.

Other examples of information sharing include 1) the creation of a comprehensive online database of marine mammal strandings in Israel, where all the data are made available to users, following examples set by other Mediterranean countries, and 2) the online sharing of important datasets (e.g. individual photo-identification catalogues) and other research information as well as of protocols and local expertise. A policy of disclosure can encourage use of information by other researchers. Whether or not that happens in the context of friendly collaborations may not be essential for the ultimate cause of protecting marine mammals.

To achieve the goals above, incentives should be provided for the sharing and dissemination of marine mammal research data on existing online platforms, and support should be given to create new web sites and online databases that facilitate data sharing beyond national borders. Indeed, data sharing is also likely to increase collaboration *within* the national borders and facilitate exchanges among research groups, nature protection organizations, institutions and stakeholders.

An opportunity for international cooperation is offered by the planned expansion of the northern Rosh Hanikra Marine Reserve up to the northern border with Lebanon (IMP 2015). Because Lebanon is also planning to establish a marine reserve on its southern coast, immediately north of the border with Israel, these parallel initiatives may result in the creation of a large protected area encompassing the waters of both Israel and Lebanon. International agreements such as ACCOBAMS (Annex 2) may facilitate exchange of information and help coordinate efforts by Israel and Lebanon, to ensure marine mammal protection in this important area.

Support the ACCOBAMS Survey Initiative

The Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS) has been working for several years on a comprehensive project to estimate cetacean abundance and distribution throughout the Mediterranean and Black Seas, the "ACCOBAMS Survey Initiative" (UNEP/MAP 2015). This project aims to improve understanding of the conservation status of cetaceans, consistent with the commitments made by the Parties to ACCOBAMS (Annex 3). Aerial surveys were conducted in several portions of the central Mediterranean Sea (e.g. Fortuna et al. 2011, Panigada et al. 2011) and efforts are underway to achieve a region-wide survey coverage. Research combining visual survey methods (boat-and ship-based surveys) and passive acoustic monitoring is planned for the near future throughout the Mediterranean Sea (ACCOBAMS 2015, UNEP/MAP 2015).

Supporting and facilitating the ACCOBAMS Survey Initiative would appear to be in the best interest of Israel, considering that such initiative is likely to produce significant information on the abundance and distribution of cetaceans and other marine species in the entire Levantine Basin. While this decision may imply political and security aspects that go beyond the scopes of this Action Plan, the relevant authorities should balance the pros and cons of conducting own marine mammal monitoring versus benefiting from collaboration with an initiative that is already underway.

Make this Action Plan widely available, and its implementation process transparent

This Action Plan should be widely advertised (via marine mammal and marine conservation e-mail lists, social media, the press etc.) and made promptly available online to encourage involvement, collaboration and networking. Non-governmental organizations, individual scientists and conservation officers should be informed through a carefully planned communication campaign. Notifications should include the relevant fora of international treaties (Section 2.4) with the purpose of having this and future Plans assessed, endorsed and supported.

A transparent management policy should be adopted with regard to the process leading to implementation of this Action Plan, with a view to letting others benefit from Israel's experience and use it as a reference for other marine mammal conservation action in the region. Information should be disclosed to ensure that any lesson learned is shared with other countries in the Levantine Basin and northern Red Sea.

Because this Action Plan primarily addresses decision makers in Israel, a Hebrew translation attached to the original English version would make it more widely accessible. The costs and benefits of a professional translation should be evaluated. Because of the technical nature of this Plan, translations should be carefully checked and matched with the original English text by a marine mammal expert.

3.2 Research

The role of science

With increasing pressures on marine mammals and their habitat comes a responsibility to monitor their populations, assess human impacts and identify measures that can slow down, stop or reverse the damage caused by human activities. Scientific research provides essential information to decision makers and supports the management process by clarifying cause-effect mechanisms.

In the waters of Israel, understanding of marine mammal distribution and habitat is still limited, and virtually no information exists on population abundance and trends. Insufficient knowledge conflicts with the need of assessing population status and adopting meaningful conservation measures. In such a scenario, higher priority should be given to research that can effectively support conservation management. To contribute most effectively to marine mammal conservation, such research should be well designed, conducted rigorously, fully independent, and focused on important questions.

> *Any scientist of any age who wants to make important discoveries must study important problems. Dull or piffling problems yield dull or piffling answers. It is not enough that a problem should be "interesting"—almost any problem is interesting if it is studied in sufficient depth... No, the problem must be such that it matters what the answer is—whether to science generally or to mankind.*
>
> — Peter Medawar, Advice to a Young Student (1979)

When it comes to marine mammal conservation, the advice given by Peter Medawar means addressing the tough threats faced by marine biodiversity, rather than focusing on (interesting) "pure science" research less likely to contribute solutions. An effort should be made to prioritise and sharpen the focus of marine mammal science in Israel, making it consistent with the scopes of this Action Plan and the colossal environmental challenges of our times.

Research priorities

Priority 1 *— Assess population size, status and trends*

The majority of the world's oceans have never been surveyed to estimate marine mammal density (Kaschner et al. 2012). In the Mediterranean Sea, abundance estimates have only been produced in northwestern and central portions of the region, while scant information is available on marine mammal abundance in the Red Sea. There is clearly an acute need for conducting systematic surveys (or analyse any existing dataset) to assess the abundance, status and distribution of marine mammal populations in the marine space of Israel and in the surrounding Mediterranean and Red Sea waters.

Because present occurrence of marine mammals should be evaluated in light of past abundance, it would be important to review the historical evidence and take into consideration any evidence of "shifting baselines", particularly in terms of declining abundance and biodiversity. As noted by Daniel Pauly, each time the baseline drops we tend to perceive it as the new "normal". Earlier knowledge, even when qualitative or anecdotal, must be incorporated into present status assessments and modelling efforts to understand the true social and ecological costs of human impacts (Pauly 1995, Jackson and Jacquet 2011).

Priority 2 *— Identify critical habitat*

Critical habitat for marine mammals is defined in terms of the ecological requirements for successful breeding and foraging (Harwood 2001). Prey-rich areas as well as areas that offer low disturbance (or protection from predators) are particularly important. An understanding of marine mammal distribution, movements, habitat use and prey availability is essential for managing human activities and such knowledge can support place-based protection measures.

Marine ecosystems have high levels of seasonal and annual variation, and most marine mammal species respond to this variability by changing their distribution patterns. Although highly mobile species such as cetaceans can respond more rapidly than most terrestrial mammals to environmental change, shifts in prey availability or disturbance, they can still be seriously affected by human impacts that increase or alter natural variability. Because habitat models can take this variability into account, they have become powerful tools for predicting marine mammal distributions and understanding the ecological and anthropogenic processes involved (Redfern et al. 2006). Research in these fields represents a priority.

Priority 3 *— Identify the main threats and possible management solutions for mitigating human impact*

The main anthropogenic factors that threaten marine mammal populations have been described in Section 2.6. Of these, some raise greater concern for marine mammal conservation in Israel. Prey depletion caused by overfishing (both directly and via changes in the trophic web) is a poorly studied and likely important threat to marine mammals, particularly in oligotrophic coastal waters exploited by trawlers and other high-impact fisheries. Incidental mortality in fishing gear has been causing significant marine mammal mortality. Habitat loss and degradation as well as anthropogenic noise levels are high, and likely to increase and expand to offshore Mediterranean waters due to the recent discovery of natural gas fields and their upcoming exploitation—which may create massive impacts on the marine environment. The challenges posed by climate change are immense, and known to threaten marine ecosystems to dramatic extents, with the potential of displacing or causing the decline of entire populations. Chemical contamination and ingestion of solid debris have impacts that should be assessed through research. Oil pollution can become a serious threat to marine mammals in the event of an oil spill (Gerace and St. Aubin 1990). Finally, vessel strikes and disturbance may be relatively less important threats in Israel (at least based on the available information).

Because information in the marine space of Israel is limited to a few threats and species (e.g. common bottlenose dolphin mortality in trawling gear; Kerem and Edelist 2008, Scheinin et al. 2014), while information on the impact of other threats is still poor, priority research action should aim to:

- Monitor the long-term conservation status and trends of marine mammal populations (e.g. via repeated assessment of population abundance, distribution and habitat use; see Priorities 1 and 2)
- Assess and quantify any impact on marine mammals caused by human activities (e.g. mortality and harm, decline in abundance, habitat loss, avoidance and dispersion, social disruption, health effects, and evidence of reproductive failure, inbreeding or hybridisation)
- Clarify direct and indirect cause-effect relationships (e.g. bycatch caused by a given fishery or gear, decline of key prey caused by overfishing, hearing damage or disturbance caused by noise, immunosuppression caused by the build-up of xenobiotic contaminants)
- Identify science-based solutions for mitigating human impact (e.g. marine spatial planning, changes in fishing gear or areas, noise mitigation measures)
- Evaluate the effects of legislative and management measures (including those proposed in Section 3.1).

Research actions

Conduct visual and acoustic surveys to assess marine mammal abundance, distribution and habitat use

Multiplatform and multiyear survey data can be used to estimate marine mammal distribution and abundance, using either line transect data (Jewell et al. 2012, Roberts et al. 2016) or presence-only data (Kaschner et al. 2006, Ready et al. 2010). Data generated by systematic surveys to assess marine mammal abundance can be combined with more opportunistic observations (as long as these observations include information about effort and method) and used to produce predictive models of marine mammal distribution and habitat preferences (Cañadas et al. submitted).

Surveys may be based on ships (visual and acoustic) or small aircraft (visual only). Each approach has benefits and limitations (Garner et al. 1999, ACCOBAMS 2015). Aerial surveys may be more cost-effective, can cover large areas per unit time, and tend to be more efficient and tolerant of swell (though they are less tolerant of poor weather, including at the airport). The area covered by aerial surveys must take into account location of airports and safety concerns. Vessels are generally easier to obtain than aircraft, and vessel-based surveys tend to have lower availability bias. Relying on skilled and experience observers is important in all cases, and good training is an essential component, as are survey design and a consistent and rigorous data collection. The use of platforms of opportunity such as research vessels engaged in oceanographic and other campaigns that are not specific for marine mammals may be valuable and cost-effective, but the method has significant limitations and biases. Finally, visual surveys can produce valuable information on the abundance and distribution of species other than marine mammals, such as elasmobranchs, marine turtles and seabirds, as well as of marine debris.

Vessel-based visual surveys can be complemented by acoustic methods that allow data collection around the clock, are independent of observer skills and less sensitive to weather conditions. Acoustic surveys can detect diving animals that are visually undetectable (including at night), but they rely on animals making sounds within detection range, and species identification may be challenging. Vessel-based acoustic surveys are often the most effective way of surveying sperm whales.

Passive Acoustic Monitoring (PAM) has been used to detect and analyse sounds produced by marine mammals (André et al. 2011, Zimmer 2011). PAM relies on fixed autonomous underwater sound recorders: electronic devices that acquire and store acoustic data internally, normally deployed semi-permanently via a mooring system (Sousa-Lima et al. 2013). “C-Pods” developed by Chelonia Ltd. (http://www.chelonia.co.uk) are popular PAM devices that come with their own built-in software. Underwater sound recorders can be deployed for days or even months at a time, and then retrieved to download data for post-processing and analysis. PAM may be a particularly suitable approach for detecting marine mammals in low-density areas, and this method was successfully deployed in Israel to investigate occurrence of common bottlenose dolphins at strategic locations and assess responses to human impact (Zuriel et al. 2016). PAMGUARD (http://www.pamguard.org) is a suitable open-source software for use in PAM.

Theodolite tracking has been used to study animals from shore in a non-invasive manner. This method is relatively inexpensive, it does not influence marine mammal behaviour, and it can provide accurate information on movement patterns and habitat use, as well as information about their behavioural responses to boats, fishing gear etc. (Würsig et al. 1991, Gailey and Ortega-Ortiz 2002, Piwetz et al. 2012). In Israel, the possibility of using theodolites to track dolphins from e.g. the top of tall nearshore buildings may be considered in areas where dolphin movements occur relatively close to the coast. Low density of animals, however, may make the method impracticable.

Marine mammal stranding data, when recorded systematically, can offer insight on mortality at sea and relative abundance of species. Information from long-term monitoring of strandings, especially when coupled with data recorded at sea, may also be used to infer trends in population abundance, at least for coastal species (Peltier et al. 2012, 2013, Peynson 2010). Israel's valuable marine mammal stranding record, encompassing more than two decades, should be analysed and complemented with other survey methods to explore trends in abundance and distribution.

Power analysis and other methods to assess uncertainty should be incorporated in project design and be part of any study investigating the demography of wildlife populations. A power analysis can determine the degree of confidence of a study to detect an effect of a given size (for instance, a trend of a given magnitude). These analyses are extremely important and experts can run simulations to inform project design before a study is conducted. Such practice would allow assessment of effort needed to obtain data with enough accuracy and precision to support management decision.

Conduct photo-identification surveys to assess abundance and obtain relevant biological information

Information on cetacean population abundance can be obtained via capture-recapture techniques based on the photographic identification of individual animals (Hammond et al. 1990). Such methods can also be applied to Mediterranean monk seals (Forcada and Aguilar 2000) and dugongs (Anderson 1995). Compared to visual and acoustic surveys, photo-identification surveys can generate information on movement patterns of known individuals (including long-distance movements), site fidelity and fine-scale habitat use, group composition and dynamics, social organization, reproductive success, occurrence of hybridisation, body anomalies, lesions and skin pathologies, evidence of entanglement in fishing gear etc.

Additionally, a number of studies are suitable of being coupled with photo-identification surveys. These include studies of surface and acoustic behaviour (e.g. to investigate foraging, interactions with fisheries, short-term responses to disturbance), genetic sampling via uninvasive skin swabbing of bowriding dolphins (e.g. to investigate population structure) and other research approaches.

Photo-identification relies on long-term natural markings, and this aspect is often considered a limitation. However, modern digital photography (high resolution, image stabilisers etc.) has greatly expanded the range of marine mammal species suitable of being studied through this method. While photo-identification analyses may be more challenging when a population includes a high proportion of unmarked or poorly-marked animals, capture-recapture methods can be robust even with low percentages of marked animals (Gormley et al. 2005, Bearzi et al. 2016).

The choice between visual surveys and photo-identification surveys (combined with other studies) ultimately rests upon the research question that needs to be answered, the resolution of the needed information, and the available time, budget, means and expertise. While photo-identification surveys tend to be relatively more expensive and time consuming, they also provide valuable fine-scale information and they often represent the most appropriate method for the long-term study of marine mammal communities living in coastal waters, the investigation of dolphin interactions with fisheries, and the status assessment of low-density populations (including the Mediterranean monk seal). Individual photo-identification may be relatively less effective if the likelihood if re-capturing a given individual remains consistently low over time, e.g. as a result of nomadic movements and low levels of site fidelity within the study area.

Over 700 coastal surveys encompassing 25,000 km of navigation were conducted in the Mediterranean waters of Israel between 1998 and 2017, with a focus on dolphin photo-identification. A total of 270 dolphin sightings were recorded during these surveys. Common bottlenose dolphins were the main species encountered off the entire coast of Israel, whereas short-beaked common dolphins were only

observed south of Tel-Aviv. Bottlenose dolphin groups averaged six individuals, common dolphins about 25 individuals. Both populations seemed to occur year-round (Aviad Scheinin, personal communication). Based on this work, IMMRAC currently manages photo-identification catalogues including 148 marked individuals, of which 52 were re-observed four or more times. This valuable dataset should be properly analysed to extract meaningful biological information (e.g. through habitat and distribution modelling) and if possible obtain estimates of abundance.

Investigate population structure

Genetic samples obtained from stranded animals can be used to investigate population structure, thus contributing to the assessment of marine mammal status (Natoli et al. 2008, Gaspari and Evans 2013). Studies of skeletal variation (e.g. based on skull measurements) have also been conducted to this extent.

So far, research in Israel has focused on the population structure of common bottlenose dolphins (Sharir et al. 2011, Gaspari et al. 2015). These valuable studies should continue and be extended to other marine mammal species, with a priority on populations known or inferred to be geographically and reproductively isolated. Collaboration with researchers operating in other parts of the region is essential, as studies should aim to describe population structure from a region-wide perspective (e.g. the entire Mediterranean or Red Sea).

Assessments of population structure should aim to identify marine mammal management units and the degree of isolation in the waters of Israel, while taking into account the shortcomings of relying on management units that are defined exclusively through genetics (Taylor and Dizon 1999). In addition, it shuld be considered that genetics may not have the capacity of detecting population changes that have occurred within an insufficiently long time frame (e.g. in case of a recent colonisation).

Assess the occurrence of anthropogenic mortality

Stranded marine mammals should be inspected and necropsied to assess any evidence of human-related mortality, including bycatch in fishing gear (Section 3.2), noise-induced damage (such as evidence of hearing loss: Evans and Miller 2004, Mann et al. 2010, Morell et al. 2017; or acute and chronic tissue damage resulting from the formation *in vivo* of gas bubbles: Jepson et al. 2005), deteriorated health status (e.g. following an oil spill, Schwacke et al. 2013), ship strikes (Panigada et al. 2006) and ingestion of plastic or other materials (Baulch and Perry 2014).

Depredation of fishing gear by marine mammals sometimes results in harming or killing of animals in retaliation (Bearzi et al. 2004). When trawlers started being deployed in Israel (in the 1940s and 1950s), dolphins caused significant damage to the cotton nets and were listed as agricultural vermin and intentionally killed—including by professional bounty hunters (Kerem and Edelist 2008). In the following decades, fishing gear depredation and damage caused by marine mammals in Israel reportedly became insignificant and the occasional interactions tolerated (Kerem and Edelist 2008), apparently resulting in low levels of direct killings (e.g. shooting or harpooning).

Published findings, however, date back to a decade ago and they need to be validated by appropriate field monitoring efforts aimed to detect any extant unreported killing, with a focus on coastal species known to depredate fishing nets, such as common bottlenose dolphins (and possibly Mediterranean monk seals in the areas where the species still occurs). Recently, fishers in Israel have started to report and protest against depredation of fishing gear by dolphins (Dan Kerem, personal communication), which potentially may result in retaliation.

Investigate the food-web impact of fishing and marine mammal interactions with fisheries

Assessment of fishing fleet, fisheries catches and ecosystem impact of fishing

An overview of the composition and activity of Israel's Mediterranean fishing fleet in 2007 was provided by Kerem and Edelist (2008), who described the following scenario:

> Bottom trawlers (22 vessels active on any given day), using mesh sizes of 40-48 mm and doors up to 50-70 m. An annual effort of about 4000 fishing days was estimated for the entire fleet, effort being higher between September and May.
>
> Purse seiners (20-25 active vessels), using mesh sizes of 16-24 mm and working mostly at night.
>
> "Small-scale" fishing boats encompassing 13 ports and marinas. Of about 300 boats, approximately 250 use trammel and gillnets and 50 longlines. Actual number of boats at sea reportedly was lower by 50-80% due to overfished resources making fishing poorly sustainable. Fishing effort is higher in winter. Nets are typically 150-200 m long and 2-3 m high (trammel nets) or 12 m high (gillnets). Mesh sizes of 30-120 mm. Longlines typically have 250-800 hooks but sometimes as many as 4000.

At present, the fishing fleet of Israel includes 26 active trawlers, expected to be reduced by four units as a management measure (Oren Sonin, personal communication). In 2005, bottom trawlers were responsible for about 60% of total landings (Edelist et al. 2013, Scheinin et al. 2014), with estimated discards up to 50% (Edelist 2013). All fishing in Israel is carried out within approximately 12 nautical miles from shore, except for five pelagic longliners that have been targeting bluefin tuna in waters farther offshore since 2002 (Edelist et al. 2013). Additional removal of fish biomass is caused by SCUBA divers and by a considerable and growing recreational fishery (mostly angling, but also spear-fishing; Edelist et al. 2013).

An updated and comprehensive assessment should be made of the entire fishing fleet operating in the Mediterranean and Red Sea waters of Israel, including information about vessel size, location, fishing gear, activity levels (days at sea) etc. Information available in official fishery registers should be validated by field studies capable of detecting any incongruence or evidence of illegal activities. Information on total biomass removed by fisheries (beyond the reported landings, representing only a portion of the actual catch; Edelist et al. 2013) will help assess the present impact of fishing on Istrael's marine ecosystems and inform studies based on food-web models, relevant for the assessment of trophic impacts on marine mammals and their prey (e.g. Piroddi et al. 2011, 2017).

Reduce or eliminate marine mammal mortality in fishing gear

Based on the available information, marine mammal bycatch mostly occurs in trawling gear and it involves exclusively or predominantly common bottlenose dolphins, a species that often associates with trawlers (Scheinin et al. 2014). Between 1993 and 2008, researchers from IMMRAC recorded a mean mortality of more than eight bottlenose dolphins per year, representing a high proportion of all the recorded mortality. Mortality in gillnets was also reported. Cases of entanglement in gillnets have involved common bottlenose dolphins, rough-toothed dolphins, minke whales and striped dolphins (Kerem and Edelist 2008).

Future research should 1) monitor and assess as precisely as possible the present occurrence of marine mammal mortality in fishing gear, 2) assess the direct and indirect population impacts of such mortality, 3) identify science-based management solutions to eliminate bycatch.

Interview fishers

Well-designed and carefully conducted interviews with fishers can provide valuable information on a variety of issues relevant for marine mammal conservation, while also providing insight into perceived conflict, relevant for socioeconomic and ethnobiological studies (Souza and Begossi 2007). Because the reliability of reports may be difficult to assess and results may depend on the methods used for data collection (Lien et al. 1994), expert supervision is of paramount importance and interviews should be conducted by trained personnel based on standard protocols intended to reduce bias.

Research based on interviews should aim to investigate the occurrence of incidental mortality of marine mammals in fishing gear, the past and present occurrence of rare species (possibly including Mediterranean monk seals and dugongs), fishing gear damage and depredation by marine mammals and other animals, as well as trends in fisheries landings and reported competition with other sectors (e.g. industrial fisheries, recreational fishing, divers).

It must be considered that answers, rather than representing facts, often reflect fishers' perceptions, and the reported information may be misleading (Bearzi et al. 2011a). Therefore, the researchers conducting the study should validate information obtained from interviews before such information is used to steer further research or support management action.

Obtain information on health status and susceptibility to disease

Marine mammals stranded in Israel should be checked for dolphin morbillivirus infections as a matter of priority. Dolphin morbillivirus has caused several mortality events in the Mediterranean Sea since the early 1990s, resulting in mass mortality of striped dolphins and common bottlenose dolphins. In recent years, the virus has infected new hosts, including fin whales (Beffagna et al. 2017), sperm whales and a Cuvier's beaked whale calf (Centelleghe et al. 2017). Cross-species infection is known to occur, and 19% of cetaceans examined by the Italian Stranding Network were positive to dolphin morbillivirus, supporting the hypothesis of an endemic circulation of this virus among Mediterranean cetaceans (Centelleghe et al. 2017). State-of-the-art methods for the screening of dolphin morbillivirus can be developed through collaboration with Mediterranean centres of excellence such as the Department of Comparative Biomedicine and Food Science and the Department of Animal Medicine, Production and Health, University of Padua, Italy.

In addition, when possible, necropsies should aim to detect parasites and infectious disease (e.g. Herpesvirus, *Brucella* spp., *Toxoplasma gondii*) and toxicological analyses should be conducted on stranded animals. Recommendations for priority areas of research on the effects of chemical pollution on marine mammals, relevant for the scopes of this Action Plan, were made during a recent European Cetacean Society workshop (Evans 2013, pp. 90-91).

Review historical information

Perceived baselines tend to shift (Pauly 1995) and information published in the past is quickly forgotten. Historical information is comparatively harder to access, and scientific progress makes past research look obsolete and "unscientific". As a consequence, most scientists tend to focus on the most recent and well-published sources. Unfortunately, contempt for historical evidence and omission of older information results in poor historical perspective and failure to appreciate the real magnitude of change. Such approach has produced misperceptions that negatively affect our way of managing the natural environment (Jackson et al. 2001).

To counterbalance biased perceptions and shifting baselines at least in part, an effort should be made to unearth historical information about marine mammals and marine biodiversity in the Levantine Basin and northern Red Sea. Publications and other information found in libraries, museums and historical archives should be identified, catalogued, translated when necessary and made easily available (including online). Such work should encompass qualitative historical information (iconography, art, narrative), as that is often the only available information at times when science wasn't what it is today (Aviram 2011). Museum collections represent additional and often overlooked sources of important information. For instance, osteological collections may be indicative of the species most likely to have stranded in the past (e.g. Bearzi et al. 2003), while skeletal samples may be used for genetic and morphometric analyses (e.g. to investigate past population structure).

This information should be published in scientific reviews incorporating and comparing modern and historical information. These reports can shed light on marine mammal trends (e.g. shifts in the abundance and distribution of species that are presently rare or absent, such as the Mediterranean monk seal and the dugong), and help investigate past levels of intentional killings as well as changes in the public perception of marine mammals (e.g. see Bearzi et al. 2004, 2010).

Citizen science

A "citizen scientist" is a volunteer who helps collect or analyse research data. Citizen science projects have been flourishing around the world (Silvertown 2009). Involving the general public in marine mammal research through citizen science initiatives can help co-fund long-term monitoring efforts and contribute volunteers who assist in the collection of field data. Clearly, any data collected or analysed by inexperienced project participants must be validated by experts.

The possibility of conducting citizen science projects in the waters of Israel should be considered, with a view to facilitating the staffing and funding of marine mammal research initiatives—whether conducted at sea (e.g. vessel-based research relying on volunteer observers) or on land (e.g. involvement of volunteers in marine mammal stranding networks).

3.3 Capacity building

Why capacity must be built

This Plan moves from the realisation that it is foremost skilled, well-trained, and passionate individuals who can advance knowledge, promote action, and ultimately make a difference when it comes to marine mammal conservation. Passion can stem from the positive example and values set by other individuals playing the part of role models, and it can be cultivated through training and exposure to appropriate stimuli. Even the most passionate individual may become frustrated and divert to other interests if training and learning opportunities are poor.

To contribute to the capacity building process, Israel's universities should establish academic curricula relevant to marine mammal science and conservation. Passionate local experts who are willing to share their drive must be empowered and motivated to spread seeds of knowledge. Capacity and expertise, however, should be allowed to flourish beyond opportunities of learning from local experts or at national universities. For instance, marine mammal conferences offer excellent chances for networking and making scientific progress, but such conferences are rarely held within Israel.

Therefore, opportunities for professional growth within the country should be further enhanced by facilitating travelling and training abroad, e.g. to participate in conferences, seminars, workshops and short-term training courses. Additional valuable skills can be acquired through volunteer programmes, assistantships and internships. Several affordable field courses exist in the Mediterranean region, where theoretical lectures are combined with data collection at sea. These experiences, including direct encounters with the animals, are often invaluable and can provide motivation and ideas to kick off a career as a marine mammal conservation biologist.

Capacity building priorities

Priority 1 *— Enhance individual opportunities for professional growth*

Israeli students and young researchers must be provided with opportunities for training and professional growth in the field of marine mammals science and conservation, both within the country and at centres of excellence abroad. The most passionate and skilled individuals should be allowed (e.g. through grants and awards) to enhance their potential for producing high-quality independent work relevant to marine mammal conservation, in realms that encompass science, management, education, awareness and outreach.

Trained individuals who possess relevant skills also must be able to find actual working opportunities within Israel to ensure that the capital invested in their education is not wasted and Israel's cumulative expertise can increase. Favourable environments must be created in which individuals can grow professionally and express their full potential. Such endeavour encompasses the creation of marine mammal laboratories, research centres and other infrastructure, the establishment of specific university curricula, and the provision of support to institutions that can offer marine mammal positions to deserving individuals.

***Priority 2** — Ensure easy access to information*

Access to information is essential, and action should be taken to ensure that any information relevant to marine mammal science and conservation can be promptly retrieved by interested individuals. That includes 1) being informed about the existing opportunities, and 2) having access to scientific literature, marine mammal datasets, procedural protocols, handbooks and other information.

Students and young researchers should also be informed about the opportunities mentioned in Priority 1: training within the country and abroad, laboratories and teams doing marine mammal work, marine mammal experts willing to accept interns, university courses, workshops and conferences, as well as grants, awards and other funding sources. This information should be made available online and kept constantly updated.

An understanding of what was done by others, and how, allows for identification of important problems and possible solutions. Access to marine biology literature and specialised collections of marine mammal literature (including historical information) is essential for the progress of science. Unfortunately, even knowing what has been published in a given field may be difficult, particularly when it comes to historical literature, 'grey' literature and reports. Today, most peer-reviewed scientific articles are available online, but downloading them implies considerable financial burden unless one benefits from free online access. Public libraries with extensive and updated collections of marine mammal and marine biology literature (with emphasis on the Levantine Basin and northern Red Sea) would help solve the problem. In addition, making available online comprehensive and well-managed literature databases, and when possible the actual publications, will facilitate the work of scientists and young students interested in marine mammals.

Capacity building actions

Facilitate participation in meetings and courses

A granting system should be developed to provide selected students and young researchers interested in marine mammal science and conservation with ways of learning and specialising, either in Israel or abroad. That should include promoting and co-funding their participation in 1) international marine mammal conferences, workshops and meetings, 2) field courses involving direct observations of marine mammals and field data collection, 3) training courses to acquire advanced skills in data analysis and project design, and 4) marine mammal research conducted in the region (e.g. as observers on survey vessels).

The Action Plan's Steering Committee (Section 3.1) should be involved in the selection of the most promising candidates, based on a standard application process available online. Once students and researchers have been provided with training, they should be required to send feedback to the Committee, the aim of which should be to keep the most deserving trainees involved in the long-term.

It is fundamental that any know-how acquired by the trainees is put to good use and channelled to research and conservation programmes within the country. That requires national frameworks and organizations capable of integrating skilled individuals and eventually providing them with paid jobs.

Provide Israeli researchers with funding opportunities and facilitate the publication of important work

Governmental funding mechanisms in Israel should explicitly include marine mammal research and conservation. Funding mechanisms should provide opportunities of submitting project proposals, ideally in

the context of cross-institute and cross-country collaborations (also open to the participation of NGOs). In addition, private funding institutions should be motivated to contribute funding to marine mammal research and conservation projects. Calls for proposals should be posted online and widely disseminated.

Funding should become available for 1) the collection of new data in the context of new projects relevant for marine mammal conservation, 2) the continuation of important long-term work conducted by experienced teams, 3) the dissemination, analysis and publication of existing marine mammal datasets, and 4) the publication of books, handbooks, review papers, and other contributions that may significantly advance local and regional knowledge.

Again, the Steering Committee should be involved in the selection of project proposals.

Establish academic curricula relevant to marine mammal research and conservation

Financial support should be given by the Government to academic and education institutions, towards the establishment of curricula relevant to marine mammal science and conservation. Private foundations may also contribute to long-term funding of such curricula.

Teaching positions should be more appropriately established at Universities that are determined to sharpen their focus on marine mammals—including through the creation of facilities, libraries, data banks and initiatives such as those described in other sections of this Action Plan.

Promote exchange of information at the national level

An "Israel Society for Marine Mammalogy" may be established to promote and oversee the organization of a marine mammal conference to be held annually or biennially within the country. The Society should aim to involve scientists as well as teachers, managers of marine protected areas, NGO representatives, stakeholders, national authorities and conservation officers, with the primary goal of creating a periodic forum for information sharing and networking.

During the marine mammal conference, workshops and meetings should be organized with the goal of bringing together authorities, managers and stakeholders to exchange views, share experience and discuss challenges and possible solutions.

A funding mechanism should be identified, beyond membership and conference fees, to allow for 1) the invited participation of high-profile national and international experts (e.g. as invited speakers), 2) the invited participation of relevant stakeholders in workshops with management objectives, 3) the waiving or reduction of conference fees for selected individuals or categories (e.g. students, school teachers), and 4) the institution of a Student Award to promote high standards in the quality and clarity of scientific oral and poster presentations.

Inform and train officers and stakeholders to support the implementation of this Action Plan

Specific training should be provided to officers, public administrators and marine reserve personnel to make them aware of this Action Plan and inform them about action (either binding or not-binding) that should be taken to protect marine mammals in Israel.

A group of experts should be identified and empowered through institutional support, to organize and hold presentations at relevant offices and facilities where the goals, implementation strategy and actions in this Plan can be communicated. Such approach can be combined with the dissemination of information documents (that, however, may be less likely to be favourably accepted, understood, or even considered).

Make information available online through a high-profile marine mammal web site

A comprehensive web site (ideally in Hebrew and English) dedicated to marine mammal science and conservation should be designed, and managed consistently in the long term by a small team of marine mammal conservation experts in partnership with a skilled web designer/programmer. The web site should become a primary source of information about marine mammals in the waters of Israel, but its purpose may encompass the entire Levantine Basin and the northern Red Sea. The web site should aim to become a valuable tool not only for Israeli users, but for anyone in the region. It should be designed in a way that appeals to both the general public and the specialist, and should ensure easy access and retrievability of information through a well-thought, friendly design and programming. Structure and design should be flexible enough to allow for the expansion of the web site as new information becomes available and sections added.

At some point, the web site may include a user-friendly section where photos and videos can be easily uploaded to report sightings of marine mammals in the waters of Israel, complemented by validation and feedback provided by experts.

This Action Plan may be used as a primary source of information for the first steps of web site development. With time, contents should be widened by including e.g. detailed information about species, taxonomy, threats, facilities, opportunities in Israel and abroad, advice to students, interviews with experts, resources, videos etc.

It is of foremost importance that the web site is managed in the long term, and regularly updated. That implies 1) funding sources that are reliable and can ensure a long-term perspective, and 2) expert personnel in charge of amending information that has become obsolete, and adding new contents (possibly including a blog or news section on marine mammal science and marine conservation management in Israel).

Establish a marine mammal and marine conservation library

This Action Plan contributes a relatively comprehensive list of literature on marine mammals in Israel (Annex 2). However, more information is certainly available, which should be identified and added to the list. In particular, the list should be expanded to include historical literature and work published in languages other than English and Hebrew (ideally, such work should be integrated by translations).

As a second step, the library can be expanded to include a comprehensive list of literature on marine mammals in the Mediterranean and Red Seas. Once such library has been created, the actual publications should be made available in print at selected public and university libraries across the country, to allow easy access to anyone interested. This marine mammal library would be even more relevant if it becomes part of a larger library with a focus on marine science and conservation.

Literature information on marine mammals in the region should be easily retrievable through a searchable database (including keywords), which can be made available online—for instance in a dedicated section of the marine mammal web site described above. A part-time librarian showing competence, passion and determination to provide excellent long-term service should be trained and hired. The librarian should ensure that the library is updated and widened, to embrace fields that are directly and indirectly relevant to marine mammal science and conservation.

Ideally, the physical marine mammal library should include access to computers that allow for database access and free download of scientific publications. Printing service may be provided at a small fee. The facility hosting the marine mammal library and database should offer a pleasant and quiet environment where studies can be conducted without significant time constraints. The library might also include a room for small-scale marine mammal meetings and workshops (with multimedia projector etc.).

3.4 Awareness and education

The power of awareness

It is often claimed that lack of scientific information is the primary factor hampering conservation management. However, even extensive scientific evidence is unlikely to result in successful management as long as there is poor public awareness of the need to protect biodiversity and natural resources.

Public attitudes certainly play a major part in ensuring the success of efforts to protect marine biodiversity. People are not only consumers who can influence the market and bend it towards sustainability, but also voters and the ultimate arbiters of public policy. Marine mammals are culturally valued, charismatic animals that have become conservation icons. Raising conservation awareness among wide sectors of the civil society can strengthen community support and influence decision-making as well as human behaviours that have negative impacts on these animals.

Public awareness campaigns should be carefully designed in the context of long-term strategies with clear objectives. Effective public awareness campaigns focusing on marine mammals and their habitat should aim to convey the idea that marine conservation is not a concession to answer the calls of some tree hugger, but an inescapable, legitimate and far-reaching duty to benefit the whole of society and future generations. This holistic understanding springs from our appreciation of the natural world and our innate tendency to seek connections with nature and other forms of life (biophilia, Wilson 1984), as well as from the variety of ecosystem services, essential to human survival, that can be provided by a pristine environment.

People need to care, and caring comes from understanding and heartfelt awareness. Actions that manage to instil a solid and long-lasting affection for nature will promote the development of a society that cares about protecting biodiversity (Orr 2004). Therefore, the main priority of public awareness and education action must be creating a culture of “caring for nature”, which will provide a favourable ground for conservation-oriented policy and management. Marine mammals are charismatic “flagship species” that can elicit awe and are particularly suited for awareness initiatives, but as long as people are unaware that marine mammals occur in national waters they are unlikely to support marine conservation efforts. Protecting marine mammals and ensuring their long-term survival and well-being in the waters of Israel should be widely perceived as a conservation priority.

Awareness and education actions

Design and conduct a nation-wide awareness campaign

This action consists in formulating and implementing a comprehensive nation-wide awareness campaign designed to inform the general public about the urgent need to protect marine mammals and their habitat. The public should be provided with accurate information and become aware of the importance of reducing human impacts and addressing marine mammal conservation problems.

First, the public should be informed that several marine mammal species occur in the waters of Israel, and come to appreciate the importance of protecting these animals. Second, the public should be made aware that it is impossible to protect marine mammals without preserving the environment they live in. Third, the

public should be informed about ways of contributing to the conservation of marine biodiversity, including through changes in behaviour, exercise of democratic rights, and direct contribution to (or co-funding of) conservation action.

The campaign should aim to convey a positive conservation message (e.g. "marine mammals are worth protecting, and they *can* be protected") rather than spreading exclusively negative information, which may be perceived as ultimately frustrating ("marine mammals are vanishing").

The campaign should show positive examples of communities and stakeholders that have benefited from enlightened marine conservation management. Positive examples should be given of individuals (scientists, students, fishers, managers etc.) who have enriched their life and found personal and professional gratification by contributing to marine conservation.

Members of the public should be encouraged to become personally involved. Hands-on, practical ways of contributing to marine mammal conservation should be offered, e.g. through participation in volunteer programmes and field courses.

Marine mammals should not be mystified (e.g. idealised or turned into funny characters). Rather, they should be shown as closely as possible to what they are: magnificent animals with a dignity and a right to live in a healthy environment. They should be presented as key components of ecosystems that are complex, interrelated and vulnerable. Finally, marine mammals may be valuable tourist resources and they can help improve the natural and cultural attractiveness of an area.

When an awareness and education campaign targets stakeholders who may be directly affected by management actions intended to protect marine mammals, listening, asking questions and offering a range of solutions may be more effective than preaching.

Step 1 — Define the target public

Public awareness and education actions can be designed to affect audiences as diverse as:

- □ Central government authorities and agencies
- □ Individual policy makers, politicians and other decision makers
- □ Regional and local authorities (port police, municipalities etc.)
- □ Officers and management bodies of marine reserves
- □ Fishers, both individually and at all structural levels (federations, cooperatives, associations etc.)
- □ Recreational and semi-professional fishers
- □ Local communities in coastal areas of importance for marine mammals
- □ School pupils, students and teachers throughout the country
- □ Shipping and marine transportation sectors
- □ Pleasure boaters
- □ Recreational and professional divers
- □ Non-governmental organizations
- □ The tourism sector
- □ The scientific community
- □ The general public
- □ The media (individual journalists, writers and authors, TV and radio networks, social media etc.)

Step 2 — Define a communication strategy and develop a comprehensive set of actions

A broad communication theme should be identified (for example: "we protect marine mammals"), together with a rationale ("why marine mammals must be protected"), a communication strategy (language, logo,

use of testimonials etc.), and a set of communication media (TV, radio, YouTube videos, social networks, public events, presentations at schools, multimedia happenings, flash mobs etc.) tailored to impress and ultimately affect the behaviour of the target groups.

Specific actions that will lead to increased awareness should be identified based on lessons learned in other countries. The campaign may include the following actions:

- □ Production of printed materials (booklets, handbooks, posters, leaflets, newsletters, stickers etc.)
- □ Production or translation of video documentaries
- □ Identification and involvement of testimonials (possibly including charismatic and passionate marine mammal experts or celebrities known for their commitment to conservation)
- □ Social media and web campaigns
- □ TV and radio interviews with experts and testimonials
- □ Events dedicated to marine mammals and celebrating marine biodiversity (seminars, "dolphin days", concerts, theatre plays, photography and art exhibitions etc.)
- □ Involvement of the public in events advocating marine conservation
- □ Creation of a national web site dedicated to marine mammals (Section 3.3).

Step 3 — Identify potential funding sources

A far-reaching proposal should be developed and submitted to potential funders. Such endeavour may benefit from successful examples of projects including strong public awareness and education components, which were conducted recently in other parts of the region.

Examples include *inter alia*:

- □ Project THALASSA (Greece)
  see: http://thalassaproject.mom.gr
- □ Project NETCET (Adriatic Sea: Italy, Slovenia, Croatia, Montenegro and Albania)
  see http://www.netcet.eu

Raise awareness in kindergartens and schools

Environmental education at schools is one of the most important ways of raising awareness and cultivating the soil where the next generation of marine mammal researchers, conservation biologists and managers can grow. Marine mammals are particularly charismatic and therefore suitable for stimulating interest and being the focus of a nation-wide education campaign targeting pupils of all ages.

Since 2009 IMMRAC has been conducting an educational programme in kindergartens, called "Feel the Sea". This programme stimulates children curiosity through practical experiences and investigations of sea resources and marine life. The programme emphasises personal responsibility and provides examples of ways of protecting biodiversity and ensuring continued ecosystem services. IMMRAC's ongoing educational activities should be expanded through a comprehensive project designed to organize presentations and activities at kindergartens and schools throughout the country, targeted to the various age classes, where pupils are given a chance of learning about marine mammals, their role in the marine ecosystem and the need of protecting them. Presentations should be combined with the dissemination of educational materials (possibly including a marine conservation teaching kit to be offered to schoolteachers) to enable follow-up work with the pupils.

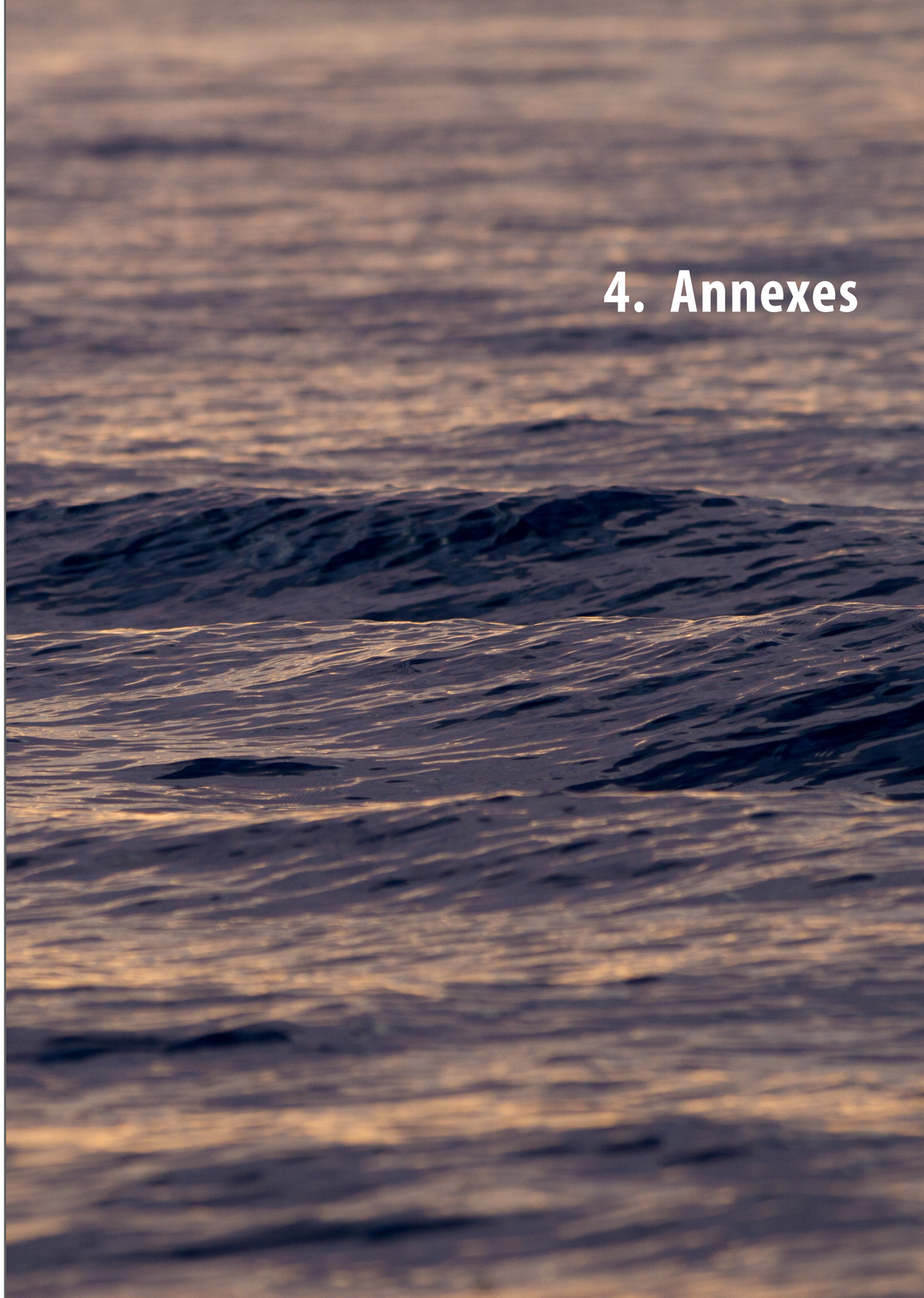
An additional way of raising awareness among pupils is organizing guided trips to educational centres such as the "Dolphin & Sea Centre" located at the Ort Naval Officers School, Ashdod. The Centre, established by IMMRAC in 2016, offers a wide range of educational activities on marine biology and conservation, marine mammals and endangered species.

Promote a reporting and storing system for marine mammal sightings and strandings

An additional indirect way of raising awareness among boaters, fishers and seafarers is to develop a system that allows for the reporting of opportunistic sightings of marine mammals, ideally complemented by photos or videos and geographic coordinates (or precise location). Leaflets and simple forms should be designed and widely distributed (at ports, marinas etc.) to obtain ancillary information on marine mammal occurrence and distribution.

Printed materials should include basic information about the marine mammal species living in Israel, their conservation needs, and a code of conduct for boaters in the presence of the animals. The initiative can be combined with a web-based reporting system where sightings and strandings can be communicated in real time via computer or smartphone.

Information reported by boaters and non-specialists should be validated by marine mammal experts and included in a central database.



4. Annexes

A1 Acronyms and abbreviations

ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
CBD	Convention on Biological Diversity
CIESM	International Commission for the Scientific Exploration of the Mediterranean Sea
CITES	Convention in International Trade in Endangered Species of Fauna and Flora
CMS	Convention on Migratory Species
CSG	Cetacean Specialist Group
EC	European Commission
EEZ	Exclusive Economic Zone
EU	European Union
GEF	Global Environment Facility
GIS	Geographic Information System
IMMAs	Important Marine Mammal Areas
IMMRAC	Israel Marine Mammal Research & Assistance Center
IMP	Israel Marine Plan
INPA	Israel Nature and Parks Authority
IOLR	Israel Oceanographic and Limnological Research
ISI	Institute for Scientific Information
IUCN	International Union for Conservation of Nature
IUED	Israel Union for Environmental Defence
IWC	International Whaling Commission
MAP	Mediterranean Action Plan
MERCI	Mediterranean Sea Research Center of Israel
MoEP	Israel Ministry of Environmental Protection
MPA	Marine Protected Area
NGO	Non-governmental organization
OBIS	Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations
PAM	Passive Acoustic Monitoring
PERSGA	Regional Organization for the Conservation of the Environment of the Red Sea and Gulf of Aden
RAC/SPA	Regional Activity Centre/Specially Protected Areas
SAC	Special Area of Conservation
SPA	Specially Protected Area
SPAMI	Specially Protected Areas of Mediterranean Importance
SPNI	Society for the Protection of Nature in Israel
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environmental Programme
WCPA	World Commission on Protected Areas

A2 Literature on marine mammals in Israel

Studies on marine mammals in the wild

Criteria

The following criteria were used for inclusion of literature in the lists provided below: 1) work must refer to the Mediterranean Sea or Red Sea waters off Israel, 2) work must include marine mammal information, and 3) work must be of scientific nature.

The list includes articles published in ISI and non-ISI scientific journals, conference abstracts and contributions to conference proceedings, unpublished technical reports, unpublished theses and other "grey literature".

Although we tried to be comprehensive, some literature may be missing. The literature list presented here, totalling 118 contributions, must be seen as a first step towards a truly complete inventory of the published information (Section 3.3).

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Studies on marine mammals in captivity

Criteria

The following incomplete list of literature is meant to offer an overview of studies involving captive dolphins held at Dolphin Reef, Eilat. These studies however, are of little relevance to the wild marine mammal fauna of Israel. All studied individuals are Black Sea bottlenose dolphins *Tursiops truncatus ponticus*. These include two males and three females imported in 1990 from Taman Bay (Black Sea, Russia), and the progeny of the initial group (other 18 dolphins; Perelberg et al. 2010). Three dolphins were relocated back to the Black Sea (Entrup and Cartlidge 1998, Perelberg et al. 2010).

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A3 Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)

Because of the extraordinary regional importance of ACCOBAMS for cetacean conservation, a summary of its provisions is provided below, largely based on a recent comprehensive review by Scovazzi (2016). Emphasis has been added to some key aspects relevant for the purposes of this Action Plan.

Scope

ACCOBAMS was concluded within the framework of the Bonn Convention and entered into force in 2001. The Parties to ACCOBAMS recognise that cetaceans must be conserved for the benefit of present and future generations and that their conservation is a common concern. The Agreement binds the Parties to applying the precautionary principle, and requires an environmental impact assessment before activities that may affect cetaceans or their habitat are undertaken. ACCOBAMS binds its Parties to achieve and maintain a favourable conservation status for cetaceans. The Parties commit to prohibiting deliberate takes of cetaceans, establishing protected areas and taking measures specified in the ACCOBAMS conservation plan. As pointed out by Scovazzi (2016), ACCOBAMS does not contain provisions that exclude its application to navy ships or State-owned ships in general and therefore military activities seem to fall under the scope of the Agreement.

No taking of cetaceans

One of the main obligations of the Parties to ACCOBAMS is to prohibit and take all necessary measures to eliminate, where this is not already done, any deliberate taking of cetaceans (as defined in the Bonn Convention, taking includes hunting, fishing, capturing, harassing, deliberate killing, or attempting to engage in any such conduct). Not only whaling, in any of its forms, but also all activities which may harass cetaceans are consequently banned in the Agreement area. Two exceptions to the interdiction of "taking" are envisaged in emergency situations and for non-lethal *in situ* research aimed at maintaining a favourable conservation status for cetaceans. Emergency situations are only those "where exceptionally unfavourable or endangering conditions" for the conservation status of cetaceans occur. Due to the broad meaning of "taking", some activities which have taken place in the ACCOBAMS area, such as the use of dolphins for military exercises or the keeping of cetaceans in captivity for exhibition or amusement, are to be considered as violations of the obligations arising from ACCOBAMS.

Marine Protected Areas

Another main obligation of Parties to ACCOBAMS is the establishment of a network of Marine Protected Areas that would contribute to achieve and maintain a favourable conservation status for cetaceans. At the Mediterranean regional level, the relevant instrument is the SPA Protocol of the Barcelona Convention. In 2010, the ACCOBAMS Meeting of the Parties identified 10 "areas of special importance for the common dolphin and other cetaceans", three "areas of special importance for Black Sea cetaceans", five "areas of special importance for the bottlenose dolphin", one "area of special importance for the sperm whale" and three "areas of special importance and diversity for various cetacean species".

ACCOBAMS Conservation Plan

The Conservation Plan of ACCOBAMS deals with the conservation, research and management measures that the Parties "shall apply". While the Parties are under a legal obligation to apply the measures in question, they are allowed to comply with this obligation "to the maximum extent of their economic, technical and scientific capacities", which provides a legal loophole.

Adoption of national legislation

The Parties to ACCOBAMS should adopt and enforce national legislation that gives full protection to cetaceans.

- As regards fishing activities, the obligations to adopt measures to minimise adverse effect on the conservation status of cetaceans, to prevent fishing gear from be discarded or left adrift at sea, to require the immediate release of cetaceans caught incidentally in fishing gears.
- As regards activities in general which may affect cetaceans, the obligation to carry out an environmental impact assessment as a basis for allowing or prohibiting the continuation or the future development of activities such as fishing, offshore exploration and exploitation, nautical sports, tourism and cetacean watching, as well as establishing conditions under which such activities may be conducted.
- As regards pollution, the obligations to regulate the discharge at sea of pollutants believed to have adverse effects on cetaceans and to adopt within the framework of other appropriate legal instruments stricter standards for such pollutants.
- As regards the assessment and management of human-cetaceans interactions, the obligation to take appropriate remedial measures.
- As regards habitat protection, the obligation to establish and manage specially protected areas for cetaceans.
- As regards research and monitoring, the obligation to develop systematic research programmes on dead, stranded, wounded or sick cetaceans.
- As regards capacity building, collection and dissemination of information, training and education, the obligation to cooperate to develop systems for collecting data on observations, incidental catches, strandings, epizootics and other phenomena.
- As regards responses to emergency situations, the obligation to prepare emergency plans.
- As regards institutions, the obligation to create or strengthen national institutions with a view to furthering the implementation of ACCOBAMS.
- As regards the functioning of ACCOBAMS, the obligations to designate a focal point and prepare reports on the implementation of the agreement.

The provisions of ACCOBAMS cannot affect the right of any Party to maintain or adopt more stringent measures for the conservation of cetaceans and their habitats. In other words, if there is a conflict between the provisions in ACCOBAMS and the provisions in national legislation, those that are more favourable for cetaceans prevail (criterion of the better protection).

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